

**BUILDING RESILIENCE
TO DISASTERS AND CLIMATE CHANGE:
PATHWAYS FOR ADAPTIVE AND INTEGRATED
DISASTER RESILIENCE IN INDONESIA**

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ABSTRACT

Disasters caused by natural hazards and climate change impacts are occurring more frequently, and are becoming more costly than ever before. The causes of vulnerability to disasters are socially, economically and environmentally intertwined and result in differentiated impacts across regions and social groups. Disasters are also becoming more complex and uncertain because of the interactions between increasing populations, poorly planned urbanisation and economic developments, and environmental degradation. The acceleration of climate change is expected to increase the frequency, magnitude and severity of hydro-meteorological disasters, and this in turn will lead to exacerbated impacts of such events. The increasing complexities of global environmental and socio-economic change and the interconnectivities between processes at global, regional and local scales requires greater nation and community resilience to disasters.

While there has been a proliferation of research on socio-economic resilience to disasters and climate change, a better utilisation of the concept of governance within disaster risk reduction (DRR) and climate change adaptation (CCA) as part of an integrated analysis is urgently required. The research presented in this thesis aims to identify and examine governance strategies that can better support the integration of DRR, CCA and adaptive governance (AG), in policy and practice, in order to build the resilience of nations and communities. Resilience is used as the overarching theoretical concept for linking the different areas of work on DRR, CCA, and AG. DRR is a systematic approach for risk reduction, while CCA needs to be integrated to DRR for more effective climate-risk reduction activities. Integrating the characteristics and processes of AG into DRR and CCA helps to address increasing complexities and uncertainties, through greater capacity, and more flexible and learning-based governance approach. The theoretical analysis examines the relationships between resilience and DRR, the conceptual development of DRR and CCA integration, the relationships between resilience and AG, and proposes framework and pathways for 'Adaptive and Integrated Disaster Resilience' (AIDR).

The research is framed by a multi-disciplinary analysis that includes areas of research of disaster studies and humanitarian practice, social-ecological, and environmental management and governance studies, developed within the discipline of human geography. The research combines theoretical research with a case study of Indonesia to examine the progress in building resilience, progress and challenges in integrating DRR and CCA, the role of multi-stakeholder platform in DRR as an innovative approach for AG, and how a proposed framework and institutional strategies or pathways for AIDR can be implemented in practice. Indonesia is selected as a case study because it is one of the most vulnerable countries in the world to a range of natural hazards and climate change impacts. In addition, the country has also undergone significant transformation in the way DRR is planned and implemented by a multiplicity of organisations at various governance levels. Semi-structured interviews were conducted with 53 individuals from 27 key stakeholder organisations engaged in DRR and CCA in Indonesia, to examine the roles and responsibilities of a range of different stakeholders, including government organisations, non-governments (NGOs), community-based organisations (CBOs) and international organisations.

This study finds that progress in building resilience in Indonesia is determined by the development of enhanced institutional and policy frameworks for DRR and CCA, the provision of support from international organisations, and the increasing roles of NGOs and CBOs at the sub-national and community levels. Challenges to the integration of DRR and CCA and community development are mainly caused by institutional segregation of sectoral agencies at the national level and the low capacity of local governments in planning and implementation. The outcome of the work presented in this thesis is an adaptive and integrated disaster resilience (AIDR) framework. AIDR is defined as the ability of communities or nations to build disaster resilience in an integrated, systematic and adaptive manner. It is an interdisciplinary, analytical and normative framework that integrates resilience, DRR, CCA, and AG to develop a more coherent understanding of the complexities of addressing disasters and climate change effects, and that provides mechanisms to ensure adaptiveness to future complexities and uncertainties.

The research identifies seven institutional strategies or pathways for implementing AIDR in Indonesia: (1) Integrating the agendas of DRR, CCA and development; (2) Strengthening polycentric DRR governance by increasing the capacity of local governments and other stakeholders, and increasing community participation; (3) Increasing multi-stakeholder collaboration through incentives, showcasing benefits and developing umbrella organisations; (4) Improving knowledge and information exchange through comprehensive research plans and data platforms, and the incorporation of knowledge from different sources; (5) Enabling institutional learning through public awareness and education, training and by prioritising disaster preparedness; (6) Fostering self-organisation and networking amongst community groups through providing resources and connecting them with other local, regional, international, and Hyogo Framework for action (HFA) thematic networks; and (7) Comprehensively implementing disaster-risk insurance and finance across regional, sub-national and local levels, and accessing access to DRR funding from multiple sources. An imperative for all of these pathways is to place more attention and resources at the local level – to actively involve local governments, NGOs and CBOs, and to place communities-at-risk at the centre of integrated resilience-building activities.

This thesis contributes to theory by examining the linkages between four key concepts, resilience, DRR, CCA and AG, and developing a new conceptual framework for AIDR. A contribution to practice is made by critically analysing knowledge, policy and practice in DRR and CCA in Indonesia, and by identifying progress and remaining challenges in building disaster resilience in Indonesia. By applying the pathways identified through the AIDR framework, this thesis provides a comprehensive and systematic assessment of the processes that enable more effective resilience-building, and identifies more targeted and efficient strategies for the integration of DRR, CCA and development in policy and practice.

Key Words: Natural Hazard, Disaster, Resilience, Governance, Disaster Risk Reduction, Climate Change Adaptation, Adaptive Governance, Hyogo Framework for Action, Adaptive and Integrated Disaster Resilience, Indonesia.

ABSTRACT (Bahasa Indonesia)

MEMBANGUN KETAHANAN TERHADAP BENCANA DAN PERUBAHAN IKLIM: LANGKAH MENUJU KETANGGUHAN YANG ADAPTIF DAN TERINTEGRASI DI INDONESIA

Bencana yang disebabkan oleh kejadian alam dan dampak perubahan iklim yang terjadi lebih sering, dan lebih mahal dari sebelumnya. Kerentanan (vulnerability) terhadap bencana dipengaruhi oleh berbagai faktor sosial, ekonomi dan lingkungan yang saling terkait satu sama lain, dan dampak bencana pun berbeda antar tempat dan kelompok sosial. Bencana juga menjadi lebih kompleks dan tidak pasti karena interaksi antara peningkatan populasi, urbanisasi yang tidak terencana, perkembangan ekonomi, dan degradasi kualitas lingkungan. Percepatan perubahan iklim diperkirakan akan meningkatkan frekuensi, besaran dan tingkat keparahan bencana hidrometeorologi, dan ini pada gilirannya akan menimbulkan dampak bencana yang lebih buruk. Meningkatnya kompleksitas perubahan lingkungan dan sosial-ekonomi global serta inter-connectivitas antara berbagai proses pada skala global, regional dan lokal memerlukan perlunya membangun ketahanan (resilience) bangsa dan masyarakat yang lebih besar terhadap bencana.

Saat ini telah berkembang pesat penelitian tentang ketahanan sosial ekonomi terhadap bencana dan perubahan iklim, pemanfaatan yang lebih baik dari konsep tata kelola dalam pengurangan risiko bencana (PRB) dan adaptasi perubahan iklim (API) sebagai bagian dari analisis yang terpadu (integrated). Ketahanan (resilience) digunakan sebagai konsep teoritis yang menaungi tiga konsep yang lain yaitu PRB, API, dan AG. PRB adalah suatu pendekatan sistematis untuk pengurangan risiko bencana, sedangkan API perlu diintegrasikan kedalam kegiatan PRB untuk secara efektif mengurangi dampak resiko bencana dari perubahan iklim. Pengintegrasian karakteristik dan proses AG ke PRB dan API diharapkan dapat membantu untuk mengatasi peningkatan kompleksitas (complexity) dan ketidakpastian (uncertainty), melalui peningkatan kapasitas lembaga, dan tata pemerintahan yang lebih fleksibel dan berbasis pembelajaran. Penelitian yang disajikan dalam tesis ini bertujuan untuk mengidentifikasi dan menguji strategi pemerintahan yang lebih dapat mendukung integrasi PRB, API dan konsep pemerintahan yang adaptif (adaptive governance-AG), dalam ranah kebijakan dan praktis, dalam kerangka besar menuju membangun ketahanan bangsa dan masyarakat. Penelitian ini dibingkai oleh analisis multi-disiplin yang mencakup bidang penelitian bencana (disaster) dan kemanusiaan (humanitarian studies), sosial-ekologis (social-ecological system), dan studi manajemen dan tata kelola lingkungan, dikembangkan dalam disiplin geografi manusia.

Penelitian ini menggabungkan penelitian teoritis dengan studi kasus Indonesia untuk menganalisa kemajuan dalam membangun ketahanan, tantangan dalam mengintegrasikan DRR dan CCA, peran platform multipihak dalam DRR sebagai pendekatan inovatif untuk AG, dan bagaimana kerangka kerja yang diusulkan dan strategi kelembagaan atau jalur untuk AIDR dapat diimplementasikan dalam praktek. Indonesia dipilih sebagai studi kasus karena merupakan salah satu negara yang paling rentan di dunia untuk berbagai bencana alam dan dampak perubahan iklim. Selain itu, negara juga telah mengalami transformasi signifikan dalam cara PRB direncanakan dan dilaksanakan oleh banyaknya organisasi di berbagai tingkat pemerintahan. Wawancara terstruktur dilakukan dengan 53 orang dari 27 organisasi pemangku kepentingan yang terlibat dalam DRR dan CCA di Indonesia, untuk meneliti peran dan tanggung jawab dari berbagai pemangku kepentingan, termasuk organisasi pemerintah, non-pemerintah (LSM), organisasi berbasis masyarakat (CBO) dan organisasi internasional. Temuan dari studi kasus menunjukkan bahwa kemajuan dalam membangun ketahanan di Indonesia ditentukan oleh terbentuknya kerangka kelembagaan dan kebijakan untuk DRR dan CCA, dukungan dari organisasi-organisasi internasional, dan peran LSM dan CBO di tingkat nasional dan komunitas. Tantangan bagi integrasi DRR dan CCA dan pembangunan disebabkan oleh pemisahan instansi sektoral di tingkat nasional dan rendahnya kapasitas pemerintah daerah dalam perencanaan dan pelaksanaan.

Berdasarkan hasil penelitian teoritis tentang keterkaitan ketahanan (resilience) dan PRB, PRB dan API, dan ketahanan dan AG, maka diusulkanlah kerangka kerja (framework) dan strategi (pathways) untuk 'Ketahanan terhadap Bencana secara Adaptif dan Terpadu' (Adaptive and Integrated Disaster Resilience-AIDR). AIDR didefinisikan sebagai kemampuan masyarakat atau bangsa untuk membangun ketahanan terhadap bencana secara terpadu, sistematis dan adaptif. Ini adalah, kerangka kerja analitis dan normatif interdisipliner yang mengintegrasikan ketahanan, PRB, API, dan AG untuk mengembangkan pemahaman yang lebih koheren tentang kompleksitas menangani bencana dan dampak perubahan iklim, dan menyediakan mekanisme untuk memastikan kemampuan beradaptasi terhadap kompleksitas dan ketidakpastian masa depan.

Penelitian ini mengidentifikasi tujuh langkah untuk menerapkan AIDR di Indonesia yaitu (1) Mengintegrasikan agenda PRB, API dan pembangunan; (2) Penguatan pemerintahan/kelembagaan PRB dengan meningkatkan kapasitas pemerintah daerah dan pemangku kepentingan lainnya, serta meningkatkan partisipasi masyarakat; (3) Meningkatkan kerjasama multipihak melalui pemberian insentif, menonjolkan manfaat dan pengembangan kelembagaan, (4) Meningkatkan pengetahuan dan pertukaran informasi melalui rencana penelitian yang komprehensif dan penyediaan platform data, dan penggabungan pengetahuan dari berbagai sumber, (5) Mengaktifkan pembelajaran kelembagaan

melalui kesadaran publik, pendidikan, pelatihan dan dengan memprioritaskan kesiapan bencana; (6) Membina organisasi dan jaringan antara kelompok masyarakat melalui penyediaan sumber daya dan menghubungkan mereka dengan jaringan lokal, regional, internasional, dan jaringan tematik Kerangka Tindakan Hyogo (HFA), dan (7) Menerapkan asuransi risiko dan pembiayaan PRB secara menyeluruh di tingkat regional, sub-nasional dan lokal, dan mengakses akses ke pendanaan dari berbagai sumber. Sebuah keharusan bagi semua strategi ini adalah menempatkan lebih banyak perhatian dan sumber daya di tingkat lokal - untuk secara aktif melibatkan pemerintah daerah, LSM dan ormas, serta menempatkan masyarakat dalam kegiatan ketahanan bencana.

Tesis ini memberikan kontribusi untuk teori dengan menganalisa keterkaitan empat konsep kunci, ketahanan, PRB, API dan AG dan pengembangan kerangka kerja konseptual baru yaitu AIDR. Sebuah kontribusi untuk dunia nyata dibuat secara kritis menganalisis pengetahuan, kebijakan dan praktek dalam PRB dan API di Indonesia, dan dengan mengidentifikasi kemajuan dan tantangan dalam membangun ketahanan bencana di Indonesia. Dengan menerapkan kerangka AIDR, tesis ini memberikan penilaian yang komprehensif dan sistematis dari proses yang memungkinkan tercapainya ketahanan terhadap bencana dan mengidentifikasi strategi yang lebih terarah dan efisien untuk integrasi PRB, API dan pembangunan dalam kebijakan dan praktik.

Kata Kunci: Bencana, Ketahanan (resilience), Pengurangan Risiko Bencana (DRR), Adaptasi Perubahan Iklim (CCA), Pemerintahan Adaptive AG), Indonesia, Ketahanan terhadap Bencana secara Adaptif dan Terpadu.

DECLARATION

I certify that the work in this thesis entitled “Building Resilience to Disasters and Climate Change: Pathways for Adaptive and Integrated Disaster Resilience in Indonesia” has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree to any other university or institution other than Macquarie University.

I also certify that the thesis is an original piece of research and it has been written by me. Any help and assistance that I have received in my research work and the preparation of the thesis itself have been appropriately acknowledged.

In addition, I certify that all information sources and literature used are indicated in the thesis.

The research presented in this thesis was approved by Macquarie University Ethics Review Committee, reference number: <HE30OCT2009-D00158> on <23 OCTOBER 2009>

This thesis is submitted in accordance with the requirements for a Doctor of Philosophy of Macquarie University.

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JULY 12TH, 2013

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Date

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LIST OF PUBLICATIONS

Note: Only publications numbered 1-8 are included in this thesis.

Journal Articles

1. Djalante, R., Holley, C., Thomalla, F., Carnegie, M. (2013). "Pathways for Adaptive and Integrated Disaster Resilience." *Natural Hazards*. Doi: 10.1007/s11069-013-0797-5.
The extended version of the paper was awarded the Second Winner for Oran R. Young Prize – Early Career Scholars Award, at the Earth System Governance Tokyo Conference, 2013.
2. Djalante R., Thomalla, F., Sinapoy, M. S., Carnegie, M. (2012). "Building Resilience to Natural Hazards in Indonesia: Progress And Challenges in Implementing The Hyogo Framework for Action" *Natural Hazards*, 60 (3): 1-25.
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LIST OF ABBREVIATIONS

ACDM	Asian Committee for Disaster Management
ADPC	Asian Disaster Preparedness Centre
AG	Adaptive Governance
AHA	ASEAN Humanitarian Centre
AIDR	Adaptive and Integrated Disaster Resilience
AM	Adaptive Management
AMCDRR	Asian Managing Committee for Disaster Risk Reduction
ARP-DRR	Asian Regional Partnerships for Disaster Risk Reduction
ASEAN	Association of South East Asian Nations
BAKORNAS-PB	<i>Badan Koordinasi Nasional Penanggulangan Bencana</i> / National Coordinating Board for Disaster Management
BAKORNAS-PBP	<i>Badan Koordinasi Nasional Penanggulangan Bencana dan Pengungsi</i> / National Coordinating Board for Disaster and Refugees Management
BAPPEDA	<i>Badan Perencanaan Pembangunan Daerah</i> / Local Development Planning Agency
BAPPENAS	<i>Badan Perencanaan Pembangunan Nasional</i> / National Development Planning Agency
BLUD	<i>Badan Layanan Umum Daerah</i> / Local Public Service Agency
BMKG	<i>Badan Meteorology, Klimatology dan Geophysika</i> / Meteorology, Climatology and Geophysics Agency
BNPB	<i>Badan Nasional Penanggulangan Bencana</i> / Indonesia <u>National</u> Disaster Management Agency
BPBD	<i>Badan Penanggulangan Bencana Daerah</i> / <u>Local</u> Disaster Management Agency
CBDRM	Community-based Disaster Risk Management
CBO	Community-based Organisations
CCA	Climate Change Adaptation
CCR	Coastal Community Resilience
CDE	Consortium for Disaster Education
CDRC	Characteristics of a Disaster Resilient Community
CDR-CBA	Community Disaster Resilience: a Capital-Based Approach
CDRF	Community Disaster Resilience Framework

CDRI	Climate and Disaster Resilience Index
COP	Conference of Parties
CRC	Climate Resilient Cities
CRD	Community Resilience to Disaster
CRED	Centre for Research on the Epidemiology of Disasters
CRF	Community Resilience Framework
CRM	Climate Risk Management
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CBO	Civil Society Organisations
CSR	Community Safety and Resilience
DFiD	Department for International Development
DIBI	<i>Data dan Informasi Bencana Indonesia</i> / Indonesian Disaster Data and Information
DNPI	<i>Dewan Nasional Perubahan Iklim</i> / National Council for Climate Change
DRC	Disaster Resilient Community
DRC	Disaster Resilient Cities
DRM	Disaster Risk Management
DROC	Disaster Resilience for Organization and Community
DRR	Disaster Risk Reduction
EEPSA	Economy and Environment Program for South East Asia
EMDAT	Emergency and Disaster Events Database
ESG	Earth System Governance
EWS	Early Warning System
GAR	Global Assessment Report
GFDRR	Global Facility for Disaster Reduction and Recovery
GITEWS	German-Indonesia Tsunami Early Warning System
GNDR	Global Network for Disaster Reduction
Gol	Government of Indonesia
GIZ	<i>Gesellschaft für Internationale Zusammenarbeit</i> / German Organisation for International Cooperation
HFA	Hyogo Framework for Action
HFI	Humanitarian Forum Indonesia
IAP	ISDR - Asia Partnership
IATF/DR	Inter-Agency Technical Force on Disaster Reduction

ICCTF	Indonesian Climate Change Trust Fund
ICLEI	International Council for Local Environment Initiatives
ICSU	International Council for Science
IDNDR	International Decade of Natural Disaster Reduction
IFRC	International Federation for Red Cross / Red Crescent
IHDP	International Human Dimensions Programme on the Global Environmental Change
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
KOGAMI	<i>Komunitas Siaga Tsunami / Tsunami Alert Society</i>
LIPI	<i>Lembaga Ilmu Pengetahuan Indonesia / Indonesian Academy of Science</i>
LULUCF	Land Use, Land-Use Change and Forestry
MCEER	Multi-disciplinary and the National Centre for Earthquake Engineering Research
Mendagri	<i>Menteri Dalam Negeri / Ministry of Home Affairs</i>
MoE	Ministry of Environment
MoHA	Ministry of Home Affairs
MPBI	<i>Masyarakat Penanggulangan Bencana Indonesia / Indonesia Society for Disaster Management</i>
MSP	Multi-Stakeholder Platform
MTR	Mid-Term Review
NGO	Non Government Organisation
NTB	<i>Nusa Tenggara Barat / West Nusa Tenggara</i>
OCHA	Office of Coordination of Humanitarian Affairs
Perda	<i>Peraturan Daerah / Local Regulation</i>
PLANAS	<i>Platform Nasional Pengurangan Resiko Bencana / National Platform for DRR</i>
PMI	<i>Palang Merah Indonesia / Indonesian Red Cross</i>
PRB	<i>Pengurangan Resiko Bencana / Disaster Risk Reduction</i>
RAN-PI	<i>Rencana Aksi Nasional Perubahan Iklim / National Action Plan for Climate Change</i>
RAN-PRB	<i>Rencana Aksi Nasional Pengurangan Resiko Bencana / National Action Plan for Disaster Risk Reduction</i>
REDD	Reducing Emissions from Deforestation and Forest Degradation
MENRISTEK	<i>Kementrian Riset and Teknologi / Ministry of Research and Technology</i>
MQ	Macquarie University

SCDRR	Safer Community for Disaster Risk Reduction
SD	Sustainable Development
SREX	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
TEWS	Tsunami Early Warning System
TDMRC	Tsunami Disaster Management Research Centre
UNCSD	United Nations Conference on Sustainable Development
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNESCO	United Nations Economics and Social Cooperation
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
UNTWG	United Nations Technical Working Group
UNU	United Nations University
UNU-IAS	United Nations University – Institute of Advance Studies
US/IOTWS	United States/International Organisations for Tsunami Early Warning
USGS	United States Geological Survey
VCA	Vulnerability and Capacity Assessment
WCDR	World Conference on Disaster Reduction
WWF	World Wide Fund for Nature
YLPDRR	Yogyakarta Local Platform for Disaster Risk Reduction

LIST OF TERMINOLOGY

Adaptiveness	The capacity of a social actor or social–ecological to adapt in response to, or in anticipation of, changes in the environment (Lebel et al., 2006).
Adaptability	The capacity of the actors in a system to manage resilience with intent determines whether they can successfully avoid crossing into an undesirable system regime or succeed in crossing into a desirable one (Walker et al., 2006).
Adaptive Governance	A governance approach that favours less rigid, less uniform, less prescriptive, and less hierarchical approaches to governing and embrace more collaborative, decentralized decision making, participatory, flexible and multilevel arrangements to address complex environmental challenges (Lebel et al., 2006; Holley et al., 2011).
Complexity	A situation whereby a problem lacks transparency, is comprised variables with significant connectivity, and there is a time-delay between causes and impacts (Frensch and Funke, 1995).
Climate Change Adaptation	The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (UNISDR, 2009b).
Disasters	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UNISDR, 2009b).
Disaster Risk Management	The systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster (UNISDR, 2009b).
Disaster risk reduction	The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events (UNISDR, 2009b).

Hazards	A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR, 2009).
Hydro-meteorological hazard	Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR, 2009).
Natural hazards	Natural process or phenomenon that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR, 2009b).
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR, 2009b).
Risk	The combination of the probability of an event and its negative consequences (UNISDR, 2009b).
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987).
Transformability	The capacity to create a fundamentally new system when ecological, economic or social structures make the existing system untenable (Walker et al., 2004).
Uncertainty	Uncertainty is related to human's incomplete knowledge of complex problems which leads to an inability to predict future dynamics (Berkes, 2007) or the likelihood and impact of a decision (Milliken, 1987).
Vulnerability	The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009b).

**The Outcome of the United Nations Conference on Sustainable Development
“The Future We Want”: excerpts on Disaster Resilience**

“We reaffirm our commitment to the Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters, and call for States, the United Nations system, the international financial institutions, subregional, regional and international organizations and civil society to accelerate implementation of the Hyogo Framework for Action and the achievement of its goals.

We call for disaster risk reduction and the building of resilience to disasters to be addressed with a renewed sense of urgency in the context of sustainable development and poverty eradication and, as appropriate, to be integrated into policies, plans, programmes and budgets at all levels and considered within relevant future frameworks.

We invite governments at all levels, as well as relevant subregional, regional and international organizations, to commit to adequate, timely and predictable resources for disaster risk reduction in order to enhance the resilience of cities and communities to disasters, according to their own circumstances and capacities.”

**UNCSD, General Assembly Resolution A/RES/66/288
(UNCSD, 2012, p. 36)**

**Conferment of the Global Champion Recognition for Disaster Risk Reduction
to H. E. Mr. Susilo Bambang Yudhoyono, President of Indonesia**

“When a disaster strikes, a leader’s true character is revealed.

*A few short months after you took office, Mr. President,
the earth and sea rose up against Indonesia.*

The damage from the 2004 tsunami was unprecedented.

But you had the wisdom to see that the lessons were just as historic.

*The Asian tsunami was partly responsible for the development of our United
Nations blueprint for disaster risk reduction: the Hyogo Framework for Action.*

Your country was the first to act on it.

You led the way ... and more than 100 other countries followed.

Now, every province in Indonesia has an independent disaster risk agency.

The Government is reaching out to the most remote villages.

And you are committed to the safety of this country’s thousands of schools and hospitals.

Mr. President, I am honoured to be here today to recognize your outstanding work.

*On behalf of the community of nations, it is my great pleasure to salute you as
the world’s first Global Champion for Disaster Risk Reduction.”*

Bali, 19 November 2011

United Nations, the Secretary-General, Ban Ki-Moon

PREFACE

The overwhelming magnitude of witnessing and experiencing disasters firsthand initiated my passion to do research on disasters. This research is specifically motivated by the 2004 Indian Ocean tsunami following an 8.9 Magnitude earthquake off the coast of Sumatra, which had the greatest impact on Aceh, Indonesia. As a person who was working for the Kendari local government at that time, the catastrophe made me wonder: What would the local government do if a disaster of this scale hit my area? How should I and other community members react during the evacuations process? How would I feel about being evacuated and losing many family members?. At that time I was about to start a Master of Project Management degree at Queensland University, Australia. The idea was to do my master's thesis on the coordination of multi-organisations during the recovery and reconstruction process following the tsunami in Aceh. However, due to problems with funding and the time period limitations, I changed my research to a different project. As things turned out, the earthquake that struck Yogyakarta in 2006 re-ignited my desire to do my PhD in disaster management. After being accepted to do my PhD study with the support of an AusAid scholarship, I started my PhD at Macquarie University in July 2009, without any understanding of how disaster should be managed or of the concepts of disaster risk reduction, vulnerability or resilience. During my study here at Macquarie, I met fellow Indonesian students who themselves had survived the Aceh tsunami or experienced the Yogyakarta earthquake, and who had also tragically lost immediate family members.

During the course of doing this PhD research, one disaster after another struck Indonesia and Australia, and repeatedly, worldwide. There was the 2010 earthquake and Merapi volcanic eruption in Yogyakarta. A small tsunami hit Mentawai followed by a flash flood in Wasior, Papua, also in 2010. Massive floods paralysed Jakarta, the capital city of Indonesia, every year. Then, in April 2010 an earthquake shook Kendari, one of my local case studies, a day after I had left Indonesia from my fieldwork in the city. While at the Sydney Airport, I received the news about the earthquake and quickly checked to see if any tsunami warning had been raised, on websites such as USGS or BMKG and the Pacific tsunami warning services. I used many social Internet sites to monitor the situation in Kendari and also to post information on the earthquake, whether a tsunami warning had been raised and what to do if an earthquake were to happen again. These traumatic experiences motivated me to use my time wisely and productively while in Australia. I need to be ready and prepared to return to Indonesia at any time, should an unpredicted disaster such as earthquake hit my home in Kendari. On July 15th 2013, two days after I submitted my thesis, a very long and intense rain event in Kendari flooded and devastated the city. This could have been included in my case study should it happened in my PhD period.

Disasters that have occurred worldwide have given me opportunities to learn about issues that influence vulnerability and the resilience of nations and communities. The Haiti earthquake in 2010 demonstrated how societal vulnerability is heavily influenced by the institutional capacity and governance of a nation. An earthquake that hit the neighbouring country of Chile, with a similar scale to the one that hit Haiti, did not do as much damage, by virtue of the existence of an emergency management system, strong compliance with building codes and effective leadership. The flood that hit Queensland early in 2011 revealed that even in a supposedly more developed nation like Australia, the capacity and experiences in managing disaster impacts would need to be evaluated when the impact of climate variability or climate change become greater over time. There were then two earthquakes in New Zealand in 2011 and 2012. My most vivid memory from the news was about a girl who texted her family to come and get her out from under the rubble of their building. Even the building code of an advanced nation like New Zealand was not adequate to withstand earthquakes of that scale. Society as a whole needs to transform so that we 'live' with disasters, and so that a culture of resilience becomes entrenched within the very fabric of community life. These disasters taught me that people are inherently resilient. People survive, go through, recover and hopefully learn from disasters.

I was in Tokyo attending a workshop on building resilience to disasters when the triple disaster of the Tohoku earthquake-tsunami-nuclear crisis assaulted Japan in March 2011. The near-death experience of walking down the stairs of the United Nations University 10-floor building is still vivid in my mind today. The building swayed to the left and right as I rushed down the stairs. I remember thinking that if the building was to collapse, I would be sure to be buried within it. I was in the middle of writing my thesis, when bush and forest fire broke out in Sydney in the midst of the heat wave that hit Australia in November 2012. It was dreadful trying to think, write and concentrate in my office room in temperatures around 45 degrees Celsius. One headline in a newspaper described the society in wealthy Middle East countries as 'building a fridge inside an oven'. As the world is expected to be warmer over time, we need to learn to live sustainably.

Each event leads me to question whether the research on disasters that I am currently doing is worthy of doing, and whether my study can help to prevent death and reduce the number of people being impacted. These experiences make me extremely aware that, by choosing this topic for my PhD, I am taking on a responsibility to learn and document my learning appropriately and rigorously if I am to contribute to society. My thoughts and prayers go to those who have died or have been otherwise affected by disasters. I hope that this thesis makes an insightful contribution to knowledge in DRR, and that it contributes to reducing disaster impacts upon society at large.

BLANK

PART I OVERVIEW

*“Disasters are complex in nature.
Complex problems require interdisciplinary solutions. In the future, more
interdisciplinary, theory-driven, and empirically robust research is needed to
fully understand the concept of resiliency.”
(Kapucu et al., 2013, p. 358).*

PART I: OVERVIEW

This thesis is divided into four parts, namely Part I: Overview, Part II: Theoretical Review, Part III: Case Study of Indonesia, and Part IV: Synthesis and Conclusion. There are 11 chapters in the thesis.

Part I provides a thesis overview, the rationale of the PhD, key concepts adopted, and the PhD design and thesis structure. There are two chapters in this part.

- Chapter 1 is the introduction. This chapter is structured into six sub-sections. Section 1.1 presents the PhD aim, objectives, and research questions. Section 1.2 outlines the rationale for conducting the PhD and also for choosing Indonesia as the case study. Section 1.3 outlines the positioning of the research within the disciplines of human geography. The next section discusses reviews of the four key concepts adopted, resilience, DRR, climate change adaptation (CCA) and adaptive governance (AG). This leads to the discussions of the proposed adaptive and integrated disaster resilience (AIDR) (Section 1.5). Finally, Section 1.6 presents the PhD design and thesis structure.
- Chapter 2 presents the research methods, fieldwork and analysis. Section 2.1 discusses methods; Section 2.2 outlines details of the fieldwork; Section 2.3 outlines data analysis and publication; and Section 2.4 outlines the ethics and reflections in conducting the research.

CHAPTER 1 INTRODUCTION

1.1 Thesis Aim, Objectives and Research Questions

The world has entered the age of the 'Anthropocene' (Crutzen and Steffen, 2003) in which human systems are affecting environmental systems at such an unprecedented rate (Steffen et al., 2007) that the imbalances could threaten the very existence of humans themselves (Steffen et al., 2004). Global environmental and societal changes have led to increasing uncertainties and complexities (UNEP, 2012), and to address these, an integrated analysis of human-environment or social-ecological systems (SES) is required (Holling, 2001; Turner et al., 2003b; Liu et al., 2007).

Disasters are one of the manifestations of SES interactions (UNISDR, 2009a, 2011b). These impacts are interconnected physically, economically and socially, and can occur at different spatial and temporal scales (O'Keefe et al., 1976; Wisner et al., 2004a; Adger, 2006b). Disasters are further becoming more complex and the impacts are becoming more uncertain due to interactions between increasing populations, poorly planned urbanisation, economic development, environmental degradation and incomplete knowledge on the causes of vulnerability and the impacts of disasters (Cannon and Muller-Mahn, 2010; UNISDR, 2011b). Population growth and urbanisation lead to more people living in high-risk areas, while development in high-risk areas increases economic exposure to disasters (Mileti, 1999; World Bank and United Nations, 2010). Disasters caused by hydro-meteorological hazards (e.g. floods, droughts, storms, extreme temperatures, extreme rainfall events) are expected to be exacerbated by climate change because of the increased frequency, magnitude and severity of these hazard events (IPCC, 2007a). Economic developments often ignore the importance of preserving the quality of the environment (UNEP, 2012), and to a certain extent, exceeding the 'Planetary Boundaries' as a safe operating space for humanity (Rockstrom et al., 2009). Incomplete knowledge on the characteristics of hazards and their associated impacts adds another layer of uncertainty to the analyses of SES (IPCC, 2012b).

The management of disasters and climate change risks requires a multidisciplinary and integrated approach that considers different temporal and spatial scales (Mette, 2012), includes multiple stakeholders (PfR, 2011), integrates multiple sectors (McBean, 2012), and accommodates different types of knowledge, including expert and local knowledge (EMDAT, 2012b). An integrated strategy is necessary since the characteristics of hazards are changing; the impacts on societies are increasing and expected to worsen in the future; climate change-related hazards losses dominate compared to geophysical hazards; and many low and lower-middle income countries are particularly at-risk to many different hazards (Eriksen and O'Brien, 2007; IPCC, 2007c; Linnerooth-Bayer et al., 2007; UNFCCC, 2008; Cannon and Muller-Mahn, 2010; Gaillard, 2010; IPCC, 2011).

Studies that advance understandings of resilience in the context of either disasters or climate change have proliferated in recent years. Scholars and practitioners have also recognised that the combined adverse effects of disasters and climate change must be addressed in an integrated manner in policy and practice. Despite this advancement, the utilisation of governance concept within disaster risk reduction (DRR) and climate change adaptation (CCA) studies as an integrated analysis is still lacking. This thesis contributes to this endeavour by analysing the inter-relationships between key concepts of resilience, DRR, CCA, and adaptive governance (AG). I argue that governance strategies, which integrate DRR, CCA, and development, and provide concrete institutional mechanisms for dealing with complexity and uncertainty, are necessary to help countries move toward becoming more resilient societies. I select Indonesia as a case study for my research because it is one of the countries that are most vulnerable to both geophysical and hydro-meteorological hazards, and which has experienced numerous disasters, from minor to medium and catastrophic scales, and where there exist a range of different stakeholders, government, non-government (NGOs) and international organisations. Indonesia has undergone extensive transformation in the way DRR is governed, and this has led to its prominence in the global DRR communities (UNISDR, 2011e; UN, 2012e). This disposition offers an ideal opportunity for me to study the complexity of governance for, and to gain a better understanding of the progress and challenges in building resilience to, the range of hazards affecting Indonesia. The aim of developing an integrated governance strategy for building resilience is underpinned by the following three research objectives (Table 1-1). The overall research question is: *What governance strategies are needed to achieve an integrated DRR and CCA in order to build resilience to disasters and climate change?* This overall research question is broken down into three more specific research questions that address the objectives of this thesis (Table 1-2).

Research Objectives

1. To develop an in-depth understanding of the inter-relationships between theoretical concepts related to building resilience to disasters and climate change.
2. To review the successes and challenges in building resilience to disasters and climate change in Indonesia, one of the most vulnerable countries in the world.
3. To develop a set of adaptive governance strategies aimed at helping to achieve integrated disaster risk reduction and climate change adaptation in both policy and practice.

Table 1-1: Research objectives of this thesis.

Research Questions

1. What are the theoretical concepts for building resilience to disasters and climate change?
2. What are the successes and challenges in building resilience to disasters and climate change in Indonesia?
3. How can efforts to build resilience to disasters and climate change be better integrated in policy and practice?

Table 1-2: The research questions addressed in this thesis

1.2 Rationale

1.2.1 The need for an integrated approach to build resilience to disasters and climate change

There are three reasons for an integrated approach in building resilience to disasters and climate change. First, the characteristics of hazards and disasters are changing and the economic and societal impacts are increasing, and low and lower-middle income countries tend to be more at-risk to disasters. Second, globally, hydro-meteorological events dominate the number of disasters, and the impacts from these types of hazards are expected to increase. Third, despite the overall progress of global DRR activities, considerable challenges remain. In the following sections I discuss each of these issues in more depth.

1.2.1.1 Global disaster characteristics are changing and the economic and societal impacts are increasing

Disaster is defined as “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (UNISDR, 2009b). Disaster impacts are measured in several ways: the number of deaths, the number of disasters, total number of people impacted, and loss in economical terms (EMDAT, 2012b). In order for a disaster to be entered into the EM-DAT: OFDA/CRED International Disaster Database, at least one of the following criteria has to be fulfilled: 10 or more people reported killed, 100 people reported affected, a call for international assistance, and the declaration of a state of emergency (EMDAT, 2012b). To date, there have been more than 11,000 disasters globally. These have resulted in around 23 million deaths, more than 6.9 million people affected, and damages equivalent to more than US\$ 2.36 trillion (EMDAT, 2012b). The global distribution of disasters caused by natural hazards for the period from the 1900s until 2011 is shown in Figures 1-1 to 1-4. Figure 1-1 shows the number of disasters reported between 1900 and 2011. The figure shows that the number of disasters started to increase slightly in the 1940s and then much more rapidly from the mid-1970s onwards. The last decade experienced the largest number of disasters, with almost 550 disasters reported in some years. While the trend in the number of disasters has decreased since the mid 2000s-2010s, there are still around 400 disasters reported per year. Figure 1-2 shows a similar trend in the number of people affected by disasters with a rapid increase, starting in the 1950s and continuing to the present. Figure 1-3 shows a sudden increase in the estimated damage caused by disasters in 1970s, which has continued to rise at a rapid rate ever since. This increase in damage coincides with the increase in the world’s population, urbanisation and economic investments since the 1970s (World Bank, 2005; UNISDR, 2009a, 2011b).

A more positive outlook is shown in Figure 1-4. This figure indicates that the number of people killed by disasters has decreased considerably since the 1950s. This shows that past efforts in DRR have been successful in reducing deaths, but not in reducing the number of people affected and the economic costs caused by disasters (World Bank, 2005; UNISDR, 2009a, 2011b).

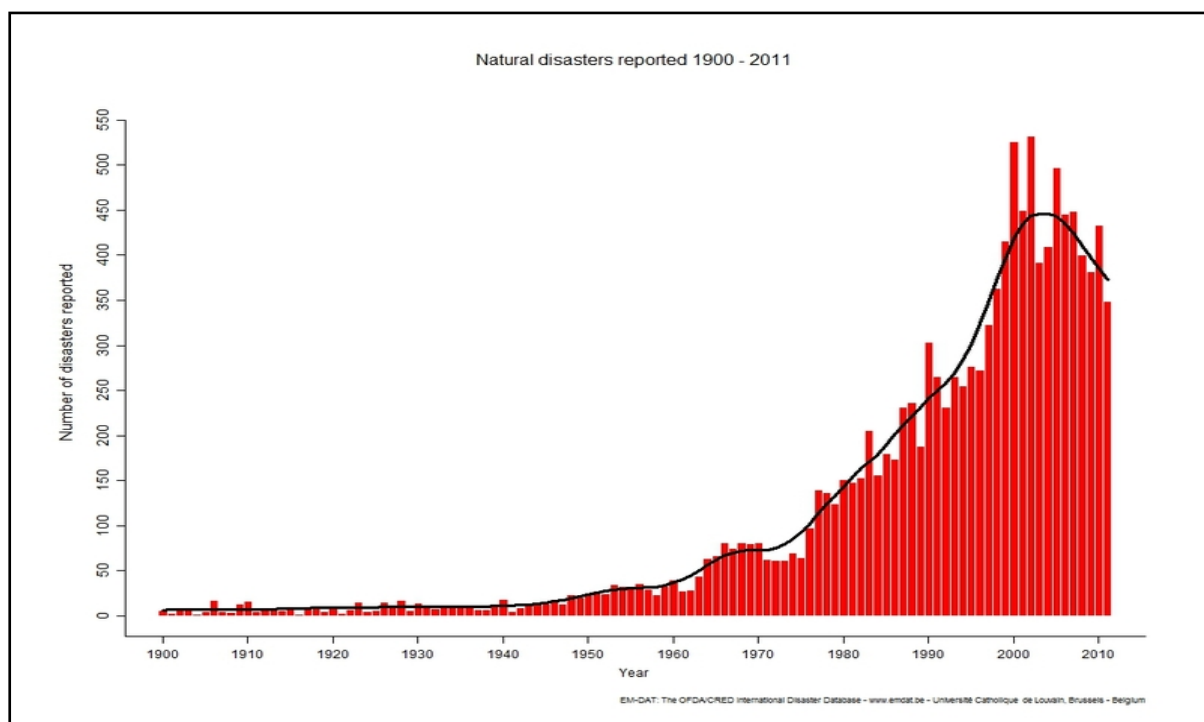


Figure 1-1: Number of Disasters Caused by Natural Hazards Reported During 1900-2011 (EMDAT, 2012b).

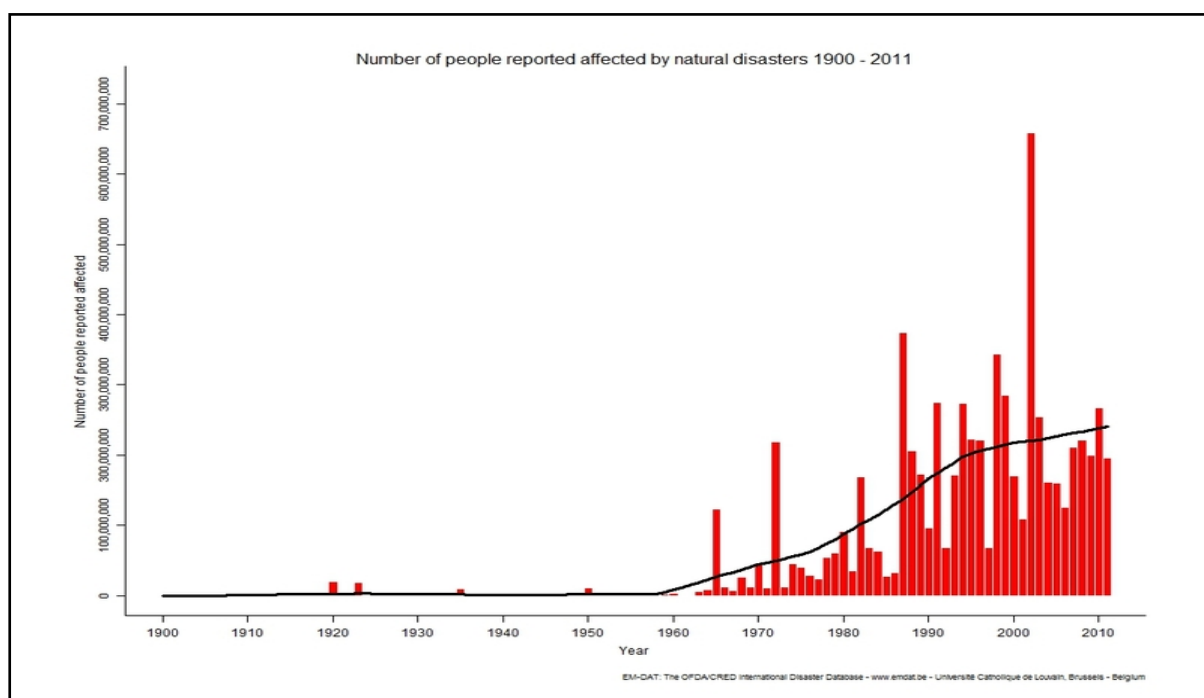


Figure 1-2: Number of People Reported Affected by Disasters During 1900-2011 (EMDAT, 2012b).

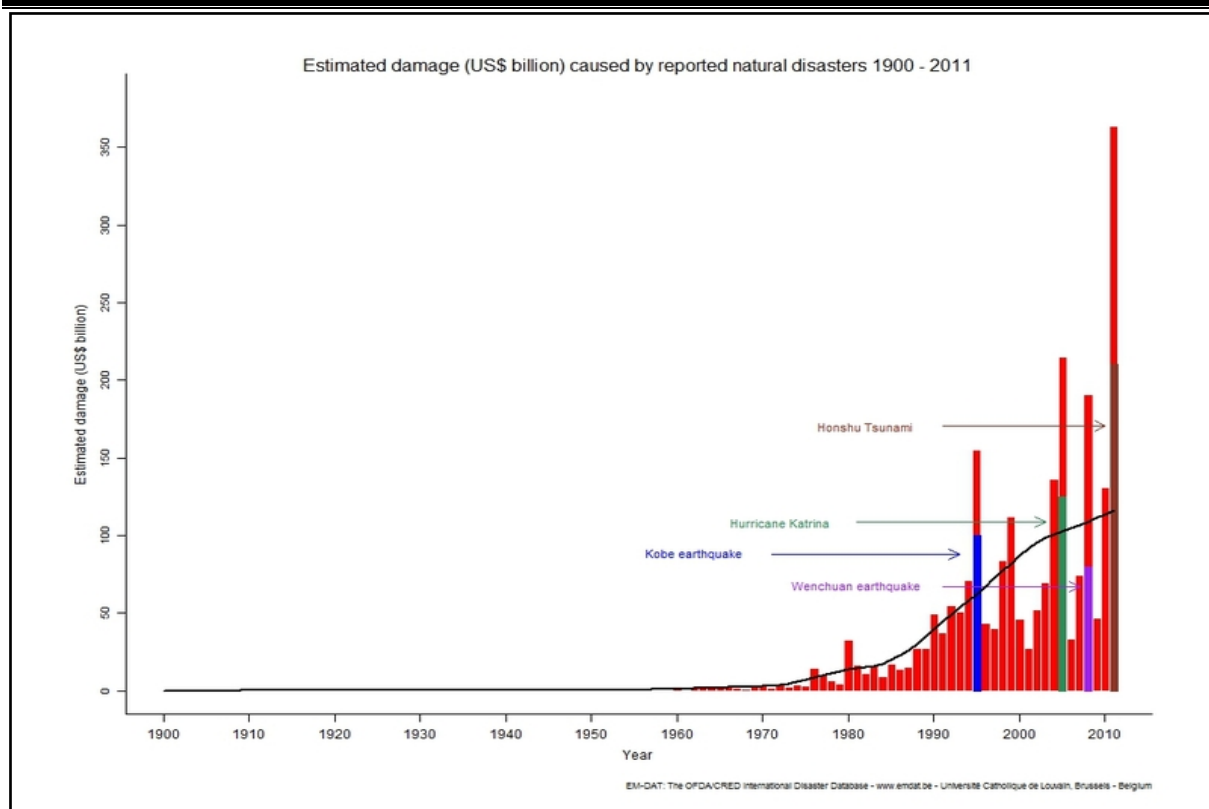


Figure 1-3: Estimated Damage (US\$ Billion) Caused by Disasters During 1900-2011 (EMDAT, 2012b).

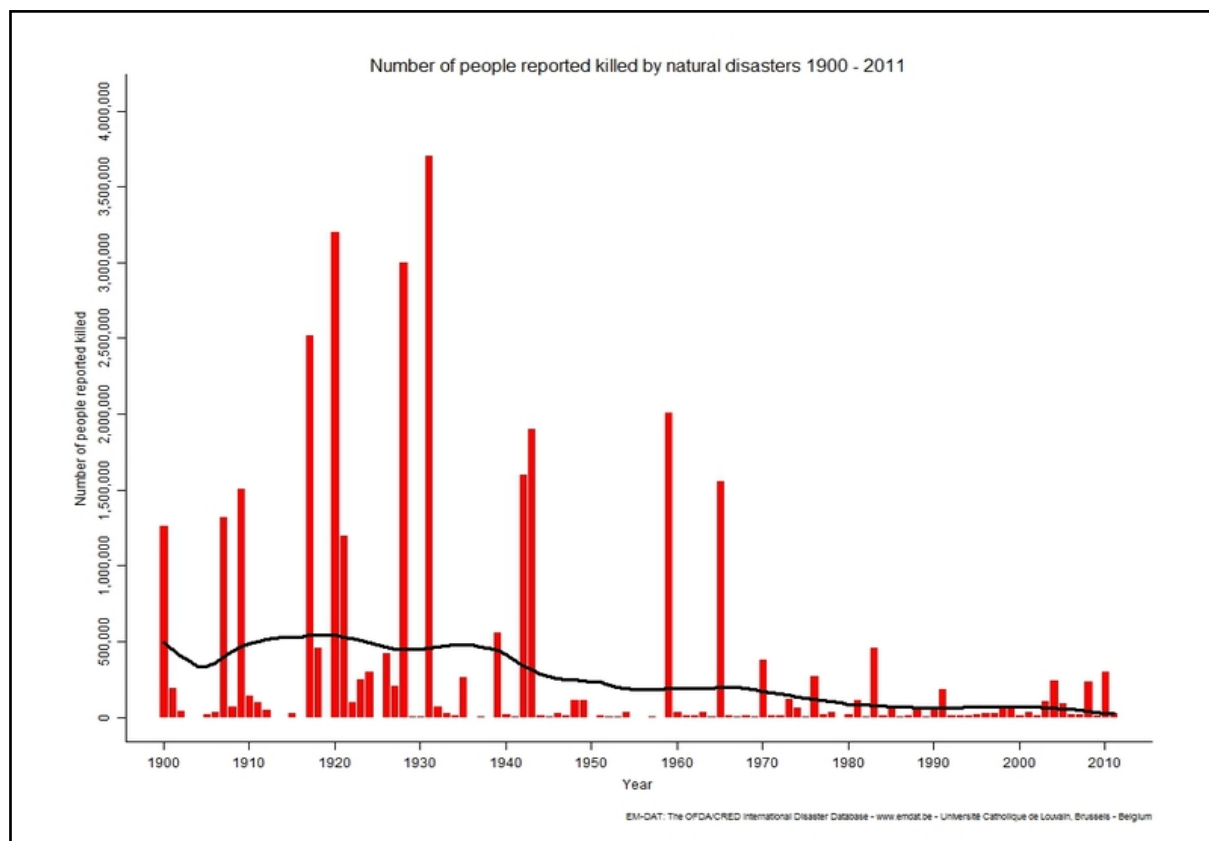


Figure 1-4: Number of People Killed by Natural Disaster 1900-2011 (EMDAT, 2012b).

1.2.1.2 Disasters caused by hydro-meteorological hazards dominate and their impacts are expected to increase

Climate change is expected to increase the frequency, magnitude and intensity of hydro-meteorological hazards (IPCC, 2007a). Figure 1-5 shows the distribution of the number of disasters differentiated by geophysical (earthquake, volcanic eruption and tsunami) and hydro-meteorological hazards. Hydro-meteorological disaster is defined as a “process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage” (UNISDR, 2009b, p. 18). Hydro-meteorological hazards include tropical cyclones (typhoons and hurricanes), thunderstorms, hailstorms, tornados, blizzards, heavy snowfall, avalanches, coastal storm surges, floods including flash floods, drought, heatwaves and cold spells (UNISDR, 2009b, p. 18). In the period from 1900 to 2013, hydro-meteorological disasters strongly dominate the global number of disasters. The period 2001-2010 has been the decade of climate extremes (WMO, 2013). Table 1-3 shows that disasters caused by floods are the most frequent type of disasters, result in the largest number of people affected, and cause the largest amount of damage.

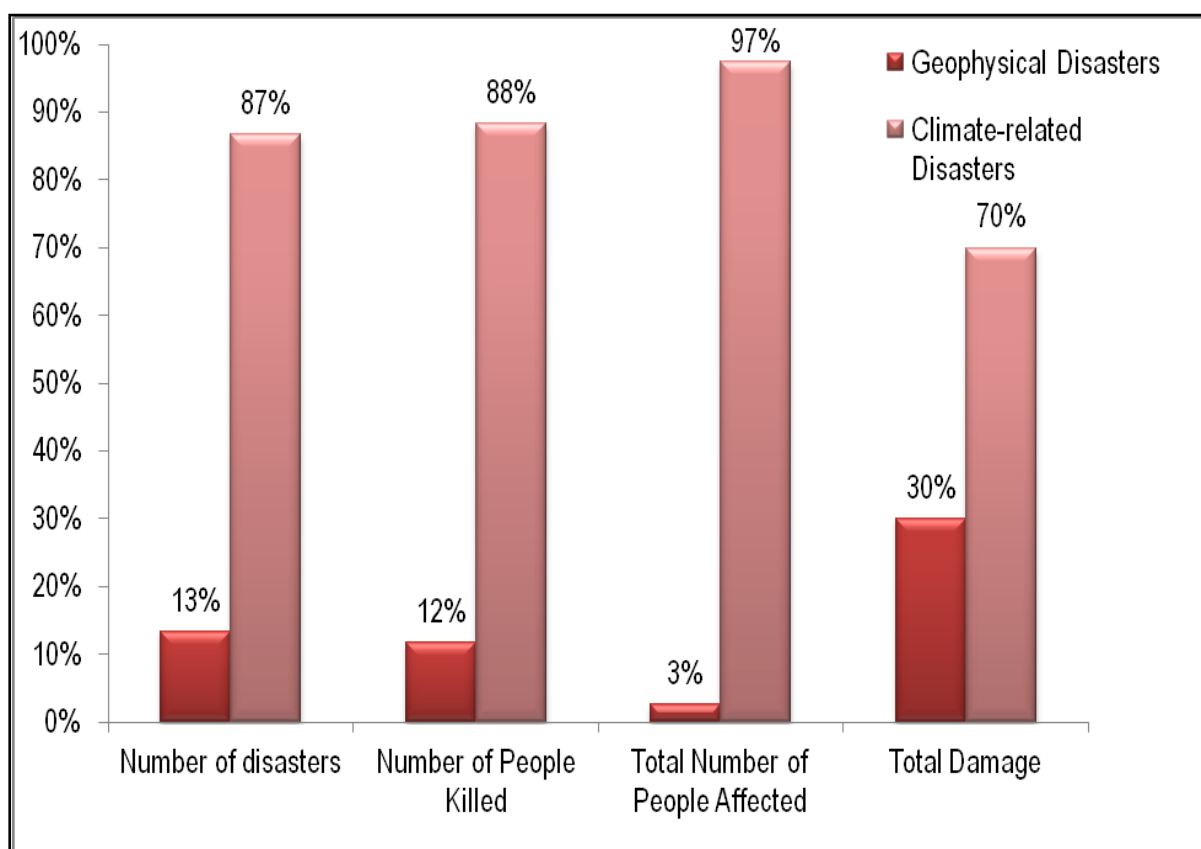


Figure 1-5: Numbers of Geophysical and Hydro-Meteorological Disasters 1990-2013 (EMDAT, 2012b).

PART I: OVERVIEW

Type	Number of Disasters	Number of People Killed	Total Number of People Affected	Amount of Damage (000 US\$)
Drought	636	11,711,271	2,165,064,458	123,627,906
Earthquake (seismic activity)	1,175	2,296,206	170,609,754	531,523,998
Tsunami	58	267,786	2,941,108	223,027,400
Flood	4,153	6,933,334	3,524,576,308	588,188,973
Mass movement dry	55	5,017	29,180	251,600
Mass movement wet	611	59,912	13,697,684	8,449,998
Storm	3,571	1,383,369	924,560,237	399,652,623
Volcano	226	96,312	5,281,981	1,100,000
Wildfire	370	3,643	5,947,952	53,307,055
TOTAL	10,855	22,756,850	6,812,708,662	1,929,129,553

Table 1-3: Different types of disasters and their impacts worldwide 1900-2013 (EMDAT, 2013c).

1.2.1.3 High vulnerability to disasters of low and lower-middle income countries

The relationships between disasters and development are well documented (Middleton and O'Keefe, 1997; Paton and Johnston, 2001; Pelling and Uitto, 2001; Adger et al., 2002; Folke et al., 2002; McEntire et al., 2002; Pelling et al., 2002; Adger et al., 2003b; Pelling, 2003a; Pelling et al., 2004; Adger et al., 2005a; Sperling and Szekely, 2005; Schipper and Pelling, 2006; IDS, 2007; UNDP, 2007/8; CCCD, 2008; Collins, 2009). Disasters can impede development gain and reverse years of development works (Schipper and Pelling, 2006). Impacts from floods, earthquakes, forest fires and other disasters can significantly affect human livelihoods. Development is closely linked with the level of exposure of a community, while conversely, the level of disaster risks experienced in a community is linked to the developmental choices undertaken (UNDP, 2004). Hence Schipper and Pelling (2006) suggest for an integrated approach for reducing losses to disasters, meeting development goals and responses to climate change.

The World Bank (2013c) classifies countries' economies based on gross national income (GNI) per capita. A country is of low income when the GNI is US\$ 1,025 or less, lower-middle income when GNI is US\$ 1,026 - US\$ 4,035, upper-middle income when GNI is US\$ 4,036 - US\$ 12,475, and high income when GNI is US\$ 12,476 or more (Figure 1-6). Low-income and middle-income economies are referred to as 'developing economies'. Disasters impact low-income countries disproportionately (Figure 1-7). EMDAT shows that 98% of death from disasters occur in low- and middle-income countries combined, while only 2% in high-income countries (EMDAT, 2012b). Low-income countries also suffer disproportionately when the economic loss is measured in proportion to their gross domestic product (GDP) (Hochrainer, 2009).

Developing countries in the global South and Small Island Developing States (SIDS) are generally considered to be more at-risk to disasters because of their socio-economic and governance characteristics: 1) Poor and marginalised people tend to live in informal settlements without adequate protection and safety standards and they tend not to have sufficient capital or insurance to be used as a buffer in times of hardship; 2) Infrastructure is frequently planned in high-risk areas without consideration of the risks from natural hazards and climate change impact; 3) Building codes don't exist or are not enforced, which causes infrastructure and dwellings to be vulnerable to hazard; 4) Lack of capacity and ineffective governance structures and institutions; and 5) High dependence on climate-dependent livelihood sectors such as agriculture, or fisheries (UN HABITAT, 2007, 2011).

The World Risk Index (WRI) (Figure 1-8) describes the level of risk to different countries of disasters based on exposure, susceptibility, coping capacities and adaptive capacities (UNU-EHS, 2012). The World Risk Index defines exposure as entities (populations, built-up areas, infrastructure components, environmental areas) that are exposed to the effects of one or more natural hazards. Susceptibility refers to the likelihood of harm, loss and disruption in an extreme event triggered by a natural hazard, which is calculated based on infrastructure, nutrition, housing situation and economic framework conditions (UNU-EHS, 2012). Coping capacity is the abilities of societies and exposed elements to minimize negative impacts through direct action and resources available, based on governance, disaster preparedness and early warning capacity, medical services, and social networks (UNU-EHS, 2012). Adaptation encompasses strategies to deal with the negative impacts of natural hazards and climate change in the future (UNU-EHS, 2012). Of the 173 countries included in the WRI, Vanuatu is the country most at-risk and Qatar is the least at-risk (UNU-EHS, 2012). The Climate Change Vulnerability Index (Figure 1-9) shows that countries in the global South, many of which are developing countries, are more vulnerable than countries in the North (Maplecroft, 2012). This Index identifies Manila, Ho Chi Minh City, Mumbai, Chennai, Kolkata, Dhaka, Yangon, Bangkok, Jakarta, and Lagos as cities that are extremely vulnerable to climate change (Maplecroft, 2012). All of these cities are megacities and located in low or lower-middle income countries (Maplecroft, 2012). They are the most vulnerable because they are located in low-lying coastal areas (Zou and Wei, 2010) and urbanisation forces people to live in high-risk areas such as riverbanks, flood plains, or mountain-slopes (Pelling and Mustafa, 2010). Any slight increase in sea level or precipitation leads to flooding or landslides. Majority of these cities house as many as 10 million people, which put immense pressure on the environments and in turn can increase exposure to hazards (Kreimer and Munasinghe, 1991). Ineffective governance further undermines the adaptive capacity of people in these countries (Hill and Engle, 2013).

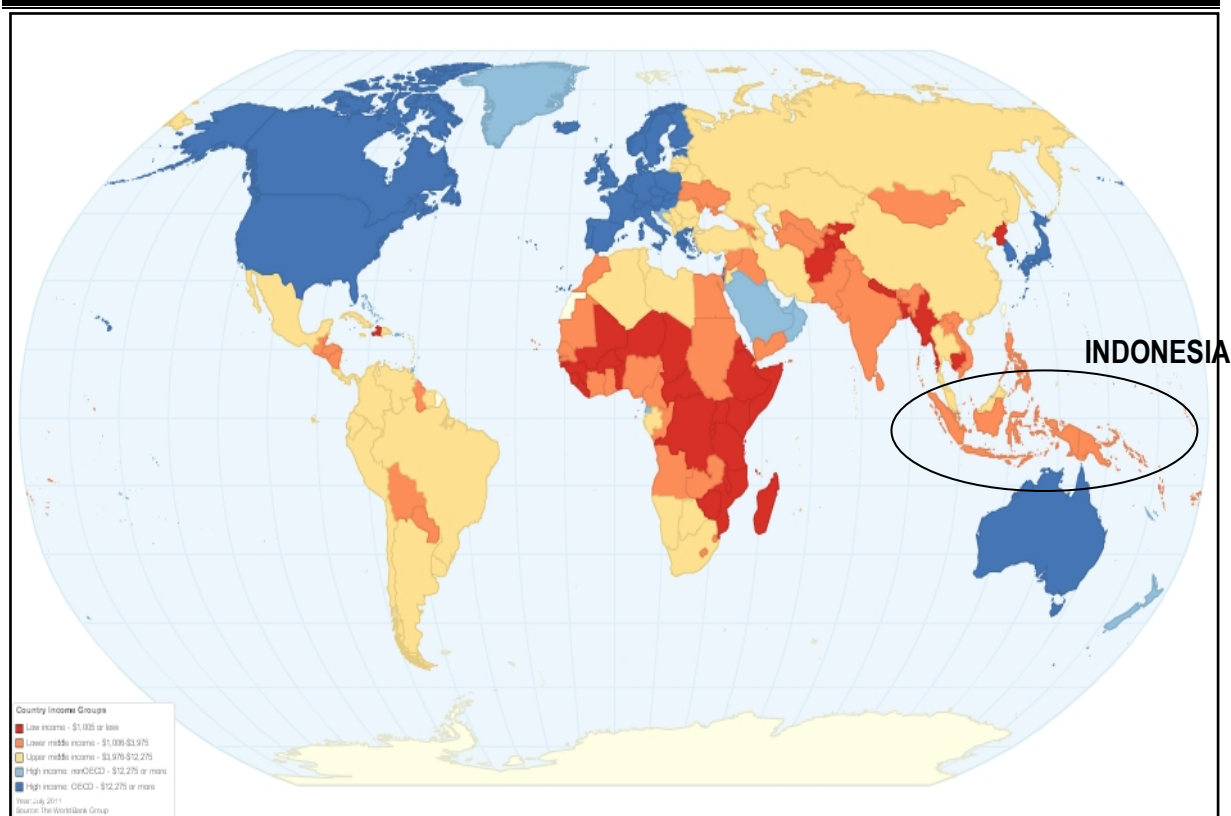


Figure 1-6: Country Income Groups – World Bank Classification (World Bank, 2013).

Note: the light blue bar is high income (non-OECD) countries.

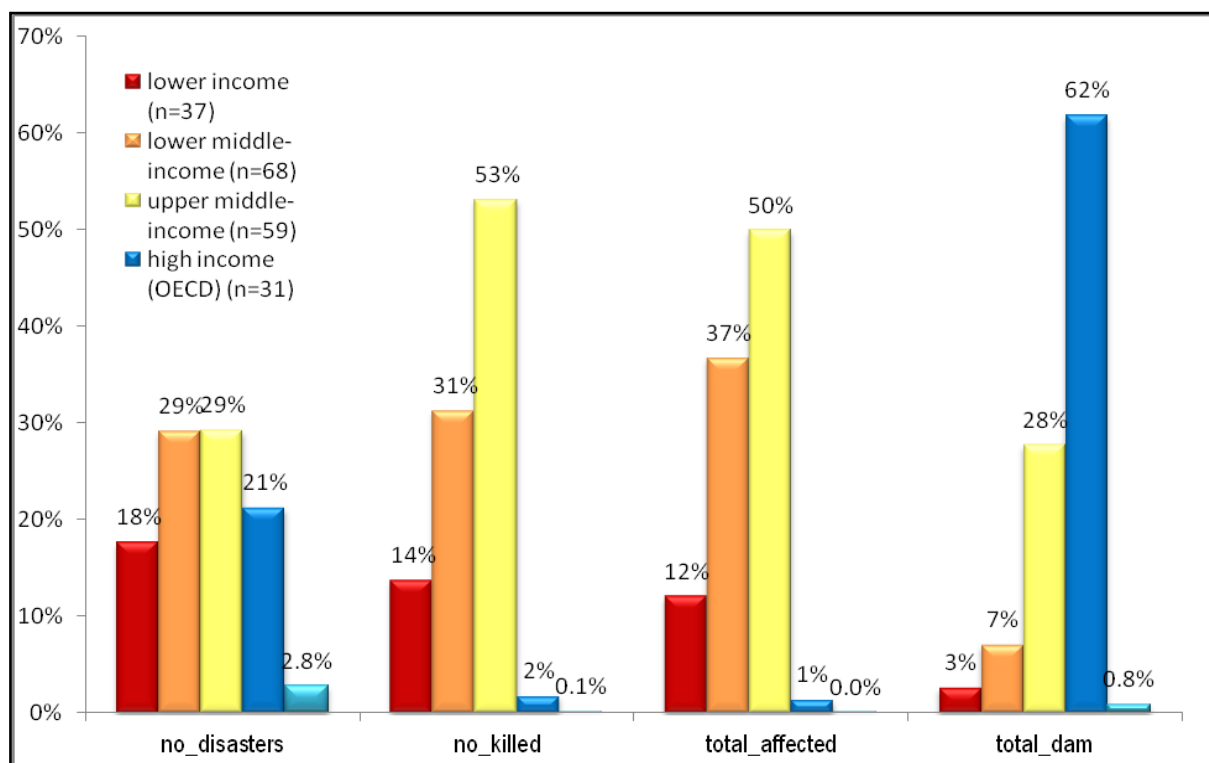


Figure 1-7: Lower and Middle-Income Countries are Disproportionally Impacted by Disasters, but Total Damage in High-Income Countries is Highest (EMDAT, 2012b).

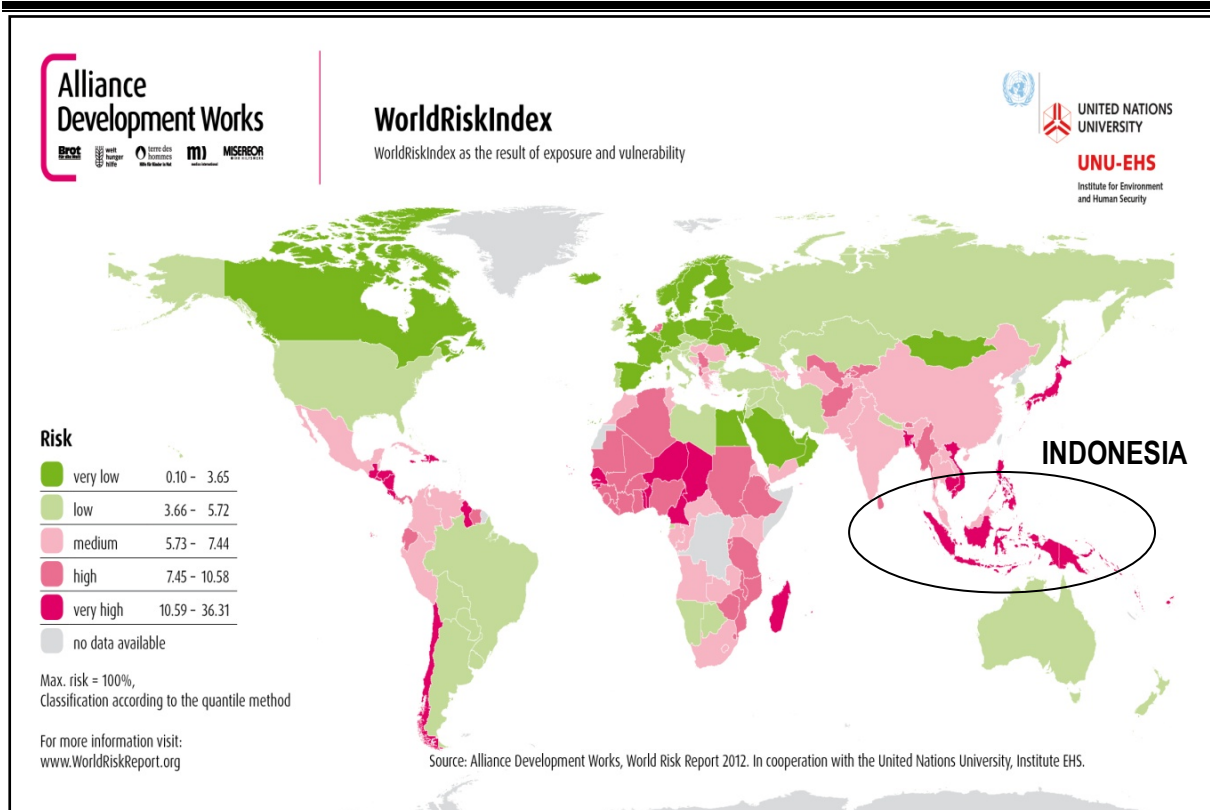


Figure 1-8: World Risk Index 2012 Showing that Developing Countries are More Vulnerable (UNU-EHS, 2012)

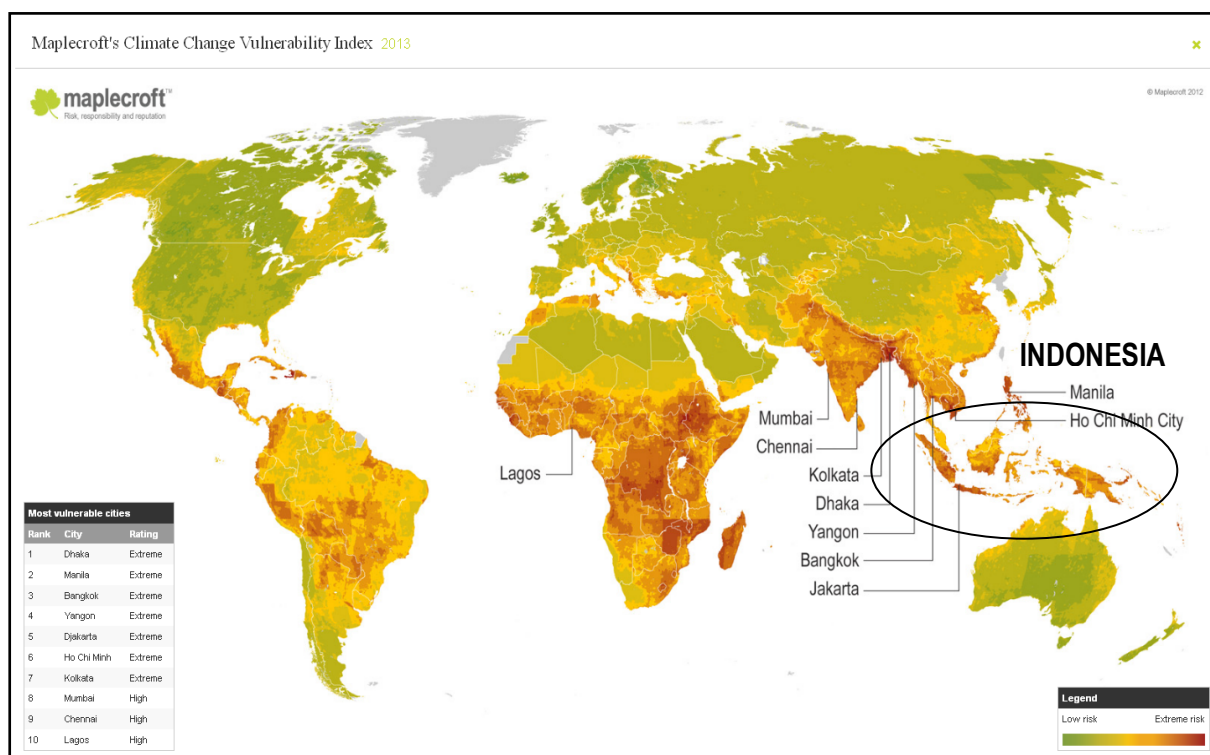


Figure 1-9: Climate Change Vulnerability Index Showing that Developing Countries are More Vulnerable (Maplecroft, 2012).

1.2.1.4 Progress of global disaster risk reduction and remaining challenges

Presenting the hazard characteristics and disaster impacts in the previous section, I now move to discuss the history of disaster management. The history of DRR stretches from technical approaches to disaster management (DM) in the 1960s, to a recent worldwide movement to reduce vulnerability and increase resilience by integrating these concerns into sustainable development. Disaster management is defined as “the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster” (UNISDR, 2009). In the 1960s efforts were limited to responding to disasters, then during the 1970s-1980s, DM started to move to include assistance for relief through the establishment of the United Nations Disaster Relief Co-ordinator (Alexander, 1997; Coppola, 2010; UNISDR, 2011b, 2012c).

DRR gained prominence in the international sphere in the early 1990s. The International Decade for Natural Disaster Reduction (IDNDR) was initiated by the UN in 1989 to mark the increasing impact of disasters on humans and property and the subsequent economic damages in the 1980s (UN, 1989). In 1994, the United Nations World Conference on Disaster Reduction (WCDR) held in Yokohama, Japan, created the ‘Yokohama Strategy for a Safer World: Guidelines for Disaster Prevention and Mitigation’. This event marked a transformation to holistic DRR, from prevention, to mitigation, rehabilitation and reconstruction (IDNDR, 1994). The Yokohama strategy calls for systematic and comprehensive vulnerability reduction and stakeholder involvement, including those the most vulnerable (IDNDR, 1994). This precedence built the momentum for wider DRR strategy which manifested in the International Strategy for Disaster Reduction (ISDR) in 1999 (UNISDR, 2007). The UN Office for DRR (UNISDR) was created to facilitate the implementation of the ISDR “to serve as the focal point in the UN system for the coordination of disaster reduction and to ensure synergies among the disaster-reduction activities of the UN system and regional organizations and activities in socio-economic and humanitarian fields” (UN, 2012b).

In the aftermath of the 2004 Indian Ocean tsunami, the World Conference on Disaster Reduction (WCDR) was held in Hyogo, Japan, in January 2005. This conference was the creation of the Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters (UNISDR, 2007). The HFA is the framework for a comprehensive, integrated, multi-disciplinary approach to identify and implement DRR measures (UNISDR, 2007). Table 1-4 lists the expected outcome of the HFA, three strategic goals, five priorities for actions and four cross-cutting issues.

Focus	The Hyogo Framework for Action
Expected Outcome	The substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries.
Strategic Goals	<ol style="list-style-type: none"> 1. The integration of DRR into sustainable-development policies and planning. 2. The development and strengthening of institutions, mechanisms and capacities to build resilience to hazards. 3. The systematic incorporation of risk-reduction approaches into the implementation of emergency preparedness, response and recovery.
Priorities for Action, and indicators of progress	<ol style="list-style-type: none"> 1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation: (1) The existence of institutional and legal frameworks for DRR; (2) The availability of resources; (3) Community participation; and (4) The functioning of a national platform for DRR. 2. Identify, assess and monitor disaster risks and enhance early warning: (1) Risk assessment and vulnerability information; (2) Hazard and vulnerability information system; (3) Early warning system; and (4) National, regional / trans-boundary, and local risk assessments. 3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels: (1) Disaster information sharing and dissemination systems; (2) School curricula and educational materials on DRR; (3) Research, tools, analysis for risk assessments; and (4) Public awareness strategy. 4. Reduce the underlying risk factors: (1) DRR as part of development policies and plans; (2) Social policies to reduce vulnerabilities; (3) Economic policies that reduce economic vulnerability; (4) The inclusion of DRR into built-environment planning; (5) The inclusion of DRR into recovery and reconstruction; and (6) Risk-screening for major development projects. 5. Strengthen disaster preparedness for effective response at all levels: (1) Policy and mechanisms for disaster management; (2) Disaster preparedness and contingency plans with training and drills; (3) Financial reserves and contingency mechanisms; and (4) Procedure for information exchange during response and recovery.
Cross Cutting Issues / Drivers of progress	<ol style="list-style-type: none"> 1. Multi-hazard approach. 2. Gender perspective and cultural diversity. 3. Community and cultural diversity. 4. Capacity building and technology transfer. 5. Strengthen disaster preparedness for effective response at all levels.
Level of Progress	<p>Level 1: Minor progress with few signs of forward action in plans or policy.</p> <p>Level 2: Some progress but without systematic policy and/or institutional commitment.</p> <p>Level 3: Institutional commitment attained but achievements are neither comprehensive nor substantial.</p> <p>Level 4: Substantial achievement attained but with recognised limitations in capacities and resources.</p> <p>Level 5: Comprehensive achievement with sustained commitment and capacities at all levels.</p>
Future outlook	<p>Area 1: The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.</p> <p>Area 2: The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.</p> <p>Area 3: The systematic incorporation of risk-reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.</p> <p>Area 4: Identification of the single most important element of the post-2015 framework for disaster risk reduction.</p>

Table 1-4: Summary of the Hyogo Framework for Action (HFA) (UNISDR, 2007).

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The UNISDR coordinates the planning and implementation of the HFA (UNISDR, 2011f). There are three reviews of the implementation of the HFA, compiled in the Global Assessment Report (GAR) 2009 (UNISDR, 2009a), 2011 (UNISDR, 2011b), and 2013 (UNISDR, 2013a). For each GAR, the world progress in implementing the HFA is reviewed. This is done through the compilation of national governments' submission of their own progress in implementing the HFA. The HFA was reviewed in 2010 to examine progress towards its goal and to decide how to accelerate efforts in order to reach its goal by 2015 (UNISDR, 2011d). The latest developments in DRR focus on the post-2015 framework (UNISDR, 2012d), how to align DRR with the Sustainable Development Goals (UN, 2012a), and the Millennium Development Goals (UN, 2011), and how to strengthen DRR at the local level to make cities more resilient (UNISDR, 2012a). A third WCDR is planned for 2015 in Japan, during which a final review of the implementation of the HFA will be conducted and a post-2015 HFA developed. The synthesis report of the consultation for post-2015 highlights three themes: a) the need to focus DRR efforts more strongly at the local level, b) the need to create an integrated approach within DRR, and c) the importance of an enabling environment to implement DRR (UNISDR, 2013e). Table 1-5 summarises key DRR activities at the international level.

Year	Key International DRR Activities
1989	- International Decade for Natural Disaster Reduction
1994	- The Yokohama Strategy and Plan of Action
2005	- World Conference on Disaster Reduction (WCDR) in Japan - The Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters
2007	- First session of the Global Platform for Disaster Risk Reduction
2009	- Second session of the Global Platform for DRR - First Global Assessment Report (GAR1)
2010	- Mid-Term Review of the HFA - Making Cities Resilient: 'My City is Getting Ready!' campaign
2011	- The Third Session of the Global Platform - Second Global Assessment Report (GAR2) - Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the IPCC (SREX)
2012	- United Nations World Conference on Sustainable Development (Rio+20)
2013	- Global Consultation for Post-2015 HFA - Global platform for disaster risk reduction 2013: Fourth session - Global Assessment Report 2013 - High Level Panel on Post-2015 Development Agenda: 'A New Global Partnership: Eradicate Poverty and Transform Economies through Sustainable Development' - Communiqué from the meeting of the High-Level Panel of Eminent Persons on the Post-2015 Development Agenda in Bali, Indonesia, 27 March 2013
2015	- Third World Conference on DRR in Japan (planned) - Post-2015 HFA (HFA2) - Post- 2015 Sustainable Development Framework

Table 1-5: Timeline showing key events, activities and outcomes in DRR at the global level.

A very strong polycentric governance system has been established for DRR (Figure 1-10 below). Polycentric governance is characterised by the presence of various kinds of governing authorities and entities at different scales of governance (McGinnis, 1999), and there are many centres of decision making and actions in an interdependent system of relations (Ostrom et al., 1961). Based on the data in PreventionWeb (UNISDR, 2012c), the UNISDR-managed gateway for disaster information, there are currently 5,134 organisations working on DRR worldwide. This landscape is currently dominated by government organisations, and academic and research institutions (UNISDR, 2012c). My research shows that there is an enormous potential for more NGO involvement if more international supports is directed to the local level. Figure 1-10 also shows that the news and media, as well as the private sectors, are still under-represented and under-utilised within DRR activities.

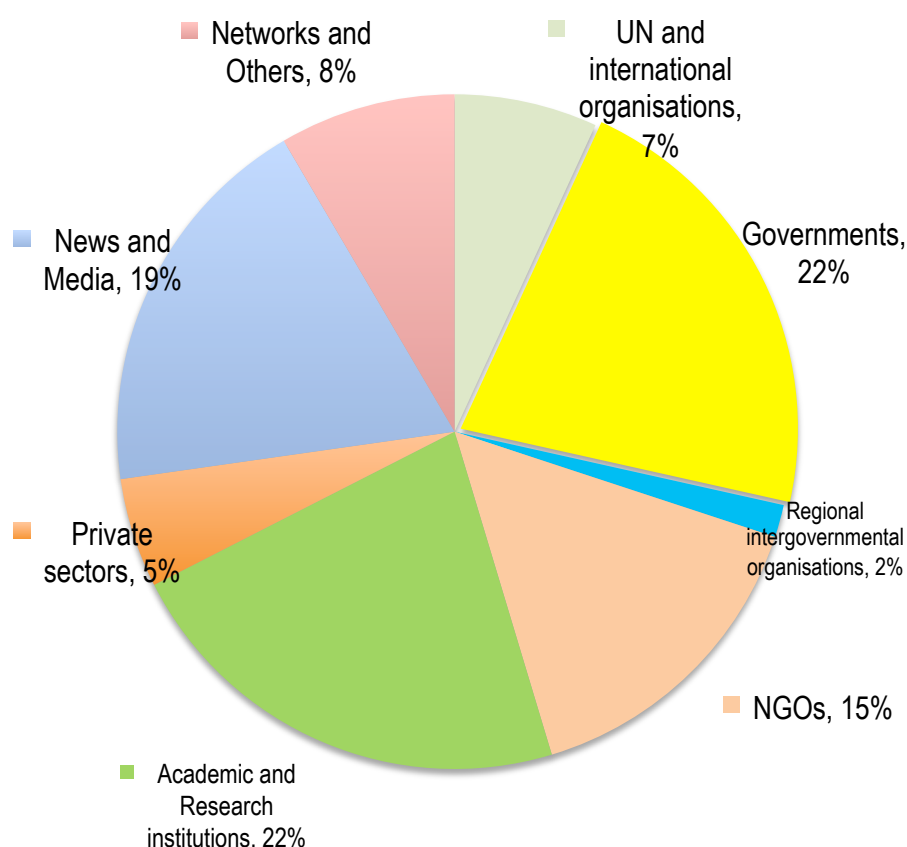


Figure 1-10: The Compositions of Organisations Working in DRR Worldwide (UNISDR, 2012c).

The level of progress towards the HFA priorities for action is measured using 5 levels, with level 1 being the least progress and level 5 being the most progress (Table 1-4). Figure 1-11 shows an increase in the overall global progress for all priorities for action since 2007 from level 3.1 in 2007, to an expected level of 3.3 in 2013. The current overall global level is 3, which indicates that “institutional commitment attained but achievements are neither comprehensive nor substantial” (UNISDR, 2007, p. 9).

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Figure 1-12 shows the progress achieved against by each of the HFA priorities for action. In all three periods of reporting, the highest level of progress is achieved for priority HFA-5 'Disaster preparedness and response', and for HFA-1, 'DRR governance and institutions'. The lowest level of progress achieved is for HFA-4 'Reducing the underlying risks'

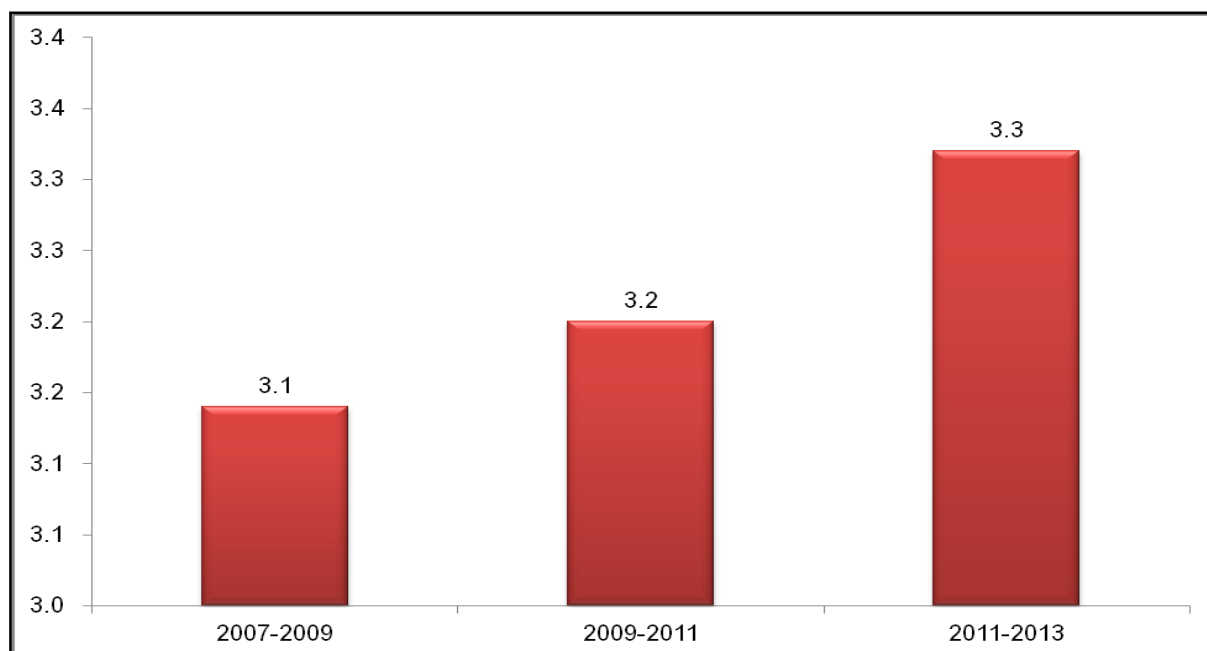


Figure 1-11: Overall Global Progress Towards the Five HFA Priorities for Action Showing an Increase From Level 3.1 To Level 3.3 Between 2007-2013 (UNISDR, 2013a).

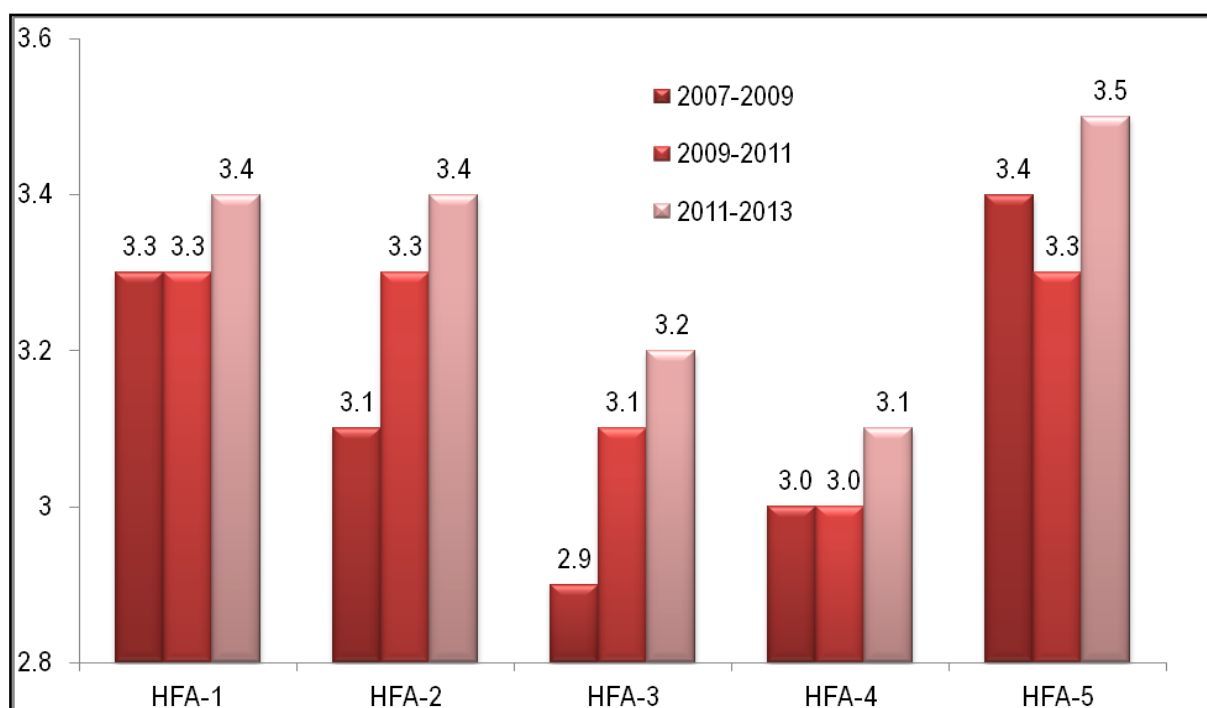


Figure 1-12: Overall Global Progress in Implementing the 5 HFA Priorities for Actions at Different Reporting Periods, with HFA-1 and HFA-5 Having the Highest Levels of Progress (UNISDR, 2013a).

Figure 1-13 shows the geographical distribution of progress towards implementing the HFA priorities for action (UNISDR, 2013a). Brazil and Switzerland achieve the highest level of progress with 4.5 and Comoros the least level of progress with 1.8 (EMDAT, 2012a). Countries such as Australia, China, India, Brazil, and those in North America achieve a level above the world average on 3.3, while the progress of low and middle-income countries in the global South such as those in Africa and Asia remains below the world average. This correlation between a nation's progress towards the HFA goals and its level of GDP per capita also reinforces the notion that DRR needs to be more strongly integrated into development.

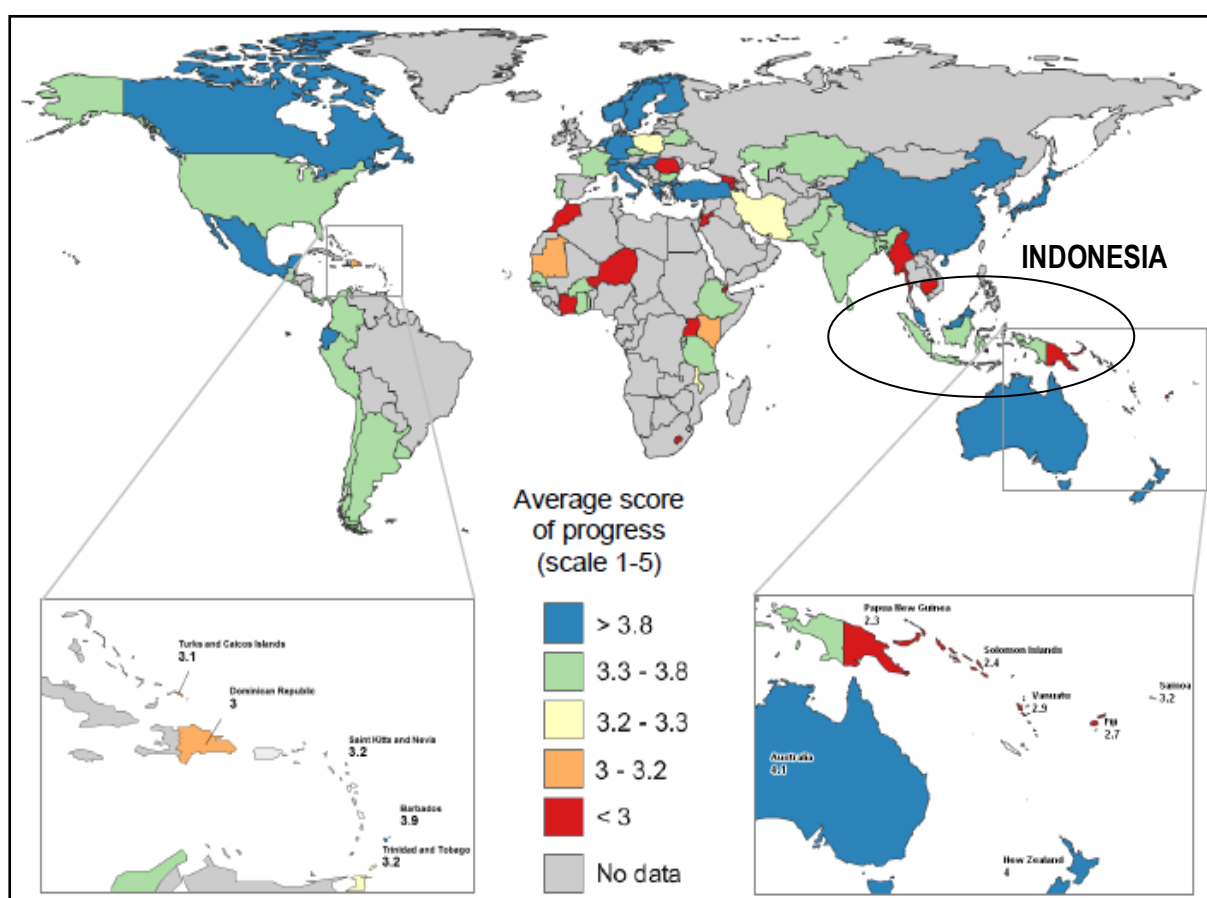


Figure 1-13: Geographical Distributions of Progress Towards HFA Priorities for Action During the Period 2011-2013 (UNISDR, 2013a).

1.2.2 Case study of DRR in Indonesia

Because of the significant risk of disasters faced by Indonesia (circled within Figures 1-8, 1-9 and 1-13 previously), and its transformations in the way DRR is implemented, the research focuses on this country's effort to gain better understanding of how institutions related to DRR perceive, respond to, manage and build resilience to disasters. The following sections explain the rationale for selecting Indonesia in more detail. Firstly, it is one of the most vulnerable countries in the world due to the inter-linkages of geographical, social, economical and environmental factors. Secondly, it is highly vulnerable to both geophysical and climate-related disasters. Finally, while there are significant improvements towards DRR, there are still many challenges remaining.

1.2.2.1 Inter-linkages of geographical, social, economical and environmental factors contribute to Indonesia's high vulnerability to hazards

Indonesia is an archipelago of more than 17,000 islands (BAPPENAS and BNPB, 2010), and is the fourth-ranked country in terms of total population that lives in low-elevation coastal zones (McGranahan et al., 2007). More than 85% of its 240 million population live within 100m above sea level (Dahuri, 2006). The islands of Java and Sumatra are also the most populated and urbanised islands in Indonesia. The capital city of Jakarta houses as many as 21 million people (Firman, 2009). Indonesia is placed 124th out of 187 countries within the Human Development Index (UNDP, 2011). Even though Indonesia is categorised as a lower-middle income country by the World Bank, and also is part of the G20, with a total GDP of (current US\$) \$ 846.8 billion in 2011, the GDP per capita was US\$3,495 in 2011 (World Bank, 2012b). With the total population standing at approximately 234 million, currently 18.1% of its population live below US\$1.25 a day (World Bank, 2012c). While Indonesia is enjoying a growth of 6.3% in 2013 (World Bank, 2012c), the population is 63% of productive age (15+) and still 6% of the total labour force are unemployed (World Bank, 2012c). Poverty reduction is the number one issue for development in Indonesia. Economically, the country is dependent on the key sectors of agriculture, coastal zones and marine ecosystems, water resources, fisheries, and forest services, all of which are highly susceptible to changes in climate (World Bank, 2012a).

The inter-linkages of geographical, social, economical and environmental factors contribute to Indonesia's high vulnerability both to disasters and climate change. Being located in the geographically exposed 'ring of fire' makes it highly exposed to geophysical hazards such as earthquakes and tsunamis (BAPPENAS and BNPB, 2010). Figure 1-14 shows the Natural Hazard Risk Map which indicates that, in general, the whole of Indonesia, from Sumatra (western) to Papua (eastern) Islands, with the exception of Kalimantan Island, is at medium to high risk of a range of hazards (OCHA-ROAP, 2011).

OCHA Regional Office for Asia Pacific Indonesia: Natural Hazard Risks Issued: 01 March 2011

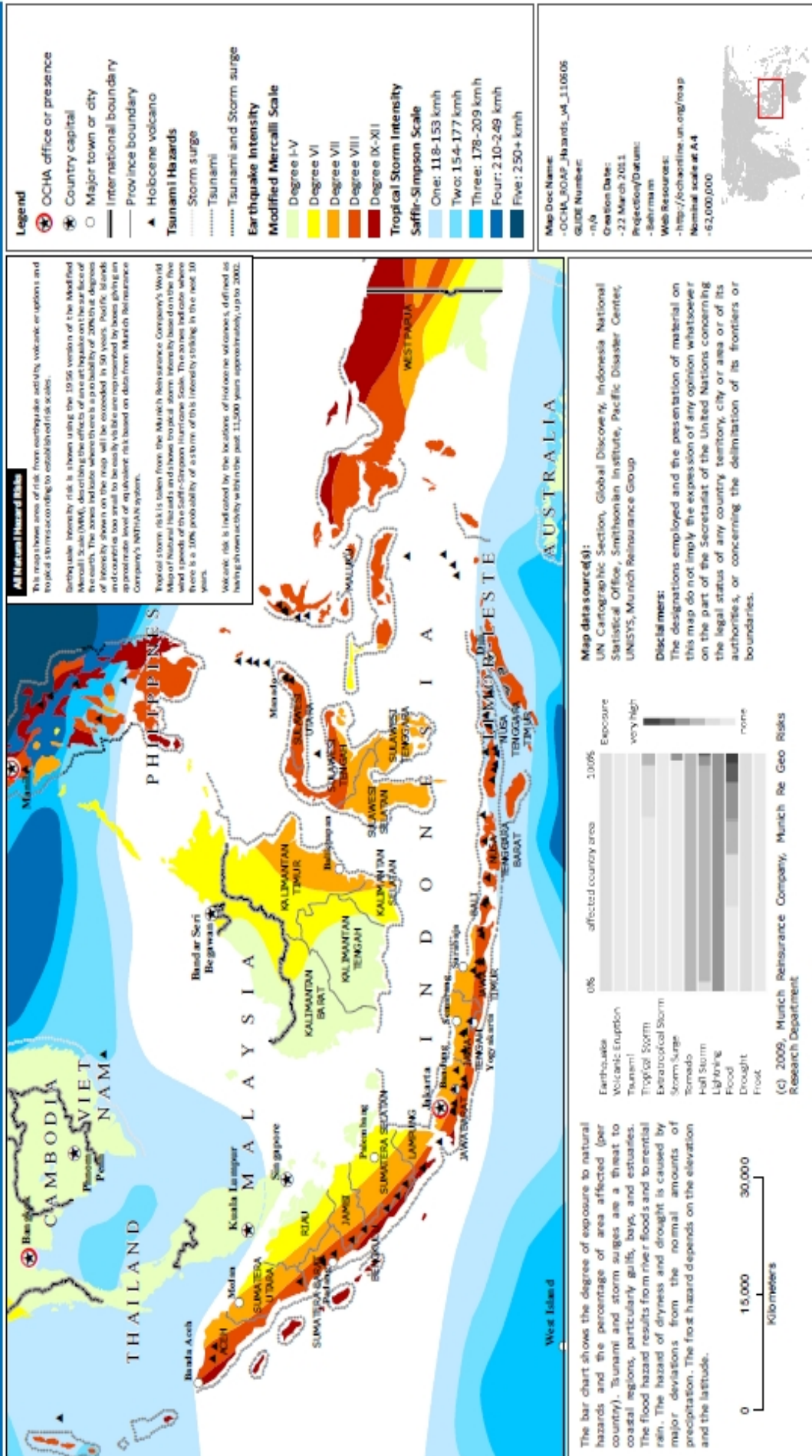


Figure 1-14: Risk Map of Indonesia (OCHA-ROAP, 2011).

PART I: OVERVIEW

To date, earthquake or seismic activities are the second most frequent, deadliest, and costliest disasters in Indonesia, with Indonesia having been struck by deadly tsunami 9 times, including the 2004 Indian Ocean tsunami which killed 168,372 people in the country alone (Table 1-6). Indonesia is ranked 33rd out of 173 at risks of hazards (UNU-EHS, 2012) and is 47th out of 179 in the Global Climate Risk Index (Germanwatch, 2012). To date, there have been 396 disasters, which caused more than 237 thousands deaths, have impacted more than 27.6 million people, and have cost over 27.3 billion US\$ (EMDAT, 2013c) (Table 1-6). The islands of Java and Sumatra are located in the 'ring of fire' of volcanic mountains.

Type	Number of Disasters	Number of People Killed	Total Number of People Affected	Amount of Damage (000 US\$)
Drought	9	9,329	4,804,220	160,200
Earthquake (seismic activity)	102	30,065	8,447,214	7,059,326
Tsunami	9	168,372	580,520	4,506,600
Flood	154	6,437	9,134,914	5,806,047
Mass movement dry	1	131	701	1,000
Mass movement wet	48	2,251	393,188	120,745
Storm	12	2,013	30,248	1,000
Volcano	52	18,271	1,176,026	344,390
Wildfire	9	300	3,034,478	9,329,000
TOTAL	396	237,169	27,601,509	27,328,308

Table 1-6: Number and types of disasters and their impacts in Indonesia 1900-2013 (EMDAT, 2013a).

1.2.2.2 High vulnerability to both geophysical and climate-related disasters

Indonesia is vulnerable to different types of natural hazards mainly geophysical and hydro-meteorological. The country has long faced high numbers of disaster and climate-change risks, from frequent floods to devastating earthquakes and tsunamis. Climate-related disasters dominate the landscape of disasters in Indonesia. Amongst these disasters, the hydro-climatological disasters contribute 71% of disaster occurrences, 16% of total deaths, 67% of total people affected, and 52% of costs incurred (Figure 1-15). Increase in flood frequency and intensity due to climate change is expected to exacerbate disaster risk in Indonesia (IFRC, 2010). It is located in the geographically exposed 'ring of fire' which makes it highly exposed to geophysical hazards from earthquakes and tsunami (BAPPENAS and BNPB, 2010).

Examining the disasters in more detail (Table 1-6 previously), flood and earthquake are the two most frequent disasters affecting the highest number of people. This is the strongest driver for the integration of DRR and CCA in Indonesia. That is, the increasing activities for CCA should utilise the knowledge, tools and experiences gained from DRR as the first line of defence to climate change. In addition, earthquake and tsunami cause the highest number of people to be killed, which suggests the need for better community preparedness to these disasters in Indonesia.

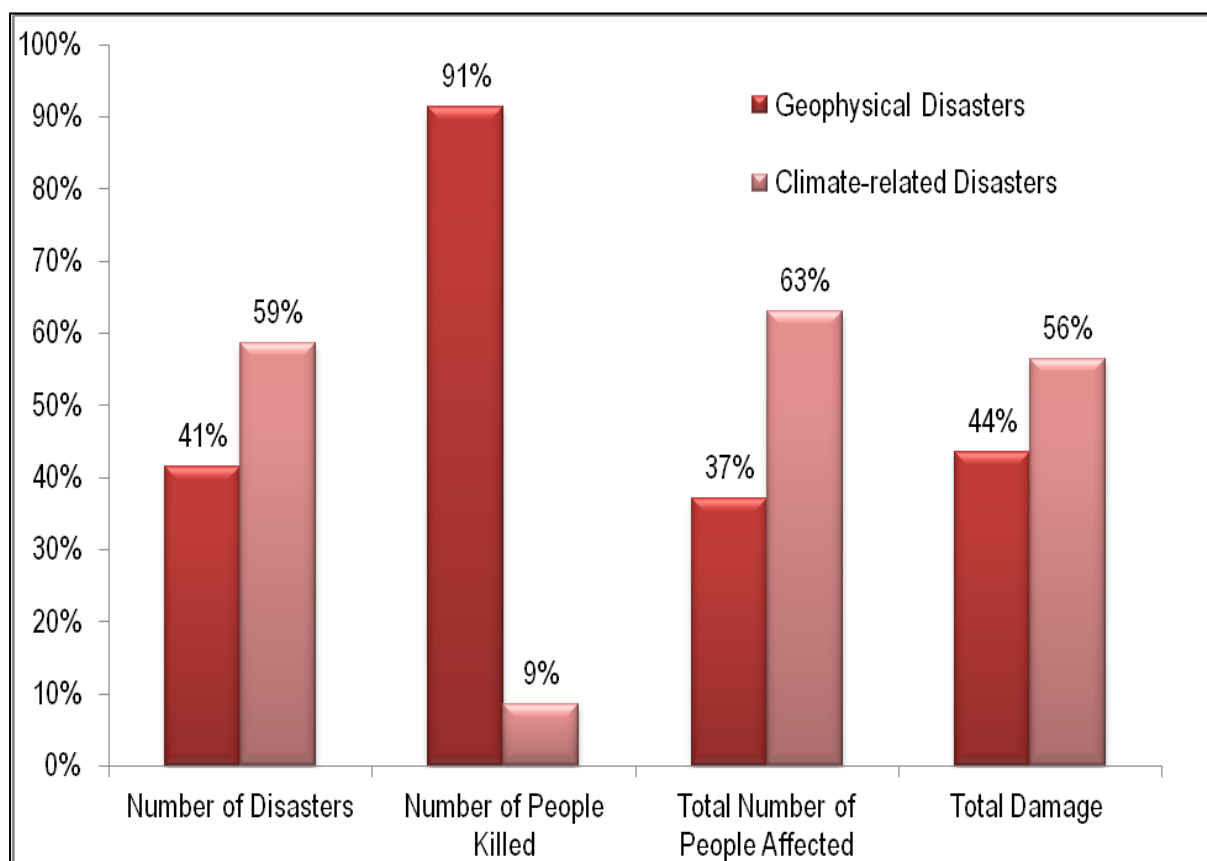


Figure 1-15: Percentage of Occurrence of Geophysical and Climate-Related Disasters and Their Impacts in Indonesia 1900-2013 (Modified from EMDAT, 2012a).

1.2.2.3 Achievements in DRR and remaining challenges

Since the 2004 Indian Ocean tsunami occurred, there have been many significant transformations in reducing disaster risks in Indonesia. Significant paradigm changes have occurred in the way disasters are dealt with in Indonesia. Management of war victims, conflict victims and refugees were the key concern in the early stage of disaster management in Indonesia. During the period of the 1960s to early 2000s, disaster management was still viewed as post-disaster efforts. The 2004 Indian Ocean tsunami brought enormous shifts to the way disaster is viewed globally and also in Indonesia. Table 1-7 shows the key timelines for DRR activities in Indonesia.

PART I: OVERVIEW

Year	Key DRR Activities in Indonesia
1945	National Board for War Victim Supports (BPKKP)
1966	National Board for Disaster Management (BP2BAP)
1967	National Coordination Team for Disaster Management (TKP2BA)
1979	National and Provincial Coordinating Board for Disaster Management (<i>Bakornas and Satkorlak PBA</i>)
2001	National Coordinating Board for Disaster Management and Refugees (<i>Bakornas PBP</i>)
2004	Indian Ocean tsunami hit Aceh and Nias and tsunami Relief, Rehabilitation and Reconstruction started
2004	Aceh and Nias tsunami Relief, Rehabilitation and Reconstruction
2005	National Coordinating Board for Disaster Management (<i>Bakornas-PB</i>)
2006	National Action Plan for DRR (2006-2009)
2007	Law No 24/2007 on Disaster Management Law No 26/2007 on Spatial Planning Law No 27/2007 on Small Islands and Coastal Management
2008	National, Sub-National, Local Disaster Management Agency (BNPB and BPBD) National Council for Climate Change (DNPI)
2009	National Platform for DRR (PLANAS)
2010	Mid-Term Development Plan (RPJM) 2010-2014 National Action Plan for DRR (NAP-DRR) 2009-2012, National Disaster Management Plan (NDMP) and Guidelines (Renas PB) 2010-2014
2011	President Yudhoyono was appointed as the Global Champion for DRR
2012	AMCDRR in Yogyakarta
2013	Thematic Consultation on Post-2015 HFA in Jakarta

Table 1-7: Timelines showing key activities for DRR in Indonesia.

The adoption of the HFA in 2005 brought enormous changes through the calls for a comprehensive and systematic planning, implementing and evaluating progress in building nation and community resilience worldwide, including in Indonesia. Various laws, agencies, action plans, and planning documents related to DRR have been developed subsequently. Figure 1-16 shows the increase in the progress of implementing the HFA within the three reporting periods of 2009, 2011 and 2013. Indonesia's progress increases from 3.0 to 3.5 within the 7-year reporting period. In general, Indonesia's progress in implementing the HFA is moving in a positive direction, and as a result, President Susilo Bambang Yudhoyono is mandated as the Global Champion for DRR by the United Nations General Secretary (UNISDR, 2011c). The president is considered to have successfully led the reconstruction processes in Aceh and Yogyakarta, set up the necessary regulations and institutional frameworks for DRR, and collaborated closely with international agencies in assisting DRR in Indonesia. Figure 1-17 shows Indonesia's progress in implementing the HFA priorities for actions. It should be noted that even though the process of assessing the progress in implementing the HFA is facilitated by BNPB and PLANAS, this process is generally not accompanied by systematic methods of checking and clarifying the objectivity of the report. The government of the United Kingdom is the first country to have conducted a peer-review process in measuring its HFA progress (UNISDR, 2013f).

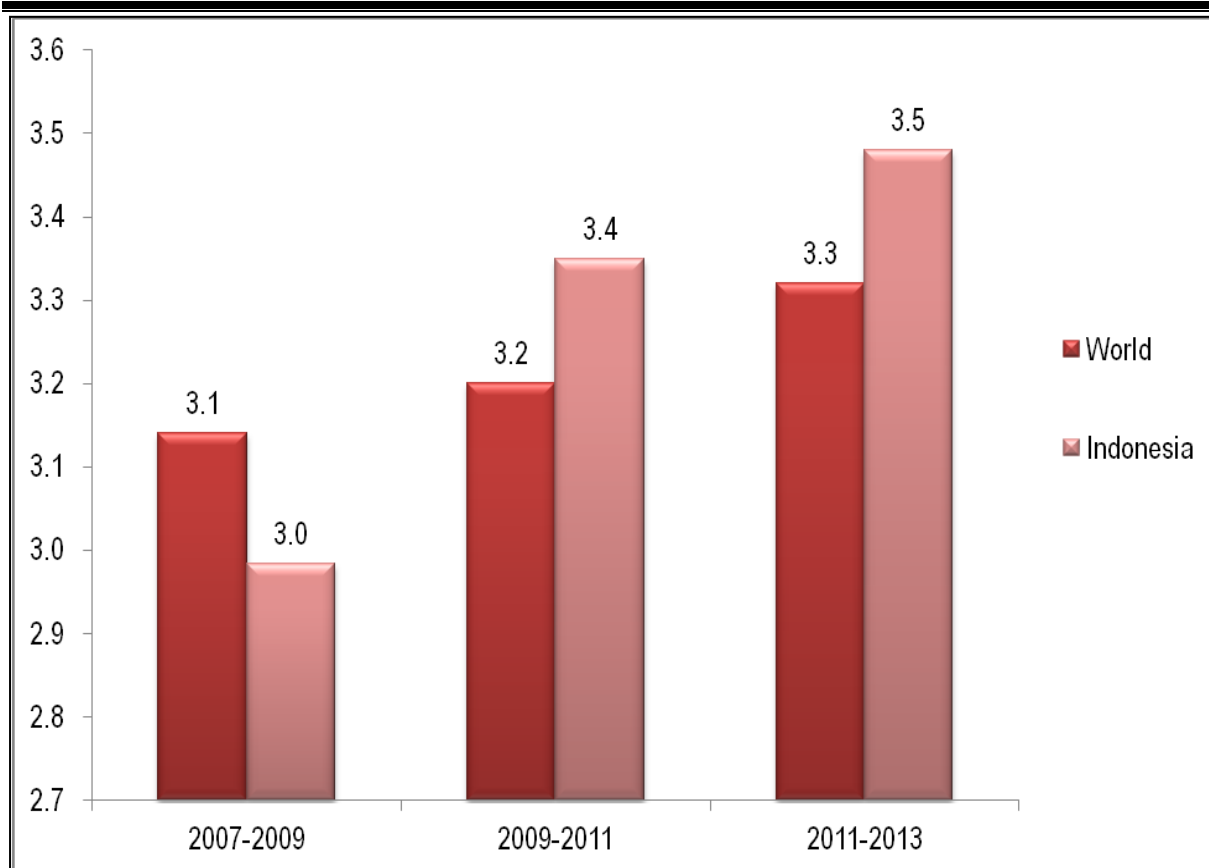


Figure 1-16: Indonesia's Progress Towards the HFA Priorities for Action over Three Different Time Periods Compared to the Global Average (BNPB, 2009, 2011; 2013b).

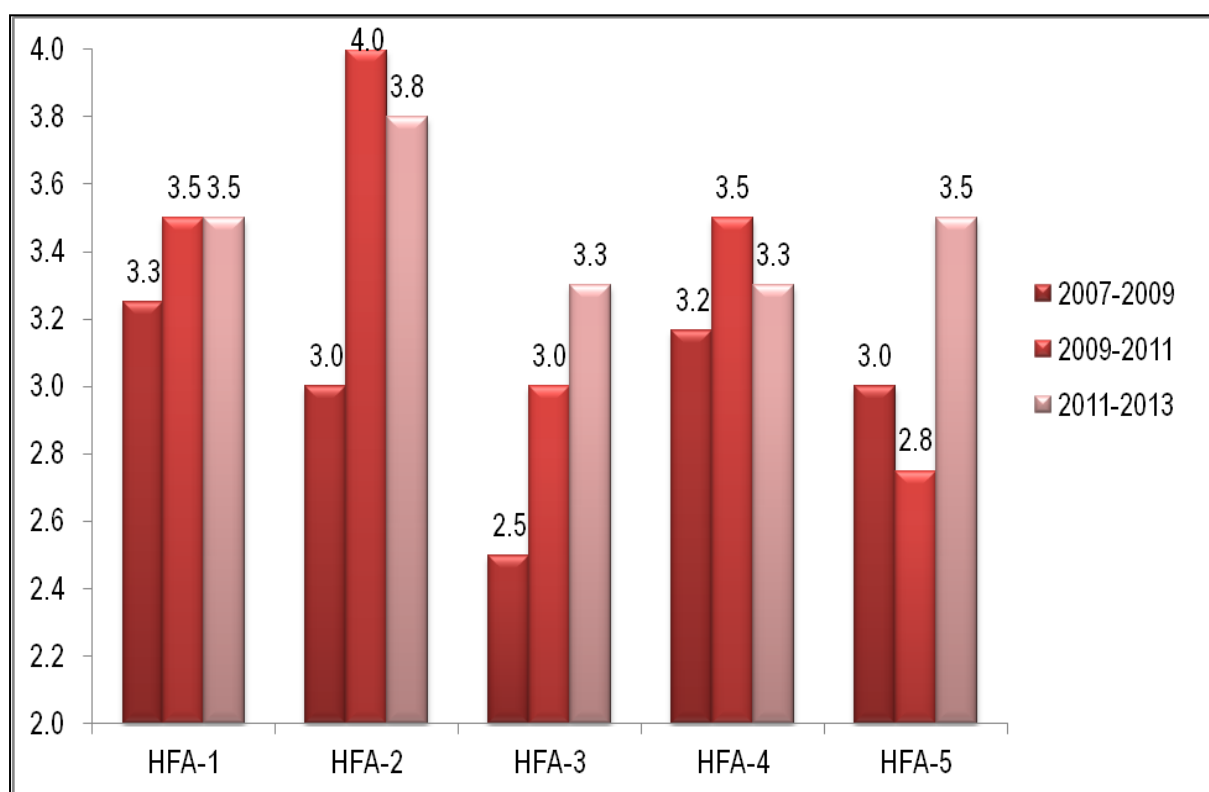


Figure 1-17: Indonesia's Progress Towards the 5 HFA Priorities for Action over Three Different Periods Compared to the Global Average (BNPB, 2009, 2011; 2013b).

One key paper that is included in the thesis (Chapter 6) reports the results of my fieldwork examining stakeholders' perceptions on the progress of building resilience, including the progress in implementing the HFA. The key progress is measured through achievement in the HFA five priorities for action: HFA-1 on DRR institutions, HFA-2 on risk knowledge and warning, HFA-3 on education, HFA-4 on risk factors, and HFA-5 on disaster preparedness.

HFA-1: Governance and Institutions for DRR

Indonesia's strongest movement forward is in HFA-1, governance and institutions for DRR, progressing from 3.3 to 3.5. The driving factor for this is the adoption of Law 24/2007 on Disaster Management, which is followed by the enactment of laws and regulations, the establishment of key organisations, and the involvement of multi-stakeholders for DRR. The disaster and climate change issue is one of the nine development priorities within Indonesia's Mid-Term Development Planning 2010-2014 and the integration of disaster management plan within the national plan is shown in Figure 1-18. The figure shows the mainstreaming of DRR within Indonesia's development planning framework based on Law 25/2004 (Gol, 2004). The national Disaster Management Plan (DMP) is developed according to the 5-year Mid-Term Development Plan 2010-2014 (MTP), and the local DMP needs to be developed according to the local MTP. With a shorter planning horizon, there is a 3-year DRR action plan and an annual plan implemented by BNPB at the national level and BPBD at the local level. The legal and institutional framework for DRR is centred on the formation of the National Disaster Management Agency (BNPB) and its sub-national or local counterparts (BPBD) (BNPB, 2011) (Figure 1-19). The figure shows that under the leadership of the Indonesian president, BNPB is supported by a steering committee of experts and professionals in DRR, and 13 government ministries and organisations. The disaster management agencies are set up at the national level and across the 33 provinces and 495 local governments (BNPB, 2011). The formation of these agencies is a significant improvement to efficiency, as there is a single organisation that has the mandate and responsibility for DRR. It also shows the Indonesian government's high commitment to DRR.

The country's adoption of Law 24/2007 on Disaster Management transforms DRR in Indonesia in many ways. Responsibility for DRR is now shared amongst governmental organisations at multiple scales and the roles of non-governmental organisations (NGOs) are strongly recognised in helping to build resilience, especially at the local and community level (BNPB, 2011). The sharing of responsibility among different agencies is extremely important since it enables pooling of knowledge, and resources amongst different agencies, and the collaboration helps to enhance trust between government and NGOs, all of which is beneficial to increasing resilience.

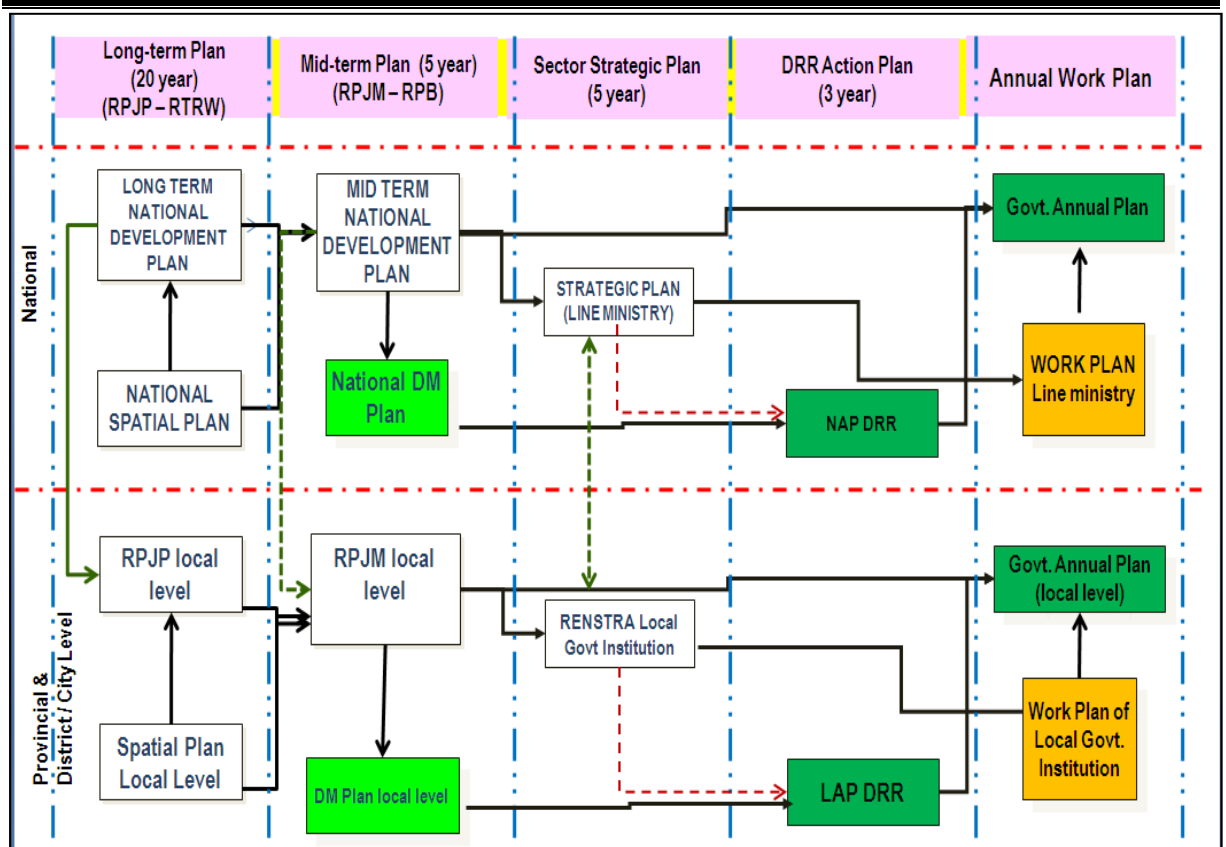


Figure 1-18: The Integration of Disaster Management Plan within the National Development Planning System (Bappenas, 2010).

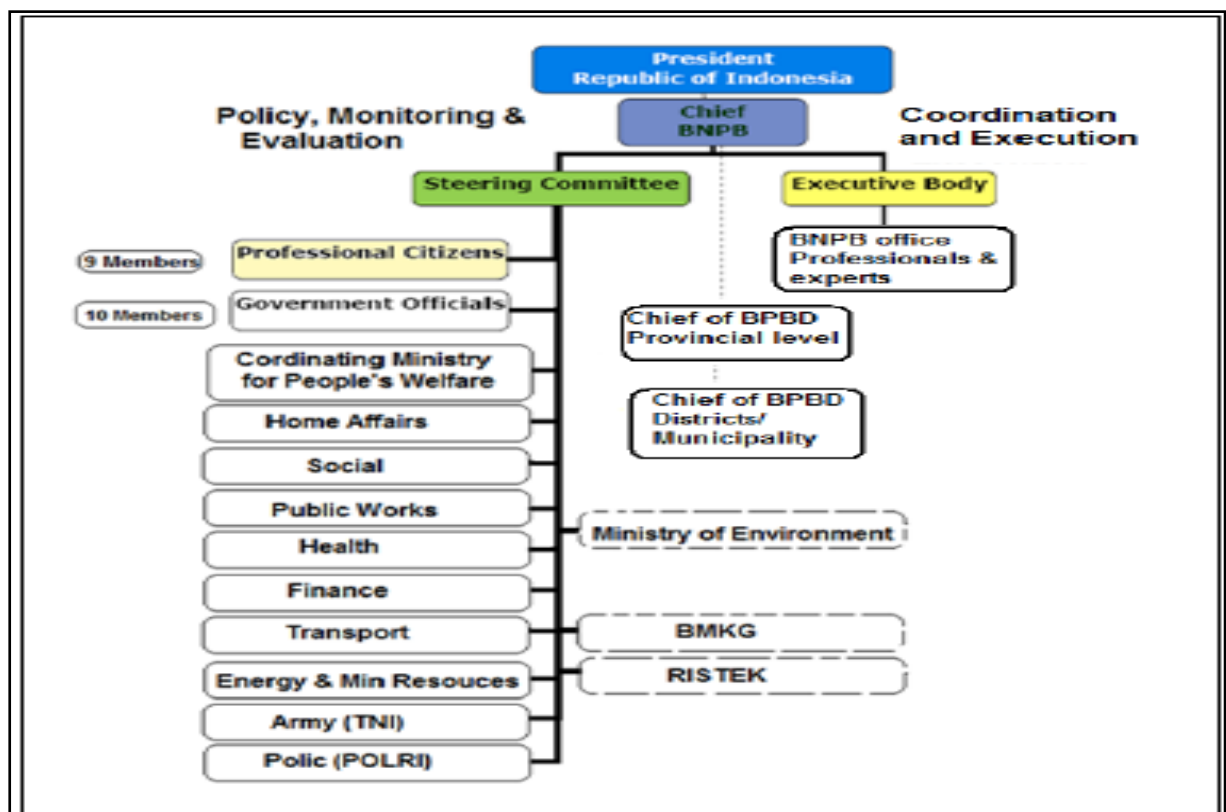


Figure 1-19: BNPB Steering Committee and Executive Body at the National and Local Level (Chang-Seng, 2010).

The roles of multi-stakeholder actors in Indonesia are increasingly recognised and their efforts are very significant at the local level. Data from UNOCHA-3W (2012) shows that there are approximately 786 organisations recorded as being involved in different aspects of DRR in Indonesia (Figure 1-20). National and international NGOs are in the majority, followed by donor agencies, the United Nations and Red Cross societies. This represents a great potential for increasing NGOs roles in DRR. The NGOs in Indonesia demonstrate a vital role in helping to increase resilience, especially at the community level, mostly through the community-based DRR.

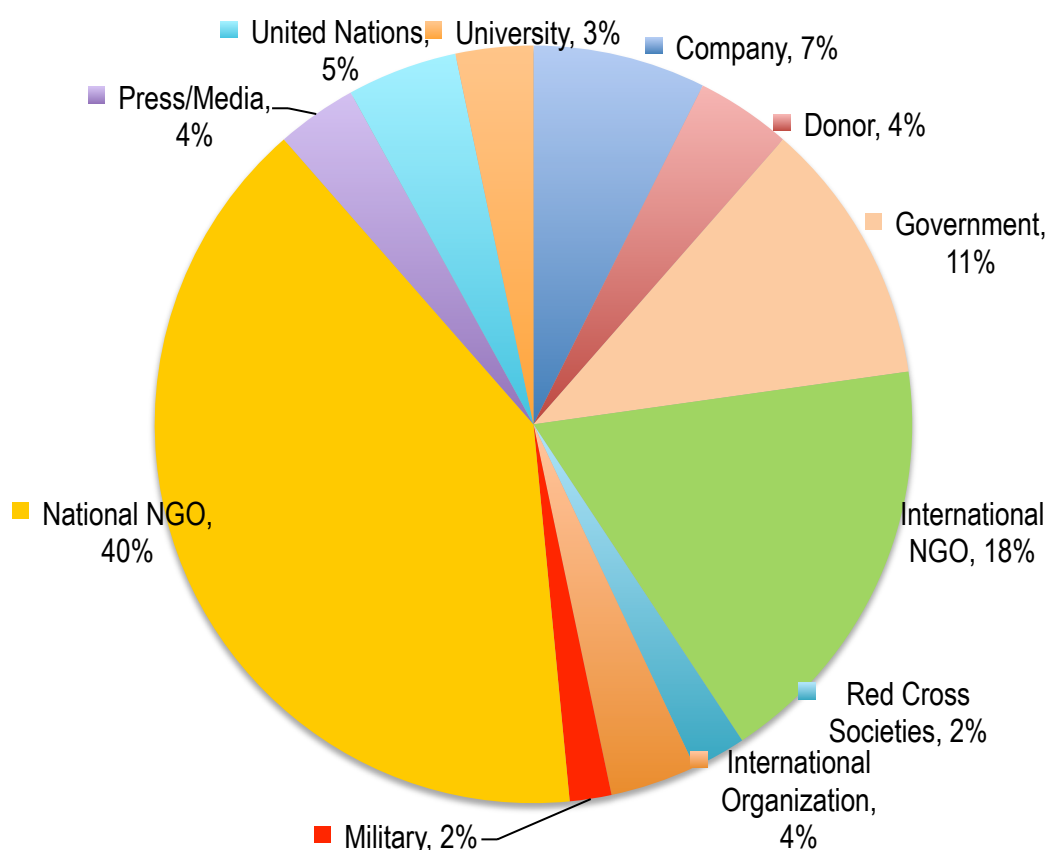


Figure 1-20: Number and Types of organisations working in DRR in Indonesia (OCHA, 2012).

Five local (Makassar, Jakarta, Bantul, Padang, and Sleman) and from two sub-national governments (Yogyakarta and West Sumatra) reported their implementations of the HFA as well as their involvement in the Resilient Cities Campaign (UNISDR, 2013b). The recommendations outlined in the HFA Mid-Term Review and other UNISDR documents state that DRR activities for this priority need to focus on increasing the capacity of local stakeholders (governments, NGOs, CBOs and CSOs). This is also in line with the findings of papers written in this thesis (Djalante and Thomalla, 2012; Djalante et al., 2012; Djalante, 2013; Djalante et al., 2013), that the most significant challenges in implementing HFA-1 include mainstreaming of DRR into development issues, sectoral coordination between agencies, provision of data and information on risks and hazards, and lack of capacity of local stakeholders to implement DRR at the local level .

HFA-2: Risk Knowledge and Early Warning

The HFA priority for action 2 focuses on risk knowledge and early warning. Indonesia has received enormous support following the 2004 Indian Ocean tsunami, and one of the key focuses reported by BNPB is the development of the tsunami early warning systems (TEWS) through projects from GITEWS or INATEWS (BNPB, 2011). However, criticisms arising from the establishment of these TEWS assert that they are still highly technologic-centric and that there needs to be improvement at the end-to-end warning system which is concerned with the ability of institutions and communities to respond to warnings (Chang-Seng, 2010). Moreover, the other key issues in this priority are the need for the provision of risk analysis and knowledge that can be translated to meaningful information that can be utilised by society in general, which is currently lacking in Indonesia.

HFA-3: Education

The HFA priority for action 3 calls for the strengthening of education for DRR in order to build a culture of safety and resilience. This has the lowest progress achieved, from 2.5 to 3.0, then to 3.3. Education has a very important role in increasing awareness to the multi-facets of disasters, from prevention to disaster response. In Indonesia, disaster education is increasingly included within school curriculums, supported with the increasing involvement of schools and hospitals in the UNISDR 'Safe School and Hospital' campaign (UNISDR, 2013b). The roles of non-government organisations are very important in helping to increase awareness of disasters, especially at the local and community level.

HFA-4: Reducing Underlying Risks

Priority for action 4 is concerned with determining the underlying risks that make nations or communities vulnerable in the first place. Indonesia achieves considerably less progress in this priority. This priority is strongly related to development, since lack of supporting economic, social and environmental conditions contribute to the country's vulnerability to natural hazards. At the policy level, DRR is formally integrated into development policies and plans, most notably in the mid-term National Development Planning Agenda of 2010-2014 (GoI, 2010), in which disaster and climate change issues are considered as one of nine development priorities (GoI, 2010). While there is promising progress nationally, mainstreaming of disaster issues within local government agendas is hindered by lack of awareness and understanding, as well as by preference given to poverty reduction and local economic development.

HFA-5: Disaster Preparedness

The fifth and final HFA priority for action is concerned with increasing preparedness. This holds a crucial role, since preparedness is the key to reducing death from disasters, and is be the most advanced priority Indonesia could achieve. There are various planning documents produced, such as several national strategic plans issued by the relevant government agencies working for DRR. These include the National Action Plan on DRR (NAP-DRR) 2006-2009 (BAPPENAS and BAKORNAS-PB, 2006), the NAP-DRR 2010-2010 (BAPPENAS and BNPB, 2010) and the National Guidelines for DM 2010-2014 (BNPB, 2010b), complemented with the Indonesia Inter-Agency Contingency Plan (OCHA Indonesia, 2009), and local contingency and preparedness plans also exist (BNPB, 2011). What is not clear from this is whether these plans are actually implemented and if so, whether they are regularly tested and updated to reflect changes or experiences. There is also forward movement initiated by international organisations to increase disaster preparedness around the Asian region and in high-risk areas throughout Indonesia. While these activities are extremely important, there should be more locally-driven activities on disaster preparedness and planning included, where communities are actively taking part in the planning and implementation.

As identified by Djalante and Thomalla (2011), some emerging challenges that need to be incorporated within future DRR activities include the integration of climate change issues within the HFA, and the need for urban risk management and coastal-zone management considerations as part of DRR. Finally, there needs to be strengthening of local stakeholders' capacity in managing complexities arising from increasing natural hazards, climate change impacts, urbanisation and poverty.

1.3 Positioning the Research within the Discipline of Human Geography

The key discipline influencing the development of this study is that of human geography. Human geography focuses on patterns and processes that shape human interaction with the built and natural environments and is concerned with scale, space, actor, network, place, identity, and culture (Sneddon, 2009). Human geography is the study of the cultural aspects found throughout the world and how they relate to the spaces and places where they originate and then travel as people continually move across various areas (Tuan, 1971). The word 'geography' originates from the ancient Greek *gē* 'earth' + *-graphia* 'writing', translating as 'to describe the world'. The study of the world spans from European imperial explorations into unfamiliar territories. In the 1890s, the geographic study focused on geographic sub-disciplines, such as rural or regional geography, and from the 1950s until today it is systematically studied and spans across studies of the humanities, sciences and social sciences with more inter-disciplinary practices (Gibson, 2009).

Human geography as a discipline is suggested as being in the phase of a 'new age' where geographers are challenged to go deeper into the human dimensions of global change and hence to shift from the social sciences and humanities to a science of global change, whereby subjectivity is recognised, and change and transformation is emphasised (O'Brien, 2011). Four strategies are proposed if human geographers are to lead the shifts. First, there needs to be a new framing of environmental problems which recognise how different cognitive, emotional, spiritual and ethical factors influence institutional responses to environmental change. Second, there needs to be a move beyond scale of analysis of the relations between local, regional, and global, to also recognise the subjective spaces between 'us' and 'the other' which pervades the geography of identity. Third, there needs to be a redefinition of the bigger picture of environmental problems to not just focussing on global interpretations, but also on the connections and linkages among multiple processes, responses and outcomes. Finally, O'Brien suggests contributing in creating alternative futures through scenarios, social learning through participatory analysis and engagement (O'Brien, 2011).

Tierney (2007) suggests that in human geography studies, it is generally agreed that disasters are not just natural but also socially and politically constructed and hence examining the impacts of disasters on people, communities, societies and nations as a whole is significantly valuable. An integrated approach is increasingly needed to better understand the complexities of problems such as global social-environmental changes and inter-linkages with the problems at specific scale (O'Brien, 2011). This is also essential to better understand issue-driven or problem-based approaches which need integration, interactivity and strong forms of collaboration and partnership (Straussfogel and von Schilling, 2009; O'Brien, 2011). An integrated approach in research is utilised in studies that examine the complex inter-linkages of social-ecological systems, such as natural resource management (Janssen and Goldsworthy, 1996), coastal management process (Christie et al., 2005), multi-scale large watershed management (Lebel et al., 2009), or in climate change adaptation and sustainability research (Howarth and Monahan, 1996; Few, 2007; Yin, 2009; Davoudi et al., 2012). Tierney (2007) states that the study of risk lends itself as a integrated field since risk needs to be understood through different lenses, such as "risk perception, the social construction and social amplification of risk, risk assessment, and risk management, both in specific societies and in cross-societal and comparative contexts". The design and planning of resilient community is highly complex, which call for interdisciplinary perspectives (Kapucu et al., 2013). The wide range of interpretation of the term 'resilience' and the utilisation of the concept from different disciplines such as psychology, ecology, economy, and engineering, suggest the need for multidisciplinary and multi-level considerations in defining and achieving resilience (Lemyre and O'Sullivan, 2013).

There are substantial transformations in the way disasters are studied and understood over time, and the discipline of human geography contributes to this. Understanding the characteristics of risks is the key to developing approaches to manage or reduce them. Disasters were originally viewed as 'acts of God', shifting to the recognition that humans can actually take 'naturalness' from natural disasters, which lead to the analysis of the social creation of disasters (O'Keefe et al., 1976; Blaikie et al., 1994; Wisner et al., 2004b; Tierney, 2007). The studies on disasters originally focus on the behaviours during or immediately after disaster impact. Tierney (2007) writes that classical disaster research originates from earth and atmospheric systems which consider hazards as physical events that impinge on the built environment and social system. Current studies on disasters strongly emphasise not only the frequency and magnitude of hazards, and the geophysical processes that create them, but also on understanding the causes of vulnerability and impacts across SESs (Alexander, 1995; Tierney, 2007; Wisner, 2009). System theory is hence used in disaster research, which views extreme events as events disrupting to the society which call for societal reorganisations and for adaptation by the affected social units (Straussfogel and von Schilling, 2009).

Vulnerability is defined as "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009b, p. 30). There are many aspects of vulnerability from physical, social, economic and environmental factors, often determined by the three factors of exposure, sensitivity and adaptive capacity (Adger, 2006a). Vulnerability is the pivotal key that differentiates hazards from disasters. Disaster studies extend beyond merely responding to disasters, but also preparing for and recovering from the impacts of the events. Systematic works in disaster studies and research began in the 1950s, marked by significant works from Dynes et al. (1975; 1975; 1975; 1976; 1994; 1999; 2001), Quarantelli et al. (1984; 1986; 1988; 2000; 2001; 2003; 2004a; 2006b; 2006; 2008b; 2012), Hewitt, Burton, Kates and Whites (1988; 1989; 2001), Mileti (1992; 1995; 1999), and O'Keefe and Wisner et al., (1976; 1978; 2003a; 2004a; 2006). There are some works on the theoretical underpinnings of vulnerability (Turner et al., 2003b; Adger, 2006b; Vogel, 2006; Füssel, 2007; UNDP, 2007/8; Wisner, 2009). Some works focus on the relationships between vulnerability and poverty (Downing, 1991; Cannon, 2006; Adger and Winkels, 2007; Eriksen and O'Brien, 2007; Pelling and Mustafa, 2010). Others discuss what determines social vulnerability to climate change (Adger, 1998; Adger, 1999; Adger and Kelly, 1999; Handmer et al., 1999; Neil Adger, 1999; Cutter et al., 2003) and the roles of institutions in influencing societal vulnerability (Young, 2010; Fünfgeld, 2012). Cutter et al. (2008b) summarises the discussion that common themes for vulnerability research include the importance of social-ecological system perspective, of place-based studies, and of human-rights issues to be used as a basis for hazard and impact mitigation planning.

The next key development in the study of disasters examines the shifts from the paradigm of vulnerability (Adger, 2006b), to the concept of resilience (Buckle, 2000; Paton and Johnston, 2001; Cutter et al., 2003; Cutter et al., 2008b; Miller et al., 2010; Birkmann et al., 2013). Resilience is defined as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks” (Walker et al., 2004). Recently, Miller et al. (2010) outline the ways in which vulnerability and resilience are strongly interlinked (Table 1-8).

Analytical concept	Vulnerability	Resilience
Integrated social-ecological Analyses	From social to coupled SES or human-environment systems; still rare to truly integrate ecological processes.	From ecological toward social dimensions within coupled SES; social often secondary;
Approach to system	Unit of analysis	Systems thinking
Slow versus fast change	Core (shocks and stresses)	Core
Multiple stressors	Core	Multiple variables
Scale	Core: Usually social units from local to global, or geophysical units	Core; Physical units from local to Global
Alternate stable states	Core	Weak, except in terms of livelihood or governance
Adaptation	Core	Core
Transformation	Weak, except in terms of livelihoods. Rarely is attention given to the processes enabling or underlying transformation.	Core
Adaptive management	Core	Core
Agency	Core	Weak

Table 1-8: Comparison of analytical concepts between vulnerability and resilience (Miller et al., 2010).

The ever-increasing impacts of disasters and the occurrence of large-scale, catastrophic and complex disasters mark another wave of interest in disaster studies. Over the current period, disaster studies are becoming more complex, broadening in considerations of climate change, geophysical or technological catastrophes and nuclear disasters. Some of the most notable works involve scholars such as Kasperson et al. (1998; 1999; 2003b; 2008; 2010; 2011; 2011; 2011; 2012), Turner et al. (1978; 2003c; 2004; 2004; 2006), Alexander (1995; 1998; 1999; 2000; 2001; 2001; 2013), and Pelling et al. (2008; 2010; 2011; 2011; 2011). All of these studies provide foundations for contemporary disaster research which calls for more inter-disciplinary, integrated solutions, involving multi-stakeholders, multi-disciplines, knowledge from science and community, and which becomes more policy-relevant (Wisner et al., 2012).

1.4 Review of Key Concepts: Resilience, Disaster Risk Reduction, Climate Change Adaptation and Adaptive Governance

I utilise several key concepts of resilience, disaster risk reduction (DRR), climate change adaptation (CCA), and adaptive governance (AG), within several research areas of disaster studies, environmental management, and policy and governance. Disaster research is the core building block of this study to focus on building resilience to disasters. Climate change research adds another layer, which contributes to the question of integrating climate change into disaster policy in Indonesia. The last key research area is that of policy and governance, which is used to examine policy and governance related to DRR and CCA in Indonesia. These concepts are selected because resilience is considered to be the overarching concept for DRR and CCA, and integrating the mechanisms of AG into DRR and CCA could serve to accommodate increasing complexities and uncertainties. Utilising these four concepts, I propose adaptive and integrated disaster resilience (AIDR) as the conceptual space at the intersection between resilience, DRR, CCA, and AG. Figure 1-21 shows the framing of the relationships between the key concepts.

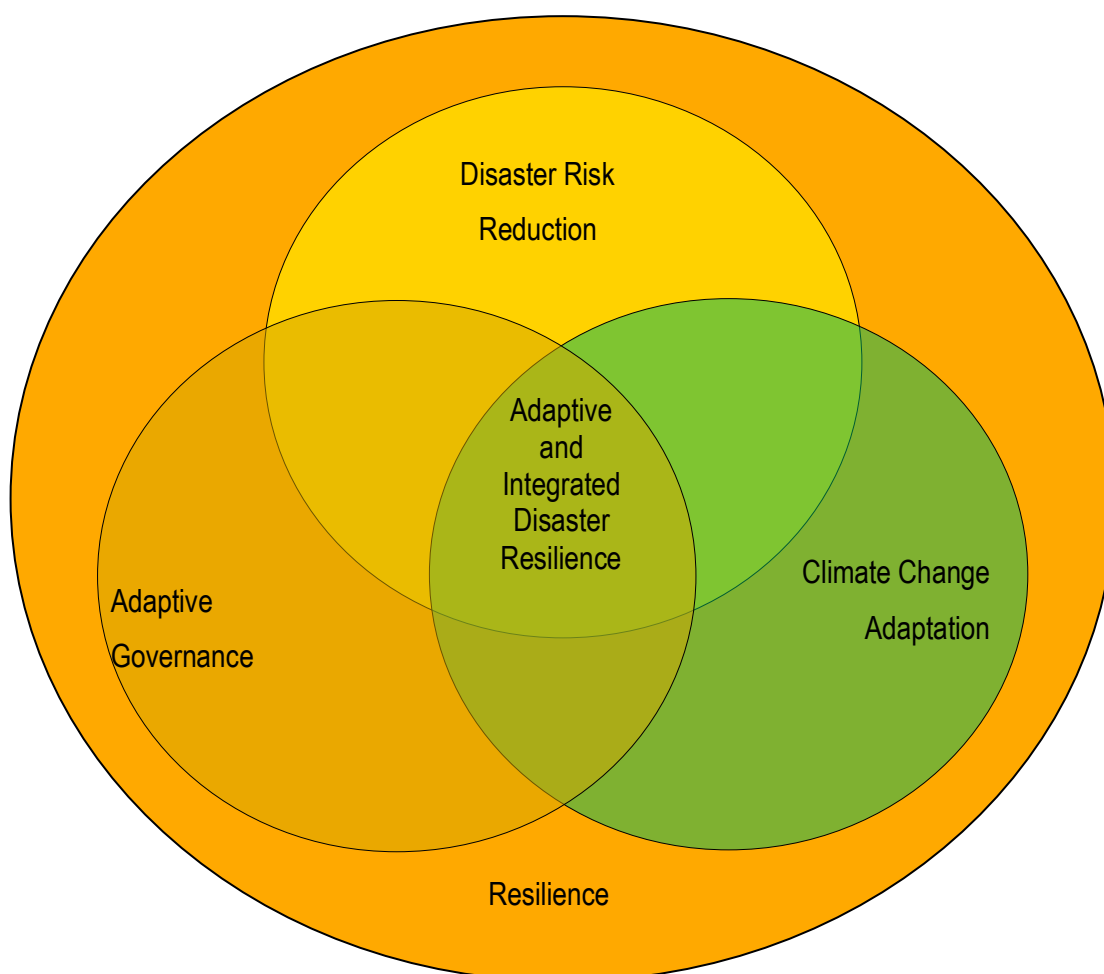


Figure 1-21: The Framing of the Relationships between the Key Concepts of Resilience, DRR, CCA, and AG.

In the following sub-sections, I define the key concepts that are employed in the thesis, briefly discuss their definitions, development in research, characteristics, inter-linkages between other key concepts, the relevance of each concept to resilience, and how this study can fill the gap of integrated studies for disaster resilience in literature. A more detailed literature review on the relationships between each key concept and resilience is given in the thesis in Part II Theoretical Review.

1.4.1.1 Resilience

I examine the development of resilience concepts within academic literature, and review how resilience is interpreted specifically within disasters studies and also in practice by organisations working in implementing DRR or CCA. The first part of this section discusses the development of resilience concepts, and how the studies of complex adaptive system (CAS) and social-ecological system (SES) influence the development of resilience concept.

The study of CAS is the subject of study by both natural and social scientists within many disciplines (e.g. Levin, 1998; Ostrom, 1999; Hartzog, 2004; Vrancken and Vree, 2004; Wilson, 2006). The essential aspects of CAS include non-linearity, leading to historical dependency and multiple possible outcomes of dynamics (Levin, 1998). This is different from a single system since non-linearity, uncertainty, feedback, and self-organisation can emerge and be observed (Holland, 1995). Holland (1995) further identifies four basic properties of CAS: aggregation, non-linearity, diversity, and flows. There are well-known studies that examine different forms of CAS, such as the society (Buckley, 1998), technology (Fleming and Sorenson, 2001), or language (Steels, 2000). Others use CAS as the framework to examine collaborative planning (Innes and Booher, 1999) or supply networks (Choi et al., 2001). Levin (1998) states that ecosystems are very much CAS since patterns emerge at higher levels originating from lower levels' localised interactions and selection processes. Folke (2006) argues that the study of CAS primarily tries to explain the emergence of structures and patterns of interactions from seemingly complex disorders, in order to guide change. To analyse CAS, studies need to focus on the intersections, commonalities and areas of overlap rather than looking for differences and conflicting views (Armitage et al., 2008). Resilience is a concept that has advanced in relation to the dynamic development of CAS, with interactions across temporal and spatial scales (Folke, 2006). In disaster studies, Tierney (2007) states that system theory is the most frequently used perspective in early disaster research since extreme events disturb societal systems and sub-systems.

A social-ecological system (SES) is defined as an integrated system of ecosystems and human society with reciprocal feedback and interdependence (Folke et al., 2010). In more detail, the Resilience Alliance (2013) defines SES as “a multi-scale pattern of resource use around which humans have organized themselves in a particular social structure (distribution of people, resource management, consumption patterns, and associated norms and rules). It consists of 'a bio-geo-physical' unit and its associated social actors and institutions, which emphasise the *'humans-in-nature'* perspective (Resilience Assessment, 2013). Examples of SES include agriculture, fisheries, climate change, and exploitation of natural resources, the national economy, and the society. Yong et al. (2006) argue that the natural analytical unit for sustainable development research is the SES. The SES can be specified for any scale from the local community and its surrounding environment to the global system constituted by the whole of humankind (the Anthroposphere) and the Ecosphere. Three related attributes of social-ecological systems (SES) determine their future trajectories: resilience, adaptability, and transformability (Walker et al., 2004). Resilience (the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks) has four components: latitude, resistance, precariousness, and Panarchy, and they are often explained using the metaphor of a stability landscape. Resilience of an SES involves resilience at multiple scales, from the scale of a farm or village, through communities, regions, and nations, to the globe (Resilience Alliance, 2013). Adaptability is the capacity of actors in the system to influence resilience. Transformability is the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable (Walker et al., 2004). Folke et al. (2003) further suggest four necessary factors to building resilience: (1) Learning to live with change and uncertainty; (2) Nurturing various types of ecological, social and political diversity for increasing options and reducing risks; (3) Increasing the range of knowledge for learning and problem-solving; and (4) Creating opportunities for self-organization, including the strengthening of local institutions and building cross-scale linkages and problem-solving networks. Resilience refers to the complex system integration across multiples scales and dimensions which require the use of system-thinking or a system-science approach in responding to the complexities of disasters (Bevc, 2013). Resilience in a systems-approach is about determining property and characterisation of the relationships and interconnectedness of the complex system of components and mechanisms (Lemyre and O'Sullivan, 2013). Resilience concept has been extensively researched in various in much academic literature, ranging from ecology (Peterson, 2000; Carpenter et al., 2001), to sociology (Tierney, 1999), psychology (Crittenden, 1985), natural resource management (Benson and Garmestani, 2011), mathematics (Batabyal, 1999), engineering (Bruneau et al., 2003), social science (Lorenz, 2010), economy (Farber, 1995), security (Prior and Hagmann, 2013), and law (Ruhl, 2011).

Folke (2006) summarises the sequence of the development of resilience concepts, from the more narrow interpretation to the broader social–ecological context (Table 1-9).

Resilience concepts	Characteristics	Focus on	Context
Engineering resilience	Return time, efficiency	Recovery, constancy	Vicinity of a stable equilibrium
Ecological/ecosystem resilience	Buffer capacity, withstand shock, maintain function	Persistence, robustness	Multiple equilibria, stability landscapes
Social resilience			
Social–ecological resilience	Interplay disturbance and reorganization, sustaining and developing	Adaptive capacity transformability, learning, innovation	Integrated system feedback, cross-scale dynamic interactions

Table 1-9: Evolution of resilience concepts (Folke, 2006).

In disaster studies, resilience is interpreted as “the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions” (UNISDR, 2009). The underlying reason for building resilience is that it is increasingly recognised that vulnerability to hazards is not simply a function of exposure to the hazard, but an outcome of complex interacting processes that include social, economic and environmental factors (Klein et al., 2003). Hence, it is important to reduce vulnerability and enhance resilience to a broad range of shocks and surprises, not just to focus on a single hazard. The resilience concept I adopted in this research is strongly aligned with the inherent attributes of resilience in the ability to learn and adapt (Holling, 1973; Walker et al., 2004; Folke, 2006). The ability to learn and adapt implies the ability of a system to improve and get better over time, at pursuing and implementing a particular set of management objectives, and at dealing with and pursuing new management objectives when the context changes or is subjected to disturbances (Lebel et al., 2006). Hence, the role of adaptive management (Holling, 1978; Walters and Hilborn, 1978; Walters, 1986; Gunderson, 1999; Lee, 1999) or adaptive governance (Brunner et al., 2005; Folke et al., 2005; Bryner, 2006; Brunner, 2010) which call for flexibility, learning, and managing change, within the interlinked social-ecological system, is extremely relevant in this study.

Furthermore, my review of literature shows that the utilisation of the resilience concept revolves around defining, characterising and measuring disaster resilience (Birkmann et al., 2012), within a community (CCE, 2000; IFRC, 2004; Ross and Carter, 2011), cities (Godschalk, 2003; Pelling, 2003b; Pickett et al., 2004; Shaw, 2009) or at a nation level (UNISDR, 2007). One major part of this research examines how resilience is defined and interpreted conceptually and also practically by organisations working on DRR.

Understanding on defining, characterising and measuring disaster resilience is extremely important in order to objectively determine whether progress has been made in building resilience (Cutter et al., 2008b). At the organisational level, there is growing research in how to increase organisations resilience through creating high-reliability organisations (HRO) (Vogus and Welbourne, 2003; Schulman et al., 2004; Shawn Burke et al., 2005; Weick et al., 2008; Boin and van Eeten, 2013). An HRO has a system in place for managing changes, and adjustment and learning from the changes are systematically documented and assessed. This approach is harnessed in this study as an example when an organisation or nations aim to build resilience through strengthening learning processes.

Some of the latest literature focuses more on social resilience (Adger, 2000; Lorenz, 2010; Hutter, 2013; Hutter et al., 2013; Lorenz, 2013; Maclean et al., 2013). Adger (2000) defines social resilience as the ability of groups or communities to cope with external stresses and disturbances as a result of social, political, and environmental change. The capacities of a social system that constitute resilience are adaptive capacity, coping capacity and participative capacity (Lorenz, 2013). Adaptive capacity is the ability to modify the system's structure to prevent future disasters, coping capacity is the system's property when coping with past hazardous events, and participative capacity is the system's ability to change its structure when subjected to interventions by other systems (Lorenz 2013). The development of resilience theory from different disciplinary perspectives has lead to a better understanding of the application of resilience in the context of DRR and CCA. Some scholars state that a proliferation of research that tries to define, interpret and give characteristics and meaning to resilience lead to a better understanding of the concept and its applications. However it needs to be realised that there is no consensus on a definition of resilience and that it means different things to different people (Bhamra et al., 2011; Alexander, 2013; Downes et al., 2013; Kuhlicke, 2013; Reid and Botterill, 2013).

I provide a detailed review of the relationships between the development of resilience concepts and the interpretation and application of resilience in DRR literature in Part II, Chapter 4 of the thesis.

1.4.1.2 Disaster risk reduction

The UN International Strategy for Disaster Reduction (UNISDR) define DRR as a systematic reduction of disaster risks through comprehensive efforts in managing causal factors of disasters (2009b p.10). This concept is different to disaster risk management which is defined as “the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster” (UNISDR, 2009b p.10).

The UNISDR's framework for DRR shows that DRR is influenced by the political, socio-cultural and ecosystem/environmental contexts (UNISDR, 2007). This context is important since it provides the supporting environment in which DRR can be implemented (Djalante and Thomalla, 2011). DRR is interpreted as systematic processes which consider risk factors that influence vulnerability to hazards (Mitchell, 2003). This hence calls for vulnerability/capacity as well as hazard analysis and monitoring, within a greater context of risk identification and impact assessment (Birkmann, 2007). Different stages of DRR are important to be recognised, from preparedness, emergency management, to recovery (Coppola, 2010).

In this thesis, I review the progress of DRR by examining the implementation of the HFA globally and Indonesia. The examination focuses on the progress, challenges, key drivers as well as emerging challenges and complexities that might become more prevalent in the future. I provide a detailed review on the development of the HFA as well as other disaster resilience frameworks in Part II, Chapter 4 of the thesis.

1.4.1.3 Climate change adaptation

Climate change research focuses on explaining and measuring vulnerability, resilience and adaptive capacity to climate change (Klein et al., 2003; Turner et al., 2003b; Gallopín, 2006; Janssen and Ostrom, 2006; Smit and Wandel, 2006; Vogel, 2006; UNDP, 2007/8; Miller et al., 2010; Engle, 2011). Each one of these concepts has been subjected to contestation on the definitions, meanings, characteristics and factors influencing it. Since the concepts of vulnerability and resilience have been discussed previously, this section focuses on reviewing the concept CCA and adaptive capacity. CCA is defined as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (UNISDR, 2009b).

The key organisations involved in the adaptation vary from the international to the local levels. The United Nations Framework Convention for Climate Change (UNFCCC) is the key international environmental treaty negotiated at the United Nations Conference on Environment and Development (UNCED), which is largely known as the 'Earth Summit' in Rio de Janeiro in June 1992 (UNFCCC, 2013). The objective of the treaty is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC, 1992, p. 9). There have been key agreements produced from the negotiation processes, include the UNFCCC Convention, Kyoto Protocol, Bali Road Map, Cancun Agreements, Durban Outcomes and Doha Climate Gateway (UNFCCC, 2013).

CCA is formally and strongly recognised in the Bali Action Plan, held in 2007 (UNFCCC, 2007). Since then, the negotiation focuses on the process of CCA as well as the adaptation funding. Another key agency is the Inter-governmental Panel on Climate Change (IPCC), the leading body for the assessment of climate change. It was established in 1988 by the UNEP and WMO to provide a scientific view on the current state of knowledge on climate change and the potential enviro-socio-economic impacts. There have been four scientific reports on the science and impacts of climate change, contributed voluntarily by scientists from all over the world contribute voluntarily to the reports (IPCC, 2012a).

I find extensive literature written in relation to the types, purposes and processes of adaptation (Adger et al., 2005a; Adger et al., 2005b), key actors, limits and barriers for adaptation (Hulme et al., 2007; Lorenzoni et al., 2007; Adger et al., 2008; Adger et al., 2009; Moser and Ekstrom, 2010), and finances for CCA projects (Bouwer and Aerts, 2006). The IPCC (2001, 2007b) outlines options or measures for adaptation generally be classified based on the timing, goal, intended purposes. In general, adaptation measures can be generally categorised to be reactive or anticipatory, and planned or autonomous (IPCC, 2001, 2007b). Reactive adaptation take place after the initial impacts started to be evident, while anticipatory adaptation takes place certainly before the impacts emerge. Moreover, planned adaptation is an outcome of a systematic policy and decision making processes based on anticipated or expected impacts, while autonomous adaptation is an action taken by any entities to voluntarily adjust their actions due to changing perception of climate risks (IPCC, 2001, 2007b; Moser and Ekstrom, 2010). Adaptation options can be further categorised based on key sectors involved such as water, health, disasters, agriculture, fisheries, etc., and hence include sectoral, multi-sectoral, and cross-sectoral adaptation. To measure the success of CCA measures, the elements of effectiveness (capacity to achieve objectives), efficiency (benefits to costs), equity (winners and losers from adaptation, and who decides), and legitimacy (acceptance by those participated and affected by adaptation decisions) need to be present (Adger et al., 2005a). Finally, Adger et al (2009) further review the limits of adaptation which is constructed around three key dimensions of ecological and physical limits, economic limits, and technological limits. They further explains that issues of values and ethics, risk, knowledge and culture are all the social limits of adaptation which should be properly investigated and accommodated in developing adaptation option. My review of literature shows that CCA studies are also linked with other key sectors that are highly impacted by climate change, such as health (Townsend et al., 2003; Wiley, 2010), food security (Schmidhuber and Tubiello, 2007), human security (Bogardi, 2004; Barnett and Adger, 2007; O'Brien et al., 2008; Barnett and Adger, 2009, 2010; Redclift et al., 2011), migration (Warner et al.; McGranahan et al., 2007; Adamo, 2010; Warner, 2010; Black et al., 2011; Black et al.,

2012), disasters (Helmer and Hilhorst, 2006; Thomalla et al., 2006; Schipper, 2009), into development (Schipper and Pelling, 2006; CCCD, 2008; Christopolos, 2008; Hurlbert, 2009; McBean and Rodgers, 2012), water (Gunderson et al., 2006; Galaz, 2007; Molle et al., 2007; Bates et al., 2008; Pahl-Wostl et al., 2008; Hoff, 2009; Gupta and Lebel, 2010; Huntjens et al., 2010; Lebel et al., 2010b; Engle et al., 2011; Huntjens et al., 2011), law (Karkkainen, 2001; Freeman and Farber, 2005; Camacho, 2007; Orts and Coglianesi, 2007; Hurlbert, 2009; Biermann et al., 2010; Ebbesson, 2010; Doremus et al., 2011; Ruhl, 2011), and development in general (CCCD, 2008; Christopolos, 2008; World Bank and United Nations, 2010). I also find there are studies at different levels, such as cities (Bulkeley and Betsill, 2003; UN HABITAT, 2011) or community (Heltberg et al., 2009).

There is major literature that tries to examine how to measure and increase adaptive capacity. Adger et al. (Adger et al., 2003a; Adger, 2003; Adger et al., 2004; Adger and Vincent, 2005; Brooks and Adger, 2005; Tol and Yohe, 2007) have examined the characteristics and conditions by which adaptive capacity can be enhanced. There have been many discussions on the roles of governance and institutions to enhance adaptive capacity (Brunckhorst, 2002; Folke et al., 2003; High and Pelling, 2003; Grothmann and Patt, 2005; Eriksen et al., 2009; Keskitalo and Kulyasova, 2009; Pahl-Wostl, 2009; Armitage and Plummer, 2010). There is also a proliferation of literature on measuring adaptive capacity in the water sector (Kumler and Lemos, 2008; Posey, 2009; Adamo, 2010), the marine sector (Juda, 1999; Jentoft, 2007; Olsen et al., 2011), and the forest sector (Brown et al., 2010; Marshall et al., 2010; Beier, 2011). Tools to measure adaptive capacity include indicators for adaptive capacity (Adger et al., 2004), the adaptive capacity wheel (Gupta et al., 2010), and an adaptive learning framework (Pahl-Wostl, 2009).

Scholars note the benefits for an integrated DRR and CCA. They both aim to reduce vulnerability, increase resilience, support no-regret solutions that are pro-active, holistic and long term (Sperling and Szekely, 2005; Thomalla et al., 2006; Schipper, 2009). The potential financial, human and natural resource effectiveness resulting from this synthesis is another advantage of integration (Schipper, 2009; Mercer, 2010), specifically in resource-limited countries. Collier et al. (2009) argue that the emerging fields of CCA and DRR provide significant opportunities to avoid and/or reduce many of the negative consequences associated with such events. However, despite the recognition that DRR and CCA should be integrated, practices show that these progresses are still slow (CSDRM, 2010) and varied at different governance levels and sectors (Schipper, 2009; Mercer, 2010), and are documented as exclusive and separate in academic literature and within reports of organisations (Djalante, Under review).

I examine how climate change has or can alter the characteristics of disasters. Moreover, I also compile tools and strategies, and review progress and challenges for the integration of DRR and CCA, and examine this integration in Indonesia. I provide a detailed review on the rationale, tools, strategies, and progress necessary for integrating DRR and CCA in Part II, Chapter 5 of the thesis.

1.4.1.4 Adaptive governance

This section reviews some of the most relevant issues in governance theories utilised in this thesis. Stoker (1998) says that governance represents a particular governing style which, defined by boundaries within and between public and private sectors, can no longer be straightforward. Governance is different to government, which is understood as the processes of making decisions and enforcing them through authority and sanctions. Stoker (1998) makes five propositions about governance: (1) It is comprised of a collection of institutional actors that are from inside and outside government; (2) The management of social and economical issues have unclear boundaries and responsibility; (3) There is power dependence amongst institutions; (4) There are autonomous self-governing networks of actors; and (5) Tools and techniques are utilised to steer and guide instead of by command and authority.

The analyses in Part II (Theoretical Review) and Part III (Case Study of Indonesia) utilise governance concepts to examine the progress and challenges in implementing DRR. The roles of government and non-government organisations (NGOs) and their relationships to each other are examined in Chapters 6 and 7, while the roles of networks in helping to build resilience are specifically analysed in Chapter 9. Certain key literature focuses on the need for governance theories, which allow for consideration of the complexities arising in managing an interlinked social-ecological system (SES) with the emerging characteristics of a complex adaptive system (CAS), such as non-linearity, uncertainty, feedback, and self-organisation. The analyses do not specify how Indonesia falls into specific governance categories or strategies, but rather, this literature informs the analysis of the theoretical development of adaptive governance (Chapter 5).

Duit et al. (2008; 2010) give an excellent review on key emerging issues for governance theory in order to manage the complexity of SES, that is, to manage the behaviours of complex adaptive systems (CAS) such as non-linear dynamics, threshold effects, cascades and limited predictability. They argue that the balance between exploration (e.g. learning processes, feedback loops, monitoring schemes, resources, and capital) and exploitation determines the adaptive capacity of a governance system. Four typologies of governance system, namely rigid, robust, fragile and flexible governance are proposed.

Rigid governance is where stability is maximised, but lacks flexibility. Robust governance combines both a high level of capacity and exploration and is hence well-equipped to manage change and transformation. Fragile governance simply does not have the capacity to manage change due to lack of knowledge and capital. Flexible governance has high ability to manage change, but lacks the ability to transform.

Another very relevant analytical governance strategy to this research is termed 'multi-level governance', which is related to the examination of the relationships between DRR stakeholders at different levels of government, from international, regional, national, local and community levels. Hooghe and Marks (2003) examine the relevance of multi-level governance in managing complex environmental problems. They propose two types of multi-level governance. Type I is characterised by 'dispersion of authority to general-purpose, non-intersecting, and durable jurisdictions', while Type II is 'task-specific, intersecting, and flexible jurisdictions'. Bulkeley and Betsill (2005) use a multilevel governance perspective to examine the discursive and material struggles which take place in creating sustainable cities, arguing that 'urban' climate protection governance must challenge traditional distinctions of environmental politics between local, national and global, to involve an expanded network sphere between state and authorities.

This theory of multi-level governance is employed in Chapter 5 (Adaptive Governance and Resilience) and is categorised as the third group of AG scholarship, that is derived from legal and natural resource management scholarship and focuses on collaborative governance of environmental problems. This theory is also extremely relevant in the analysis in Chapter 9, on the emergence of multi-stakeholder platforms (MSPs) for DRR and their roles in helping to build resilience from a global, regional (Asian and south-east Asian), national and local (Indonesian) perspective. Rhodes (1996) specifically looks at the role of self-organising and inter-organisational networks as a major type of governance characteristic, and argues that these networks beneficially strengthen governance processes, since they complement markets and hierarchies for the allocation of resources and the exercise of control and coordination. In DRR studies, the role of networks and self-organisation is increasingly recognised, as is outlined in Chapter 5 on the relationships between AG and disaster resilience. In this chapter, network and self-organisation is one of the four key characteristics of adaptive governance that I propose as crucial to building disaster resilience.

The importance of examining the governance of DRR at the local level is proposed in literature (Nagasaka et al., 2009; Prabhakar et al., 2009). Local government and other stakeholders have an imperative role in DRR since they are usually the first responder following disasters, they tend to have better knowledge of their localities, and the resilience of local communities is determined by the existence of networks and the participation of local stakeholders (King, 2008). The role of local and city stakeholders is the subject of analysis in governance literature related to disasters and climate change. Betsill and Bulkeley (2003; 2004; 2005; 2006; 2012) extensively study this issue. They identify three issues critical to the study of cities and climate change: the multi-level nature of climate governance; the role of knowledge in local climate policy; and the gap between theory and implementation of local climate policy. In addition, Keil (1998) examines the globalisations of cities, which looks at the increasing significance of local actors in influencing global governance. This is particularly true with the increasing roles of cities and local governments in taking charge of climate-change mitigation, adaptation and disaster-resilience agendas. Networks of cities such as C40 and Cities for Climate Change have pushed forward the agendas of greenhouse gas emission reductions in the midst of slow negotiation by national governments within the UNFCCC. The 'Resilient Cities' campaigns by the UNISDR, and similarly, by ICLEI, encourage coordination and collaboration between cities in building resilience to disasters and climate change. A detailed analysis of the roles of cities is given in all chapters through Part II (Theoretical Review) and Part III (Case Study of Indonesia).

The last theory relevant to this research is that proposed by Loorbach (2010), termed 'Transition Management for Sustainable Development'. Specifically, Loorbach proposes four types of governance activities that are important for societal transitions: strategic, tactical, operational, and reflexive. Strategic activities identify long-term vision, norms and goals. Tactical activities include steering a dominant structure through establishing rules, regulations, institutions, organisations, networks, infrastructures and routines. At the operational level, this means conducting activities that can lead to innovations, which lead to new structures, culture, routines and actors. Finally, reflexive activities include monitoring, assessment and evaluation of policies and societal change. This theory gives a very robust framework through which DRR can be transformed, and is particularly relevant to research on aligning DRR agenda with sustainable development goals (UN, 2012c). Loorbach (2010) further argues that societies are increasingly complex on three levels: at the societal level itself, at the level of potential impacts on the society, and at the level of governance needed to manage these complexities. This goal can be attained by increasing the adaptiveness of current modes of governance to environmental change (Lebel et al., 2006). Adaptiveness is defined as the capacity of a social actor or SES to adapt in response to, or in anticipation of, changes in the environment (Lebel et al., 2010a).

The role of governance is crucial in reducing vulnerability and increasing resilience. A challenge in developing disaster resilient communities is not just anticipating and managing the expected damages but also integrating multiple stakeholders at multiple scales to mitigate and respond to disasters (Kapucu et al., 2013). Lack of governmental resources and capacity often leads to the inability to provide adequate services and infrastructures, which could put the society in a vulnerable position. Ineffective governance, lack of accountability, and institutions that are too rigid and slow to change influence the ability to keep up with social-ecological changes (Young, 2002, 2010, 2011). Generally, the current set-ups in most institutional arrangements in managing environmental problems are not yet fully equipped to keep up with social-ecological system (SES) complexities and rapid changes, because they are too rigid, too sectoral, have narrowly defined mandates, and have planning terms that are incompatible with the rate of change in the SES (Lemos and Agrawal, 2006; Ebbesson, 2010).

Hence, there needs to be a governance approach that provides a framework for the society to face the ever-changing SES and to increase its capacity to face the complexities and uncertainties related to current and future disasters and climate change. Adaptive governance (AG) is propounded as a governance approach that proposes “an engagement with forms of environmental policy that favours less rigid, less uniform, less prescriptive, and less hierarchical approaches to governing, and embraces more collaborative, decentralized decision-making approaches that devolve control to participatory and multi-stakeholder groups, embrace flexibility and multi-level arrangements, and pursue explicitly adaptive and arguably more effective means of addressing complex environmental challenges (Lebel et al., 2006; Holley et al., 2011).

AG is understood to include a conceptualisation of adaptive management (Holling, 1978), adaptive co-management (Olsson et al., 2004) or collaborative governance (Freeman, 1997-1998; Karkkainen, 2001; Heikkila and Gerlak, 2005; Pahl-Wostl et al., 2007). Despite the increasingly available literature on designing governance systems that aim to enhance resilience, a substantial gap in the natural hazards scholarship remains on how adaptive governance for building resilience to disasters should be formulated.

This research contributes to interdisciplinary research on the conceptual understanding of the interlinkages between adaptive governance (AG), resilience, and disaster risk reduction (DRR). Specifically, this research examines lessons from environmental governance literature to identify governance characteristics that are shown to increase resilience. Detailed review on the relationships between AG and resilience is given in Part II, Chapter 6 of the thesis.

1.5 A Proposal for Adaptive and Integrated Disaster Resilience

The growing recognition of global environmental changes and risks has led to calls for greater consideration of the increasing uncertainties and complexities (UNEP, 2012). Addressing these complexities and uncertainties requires an integrated analysis of human-environment or social-ecological systems (SES) (Holling, 2001; Turner et al., 2003b; Liu et al., 2007). Integrated approaches to complex environmental problems have long been discussed in the literature, particularly in environmental and resource management (e.g. Cicin-Sain, 1993; Pahl-Wostl, 2008; Pollard and du Toit, 2008; Huntjens et al., 2011).

The need for an integrated approach is also increasingly recognised in disaster studies. This integrated approach involves considering not only the frequency and magnitude of hazards, and the geophysical processes that create them, but also requires understanding of the causes of vulnerability, resilience and the impacts across SES (Adger, 1996; Adger and Brooks, 2003; Wisner et al., 2004a; Adger et al., 2005c; Adger, 2006b). Collier et al. (2009) argues there is an urgent need for a holistic and dynamic systems approach, focusing on social-ecological resilience as a primary objective for adaptation and risk reduction. This approach is multidisciplinary, using the natural and social sciences, and takes into account different temporal and spatial scales, multiple sectors and stakeholders, as well as expert and local knowledge (Paton and Johnston, 2006; Wisner et al., 2012; Berkes and Ross, 2013; Engle et al., 2013; Kapucu et al., 2013). However, much work remains to be done to determine how an integrated approach to DRR can best be advanced (Klein et al., 2003; Paton and Johnston, 2006). In particular, challenges exist in identifying appropriate pathways to better integrate DRR within related policy areas, particularly climate change and development (UN, 2012a, d).

I examine what aspects constituting an integrated approach in building disaster resilience to future changes and disturbances could be incorporated simultaneously. I develop adaptive and integrated disaster resilience (AIDR) framework, defined as the ability of communities or nations to build resilience to disasters in an integrated and systematic manner while strengthening mechanisms to increase adaptability to future uncertainties and complexities. This framework offers a systematic and comprehensive understanding of resilience-building processes through examining each important component for building disaster resilience. The framework also provides a systematic analysis for the integration of climate change within each of the resilience factors, as well as a mechanism to ensure the ability to adapt to future changes and disturbances. I provide a detailed review of the rationale, development of the framework and pathways for AIDR in Indonesia in Part IV, Chapter 10.

1.6 Thesis Design and Structure

I summarise the design for this PhD study in Figure 1-22. It translates the three research objectives, which are explained in Table 1-1, previously. I divide the thesis into four thematic parts, which are interconnected in a sequential order. The results from one part determine the analyses in the following part. The full arrows show the systematic presentation from the Overview (Part I), to the Theoretical Review (Part II), to the Case Study of Indonesia (Part III), and to the Synthesis and Conclusion (Part IV). Figure 1-23 shows how the thesis is organised into chapters. The dashed arrows show how the results from the chapters on theories (Part II) are used to analyse chapters on Indonesia (Part III).

- Part I provides a thesis overview, rationale of the PhD and for conducting the research in Indonesia, key concepts adopted and the PhD design and thesis structure. There are two chapters in this part. Chapter 1 serves as the introduction to the thesis. It discusses the concepts underlying the research, key research questions, and the objectives of the research. Chapter 2 presents the methods for data collection, analysis and publication.
- Part II reviews different concepts that are relevant to disaster resilience. This part aims to achieve the first objective of the thesis. It presents a comprehensive analysis of the inter-linkages between the four key concepts of resilience, integration of DRR and CCA, and AG. There are three chapters in this part. Chapter 3 reviews definitions, the interpretation of resilience conceptually and in practice, and develops an integrated disaster resilience framework. Chapter 4 examines why and how DRR and CCA should be integrated to promote resilience. Chapter 5 reviews AG and resilience.
- Part III examines the case study in Indonesia, which utilises the findings from Part II. This part aims to achieve the second objective of the thesis. It provides a comprehensive analysis of Indonesia's progress in building disaster resilience, the integration of DRR and CCA, and an analysis of AG to build resilience. The discussion is based on the results from extensive literature reviews as well as in-depth interviews conducted with various key organisations in the country. There are four chapters. Chapter 6 presents an analysis of progress in building resilience in Indonesia. Chapters 7 and 8 examine the progress and challenges of DRR and CCA integration using different methods of analysis. Chapter 9 presents the role of multi-stakeholder platforms in DRR.
- Part IV presents the overall analysis and conclusions of the thesis, building on the results from Part II and Part III. This part aims to achieve the third and final research objective. There are two chapters here. Chapter 10 presents the rationale and proposes an AIDR framework. Chapter 11 concludes the research by first explaining how I answer the research question and met the research objectives, and then identify the implications of the research findings for policy and practice. Limitations of the research, as well as recommendations for future research, are provided.

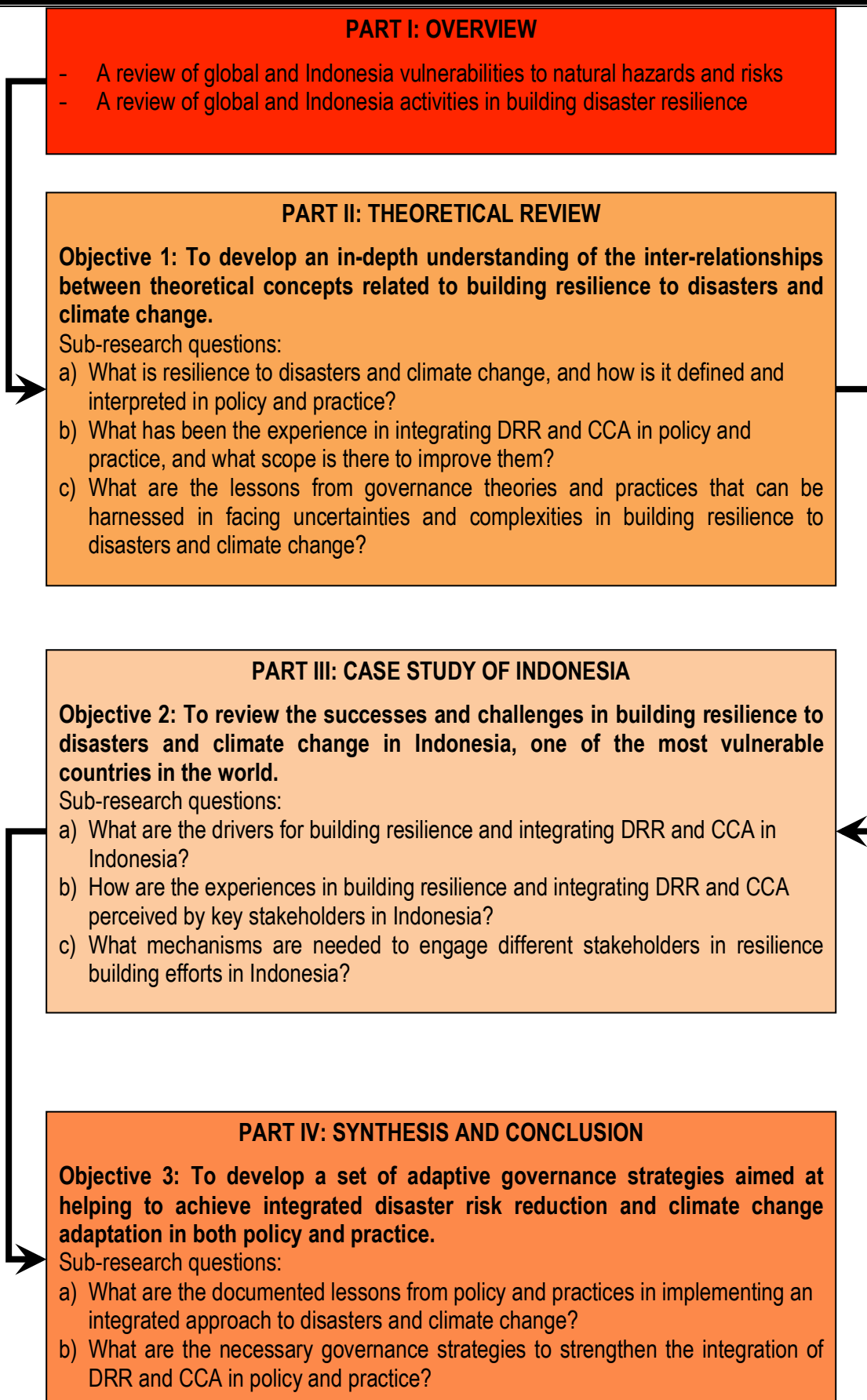


Figure 1-22: Schematic of the Thesis Design Showing the Three Research Objectives are Met In Parts II, III And IV.

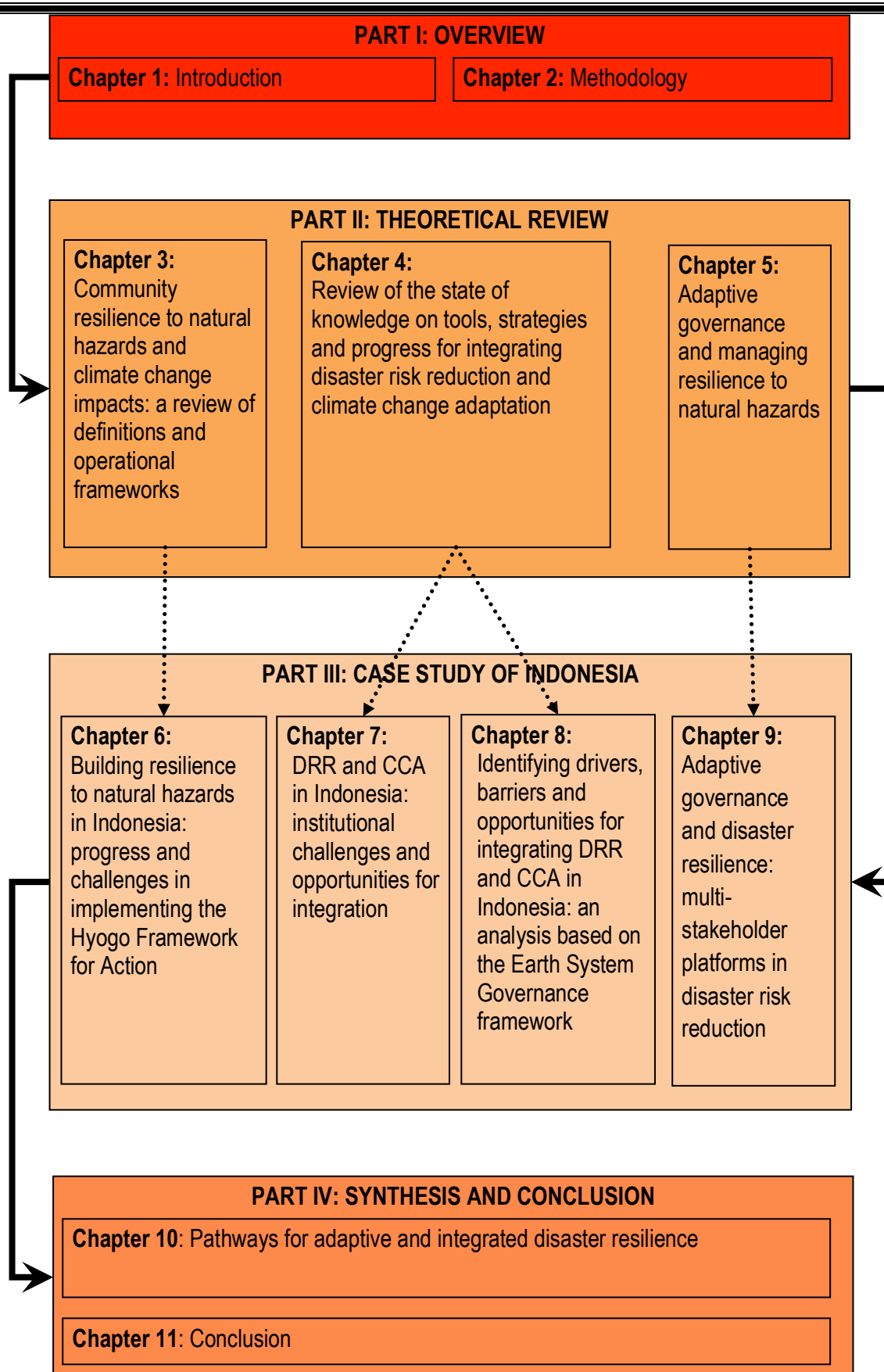


Figure 1-23: Organisations of Thesis.

CHAPTER 2

RESEARCH METHODS, FIELDWORK AND ANALYSIS

Chapter 2 is included in the thesis overview (Part I). Chapter 2 presents the research methods, fieldworks and analysis. In Section 2.1, I discuss methods, which include the use of qualitative research, literature review, and the case study. In Section 2.2, I outline of all aspects of the different fieldwork in Indonesia. In Section 2.3, I outline data analysis and publications. In Section 2.4, I outline the ethics and reflections in conducting the research.

2.1 Research Methods

The following subsections describe the methods used in this thesis to compile, generate, utilise, and analyse data, and to produce results.

2.1.1 Qualitative research

In this research, I employ a qualitative research method since it enables to gain closer understanding and deeper perspectives on key stakeholders' perceptions on the progress and challenges in building resilience to disasters in Indonesia. Qualitative research is explained by Johnston et al (2000) as 'a set of tools developed to pursue the epistemological mandate of the philosophies of meaning'. It is concerned with how the world is 'viewed, experienced and constructed' by social actors, and provides access to 'motives, aspirations and power relationships that account for how places, people, and events are made and represented' (Johnston et al., 2000). This method of research include: in-depth open-ended interviews with groups and individuals; direct engagement with participants through observation and ethnographic technique; and through interpretation of texts such as landscapes, archival materials, maps, literatures and visual images (Johnston et al., 2000). Research methods such as interviews, participant observation and textual analysis are profoundly useful in documenting and analysing social structures or individual experiences and relationships (Denzin and Lincoln, 2000).

2.1.2 Case study of Indonesia

Case study as a research method is useful when a question to be answered seek to explain "how" or "why" some social phenomenon occur (Yin, 2009). It is also relevant when a question needs an extensive and 'in-depth' description of some social phenomenon (Yin, 2009). Indonesia (complemented with several local case studies within Indonesia) is an ideal environment for exploring the research approach through synthesis and conceptualising, as it illustrates the broad spectrum of complexities. With its experience of massive disasters and ongoing hazards, Indonesia represents an excellent case study in multi-stakeholders, multi-governance, scale issues, multi-hazards, governance across scales, institutions and their response, and timely research during its process of transformation. As a researcher with ongoing access to relevant institutional structures, Indonesia offers me an exceptional opportunity to analyse how practice, policy and science interact.

2.1.3 Multi-method research

I employ a multi-method design to collect and organize the data needed to investigate the research questions outlined in Chapter 1. Multi-method research describes the independent application of more than one method in a research design. It encompasses a wide range of research strategies (McKendrick, 2009). Researchers can improve the ability to understand the phenomena they analyse through combining more than one research method in a single design (Darke et al., 1998; Creswell, 2009). Furthermore, multi-methods allow not only for providing more in-depth data, but allow for validating findings and hence increase the study reliability (Yin, 2009). There are various purposes of using multi-methods in research (Creswell and Clark, 2007). They are to triangulate or to seek convergence of results; to find complementarities, that is, to find overlapping of issues that may emerge; to find next development, that is, earlier method is used sequentially to help inform the second method; and also when a study needs to be expanded, that is, multi-methods are used to add scope and breadth to a study. Data collected for this is taken from secondary and primary sources. The secondary data is obtained from literature review, while primary data is collected through conducting semi-structured interviews with key stakeholders on DRR and CCA in Indonesia. I utilise a multi method research to find complementarities, that is, to find overlapping issues that may emerge. The methods used include: (1) Literature review; (2) Semi-structured interviews; (3) Involvement in discussion in related online social networking sites. Table 2-1 shows a summary of methods employed in each chapter, the objectives and information collected.

Thesis Chapter	Methods	Objectives	Information collected
PART II: THEORETICAL REVIEW			
3. Community resilience to natural hazards and climate change: a review of definitions and operational frameworks	- Literature review	<ul style="list-style-type: none"> - To review development of resilience concepts in different fields of studies - To compile different definitions and operational frameworks for resilience in DRR theories and practices - To propose key factors that are important in building disaster resilience 	<ul style="list-style-type: none"> - Etymology of resilience concepts from different fields of studies - Various definitions of disaster resilience. - Various frameworks for disaster resilience in humanitarian and development practices.
4. Review of the state of knowledge on tools, strategies, progress for integrating DRR and CCA	- Literature review	<ul style="list-style-type: none"> - To review the state of knowledge on the integration of DRR and CCA - To develop framework for analysing the integration 	<ul style="list-style-type: none"> - Tools, strategies and frameworks for DRR and CCA integration - Latest progress for integration. - Identified challenges for integration
5. AG and managing resilience to natural hazards	- Literature review	<ul style="list-style-type: none"> - To review conceptual development of AG - To examine key characteristics from AG that are important in building disaster resilience 	<ul style="list-style-type: none"> - Development of AG theories - Governance characteristics that influence resilience.

PART III: CASE STUDY INDONESIA

6. Building resilience to natural hazards in Indonesia: progress and challenges in implementing the Hyogo Framework for Action	<ul style="list-style-type: none"> - Literature review - Semi-structured interviews - Online social networking - Fieldwork in Indonesia - Semi-structured interviews 	<ul style="list-style-type: none"> - To gain understanding on development resilience concept in disaster studies - To gain understanding on key DRR frameworks to be utilised in this particular chapter - To identify key stakeholders involved in resilience-building activities in Indonesia - To examine stakeholders' perception on progress and barriers in building resilience to disasters and climate change in Indonesia. - To be informed with events and discussions on disasters 	<ul style="list-style-type: none"> - Review of development of DRR at the international level - Lists of key stakeholders in DRR globally and Indonesia - Working relationships between the key stakeholders in Indonesia. - Organisations activities in building disaster resilience in Indonesia - Meetings, seminars, and national events on DRR and CCA in Indonesia
7. Identifying drivers, barriers and opportunities for integrating DRR and CCA in Indonesia: an analysis based on the ESG framework	<ul style="list-style-type: none"> - Literature review - Semi-structured interviews - Online social networking - Fieldwork in Indonesia - Semi-structure interviews 	<ul style="list-style-type: none"> - To gain knowledge on the development of the ESG frameworks - To identify key stakeholders involved in DRR and CCA in Indonesia - To examine stakeholders' perception on challenges and opportunities for the integration of DRR and CCA in Indonesia - To be informed with events and discussions on disasters 	<ul style="list-style-type: none"> - Review of ESG framework. - Application of ESG in different field of studies. - Application of ESG in disaster studies. - Identification of key stakeholders in DRR and CCA in Indonesia - Stakeholder perceptions of challenges to the integration
8. Adaptive Governance and Disaster Resilience: Multi Stakeholder Platforms in Disaster Risk Reduction	<ul style="list-style-type: none"> - Literature review - Semi-structured interviews - Online social networking - Fieldwork in Indonesia - Semi-structured interviews 	<ul style="list-style-type: none"> - To identify key actors and organisations involved in multi-stakeholder platforms for DRR at different levels of governance (from international to local) - To understand the inter-relationships between MSPs - To examine key actors' perception on the current and future role of MSPs in building resilience in Indonesia - To examine effectiveness of MSPs in building resilience 	<ul style="list-style-type: none"> - Key actors and organisations in DRR - Inter-relationships between MSPs

PART IV: SYNTHESIS AND CONCLUSION

9. Adaptive and Integrated Disaster Resilience Framework	<ul style="list-style-type: none"> - Literature review 	<ul style="list-style-type: none"> - To develop understanding on current discussion on disaster resilience - To identify key issues influencing resilience - To develop strategies for integrated approach in policy and practice 	<ul style="list-style-type: none"> - Development of resilience theories - Strategies for AIDR
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Table 2-1: Methods, objectives, information collected, key concepts, scale of analysis.

The following sub-sections explain the data collection processes in more detail.

2.1.3.1 Secondary literature collection and review

I collect data for this research through comprehensive literature review from books, academic journals, on-line dialogues and discussions, Internet mailing lists and group lists related to resilience, DRR, CCA, and AG. Relevant governmental reports, documents, laws as well as non-governmental and international organisational reports are also sourced. Books, government and international reports, conference proceedings and research reports/documents are consulted in order to ascertain the most current developments in disaster resilience frameworks.

2.1.3.2 Semi-structured interviews

Semi-structured interview is another method employed in this research. A semi-structured interview is a social science research interview method using a set of trigger questions designed to elicit new ideas following the interviewee's responses (McKendrick, 2009). In this thesis, the purposes of the semi-structured interview are:

- To identify institutional activities related to DRR and CCA
- To explore respondents' perception on the progress and barriers of building resilience in Indonesia
- To explore respondents' views on the integration of DRR and CCA, progress, barriers and opportunities for the integration

2.1.3.2.1 The interview questions

I develop three different semi-structured questions developed, each for government organisations, non-government organisations and community. Moreover, there are seven types of interview questions developed for the different agencies targeted. The questions utilised in the semi-structured interviews are listed in Appendix 4 - 10. I specifically differentiate national and local level organisation to capture the dynamics of the relationships of organisations at different levels. The distinction between government and non-government organisation is intended to examine how different organisations contribute to DRR based on their mandates, and also to examine different organisations perceptions on other organisations. The different types of questionnaires and their purposes are summarised in Table 2-2 below.

No	Questionnaire type	Intended interviewee	Level	Purpose
1.	SSI-1 NAT (DRR AND CCA)	Bappenas	National	To gather information on national government planning and implementation of DRR and CCA policies
2.	SSI-2 NAT (DRR)	Government organisations in DRR	National	To gather specific information on national sectoral government planning and implementation of DRR policies
3.	SSI-3 NAT (CCA)	Government organisations in CCA	National	To gather specific information on national sectoral government planning and implementation of CCA policies
4.	SSI-1 LOCAL (DRR AND CCA)	Bappedda	Sub-national / Local	To gather information on local government planning and implementation of DRR and CCA policies
5.	SSI-2 LOCAL (DRR)	Government organisations in DRR	Sub-national / Local	To gather specific information on local sectoral government planning and implementation of DRR policies
6.	SSI-3 LOCAL (CCA)	Government organisations in CCA	Sub-national / Local	To gather specific information on local sectoral government planning and implementation of CCA policies
7.	SSI-5 (RESILIENCE)	International / Non-Government Organisations	National and local	To gather specific information on organisational activities in building resilience to disasters and climate change

Table 2-2: Different types of interview questionnaires.

2.1.3.2.2 Selection of research participants

In the selection of suitable interview participants, researchers can begin to comprehend potential participants' perspectives through the exploratory and/or background work of, for example, reading, observation, viewing television documentaries, and conducting preliminary interviews (Creswell, 2009). In this research, I choose individuals and stakeholders, agencies, institutions and organisations working with disaster risks to participate. At the national level, I select government organisations based on their mandates, tasks and functions related to DRR and CCA planning and implementation. I identify international and national NGOs and funding organisations working on DRR and CCA in Indonesia through a Google search employing key words 'disaster risk reduction, climate change adaptation, organisations for disaster management, organisations in disaster risk reduction, organisations and disasters in Indonesia' performed both in English and Bahasa Indonesia. I then email the organisation representatives for the possibility of interviews. Key personnel within these organisations who are responsible for specific DRR and CCA projects and programs and who are willing to participate in the research are selected for interview. Moreover, I identify several key informants within government and NGOs through my existing professional network. At the sub-national government levels, participants are selected in Makassar City because of their involvement in a related project on CCA conducted by the Commonwealth Scientific and Industrial Research Organisation's (CSIRO). For my interviews with stakeholders in Kendari City, I select the participants through my previous working relationship within the provincial and local government. Finally, I utilise 'snowball sampling technique', whereby I used information obtained during interviews to identify potential informants from the same and/or other organisations. Employing the snowball sampling technique, where an external connecting person introduced me to another potential interviewee, is important in terms of helping to build trust before meeting.

There are several studies emerging on the use of Facebook as research tool (Smith and Kidder, 2010; Wilson et al., 2012), to get participants and engage stakeholders (Waters et al., 2009), to examine networks and connectivity (Ellison et al., 2007). I find Facebook very useful in searching for organisational names, and through a process of asking to join an organisation's page and 'liking' the page, I am hence updated with every posting on the page. Moreover, the Facebook platform helps me to identify key people and activities within the organisation. International organisations now not only have their own websites, but many embrace the new phenomenon of having their organisational activities featured as Facebook pages. The impressive reach of Facebook is a tremendous help in keeping me updated with the activities of key people and their professional activities, and is a significant source alongside the next method, my networks from my experiences working in Indonesia.

2.1.3.2.3 Recruitments of research participants

I conducted in-depth semi-structured interview with representatives of 18 organisations engaged in DRR and CCA nationally and 17 organisations locally. The next tables list the organisations represented in the interviews and their respective role for DRR and CCA in Indonesia. The organisations included in the interviews are comprised of government organisations, NGOs, United Nations organisations and various funding institutions. Organisations outside government (local and national) are chosen in order to gain understanding on their perception on how government organisations, as the key organisations responsible for DRR in Indonesia, are or are not able to meet their expectation. Moreover, organisations at different levels, national and local, are also chosen so that I can gain better perspectives on how they perceive each other in terms of responsibility and capacity in planning and implementing DRR. Table 2-3 shows the lists of organisations at the national level, while organisations at the local level are listed in Tables 2-4 and 2-5.

Organisation websites	Areas of responsibility	Information obtained	Place /Date / No interviewed
1. BAPPENAS National Development Planning Agency www.bappenas.go.id	Bappenas is the key government agency for coordinating the development planning in Indonesia. The mandates include: - Development of national long, mid-term planning documents - Development of National DRR and CCA guidelines and action plans - Ensuring compliance and mainstreaming of sectoral issues into DRR and CCA	- National government activities in DRR in Indonesia. - Perception on progress and challenges for DRR and CCA integration in Indonesia. - Perception on progress and challenges for DRR at the local government level. - The role of Indonesia at the international DRR.	Jakarta. / Jan 2010, Jan 2011 / 1
2. BNPB National Disaster Management Agency www.bnpb.go.id	BNPB is the key government agency mandated for DRR in Indonesia. The mandates include: - Development of national guidelines and actions plans for DRR, Implementation of DRR - Responsible in all stages of disaster risk management, Emergency management in collaboration with SAR (<i>Basarnas</i>) and other stakeholders, Maintain relationships with BPBDs (Local Disaster Management Agencies), Focal Point for HFA implementation and reporting	- National government activities in DRR in Indonesia. - Perception on progress and challenges for DRR and CCA integration in Indonesia. - Perception on progress and challenges for DRR at the local government level. - The role of Indonesia at the international DRR.	Jakarta / Jan 2010, Jan 2011 / 2
3. DNPI (National Council on Climate Change) http://dnpi.go.id/portal/id	DNPI is created to coordinate the planning of climate change mitigation and adaptation and to strengthen Indonesia's position with the international negotiation framework. It is headed directly by the president but the acting daily executor is Rachmat Witoelar (Ex Environmental Minister), who is also the special envoy for climate change negotiation. There are 16 ministers involved within DNPI. There are 6 working groups within DNPI: Adaptation, mitigation, technology transfer, funding, international negotiation, and LULUCF.	- National government activities in CCA in Indonesia. - Perception on challenge for DRR and CCA integration in Indonesia. - The role of Indonesia at the international CCA.	Jakarta / Jan 2010, Jan 2011 / 3

4. BMKG Meteorology Climatology and Geophysics Agency http://www.bmkg.go.id/BMKG_Pusat/Depan.bmkg	This is a ministerial level agency. It has 4 regional offices throughout Indonesia (Jakarta, Denpasar, Makassar and Jayapura). The mandates include: - Develop national guidelines and action plans for meteorology, climatology and geophysics (MCG) - Coordination between other government agencies on issues related to MCG - Providing information to other government agencies on issues of climate change - Providing information on early warning - Data collection and record maintenance for indicators for MCG through measuring stations through Indonesia	The interview focuses on the role of BMKG in providing information related to climate change and early warning for climate hazards.	Jakarta / Jan 2010, Jan 2011 / 2
5. Ministry of Home Affairs (MoHA) http://www.kemendagri.go.id/	MoHA is responsible for the coordination between national and local governments. The ministry is working closely with BNPB in ensuring coordination of BNPB with all the BPBD (Local disaster management agencies) throughout Indonesia.	The role of MoHA in creating supporting environments in terms of planning and policy related DRR and CCA within the national and local governments.	Jakarta / Jan 2010, Jan 2011 / 1
6. Ministry of Environment http://www.new.menlh.go.id/	MoE is responsible for the planning and management of environmental issues including climate change adaptation and mitigation.	MoE activities for CCA in Indonesia as well as perception on the integration of DRR and CCA in Indonesia.	Jakarta / Jan 2010, Jan 2011 / 1
7. The World Bank http://www.worldbank.org/en/country/indonesia	The World Bank Group strategy in Indonesia focuses on the "Acceleration and Expansion of Indonesia's Economic Development 2011-2025" within the four main areas of engagement: Pro-Growth, Pro-Jobs, Pro-Poor, Pro-Green. Disaster, climate risk reduction and adaptation measures are included within the Pro-Green agendas.	World Bank activities in implementing DRR program as well as challenges and opportunities for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 1
8. UNDP Indonesia http://www.id.undp.org/indonesia/en/home.html	UNDP is the UN's arm for development activities. In Indonesia, UNDP aims to support the implementation of Indonesia's national priorities, Medium Term Development Plan 2010-2015 and other national and local development visions, strategies and plans. There are four themes of UNDP works: poverty reduction, democratic governance, crisis prevention and recovery, and environment and energy.	UNDP activities in implementing DRR program. Challenges and opportunities for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 3
9. SCDRR Multi-stakeholder: Bappenas UNDP MoHA	SCDRR was started in 2007 with four key outputs: 1) Disaster risk reduction policy, legal and regulatory frameworks established, 2) Institutional systems that support decentralized disaster risk reduction established, strengthened and integrated with local level development, 3) Communities and decision makers better informed on disaster risks and measures that can be taken to reduce those risks, 4) Local disaster risk reduction processes, methodologies, guidelines and tools developed, applied, documented and fed-back into the policy framework.	SCDRR activities in implementing DRR program as well as challenges and opportunities for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 1
10. PLANAS PRB Multistakeholder http://planasprb.org/	PLANAS PRB or National Platform for DRR is a multi-stakeholder entity to help coordinating activities amongst DRR stakeholders in Indonesia. It also supports advocacy, partnerships and collaborations for DRR at the national government level.	Perception on the roles of key organisations on DRR and CCA.	Jakarta / Jan 2010, Jan 2011 / 1
11. UNESCO – community preparedness UN organisation http://portal.unesco.org/geography/en/ev.php www.jtic.org	The Jakarta Tsunami Information Centre (JTIC) is located within the UNESCO Office in Jakarta. JTIC is a project funded by Canadian International Development Agency to increase and strengthen awareness about Tsunami and the development of the Tsunami Early Warning System in Indonesia through information service.	JTIC activities and perceptions on progress of building resilience to disasters in Indonesia.	Jakarta / Jan 2010, Jan 2011 / 1

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12. MPBI - CSO http://www.mpbi.org/	Indonesia Society for Disaster Management is a not-for profit organisations created in 2003. MPBI aims to build community resilience through DRR activities and advocacies in policies and implementations.	Perception on the roles of key organisations on DRR and CCA. The role of MPBI for DRR and CCA	Jakarta / Jan 2010, Jan 2011 / 4
13. Humanitarian Forum Indonesia (HFI) NGO http://www.humanitarianforumindonesia.org/	HFI is a network of humanitarian and development organizations, founded by seven NGOs. HFI is committed to build mutual understanding between humanitarian actors, especially NGOs, across different backgrounds, ethnic races, tribes, religions and countries, to campaign norms and humanitarian standard principles throughout dialogs and partnerships	Perception on the roles of key organisations on DRR and CCA. The role of HFI for DRR and CCA in Indonesia.	Jakarta / Jan 2010, Jan 2011 / 1
14. OXFAM International NGO http://oxfamindonesia.wordpress.com	Oxfam is an international confederation of 17 organizations networked together in more than 90 countries, as part of a global movement for change, to build a future free from the injustice of poverty. Oxfam was involved in a project called Building Resilience in Eastern Indonesia Project.	OXFAM activities for DRR in Indonesia. Perception on challenges for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 1
15. Mercy Corps International NGO http://indonesia.mercycorps.org/	Mercy Corps is a non-profit, non-government international organisation in the field of disasters risk reduction, conflicts, chronic poverty and instability. In Indonesia, Mercy Corps is involved in both DRR and CCA projects, such as ACCCRN, Stakeholder Coordination, Advocacy, Linkages and Engagement for Resilience Program, or West Sumatera Emergency Response & Recovery Program.	Mercy Corps activities for DRR in Indonesia. Perception on challenges for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 1
16. WWF International NGO http://www.wwf.org.id/	WWF-Indonesia's vision is to "ensure the sustainability of biodiversity in Indonesia". There are 4 key advocacies: promoting strong conservation ethics, awareness and actions in Indonesia society; facilitating multi-stakeholders efforts to preserve biodiversity & ecological processes on eco-regional scale; advocating for policies, law and law enforcement that support conservation; promoting conservation for the well-being of people, through sustainable use of natural resources.	WWF activities for CCA in Indonesia. Perception on challenges for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 1
17. PMI National organisation http://www.pmi.or.id/ina/	The Indonesia Red Cross activities focus on providing help and supports during emergency situations following the International Federations of Red-Cross Red Crescent (IFRC) guidelines.	PMI activities for integrated DRR and CCA in Indonesia. Perception on challenges for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011
18. IFRC http://www.ifrc.org/en/news-and-media/news-stories/asia-pacific/indonesia/	The IFRC is the world's largest humanitarian organization, providing assistance without discrimination as to nationality, race, religious beliefs, class or political opinions. There are 187 member Red Cross and Red Crescent National Societies, a secretariat in Geneva and more than 60 delegations strategically located to support activities around the world.	IFRC activities for integrated DRR and CCA in Indonesia. Perception on challenges for DRR and CCA integration.	Jakarta / Jan 2010, Jan 2011 / 1

Table 2-3: List of organisations included in the interviews at the national level.

Organisation	Areas of responsibility	Information obtained	Place / Date / No. of persons interviewed
1. Department of Infrastructure South East Sulawesi Province	Sub-national Government	- Understanding of climate change impacts on the planning and maintenance of public infrastructures.	Kendari /August-Oct 2011 / 1
2. BPBD South East Sulawesi Province	Sub-national Government	- BPBD programmes and activities. - Understanding of DRR beyond emergency management. - Challenges in implementing certain programmes and activities. - Planning and implementation capacity in DRR.	Kendari / August-Oct 2011 / 1

3.	University Haluoleo, South East Sulawesi Province	Local University	- Research activities related to disasters and climate change issues.	Kendari / August-Oct 2011 / 4
4.	Mayor of Kendari City	Local Government	- General development activities in Kendari City and the extent by which risks are considered within development. - The relationships between local, sub-national and national governments in managing resilience to disasters.	Kendari / Jan 2010 / 1
5.	Bappeda Kendari City	Local Government	- General development activities in Kendari City and the extent by which risks are considered within development. - The relationships between key sectoral agencies in managing resilience to disasters locally.	Kendari / August-Oct 2011 / 3
6.	BPBD Kendari City	Local Government	- BPBD programmes and activities. - Understanding of DRR beyond emergency management. - Challenges in implementing certain programmes and activities. - Planning and implementation capacity related to DRR.	Kendari / August-Oct 2011 / 1
7.	Department of Cleanliness Kendari City	Local Government	- Understanding on how climate change can impact their works in cleaning drainage	Kendari / August-Oct 2011 / 1
8.	Department of Infrastructure Kendari City	Local Government	Understanding of climate change impacts on the planning and maintenance of public infrastructures.	Kendari / August-Oct 2011 / 1

Table 2-4: List of organisations included in the interviews at the local level in Kendari City.

Organisation	Areas of responsibility	Information obtained	Place / Date / No. of persons interviewed
1. BMKG	National Government Makassar Office	- BMKG activities including collection and disseminations of climate-related data. BMKG general observations of climate-related data.	Makassar / Oct 2010 / 1
2. Vice Governor South East Sulawesi Province	Sub-national Government	- General development activities in the South Sulawesi Province and the extent to which risks are considered within development. - The relationships between local, sub-national and national governments in managing resilience to disasters.	Makassar / Oct 2010 / 1
3. BPBD South Sulawesi Province	Sub-national Government	- BPBD programmes and activities. - Understanding of DRR beyond emergency management. - Challenges in implementing certain programmes and activities. - Planning and implementation capacity related to DRR.	Makassar / Oct 2010 / 1
4. Department of Infrastructure South Sulawesi Province	Sub-national Government	- Understanding of climate change impacts on the planning and maintenance of public infrastructures. -	Makassar / Oct 2010 / 1
5. University of Hasanuddin South Sulawesi Province	Local University	- Research activities related to disasters and climate change issues.	Makassar / Oct 2010 / 5

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6.	Bappeda Makassar City	Local Government	- General development activities in the South Sulawesi Province and the extent to which risks are considered within development. - The relationships between key sectoral agencies in managing resilience to disasters locally.	Makassar / Oct 2010 / 1
7.	Department of Urban Planning and Infrastructure	Local Government	- Understanding of climate change impacts on the planning and maintenance of public infrastructures.	Makassar / Oct 2010 / 1
8.	Department of Cleanliness Makassar City	Local Government	- Understanding on how climate change can impact their works in cleaning drainage	Makassar / Oct 2010 / 1
9.	Department of Environment Makassar City	Local Government	- Understanding how climate change and its effects on their mandates.	Makassar / Oct 2010 / 1

Table 2-5: List of organisations included in the interviews at the local level in Makassar City.

2.2 Data Collection

I conducted the fieldwork in three separate periods. Table 2-6 summarises the fieldwork details, activities that took place, the purposes and outcomes. The first set of fieldwork took place in the period from November 2009 to January 2010, conducting preliminary interviews at the national level in Jakarta. Preliminary interview or exploratory work is important as it can afford researchers the ability to gauge the scope of the interviews as well as the perspectives of participants that they interact with (Creswell, 2009). I benefited tremendously from this initial fieldwork. I was able to meet informally with some key stakeholders, identify other potential stakeholders and their contact details. Moreover, as required in the Macquarie ethics applications, I did a preliminary Internet search to identify key organisations and key persons within the organisations. The next set of fieldwork was the primary interview with key stakeholders in Jakarta, Kendari and Makassar, which took place during the time I was involved with the CSIRO Urban Water Project in Makassar. The final set of fieldwork was an additional set conducted in 2011.

No	Period	Purposes	Outcomes
1.	November 2009 – January 2010	To conduct preliminary interviews nationally in Jakarta	- Meeting with key stakeholders - Gain information on various stakeholders on DRR and CCA - Gain information on key stakeholders and persons - Meeting schedule secured
2.	October 2010 – January 2011	To conduct primary interviews nationally in Jakarta, Makassar, Kendari	- Local government perceptions on challenges for DRR - National government perceptions on progress for DRR - National government perceptions on integration for DRR and CCA - International organisations' views on integration for DRR and CCA
3.	August-October 2011	To conduct additional interviews with stakeholders in Jakarta, Kendari	As above

Table 2-6: Summary of fieldworks showing different periods, purposes and outcomes.

2.2.1 Case studies of Kendari and Makassar

The rationale for selecting Indonesia as the case study is explained in section 1.2 of this thesis. Firstly, Indonesia is selected for its distinct position globally as one of the most vulnerable countries to disasters and climate change; a country clearly affected by geophysical and climate-related hazards. This position gives abundant opportunity to examine how integration of DRR and CCA is or is not occurring. Secondly, the research focuses and is conducted at different governance levels, nationally and locally. I do this so that I can gain better understanding of consistencies in the planning and implementation of resilience-building activities. Moreover, taking the case nationally and locally enables me to observe relationships between organisations at various governance levels. I chose two localities for this research, Kendari and Makassar (Figure 2-1). I chose Kendari as a closer focus, for its position as one of the most-at-risk localities in the South East Sulawesi Province. It is located in the eastern part of Indonesia, which is less researched compared to its western counterpart. Moreover, I have an existing network of access to local governments and stakeholders. Makassar is another city chosen in view of my involvement with the CSIRO project in the city. The following sub-section provides the characteristics and hence the rationale for selecting these two cities.



Figure 2-1: Map of Indonesia Showing the Different Localities Discussed in the Thesis (Google Earth, 2013).

2.2.1.1 Kendari

Kendari City is the main location of the research at the local level. The city is shown circled in Figure 2-2. Most previous studies on DRR at the local level focus on cities that have been subjected to massive disasters and which have received an outpouring of resources from international organisations. Importantly, it is an area where I have previous working experience and hence have an established access to stakeholders in the local government and also at the sub-national level of South East Sulawesi Province.

Kendari spans an area of almost 300 km² and is situated between 3m and 100m above sea level (Figure 2-3). The average rainfall is 2,800mm a year (Government of Kendari, 2013). It is a small city with a population of 300,000 (Government of Kendari, 2013). The main hazards identified include flood, landslide and earthquake (Table 2-7). Floods occur frequently but there are no incidents of the city being completely inundated by flood. Flooding mostly affects the area along the Gulf of Kendari, where the lowest areas of the city lie (Figure 2-4), where flood and erosion controls are installed (Figure 2-5), and which are also the most populous areas of the city (Figure 2-3). The most significant disaster to affect the area was a 6.5 magnitude earthquake on 25 April 2012, which shook the city at 6am in the morning. Immediately after the earthquake, people rushed to the Gulf to see if a tsunami had hit (Figure 2-6). The Gulf of Kendari is also a significant source of livelihood for fishermen in the area (Figure 2.7). Institutionally, the city is headed by the City Mayor, and the responsibility for disaster management lies within the office of disaster management (BPBD) (Government of Kendari, 2013).

Type	Number of Disasters	Number of People Killed	Total Number of People Affected	Amount of Damage (000 US\$)
Drought	-	-	-	N/A
Earthquake (seismic activity)	8	-	-	N/A
Tsunami	-	-	-	N/A
Flood	29	3	10,242	N/A
Mass movement dry	-	-	-	N/A
Mass movement wet	8	-	-	N/A
Storm	9	4	2	N/A
Volcano	0	-	-	N/A
Wildfire	0	-	-	N/A
TOTAL	37	--	10,246	N/A

Table 2-7: Various impacts of different types of disasters in Kendari between 1900-2013 (BNPB, 2013a).

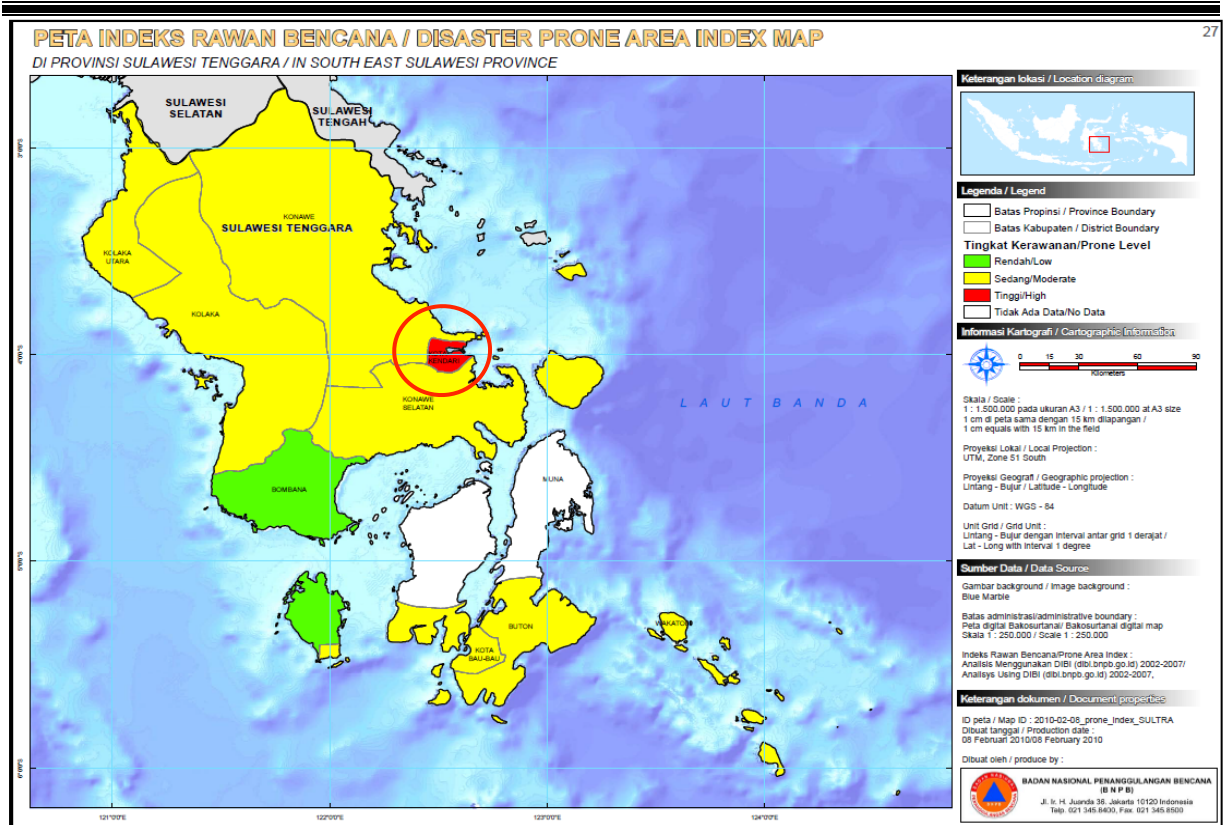


Figure 2-2: Sulawesi Tenggara Risk Map with Location of Kendari Circled (BNPB, 2013a).



Figure 2-3: Aerial picture of Kendari City Spread Along the Gulf of Kendari (Sultranews, 2012).



Figure 2-4: The Relative Flat Contour of Kendari City (Djalante, 2010).



Figure 2-5: Flood and Erosion Controls Installed by the Government of Kendari City (Djalante, 2011b).



Figure 2-6: People Flocking to The Gulf of Kendari to See if Tsunami Would Hit During The 25 April 2010 Earthquake (Kendari Pos, 2010).



Figure 2-7: Fishing Boats Moored Around the Gulf of Kendari (Djalante, 2011a).

2.2.1.2 Makassar

During the course of my PhD, an opportunity arose to be involved in the CSIRO project called Research for Development Alliance with AusAID for a project in Makassar City titled 'Climate Adaptation through Sustainable Urban Development Research Project'. As part of its Climate Adaptation Flagship, CSIRO called for PhD student involvement within their projects. Through my involvement in this project, I had the opportunity of being involved within certain parts of the project, while also receiving a top-up scholarship from CSIRO Climate Adaptation Flagship. The aim of the project was to: *"Assess the risks of climate change to affect the sustainability of fresh water supplies, establish future scenarios and planning and design alternatives for management of an integrated urban water system for the city that is adapted to climate and population change, and (3) build capacity among the country partner organisations to assess risks of climate change and develop climate adaptation strategies for sustaining fresh water supply"* (Larson et al., 2012). The project was conducted between January 2010 and September 2012. I am specifically involved in the sub-group of social sciences, which examine stakeholder perceptions on climate change within the 3rd component of the project.

Whilst in Makassar, I was involved during the stakeholder consultation workshops, which aim to understand stakeholders' perceptions of climate change and its impact on the urban water system of the city (see Figure 2-8). The result of this workshop is reported by Larson et al. (2010). The perceived impacts on the urban water system in Makassar City, from the highest to lowest rank, include increasing water costs, water shortages, extreme events, lower water quality, disasters, extreme rainfall and increased flooding (Larson et al., 2010). Moreover, I was also in charge of the data collection and analysis of formal and informal networks for urban water management in Makassar. The results of those particular activities are reported as a journal article titled 'The added value of understanding informal social networks in an adaptive capacity assessment: Explorations in the context of urban water management system of Makassar City, Indonesia' (Larson et al., 2012).

In terms of my own PhD project, in the course of interviewing the key stakeholders, I include questions on how flood is managed by particular provincial and local government organisations. During the time I was in Makassar, I also conduct interviews with agencies that have mandates related to DRR. An excerpt of the interview with the representative from BPBD of Makassar City is included in my paper in Chapter 6 on the progress and challenges in implementing the HFA in Indonesia (Djalante et al., 2012).



Figure 2-8: The City of Makassar (Bisnis Indonesia, 2012).

2.2.2 Other places discussed in the thesis

In order to provide the comprehensive analyses of Indonesia reported in Part III of the thesis, there are also other places analysed and discussed accordingly (shown in Figure 2-1. previously). These areas spread from the westernmost to the easternmost parts of Indonesia.

2.2.2.1 Sumatra Island

The island of Sumatra is the westernmost island of Indonesia (Figure 2-9). Referring back to Figure 1-14 on the Indonesia Risk Map shown previously, Sumatra is one of the most at-risk areas to both climate-related and geophysical disasters. There are three areas discussed, Aceh, Padang and Mentawai.

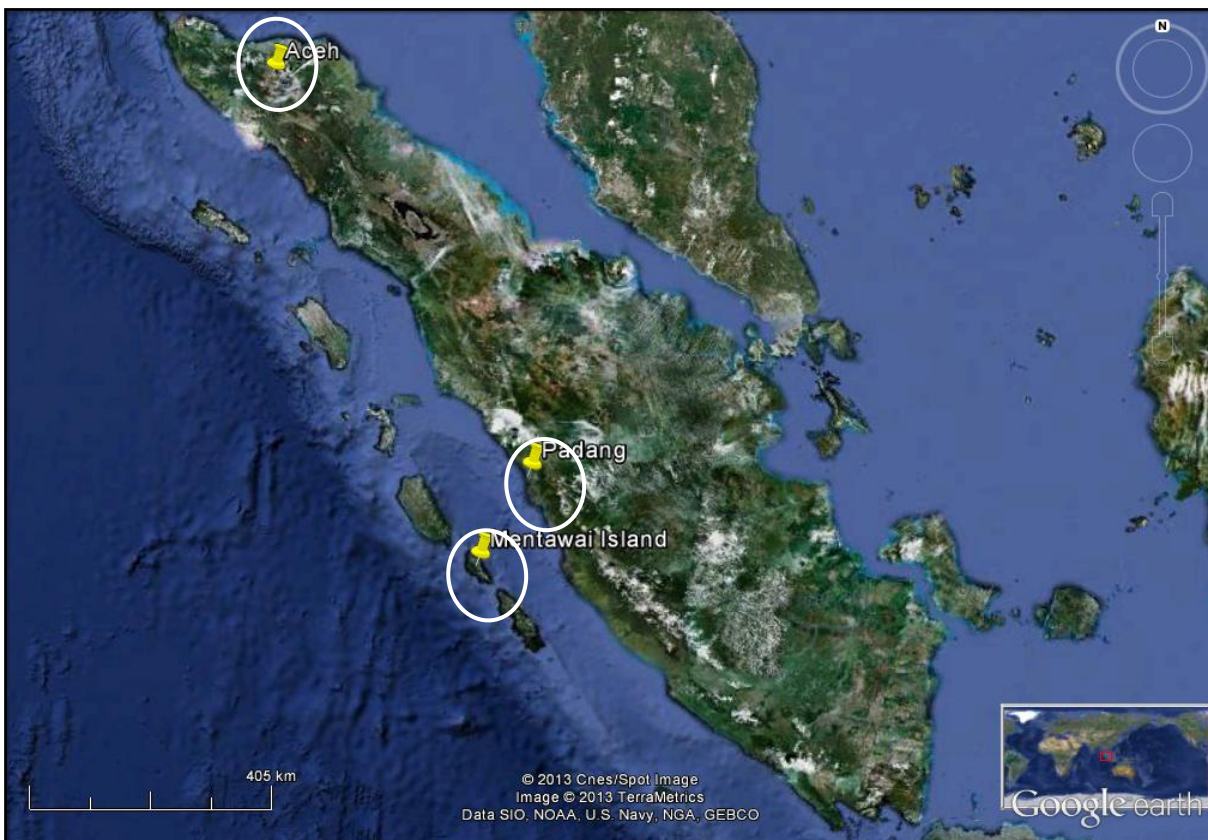


Figure 2-9: Map of Sumatra Showing Aceh, Mentawai and Padang (Google Earth, 2013).

Aceh

Aceh received worldwide attention when it was hit by an earthquake and the Indian Ocean tsunami on 26 December 2004 (Figure 2-10). There were 165,708 deaths, 532,898 people affected and almost US\$ 4.45 billion cost in damages following the event (vivanews, 2010). Immediately after the catastrophe, the world came to the rescue by giving enormous resources to the area (Cosgrave, 2007; Telford and Cosgrave, 2007). Aceh has undergone exceptional transformation in DRR since the tsunami with the formation of BPBD, regulations established, various activities and research on disasters done, and a significant learning on disasters undertaken. In this thesis, Aceh is discussed in Chapter 6 in progress on building resilience to disasters in Indonesia.



Figure 2-10: Aceh Mosque after the 2004 Indian Ocean Tsunami in Banda Aceh (UTexas, 2005).

Padang

Padang is a city to the east of Aceh that is predicted to be especially vulnerable to earthquake and tsunami due to its exposure to the Indian Ocean. During the course of writing this thesis, 7.6 Magnitude earthquakes struck the city on 30 September 2009 and the impact on buildings is as shown in Figure 2-11. During that time, the impact caused 1,195 deaths, affected 2,501,798 people and cost US\$ 2,200 million damage (EMDAT, 2013). In the aftermath, there have been substantial transformations in the way organisations coordinate and collaborate. Padang is discussed in Chapter 6 on the progress of implementing the HFA in Indonesia. It is also included in Chapter 10 on the pathways for adaptive and integrated disaster resilience.



Figure 2-11: A Building Collapsing after the Padang Earthquake in 2009 (ITU, 2009).

Mentawai

Mentawai is a small island off Padang. It is discussed in the thesis since it was struck by an earthquake of M 7.7 and the subsequent tsunami in 2010 (USGS, 2010). This tsunami caused 530 deaths, and affected 11,864 people, but no substantial damage was recorded (EMDAT, 2013). Figure 2-12 shows the historical seismicity of 7.7 Magnitude with the location shown. Mentawai is discussed in Chapter 6 on the progress of HFA in Indonesia.

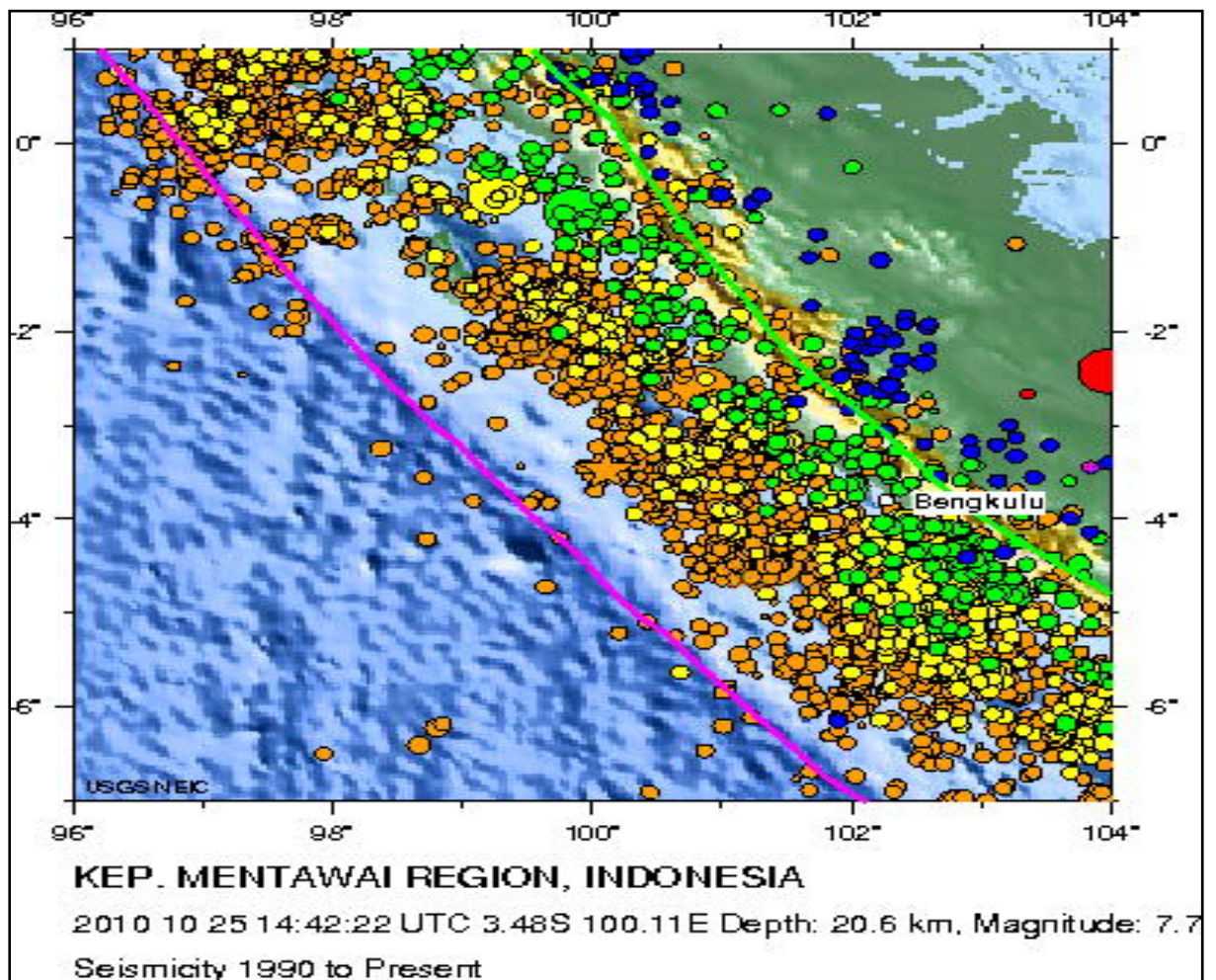


Figure 2-12: Historic Seismicity Magnitude 7.7 of Mentawai region (USGS, 2010)

2.2.2.2 Java, Bali and Lombok Islands

Java Island is located in the centre of Indonesia, and is the most at-risk island in Indonesia based on OCHA's risk map (Figure 1-14, previously). There are six places in Java discussed in this thesis (Figure 2-13).

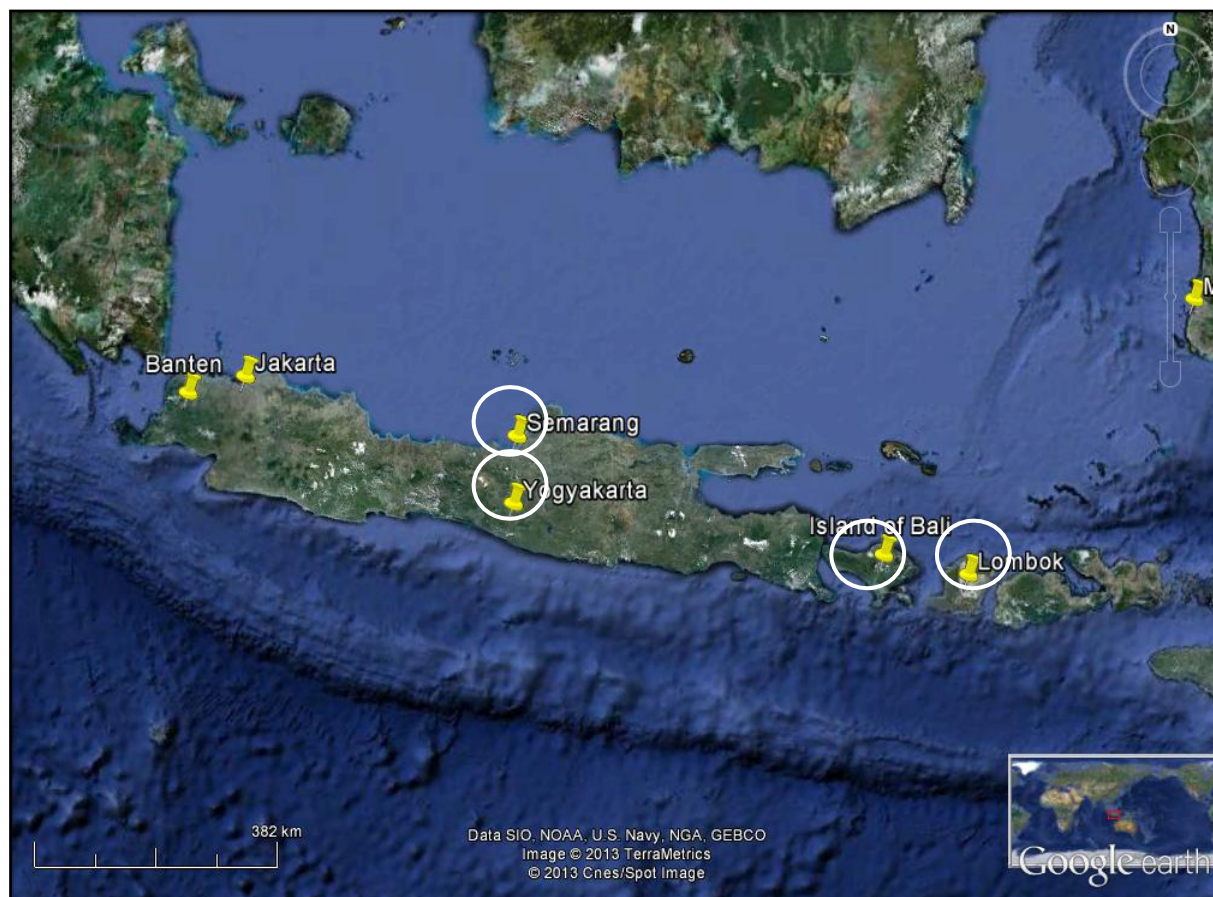


Figure 2-13: Map of Java and Cities Discussed in the Thesis (Google Earth, 2013).

Jakarta

Jakarta is the capital city of Indonesia, where government offices and most international agencies have their Indonesian office located (Abidin et al., 2011; Bunnell and Ann Miller, 2011; Kusno, 2011; Hudalah et al., 2013). However, it is severely affected by urbanisation, many informal settlements, rampant development of buildings, urban sprawl, an inadequate drainage system, frequent traffic congestion, and reduced environmental quality (Firman, 1998, 2004, 2009) (Figure 2-14). Ward et al. (2011) states that the estimated damage exposure to extreme coastal flood events with return periods of 100 and 1,000 years, is around €4.0 and €5.2 billion, respectively, and it is projected that under the 2100 scenario, the damage exposure will be 4–5 fold in northern Jakarta.



Figure 2-14: The Megacity of Jakarta (DetikNews, 2013).

PART I: OVERVIEW

Flood has frequently hit Jakarta, and in 2013, a massive flood hit Jakarta paralysing the whole city (Figure 2-15). Jakarta is discussed in Chapter 6 on the progress of implementing the HFA and in Part IV, Chapter 10, which discusses the pathways for adaptive and integrated disaster resilience (AIDR) in Indonesia.



Figure 2-15: Flood Inundating the City Center of Jakarta (DetikNews, 2013).

Yogyakarta

Yogyakarta is a city located in the middle of Java Island. The city is located in the vicinity of Mount Merapi, one of the most active volcanos on Earth, which erupted from 26 October to 22 November in 2010 (Smithsonian Institution, 2013) (Figure 2-16).



Figure 2-16: Merapi Eruption in 2010 (Demotix, 2010).

Yogyakarta was hit by a 6.3 M earthquake on 26 May 2006 (USGS, 2010), and caused 5,778 deaths, 3,177,923 total people affected and US\$ 3,100 million damage (EMDAT, 2013) (Figure 2-17). Yogyakarta is discussed in Chapter 6 on the progress in implementing the HFA and in Chapter 9 on the role of MSPs in Indonesia.



Figure 2-17: Impact of Yogyakarta Earthquake in 2006 (VP, 2006).

Semarang

Semarang is the capital city of Central Java Province, in the vicinity of Yogyakarta. I discuss Semarang as a city that has experienced rapid erosion, urbanisation and land-subsidence (Marfai and King, 2008) (Figure 2-18). The thesis discusses Semarang in Chapter 6 on the progress in implementing the HFA.



Figure 2-18: Aerial View of Semarang City (Seputar Semarang, 2013).

Bali and Lombok

Bali and Lombok are the small island groups east of Java, and are the main resort islands in Indonesia (Figure 2-19). I discuss Bali in Chapter 6 on the progress in implementing the HFA in relation to hotel and private sector cooperation for the tsunami early warning system. One of the provinces in Lombok, West Nusa Tenggara, is discussed in Chapter 7 on DRR and CCA in Indonesia, as being the first provincial government that has formally incorporated climate change adaptation within their development programme.



Figure 2-19: A Resort Island of Bali (BTB, 2013).

2.2.2.3 Papua Island

Papua is the easternmost island in Indonesia (Figure 2-20), sharing a border with Papua New Guinea on the eastern side of the island.

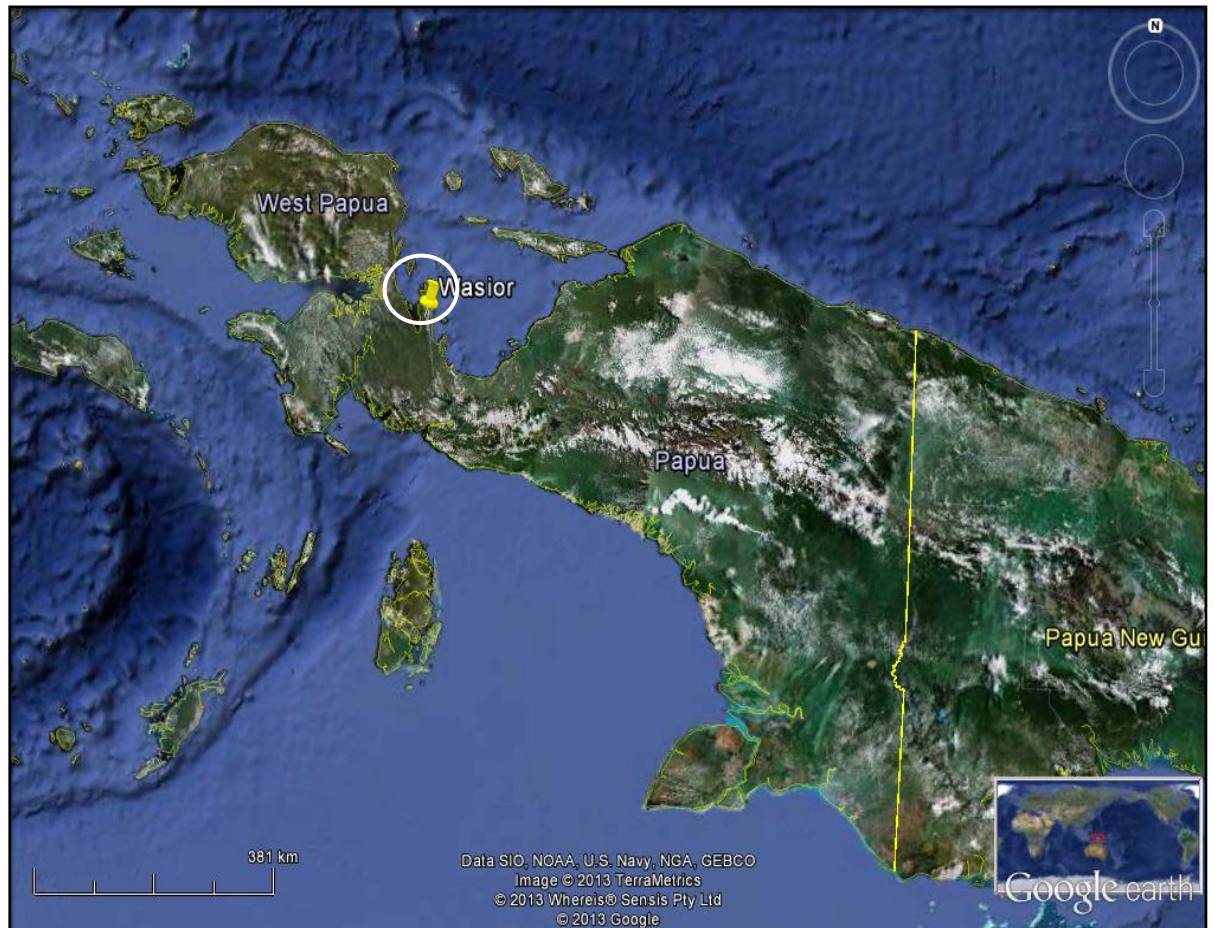


Figure 2-20: Map of Papua Island, with Wasior Location Circled (Google Earth, 2013).

Wasior

Wasior is located on the western side of the Island of Papua (Figure 2-20). In 2010, a large flash flood hit the city and caused 291 deaths, with 12,428 affected and damages of US\$ 78 million (EMDAT, 2013) (Figure 2-21).



Figure 2-21: Flood in Wasior, Papua in 2010 (vivanews, 2010).

2.2.2.4 The use of social networking tools

In the process of research I utilise various social networking sites (SNS) for different purposes. I join several mailing lists relating to disaster to be able to gauge discussions amongst actors. To keep contact with my respondents and to clarify my interview results, as well as to get organisational reports from Indonesia, I often use Facebook (2012), as mentioned previously, Yahoo Messenger (2011) or Skype (2003). As I describe in the section on access to government officials, it can be hard to reach these people. They could be at meetings or seminars, or could be away from Jakarta or even out of the country. I am able to contact them or to check their activities by checking their 'statuses in these networking sites. The same route applies when I am distributing information on my published papers, which might include information pertinent to policy makers or decision-makers in Indonesia, and it is an encouraging experience when this information reaches these important stakeholders in good time. I also find the mailing lists and networking sites to be a good source of information on related DRR activities. Table 2-8 lists the social networking sites used, which include Internet mailing lists, on-line dialogues.

Social networking sites	Information obtained
Internet mailing lists	
1. Disaster Group - bencana@googlegroups.com	Actors involved in DRR and CCA in Indonesia Organisation activities on building resilience National event on DRR or CCA
2. Environmental Group- linkungan@googlegroup.com	Actors involved in DRR and CCA in Indonesia Organisation activities on DRR and CCA
3. sei-network.lists.unimelb.edu.au	Research activities and publications related to the human dimension of climate change
4. National Climate Change Adaptation Research Facility	Research activities and publications related to the CCA in Australia
5. Climate L climate-l@lists.iisd.ca	Activities and publications related to climate change mitigation and adaptation worldwide
6. Earth System Governance noreply@earthsystemgovernance.org	Activities and publications related to earth system governance framework worldwide
7. SENSE e-News no-response@sense.nl	Information on research activities of PhD students in Europe researching CCA or environmental governance issues
8. DISCCRS - DISsertations initiative for the advancement of Climate Change Research info@disccrs.org	An American-based mailing list, which provides early-career natural and social scientists with climate-change information resources.
9. Nordic Institute of Asian Studies sec@nias.ku.dk	Research and activities related to Asian studies in Nordic Countries
10. Tyndall Centre for Climate Change Research. Latest News	Research and activities related to climate change done at the Tyndall Centre, a consortium of 8 universities and research institutes and headquartered at the University of East Anglia,
11. CSIRO clientcentral@events.csiro.au	Research activities done within CSIRO delivered on a weekly basis.
12. IHDP Secretariat secretariat@ihdp.unu.edu	Research and activities done by members of the International Human Dimensions Programme on the Global Environmental Change
13. Asia Pacific Adaptation Network asiapacificadapts@listserv.ait.ac.th	Network of Practitioners which deliver information on CCA activities in the Asia Pacific Region
14. UNU-IAS arima@ias.unu.edu	Information on UNU-IAS related activities
15. Google Alert	Daily alert on information that is available on the Internet, related to:

	<ul style="list-style-type: none"> - Resilience and disasters in Indonesia - Disaster resilient cities and communities - Disaster resilience “an integrated approach” - Disaster risk reduction and climate change adaptation
16. Young Human Dimensions Researchers List	YHDR@listserver.ciesin.col umbia.edu An American-based mailing list which provides early-career natural and social scientists with climate-change information resources
17. MPBI News	Mailing lists for members of Indonesia Society for Disaster Management on DRR activities in Indonesia
18. IISD Reporting Services iisd-rs@iisd.org	Research and activities of the International Institute of Development Studies, located in Canada
19. Eldis Climate Change eldis-climate@ids.ac.uk	A knowledge services support of the International Development Studies (IDS) in UK. It provides information on IDS-related research and activities on climate change
20. Indonesia Study Group	Indonesia.study.group@mailman.anu.edu.au Information on research on Indonesia at the Australian National University
21. PreventionWeb:	http://www.preventionweb.net/english/ Updated information related to DRR on a daily basis
22. Scholar alert	Google alerting of citations of a particular article or author
23. Journal Alert	Alert from journals published on issuance of journal articles
24. The Research Whisperers	Information on different aspects of research, doing PhDs, writings, time management, etc
On-line dialogues	
25. Towards a Post-2015 Framework	http://www.preventionweb.net/posthfa/dialogue/ Dialogue on stakeholders' perception on post-2015 HFA
26. Resilience Cities	RESILIENT-CITIES@groups.preventionweb.net Stakeholders' perception on progress and challenges in building resilience in cities
27. GPHIGHLIGHTS- L@groups.preventionweb.net	Debate on Global Platforms for DRR 2013
28. Information Management for Disaster Risk Reduction	DRRIM-L@groups.preventionweb.net Dialogue on how to serve the need for information management for DRR
29. Midterm review of the HFA (28 June – 2 July 2010)	Topic 1: HFA's role in informing decision-making and priority setting at the national and regional level Topic 2: Less effective elements of the HFA Topic 3: Integration of climate change in HFA Topic 4: What kind of instrument post-HFA
Social networking sites	
30. Facebook - www.facebook.com	Organisations and activities in DRR and CCA
31. LinkedIn - www.linkedin.com	Organisations and activities in DRR and CCA

Table 2-8: List of subscriptions to social networking sites.

2.3 Data Analysis

Data analysis is interpreted as a process of gaining meaning from or making sense of information collected for a project (Thomas and Hodges, 2010). I use the computer software, N-Vivo (QSR International, 2013) to transcribe, code and analyse information obtained from the semi-structured interview. However, as this is my first time using N-Vivo for research I have to do an introductory course on using the software. To overcome difficulties using the software, I sometimes have to manually read and code my data when I need to read interview results more carefully and in greater detail.

2.4 Thesis-by-Publication

“How can we know what we think until we see what we say”

Karl Weick on ‘The Social Psychology of Organizing’

I conduct my PhD through thesis-by-publication. By having papers ready to be presented, it allows me to participate in conferences, workshops and PhD training schools. Macquarie University defines a thesis-by-publication as a collection of papers that are at different stage of publication process (published, accepted, submitted) that are written during the candidature, completed with a comprehensive and critical introduction and an integrative conclusion. These paper may be written by the candidate or co-written with others (Macquarie University, 2011, p. 1).

My previous working experience in construction management and my expertise in project management influences me strongly in the planning and executing of this PhD, which I approach as a four-year project, with the papers as deliverables, and supervisors as resources to help my PhD project. Extremely good time-management is the key in doing thesis-by-publication effectively. I develop PhD plans covering the whole four-year period, with yearly, six-monthly and monthly plan segments. As I start to develop my thesis structure in the beginning of year three, I begin to devise a working plan based on the thesis chapters. Several important things are listed in these plans, including fieldwork periods, journal writing and submission, supervisors’ leave or absence, conferences, and administrative issues such as progress review and yearly presentation. In my final year, I develop a chapter and thesis writing plan. Having these plans allows me to spread the writing load across the years, and to work within my supervisors’ schedule, allowing for as much help as possible during the times they are actually at the university.

The advantages of the thesis-by-publication method have been enormous for me, ranging from producing high quality journal papers, to attending conferences and being connected with international networks for researchers and research institutions. Doing thesis-by-publication also suites my writing style by which I could break down the overall research into several smaller issues to be investigated. I find it easier to work toward smaller target of accomplishing individual paper rather than trying to tackle the whole thesis as a large item. I therefore need to think harder in the initial period of my PhD in terms of determining what the individual papers are so that I can produce a coherent thesis at the end. This approach allows me to write early, document my learning early and also show-and-tell through my writing.

Having recorded the total length of time taken from paper preparation (data collecting and drafting processes) to journal review processes (submission, resubmission and acceptance), reveals that, in my case, the period taken from preparing and collecting data, to the papers being accepted generally ranges from 10-20 months. Except for the book chapter that was published in 2010, most of the papers were written in 2011 and published either in the same year or in 2012. This situation can both be an advantage and a challenge. After spending several months of preparing the draft of the paper, I then submitted it to a journal. While waiting for the review results, I then start to write my next paper. Doing this methodically allows me to produce in average 3 papers per year. The drawback of this method is that the journal review process is quite unpredictable and hence sometimes, I have to work on more than one paper at the same time because reviews from journals arrived at the same time. I write most of the papers after I finish my main fieldwork in Indonesia in 2010 and 2011. This is very important since my research is based on case study and hence I need to have data from my semi-structured interview first, before I can start writing my papers on Indonesia. This is also important since most of the journals that I submitted my papers to require a research paper that is based on empirical research, rather than a review paper that is based on secondary data from published materials or literature review.

Moreover, the field of study such as climate change is constantly changing and publications from research and organisational activities are proliferating rapidly. For example, I find my study is closely related to the ongoing 'Strengthening Climate Resilience' project which develops the 'Climate Smart Disaster Risk Management (CSDRM)' approach (SCR, 2010), and my proposed 'Adaptive and Integrated Disaster Resilience' (AIDR) framework is similar to the 'Adaptive Resiliency Framework' by Kapucu et al. (2013). These two researches indeed strengthen the relevance and the importance of my paper to theory or study of disasters and to DRR practice. Writing and publishing early is extremely important in getting my own ideas out there quickly, to show the originality of my research and hence the contributions I have made to the knowledge. Authorship is to be clarified early in the PhD process. It is stipulated in the Macquarie University guidelines that students can be single author or co-author and for co-authored papers the candidate must specify his/her specific contribution (Macquarie University, 2011). The second and third authors in most of my papers are my Principal and Associate Supervisors. I decide the positions of authors (second, third, *et cetera*) based on the contribution given in terms of work spent in reviewing my manuscripts, and the meetings and discussions that take place. To assist me in developing my paper on the relationships between resilience and adaptive governance (Chapter 5), Dr Cameron Holley from the Centre of Environmental Governance agreed to be the co-author and the second associate supervisor.

The drafting processes need approximately seven reviews from my supervisors before a paper is ready to be submitted to a journal. Prior to submitting the papers, I also send the papers for proof-reading and copy-editing since I am not a native English speaker. I always expect 'major review' and hence am prepared to work more on them after the reviewers' comments are received. While waiting for reviewers' comments, I start to write my next paper. Being strategic in selecting which journal to submit to is another relevant issue. I submit my papers to different journals with various publishers chosen for their comparative impact factors. Generally, since I have no prior experience in academic journal submission, I tend to choose journals that are fairly new when I start writing in 2010 to increase the chance of getting my paper accepted. As my confidence and experience increases, I choose higher impact journals to publish my papers on Indonesia. Journals utilised frequently in this thesis are listed in Table 2-9.

Journal Name	Publisher	Impact Factor	Chief Editor(s)	Year of First Issue	Issues Per Year	Last Issue Number (July 2013)
Asian Journal of Environment and Disaster Management (AJEDM, 2013)	Research Publishing Services	-	Rajib Shaw, Ramasamy R. Krishnamurthy	2009	Started 2, now 4	Volume 4, Number 4
Australian Journal of Emergency Management (AJEM, 2013)	Australian Emergency Management Institute	-	Australian Attorney-General's Department	1985	4	Volume 28, Issue 1 - January
Disaster Prevention and Mitigation (DPM, 2013)	Emerald	0.244	JC Gaillard Emmanuel Luna	1992	Started 3, now 5	Volume 22, issue 2
Disasters Journal (Disasters, 2013)	Wiley, Overseas Development Institute	0.868	Sara Pantuliano, Helen Young David Alexander	1977	4	Volume 37 Issue 3
International Journal of Disaster Resilience in the Built Environment (IJDRBE, 2013)	Emerald,	-	Dilanthi Amaratunga Richard Haigh	2010	3	Volume 4, Issue 2
International Journal of Disaster Risk Reduction (IJDRR, 2013)	Elsevier	-	David Alexander	2012	2	Volume 4
International Journal of Disaster Risk Science (IJDRS, 2013)	Springer	-	Peijun Shi Carlo Jaeger	2010	Started 2, now 4	Volume 4, Issue 1
Natural Hazards (NH, 2013)	Springer	1.639	Th. Glade T.S. Murty V. Schenk	1988	Started 4, now 15	Volume 67, Issue 3 – July 2013
Natural Hazards and Earth System Sciences (NHESS, 2013)	Copernicus Publisher, on behalf of EGU	1.751	Fausto Guzzetti, Bruce Malamud, Stefano Tinti, Uwe Ulbrich	2001	Started 3, now 12	Volume 13, Number 6

Table 2-9: Journals related to disasters and resilience that are utilised frequently in this thesis.

Besides the selecting of a journal, every submission also requires five proposed reviewers. I choose the reviewers whom I have quoted the most and also whose works are most strongly related to the topics addressed in the paper. I take a strategic approach in terms of varying and balancing potential reviewers chosen to maximise the chance of the paper being accepted, between highly acclaimed experts and early-career researchers, between researcher and practitioners, those at different institutions, and I choose from those with strong expertise on Indonesia or who are even Indonesian experts. Receiving comments from strategically chosen reviewers is another motivation to writing journal papers, as these comments serve to improve the quality of the paper. Additionally, these reviewers could likely be chosen as my thesis reviewers. Dealing with rejections and reviewers' comments can be a daunting experience. Taking on board the reviewers' comments on my first paper that is rejected, I rewrite and resubmit the paper to a different journal and it is accepted. I have to do major revisions for all of the papers, reworking and addressing each one of the comments. I also need to think strategically in terms of how I should compile the published papers into a coherent thesis form and argument as required by Macquarie University (2012). I need to be able to think holistically in terms of what the main research questions and arguments are, but also specifically on what each paper addresses and how they are positioned within the thesis (See Figure 1-22 on thesis structure). There have been several theses-by-publication on the topic of DRR or CCA produced within the Department of Environment and Geography of Macquarie University, which have a significant influence conceptually, and on the way in which the papers within the thesis are structured. These include those of Kithiia (2011) on CCA and social capital, Mercer (2008) on traditional knowledge on DRR, Bird (2010) on disaster preparedness, Ireland (2013) on CCA and development, and Calgaro (2010) on impacts of 2004 tsunami on Thailand. Theses which influence the development of my conceptual discussion on DRR in Indonesia include those of Kusumasari (2012) on local governance capacity for DRR, Lassa (2010) on DRR governance, Chang-Seng (2010) on tsunami governance, and Sagala (2009) on community preparedness to Merapi volcanic hazard. Importantly, the results of the paper need to be actively disseminated, not only to other researchers but also to a wider audience. My papers are included on the listing of material for PreventionWeb, a UNISDR-managed DRR gateway. PreventionWeb aims to serve the information needs of the DRR community, including the development of information exchange tools to facilitate collaboration. Based on the latest available report, in October 2012, PreventionWeb received 92,700 visits and 4,345 email subscriptions, with Indonesia in the top five countries of page views (PreventionWeb, 2012). I inform my participants that the results of my research are published and can be viewed there. Details of the publication process such as the number of revisions and time taken for submission, is summarised in Table 2-10.

Paper	Co-Authors	Journal Name	Impact Factor / Word	Manuscript Revisions	Writing Processes	Times Cited
1.Community resilience to natural hazards and climate change impacts: a review of definitions and operational frameworks	RD, FT	Asian Journal of Environment and Disaster Management,	-- 8,000	Once, Major revision	20 months (Feb 2010 – Oct 2011)	7
2.Review of the state of knowledge on tools, strategies and progress for integrating DRR and CCA	RD	International Journal of Disaster Resilience in the Built Environment	-- 4,000	Under review	Under review (March 2013 – now)	-
3.Adaptive governance and managing resilience to natural hazards	RD, CH, FT	International Journal of Disaster Risk Science	-- 8,500	Once, Major revision	12 Months (March 2011 – March 2012)	3
4.Building resilience to natural hazards in Indonesia: progress and challenges in implementing the Hyogo Framework For Action	RD, FT, SS, MC	Natural Hazards	1.529/ 10,000	Once, Major revision	10 Months (May 2011 - Feb 2012)	4
5.DRR and CCA in Indonesia: institutional challenges and opportunities for integration	RD, FT	IJDRBE,	-- 4,500	Once, Major revision	13 Months (Jan 2011 - May 2012)	1
6.Identifying drivers, barriers and opportunities for integrating DRR and CCA in Indonesia: an analysis based on the ESG framework	RD	Climate Change and Disaster Risk Managements	-- 4,500	Twice, Major revision	19 Months (Jan 2011 - Aug 2012)	1
7.AG and disaster resilience: multi-stakeholder platforms in DRR	RD	Natural Hazards and Earth System Sciences	1.751 / 10,500	Twice, Major revision	20 Months (May 2011 - Aug 2012)	2
8.Pathways for adaptive and integrated disaster resilience	RD, CH, FT, MC	Natural Hazards	1.529 / 10,500	Under second review	Under second review (Sept 2012 - now)	

Note: Riyanti Djalante = RD, Frank Thomalla = FT, Michelle Carnegie = MC, Sabaruddin Sinapoy = SS, Cameron Holley = CH

Table 2-10: Journal Submission Process.

2.5 Attendance to Conferences, Workshops And Summer Schools

Doing a thesis-by-publication also allows me to attend various conferences, workshops and PhD training schools (Table 2-11). I organise the lists of presentations based on the three key topics of my research, as well as PhD progress presentations within the Faculty of Science at Macquarie University. I gain enormous benefits from these activities. I am able to expand my networks of PhD students, early-career researchers and also experts in the field of DRR and CCA. When a meeting provides travel funding, I sometimes arrange my fieldwork in Indonesia around attending the conference.

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Especially when the meetings are aimed at PhD students, there are always opportunities to discuss the papers through presentations and writing workshops, where experts read and give detailed comments on how to improve the quality of the papers' arguments. Another useful outcome of attending these conferences is that I can identify key emerging trends in research that I can utilise in my thesis. I observe a trend toward capacity building in early-career researchers from developing countries. Through these activities, I become more aware of the need for multi-disciplinary collaborations, with the process where we are usually required to work in a team, to develop a common proposal, and to work together after the meeting in order to produce a paper or to work on a mini-research project.

Presentation Topic	Category	Organiser	Date and Place	Outcome
ADAPTIVE AND INTEGRATED DISASTER RESILIENCE				
1. Pathways for Adaptive and Integrated Disaster Resilience	Conference Impacts World 2013	Potsdam-Institut Für Klimafolgen forschung	27-30 May 2013	- Presenting the pathways for AIDR - Networking with PIK on potential for post-doctoral research
2. Adaptive and Integrated Disaster Resilience Framework	Climate Adaptation Flagships Science Symposium	CSIRO	5-7 Dec 2012, Gold Coast, Australia	- Giving 3 minute presentation on the AIDR framework
3. Adaptive and Integrated Disaster Resilience Framework	Conference Climate Change and Development	UNU-WIDER	28-29 Sept. 2012 Helsinki, Finland	- Gaining feedback on the pathways for AIDR
4. Adaptive and Integrated Disaster Resilience Framework	Early-career scientists Workshops Climate Change and Its Impacts	Brown International Advanced Research Institutes	9-23 June 2012 Rhodes Island, USA	- Gaining better understanding on the concept of adaptive governance
ADAPTIVE GOVERNANCE AND RESILIENCE				
5. Adaptive Governance and its implications for building resilience to natural hazard	Climate Change Governance in the Asia-Pacific.	Australia National University,	14-16 Mar. 2012 Canberra, Australia	- Gaining better understanding on climate change governance issues in Asia
6. Building Resilience to Disaster and Climate Change in Indonesia	Urban Response to Climate Change in Asia	National Taipei University	10-15 Nov 2011 Taipei, Taiwan	- Gaining better understanding of climate change governance in an urban setting
7. Building Resilience to Disaster and Climate Change in Indonesia	Indonesian Studies Workshop	Australian National University	21-22 July 2011, Canberra, Australia	- Understanding of breadth of current research on Indonesia
8. Adaptive Governance and its implications for building resilience to natural hazard	Summer Institute for Advanced Study of Disaster and Risk	Beijing Normal University,	1-12 August 2011 Beijing, China	- Gaining better understanding on risk governance
9. Adaptive Governance and its implications for building resilience to natural hazard	AMOS NSW Centre Postgraduate Student Symposium,	UNSW,	17 June 2011 Sydney, Australia	- Gaining better understanding of research on climate change adaptation and mitigation

DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION

10. DRR and CCA in Indonesia	Online conference KLIMA 2011	Hamburg University of Applied Sciences	7-12 Nov 2011, Internet	- Gained feedback on the use of ESG framework
11. Institutions for DRR and CCA in Indonesia	Early-career Workshops CCA and Governance	NCCARF and UNSW.	16-18 Nov 2010 Sydney, Australia	- Network with other students researching CCA governance in Australia
12. Linking DRR and CCA in Indonesia	PhD Summer School on Economics of CCA	NCCR	28 Aug – 3 Sept 2010 Switzerland	- Gaining better understanding of the economics of adaptation
13. DRR and CCA in Indonesia	Climate Adaptation Futures	NCCARF and CSIRO	27 June 2010, Gold Coast, Australia	- Presenting results of fieldwork in Indonesia
14. Building Resilience to Disaster and Climate Change in Indonesia	Young Scholar Conference on Climate Change	Australian National University	19-23 July 2010, Canberra, Australia	- Learning the concepts of complex adaptive system
15. Institutions for DRR and CCA in Indonesia	Early-career Workshops Climate Change Governance,	Australian National University	15-16 July 2010, Canberra, Australia	- Learning the concepts of complex adaptive system
16. Linking DRR and CCA Governance: The experience from Indonesia.	Young Scholars Workshop (YSW)	Australia Indonesia Governance Research Partnership	1-8 Dec 2009, Jakarta, Indonesia	- Learning about research design and gave 5 minute presentation on my PhD research
17. Linking DRR and CCA: The Experience from Indonesia	Conferences Sumatra Tsunami Disaster & Recovery.	TDMRC, Syiah Kuala University,	23-25 Nov 2009, Aceh, Indonesia,	- Presenting my latest literature review and made contact with potential interviewees

RESILIENCE AND DISASTER RISK REDUCTION

18. Building Resilience to Disaster and Climate	Early-career Workshops	NCCARF and CSIRO	27 June 2010, Gold Coast, Australia	- Building network of PhD students researching topic on disaster
19. Building resilience building to natural hazards in Indonesia	Research Seminar	College of Asia and The Pacific.	June 2010, Canberra, Australia	- Presenting my PhD topic and gained feedback on research methodology
20. Building Resilience to Disaster and Climate Change in Coastal Cities in Indonesia	National Forum and Workshops for early-career researchers	ACCRNSI, The University of New South Wales,	9 – 11 Nov 2009, Sydney, Australia	- Presenting my latest literature review on resilience framework and gained feedback on the implications
21. Linking DRR and CCA in Indonesia	Australasian Hazard Management Workshops	RMIT and NZ University	4-7 Aug 2009, Melbourne, Australia	- Networking with PhD students researching disasters
22. Building Resilience to Disaster and Climate Change in Indonesia	Conferences Sustainability in Indian Ocean,	UTS-IOSARN,	July 2009, Sydney, Australia	- Gaining information on various DRR activities in different countries

PhD PROGRESS PRESENTATION

23. Adaptive and Integrated Disaster Resilience Framework	Post-Graduate 3 Minutes Theses Presentation	MQ Faculty of Science	Aug 2012, Sydney, Australia	- Latest progress on PhD works is presented
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PART I: OVERVIEW

24. Adaptive and climate-integrated Disaster Resilience	Postgraduate workshop	Climate Futures, MQ	25 Nov 2011, Sydney, Australia	- Gaining feedback on early development of AIDR framework
25. Building Resilience to Disaster and Climate Change in Indonesia	Post-Graduate Research Presentation	Dept. of Environment and Geography, MQ	23 Nov 2011, Sydney, Australia	- Presenting latest findings and gained feedback on my findings on resilience in Indonesia
26. Building Resilience to Disaster and Climate Change in Indonesia	HDR presentations	Macquarie University,	12 Oct 2009, Sydney, Australia	- Presenting PhD topic and research plan, research methodology

Table 2-11: Lists of presentations conducted during the PhD period.

2.6 Research Ethics

Research ethics is interpreted as the conduct, responsibilities and obligations of researchers to all actors involved in the research, mainly to the subject of the research, but also including sponsors and the general public (Dowling, 2009). The term 'research ethics' is defined as how researchers conduct themselves and how they negotiate, respect and relate to research participants ethically within the issues of privacy, confidentiality, anonymity, consent, for example, and in relation to harm and power (Dowling, 2009). This study is conducted following the approval of the Macquarie University Ethics Committee with a reference number of HE30OCT2009-D00158 approved on 23 October 2009 (Appendix 1). The key issues that I need to verify in my research ethic include privacy, confidentiality, anonymity, and power relations to the respondents. Considering that I interview stakeholders that I have previous professional relationships with, I have to clearly explain my current position as a researcher and also consciously 'put my research hat on' at all times.

2.7 Researcher Positionality and Research Reflection

In the discipline of human geography discipline, it is suggested that a researcher is to be reflexive in order to examine the relationships between the researcher and those being researched. This is important in order to situate, position and emphasize that the researcher knowledge could be influenced the outside world of social meaning and power which could put the researched in a position of privilege (Kobayashi, 2009). It is important that the positionality of the researcher and those researched are scrutinised so that to increase the awareness that this positionality can influence the learning processes of the research activity (Skelton, 2009). Conducting fieldwork at the very early stage of the PhD has both advantages and disadvantages. The advantage was that I could identify the most important issues concerning resilience progress and challenges quite quickly, enabling me to steer my research direction towards newly-adopted concepts.

My research interest began with the issue of resilience and its relationships with DRR. This led me to focus my literature review, and hence my first paper, on the definitions and important characteristics of disaster resilience, and guided me in developing my semi-structured interview questionnaires before starting my fieldwork. During my preliminary stakeholder consultations, it became strongly apparent that the integration of CCA into DRR and the strategies designed for this integration to occur were additional issues of concern for several NGOs and international organisations. This then prompted me to conduct my review on the methods, tools and progress for the integration within the international literature. Continuing my next set of fieldwork, I found that the challenges for DRR and CCA integration laid in the government institutional arrangements, whereby key development sector agencies tend to work in isolation with respect to other organisations. Based on these findings, I then adopted the concept of AG in my last set of literature review and examined what innovative governance strategies could facilitate the integration of DRR and CCA in policy and practice.

I had been fortunate in being able to apply this research strategy to my fieldwork research with the funding available from the university, as well as from my scholarship. The funding from my AusAid scholarships allowed me to return to Indonesia once a year, which allowed me to conduct my fieldwork over different periods within the four year of my scholarships. The Department of Environment and Geography of Macquarie University, where I am based at, provides higher degree research (HDR) funding, which can be used for conferences and fieldwork. If funding for fieldwork had been limited, I might have to do my fieldwork once and my findings might be limited to identifying the progress and challenges of building resilience in Indonesia at the national level only. Moreover, receiving a top-up scholarship from the CSIRO allowed me to do include Makassar City as the second location for analysing DRR at the local level. Interviews with national stakeholders needed to be conducted in Jakarta. Traffic is an issue. With appointments sometimes made in very short time. Travelling from one interview venue to another could take the whole day. Sometimes meetings were cancelled or changed at late notice. Tiredness sometimes influenced my ability to gain comprehensive information beyond what was written in respective organisational reports.

Arranging meetings with key government stakeholders at the ministerial level, usually through secretaries, could prove to be very tricky. I need to be able to track the phone number of the specific section within the national government ministry. The phone numbers that are listed in the government organisation website are usually public numbers and it could be hard to track specific section phone number from there.

However, drawing on my existing networks of DRR NGOs, I was able to secure these secretaries' phone numbers and was granted meetings immediately. Furthermore, I learnt that having mutual friends with my potential respondents can be a tremendous aid to increasing the level of trust between me and the interviewee and to building a rapport early on. Moreover, gaining access to those government agencies at the national level also helped me gain access to international agencies. There was this one occasion where a respondent from a highly regarded national agency helped me to secure opportunities for interviews with other key people in key international agencies. Otherwise, I would have had to go through the long process of emailing the person, to arrange a meeting, which sometimes involved secondary communications with a secretary before being able to conduct the meeting. I find that most of the national-level respondents are involved in various meetings and collaborations or projects with other international organisations. They seem to be 'talking the same language and have the same understanding'. This is of course to be expected, that the understanding and awareness of key people within key organisations could lead to a similar set of actions. However, I sometimes feel that I have not gained any new or deeper insights beyond a reiteration of what is needed to be done. This was in stark contrast to the situation with local government, where sometimes even the most important stakeholders or organisations have only a basic understanding of DRR beyond their scope of emergency management, and I had to explain DRR in the simplest possible terms. My interviews in Makassar were pre-arranged by the University of Hasanuddin (the implementing partner of the CSIRO project in Indonesia), hence organising potential respondents there was not an issue. Sometimes, after an hour-long interview, respondents would lack interest or have to go to other meetings.

Another interesting development that arose during the fieldwork was that social networks such as Facebook and LinkedIn became really influential in helping me to keep in touch with my respondents, asking for permissions and for their approval of interviews, and also for sending them my interview results in the form of published papers. Moreover, one of the main concerns I addressed in my ethics application to the Macquarie University Ethics Committee was that I needed to be aware of 'putting my researcher hat on' at all times in order to separate myself from the respondents in Kendari City local government, in light of my professional relationships with the respondents there. However, my experiences when interviewing them proved challenging. There was one occasion when a respondent was explaining how disaster risks were perceived and included within development planning processes in Kendari, and suddenly the respondents began referring to their experiences with me, since I had also been involved in the planning processes. The lesson from this was that I needed to find strategies, which ask similar things, but which are expressed in a more directed manner.



PART II THEORETICAL REVIEW

“Natural disasters destroy or impede development and climate change will enhance their impacts... and sustainable development and an expanded climate change adaptation strategy to include disaster risk reduction may be the key to bringing them together”
(McBean, 2011, p. 1193).

PART II: THEORETICAL REVIEW

Part II presents the results of my literature review on key theories adopted in this study (resilience, DRR, CCA and AG), and is developed to meet the first objective of the research, which is:

“To develop an in-depth understanding of the inter-relationships between theoretical concepts related to building resilience to disasters and climate change”

Specifically, Part II presents the discussion on the relationships between the four key concepts adopted. There are three chapters in this part and they have been submitted or published as journal papers.

- Chapter 3 reviews the theoretical relationships between resilience and DRR. This is a meta-analysis of definitions and important factors for disaster resilience in theories and also in practices.
- Chapter 4 is a review on the state of knowledge on tools, strategies and progress for DRR and CCA integration. This chapter presents a framework to analyse the integration of DRR and CCA, developed based on a review of the most current literature
- Chapter 5 analyses the relationships between resilience, and the fourth concept adopted in this thesis, adaptive governance (AG). Ideas from adaptive governance are incorporated as strategies for DRR and CCA activities to build resilience more effectively. The key contribution of this chapter is the identification of four factors: polycentric governance, collaboration and coordination, self-organisation and networks, as well as learning and innovations, as governance strategies, which are highly relevant in building resilience.

The results found within each chapter are used to inform the analysis in building resilience to disasters and climate change in Indonesia, which is outlined in Part III. Findings from each chapter in this part also form the skeleton for the development of the adaptive and integrated disaster resilience (AIDR) framework, which is discussed in Chapter 10, Part IV on Synthesis and Conclusion

CHAPTER 3

COMMUNITY RESILIENCE TO NATURAL HAZARDS AND CLIMATE CHANGE IMPACTS: A REVIEW OF DEFINITIONS AND OPERATIONAL FRAMEWORKS

Djalante, R., and Thomalla, F. (2011) "Community Resilience to Natural Hazards and Climate Change Impacts: A Review of Definitions and Operational Frameworks" *Asian Journal of Environment and Disaster Management* 3 (3): 339-355.

3.1 Overview

Permission

Permission to include the paper in this thesis is given by the publisher. The journal is *Asian Journal of Environment and Disaster Management* (AJEDM): Focusing on Pro-active Risk Reduction in Asia. The chief editors are Rajib Shaw of Kyoto University, Japan and Ramasamy R. Krishnamurthy, University of Madras, India. I choose to submit this paper to this particular journal, as it is highly relevant to the paper's focus on disaster resilience. The journal's scope focuses on the environment and disaster-related issues in the Asian region and acts as a forum to communicate research findings, not only through academic research, but also by incorporating field-based action research. Moreover, as this is my first submission to a peer-review journal, the fact that it is a newly established publication therefore maximises my chance of having the paper published.

Authors' contributions

Riyanti Djalante

My contribution to the research and paper: Concept - 95%; Data collection - 100%; Analysis - 80%; Writing - 95%; Total - 90%.

This is the first paper I write during my PhD period. I am responsible for conducting literature review, developing the paper outlines, developing the arguments, examining the findings and developing the integrated disaster resilience framework. I am also responsible for choosing the journal, formatting the paper, responding to reviewer comments and resubmitting the paper.

Dr Frank Thomalla

As my Principal PhD supervisor, Dr Frank Thomalla guides me through developing the structure of the paper, strengthening the arguments as well as guiding me through the publication processes, from submission, responding to reviewers' comments, to resubmission.

Impacts of the paper

This paper is cited by the following:

- My subsequent papers on HFA in Indonesia (Djalante et al., 2012), adaptive governance and resilience (Djalante et al., 2011) and on the roles of multi-stakeholder platforms (Djalante, 2012).
- Three papers that discuss resilience building in Europe (Birkmann et al., 2012), Estonia (Jermalavičius and Parmak, 2012), Brazil (Silva and Silva, 2011) and New Zealand.
- Udu-Gama et al. (2012) who discuss the role of community early-warning systems in building resilience presented in the IDRC Davos Conference 2012.
- Rezki (2011) cites this paper in his submission to a writing contest conducted by Rekompak-JRF, an Indonesia NGO, on community-based post-disaster rehabilitation and reconstruction.

Introduction to the paper

This paper lays the foundation for my PhD, which is centred on the concept of disaster resilience. The paper that influences me most in writing this paper is that of Klein, Nicholls and Thomalla (2003). They review the implications of the resilience concept as utilised in the context of natural hazards. Through this paper, I develop, build, and broaden my understanding on the concept of disaster resilience, on how it is interpreted conceptually as well as practically.

The finding from this paper is that integrated disaster resilience is to be comprised of three key requirements: (1) a sustainable development component comprised of six factors of governance, education, social development, economic development, build environment and natural environment. These are the pre-conditions and enabling environments to achieve resilience and development goals; (2) a disaster risk reduction component is comprised of four factors of: disaster prevention and mitigation, preparedness, response, and recovery and reconstruction. Strengthening resilience in each factor is necessary for effective and comprehensive DRR; (3) a community characteristic component is comprised of values/aspirations/goals, partnerships and collaboration, participation and networks, and community knowledge and capacity. The research suggests that any resilience activities need to be community-centred since the communities are the agent and beneficiaries of any resilience activities. The three requirements / factors for IDR were identified based on the insights of a systematic meta analysis of disaster resilience frameworks developed by a range of organisations presented in Chapter 3. The integrated disaster resilience model is shown in Figure 3-1.

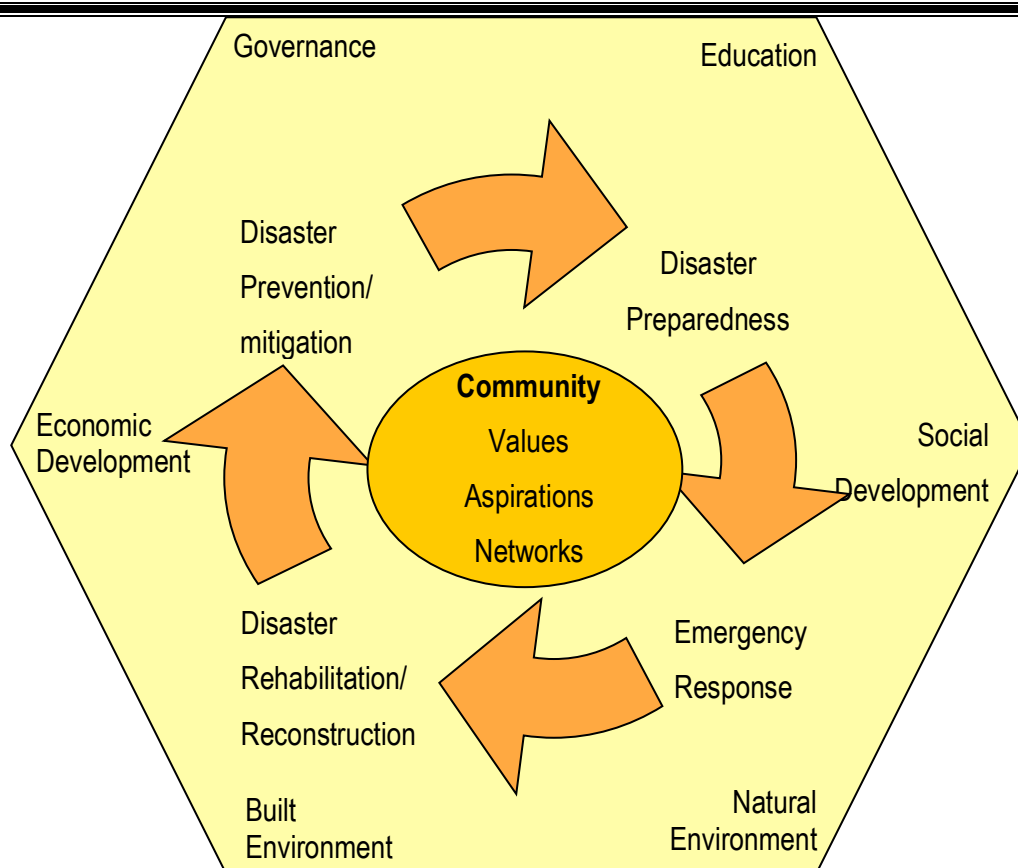


Figure 3-1: Integrated Disaster Resilience (Modified from Djalante and Thomalla, 2011).

This paper finds five out of twelve frameworks that comprehensively meet these requirements. They are Climate Resilient Cities of the World Bank, Hyogo Framework for Action of UN/ISDR, Coastal Community Resilience of US/IOTWS, Community and Safety Resilience of IFRC and Characteristics of Disaster Resilient Community of Twigg/DFID. The frameworks are reported to positively promote learning, participation and to enable comprehensive overviews of resilience status and DRR efforts. The Hyogo Framework for Action is found as one of the most comprehensive resilience frameworks. Challenges to implement resilience-building activities include how to create indicators and enabling environments that reflect local conditions, to ensure sustainability, and to reduce reliance on data and information.

Findings from this paper are utilised in Chapter 6 on “Progress in Implementing HFA in Indonesia” and in the development of the ‘Adaptive and Integrated Disaster Resilience’ framework presented in Chapter 10, Part IV.

3.2 The Paper in Published Format

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Community Resilience to Natural Hazards and Climate Change: A Review of Definitions and Operational Frameworks

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Natural hazards and climate change is increasingly acknowledged as one of important global challenges. Thus vulnerable communities urgently need to build their resilience. This paper addresses two aims: first is to examine how resilience is defined and interpreted in the context of natural hazards, second is to document and analyse experiences in operationalising them, to advance resilience theory. We contend that a comprehensive framework needs to incorporate elements of sustainable development, disaster risk reduction (DRR) and community engagement. It also needs to go beyond specifying the outcomes, to describing process by which resilience can be improved. We call this 'a multi-tiered approach for resilience: important outcomes and processes'. There are five out of twelve frameworks that comprehensively meet these requirements. They are Climate Resilient Cities of the World Bank, Hyogo Framework for Action of UN/ISDR, Coastal Community Resilience of US/IOTWS, Community and Safety Resilience of IFRC and Characteristics of Disaster Resilient Community of Twigg/DFID. The frameworks are reported to positively promote learning, participation and enable comprehensive overviews of resilience status and DRR efforts. Some challenges remaining include how to create indicators and enabling environments that reflect local conditions, to ensure sustainability, and to reduce reliance on data and information.

Keywords: Resilience, Definitions, Frameworks, Natural hazards, Climate change.

1. Introduction

The Inter-governmental Panel on Climate Change (IPCC) in its fourth assessment report stated that the frequency, severity and intensity of climate-induced disasters are likely to increase.¹ Various studies and reports have strongly suggested that the most vulnerable people are those that are least able to cope.^{2,3,4} Adaptation, which is closely related to resilience, is a must rather than an option for these vulnerable communities.²

This paper aims to contribute to the understanding of resilience by examining the insights and lessons learnt from current resilience building initiatives. It addresses two specific aims: First is to examine how resilience is defined and interpreted in the context of natural hazards. There have been many initiatives

by government and non-government organisations (NGOs) at all levels to promote resilience to natural hazards, but few academic studies have collected and analysed these experiences, and documented the lessons learnt. Furthering a cross-disciplinary or multi-disciplinary understanding of resilience is important because the concept has only recently gained popularity in studies examining the relationships between humans and the environment (so-called 'socio-ecological systems') and remains still less-explored in the field of disaster risk reduction. Second is to document and analyse experiences in operationalising community resilience and to reflect on the insights and lessons learnt to advance resilience theory.

The paper is organised into five sections: First we introduce our motivation for undertaking this research. Section two reviews the relevance of resilience concepts in the context of natural hazards and climate change and discuss recent developments in research and practice. We looked at how resilience is defined by different organisations, what resilience frameworks have been developed, and how resilience has been conceptualised both as an outcome and as a process. Section three reviews common elements and processes that are considered important for resilience building. Section four discusses the results for the analysis as well as outlines lessons learnt from implementing the frameworks. In the concluding section we reflect on how these experiences can further understanding of resilience and hence put forward suggestions how the concept can be developed further to prepare for natural hazards and climate-change impacts.

The methodology includes a review of the theoretical advancement of the concept based on literature from ecology, engineering, social science, as well as social-ecological systems. An internet search was conducted using the key words of 'resilience', 'resilience to disasters', 'resilient community', 'resilience to climate change', and 'resilience framework'. Thirty-eight frameworks were found initially. They were developed by organisations and academic scholars addressing topics from climate-resilient development, resilient organisations, specific development sectors, to the resilience of specific ecosystems. We further eliminated those that did not specifically consider community resilience to natural hazards and climate change. Table one shows the twelve frameworks selected. All of these have been proposed by organisations actively engaged in resilience research and the operational implementation of resilience in disaster risk reduction (DRR) activities.

A meta-analysis used to deconstruct the definitions into attributes, processes, desired outcomes and external drivers affecting communities (table two), and to distinguish between resilience as an outcome (table three) and as a process (table four). A gap analysis (table five) is conducted to evaluate which frameworks fulfil the fundamental elements and processes. Finally, we examined project implementation reports to identify lessons learnt in operationalising resilience and to examine whether any issues remain unresolved and need to be considered in the future.

2. Resilience in the Context of Natural Hazards and Climate Change: Research and Practice

Research on vulnerability to natural hazards, climate change and sustainable development requires a consideration of the inter-linkages between socio-economic and ecological systems.⁵ Many studies have focussed on defining, modelling and measuring vulnerability to natural hazards and on building socio-economic resilience through reducing vulnerabilities.^{6,7,8,9,10,11} The resilience concept has recently been adapted and applied to short-term disasters arising from natural hazards^{12,13,14,15} and long-term phenomena, such as climate change.¹⁶ One of the earliest works is that of Timmerman¹⁷, who defined on disaster resilience as “the capacity of a system to absorb and recover from the occurrence of a hazardous event” (p. 21). Other authors examined further how communities can be more resilient to disasters through various resilience processes - not just by resisting change but also by bouncing back, mitigating and recovering from disasters.^{18,19,20,21} Wildavsky¹⁸ noted that common characteristics of a resilient system include redundancy, diversity, efficiency, autonomy, strength, interdependence, adaptability, and collaboration. Geis²² suggested that a ‘disaster-resilient community’ is ‘the safest possible community that we have the knowledge to design and build in a natural hazard context’.

There are also a number of studies that examined application of disaster resilience in specific contexts such as coastal areas, urban settings, developing countries or islands. Pelling²³ examined the vulnerability of cities to climate change and defined resilience as the ability of an actor to cope with or adapt to hazard stress. Vale and Campanella²⁴ described how cities recover from disaster, suggested that multiple networks and redundancies of urban flow and services are key resilience characteristics that can help cities recover quickly. More recent work on resilience within DRR focuses on understanding how and why certain places and people are more or less resilient to disasters. Paton and Douglas²⁵ examined resilience as an integrated approach of individual, community, institutional and environmental perspectives. Cutter *et.al.*²⁶ combined indicators of social, built-environment vulnerability and hazard exposure onto hazard mitigation to determine the resilience of a particular place. Zhou *et.al.*²⁷ defined resilience as the “capacity of hazard-affected bodies (HABs), to resist loss and to regenerate and reorganise after disaster, in a specific area in a given period” (p. 30).

In practice, DRR is the latest paradigm in disaster management and offers a systematic approach to identifying, assessing and reducing the risks of disasters.²⁸ The application of resilience in DRR is seen as a positive approach because it brings new perspectives to the understanding of ecological and socio-economic resilience by moving away from focussing solely on needs and gaps, to focussing on building the capacity of people to help themselves.^{29,30} The ever increasing losses arising from natural hazards have forced governments and organisations to develop more integrated approaches to reduce vulnerability and build resilience of the

society.^{31,32} The adoption of the Hyogo Framework for Action 2005–2015: Building Resilience of Nations and Communities (HFA)²⁸ strengthen the application of resilience concepts for DRR.

3. Framework Analysis

This section closely analyses resilience frameworks developed for DRR, based on their scale of application, definitions, whether it is an outcome or a process framework and important components for resilience. Table 1 shows the twelve frameworks, along with the author or developing organisation and the scale of implementation (N=National, L=Local, C=Community).

3.1. Operational definitions of resilience

A meta-analysis of resilience definitions is used to deconstruct each definition into attributes, processes, outcomes and risks affecting communities as shown in Table 2.

Table 1 Frameworks for resilience to natural hazards and climate change, and scale of implementation.

No		Framework	Author(s)/Organisation	Scale		
				N	L	C
1.	HFA	Hyogo Framework for Action 2005–2015	UN/ISDR ²⁸	☑	☑	☑
2.	CDRC	Characteristics of a Disaster Resilient Community	Twigg/DFID ³³	☑	☑	☑
3.	CCR	Coastal Community Resilience	US/IOTWS ³⁴	☑	☑	☑
4.	CSR	A Framework for Community Safety and Resilience : in the Face of Disaster Risk	IFRC ³⁰	☑	☑	☑
5.	CRC	Climate Resilient Cities	World Bank ³²	—	☑	—
6.	CDRI	Climate and Disaster Resilience Index	Kyoto Univ. ³⁶	☑	☑	☑
7.	DROC	Disaster Resilience for Organization and Community	MCEER ³⁷	—	—	☑
8.	CRD	Community Resilience to Disaster	Buckle <i>et al.</i> ³⁸	☑	☑	☑
9.	CDRF	Community Disaster Resilience Framework	TAMU ³⁹	☑	☑	☑
10.	CDR-CBA	Community Disaster Resilience: A Capital Based Approach	Mayunga ⁴⁰	☑	☑	☑
11.	CRF	Community Resilience Framework	CARRI ⁴¹	☑	☑	☑
12.	DRC	Disaster Resilient Cities	Infra. Canada ⁴²	—	—	☑

Table 2 Definitions of resilience to natural hazards and climate change.

No	Frameworks	Attribute	Process	Outcome	Risk
1.	HFA	Capacity	to adapt, to resist, to change	Acceptable level of function	Hazards
2.	CDRC	Capacity	to resist, to manage, to maintain, to recover, to bounce back	—	Forces, events
3.	CCR	Capacity	to adapt, to influence	—	Change
4.	CSR	Characteristic Measures	to limit, to reduce, to respond, to recover, to adapt	—	Impacts, damage, disruption, disturbance
5.	CRC	Capacity	to sustain, to deal	—	Issues, events
6.	CDRI	Capacity	to absorb, to recover, to bounce back	Basic functions and structures	Stress, forces, events
7.	DROC	Capacity	to prevent, to mitigate, to recover	—	Loss, damage, impact
8.	CRD	Ability	to mitigate, to contain, to recover, to mitigate	Minimal social disruption	Hazards, disasters
9.	CDRF	—	—	—	—
10.	CDR-CBA	Capacity	to anticipate, to prepare, to recover	—	Disasters
11.	CRF	Capacity	to anticipate, to limit, to bounce back	—	—
12.	DRC	Capacity	to adapt, to recover	—	Hazards, impacts

In all of these definitions resilience is considered as a positive attribute of communities that enables them to have the capacity or ability to cope with and recover from disasters. It is considered an inherent characteristic of a community in which individual and collective capacity jointly determines the resilience of the whole community. In facing a disaster, communities employ a range of mechanisms that relate to the disaster risk management cycle of preparedness, mitigation, and post-disaster recovery.

All twelve frameworks defined a number of activities that contribute to building resilience, but there is no consensus on the procedural steps required to achieve this. For example, the CSR³⁰ specifies processes for building resilience that focuses on limiting, reducing, responding and recovering and adapting. In contrast, the CRC³² focuses on building resilience by sustaining and dealing with events. An analysis of the desired outcome of resilience building defined in each framework reveals that only four out of the twelve frameworks specified an expected result for resilience building activities. Most resilience definitions include the ability of a community to bounce back after a disaster and to adapt to adversities in a way that result in a better outcome. Learning from past experiences is used as a mechanism

to ensure that communities achieve an increased capacity to face future adversities and disasters.

The selected frameworks specify a range of perceived risks and stressors against which resilience needs to be build. For example, the CDRI³⁶ aims to build resilience against stresses, forces and events, while the CCR takes a wider approach to more generally include change.

3.2. Resilience as an outcome versus a process

Cutter *et al*²⁶ and IFRC³⁰ emphasised the significance of considering resilience as an outcome versus a process. Resilience is considered an outcome when it is defined as the ability to bounce-back or cope after a disaster, the ability to survive and cope with a disaster with minimum impact and damage⁴³ and the capacity to avoid, reduce, minimise impacts of disaster and recover quickly and effectively.^{12,26} Resilience is considered a process if is defined as the ability to learn and mitigate future disasters.^{14,25,26}

3.2.1. Resilience as an outcome

This section examines elements and indicators of resilience described by the twelve frameworks. Table 3 lists elements of resilience and group them into three categories: sustainable development, disaster risk reduction and community engagement.

3.2.2. Resilience as a process

This section examines how processes for resilience building outlined by some frameworks. CRC, HFA, CCR suggest similar activities to build resilience. CSR and DRC prescribed characteristics of a resilient community.

4. Discussion

4.1. Analysis of the frameworks: synergies and gaps

In this section we discuss the results of a gap analysis in which we examined which resilience elements are included in each of the frameworks (Table 5). Each of them is evaluated based on three criteria: 1) does it provide a comprehensive definition, 2) does it consider resilience both as an outcome and as a process, and 3) does it address all important resilience elements across the three categories of sustainable development, disaster risk reduction, and community engagement.

The overall assessment of the framework shows that all of the frameworks meet half the assessments' requirements. There only four of the twelve frameworks met all requirements of a comprehensive definition of resilience.

Table 3 Fundamental elements of a resilience framework.

1. HFA	2. CDRC	3. CCR	4. CSR	5. CRC	6. CDRI	7. DROC	8. CRD	9. CDRF	10. CDR-CBA	11. CRF	12. DRC
A. Sustainable Development											
1. Governance & Institutions	Institutions and legal frameworks	Governance	Governance	Governance / institutions	Departments / institutions	Institutions	Organizational dimension	-	-	-	Institutions
2. Training & Education	Training, education	-	Advocacy, education, awareness	Education	-	Education, Knowledge and awareness	-	Human capital	Human capital	Human capital	-
3. Social Development	Social development	Society and economy	-	Social development	Community development	Social development	Social dimension	Social capital	Social capital	Social capital	Social
4. Economic Development	Economic and financial policies	-	-	Economic and financial resources	Economy and financial resources	-	Economic dimension	Economic capital	Economic capital	Economic capital	-
5. Built Environment / Physical infrastructure	Infrastructure and built environment	Land use, structural design	-	Infrastructure and built environment	Infrastructure and built environment	-	Technical dimension	Physical capital	Physical capital	Physical capital	Built environment
6. Natural Environment / Ecosystem	Environmental plans include DRR	Coastal resource management	-	-	Hydro-meteorological disasters	-	-	-	-	Natural capital	Natural system
B. Disaster Risk Reduction											
7. Disaster Prevention / Mitigation	Risk assessment and VCA	Risk assessment and VCA	Risk assessment and identification	Risk assessment and VCA	-	-	-	Hazard mitigation	-	-	-
8. Disaster Preparedness	Disaster preparedness	Warning and evacuation	-	Disaster preparedness	-	-	-	Disaster preparedness	-	-	-
9. Emergency Management	Response and emergency management	Emergency response	-	-	-	-	-	Disaster response	-	-	-
10. Disaster Recovery & Reconstruction	Recovery and reconstruction	Recovery	-	-	-	-	-	Recovery	-	-	-
C. Community Engagement											
11. Values /goals /aspiration	Resources to implement DRR;	Community aspirations;	Partnerships	-	-	-	-	Community of interest;	-	-	-
12. Partnerships/ Collaboration	Community participation and decentralisation	Community goals; values;	Community-based disaster preparedness;	-	-	-	-	Aspirations; goals;	-	-	-
13. Participation/ Networks	Public awareness and outreach	Partnerships Networks;	Early warning and prediction;	-	-	-	-	Shared values; Partnerships Networks	-	-	-
14. Knowledge/ Capacity	-	-	-	-	-	-	-	Resources and skills.	-	-	-

Table 4 Frameworks that consider resilience as a process.

No	Frame works	Resilience as a process
1.	HFA	<i>Five priorities for actions:</i> <ol style="list-style-type: none"> 1. To ensure that DRR is a local and national priority with a strong institutional basis for implementation 2. To use knowledge, innovation and education to build a culture of safety and resilience at all levels 3. To reduce the underlying risk factors 4. To identify, assess and monitor disaster risks and enhance early warning 5. To strengthen disaster preparedness for effective response at all levels.
2.	CDRC	<i>Guidance note for CDRC:</i> <ol style="list-style-type: none"> 1. Section A: Introduction and Background/Key concepts 2. Section B: Tables (Components of resilience; characteristics of a resilient community; characteristics of an enabling environment) 3. Section C: Thematic areas (Governance, Risk assessment, knowledge and education, risk management and vulnerability reduction, disaster preparedness and response)
3.	CCR	<i>Steps to assess CCR:</i> <ol style="list-style-type: none"> 1. Define purpose, scope, and participants of the assessment 2. Review CCR benchmarks 3. Prepare for the assessment 4. Collect information and data 5. Compile and analyse results 6. Validate and communicate results 7. Provide recommendations to adapt plans and programs for enhanced resilience
4.	CSR	<i>Characteristics of a Safe and Resilient Community:</i> <ol style="list-style-type: none"> 1. Community understand, can assess and monitor risks, so that they can protect themselves when disaster strike 2. Community able to sustain their basic functions and structures due to disasters impacts 3. Continue to build-back after disasters and keep reducing vulnerabilities for future disasters 4. Community understand that building safety and resilience is a long-term and continuous processes 5. Community appreciate that building resilience can help to achieve sustainable development
5.	CRC	<i>A primer for reducing vulnerabilities to disasters:</i> <ol style="list-style-type: none"> 1. Understanding the impacts of climate change and disaster risk management (DRM) 2. Explaining climate change impacts and DRM 3. Assessment exercise: discovery of a 'hot spot' and create City Typology and Risk Characterisation Matrix as well as Local Resilience Action Plan (LRAP) 4. Information exercise: creating a city information base compiled in Climate Change Impacts and Disaster Risk Management Workbook and eventually Framework 5. Examine sound practice of adaptation and mitigation to climate change for lessons learnt

Table 4 Frameworks that consider resilience as a process.(continued)

No	Frame works	Resilience as a process
6.	DRC	<i>Core concepts of DRC:</i> 1. Cultural attitudes must accommodate resilience 2. Disaster resilience is a philosophy, a process and a condition 3. Resilience requires an all-hazard approach 4. Resilience requires an all-vulnerabilities approach 5. Community require greater resistance to hazard stresses 6. Community systems must be flexible 7. Recovery capacity must be enhances 8. Community must develop an adaptive capacity

The remaining frameworks include some combination of the three categories. There are more combinations of sustainable development and community engagement elements than others. Almost all of the frameworks include various aspects of sustainable development as the most important. One exception is DRC in which governance and institutions along with social and economic elements are considered most important in this category. Education is considered the next most important issue within the sustainable development category. DRR elements come second in terms of number of frameworks citing the elements. The last category, community-specific elements are the least considered. Community capacity is considered as the most important factor followed by partnerships and participation. Majority of the frameworks do not include values and aspirations.

Different trends can be observed when we evaluate how different frameworks fulfil all three assessments. HFA, CDRC, CCR, CSR, and CRC (see Table 5) can be considered the most comprehensive as they meet all of the requirements. The next group consists of three frameworks, the CDRI, DROC and CRD. These meet the requirement of a comprehensive definition and requirement of addressing all important elements but they do not consider resilience as a process. CDR-CBA and CRF consider resilience elements as combinations of the two categories sustainable development and community engagement, but view resilience only as an outcome. Finally, CDRF and DRC are almost opposite to each other in all categories except on the importance of DRR elements.

4.2. A multi-tiered resilience framework: elements and processes

We synthesize the results from the gap analysis and call it a multi-tiered approach for resilience to natural hazards, as shown in Fig. 1.

4.2.1. Analysis of resilience as an outcome: Important elements

A. Resilience and sustainable development (SD) Elements of resilience that address sustainable development include governance and institutions, education,

Table 5 Gap analysis.

Frameworks	HEA	CDRC	CCR	CSR	CRC	CDRI	DROC	CRD	CDRF	CDR-CBA	CRF	DRC
<i>1. Definitions</i>												
Attribute	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Process	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Desired outcome (Types) of Drivers	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>2. Process and/or outcome</i>												
Outcome	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Process	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>3. Resilience elements</i>												
<i>3.1 Sustainable development</i>												
Governance and Institutions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Education	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Social	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Economics	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Built Environment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Natural Environment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>3.2 Disaster risk reduction</i>												
Disaster Mitigation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Disaster Preparedness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Emergency Management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Disaster Recovery and Reconstructions	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<i>3.3 Community engagement</i>												
Values/aspiration/goals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Partnerships/Collaboration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Participation/Networks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Knowledge/ Capacity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

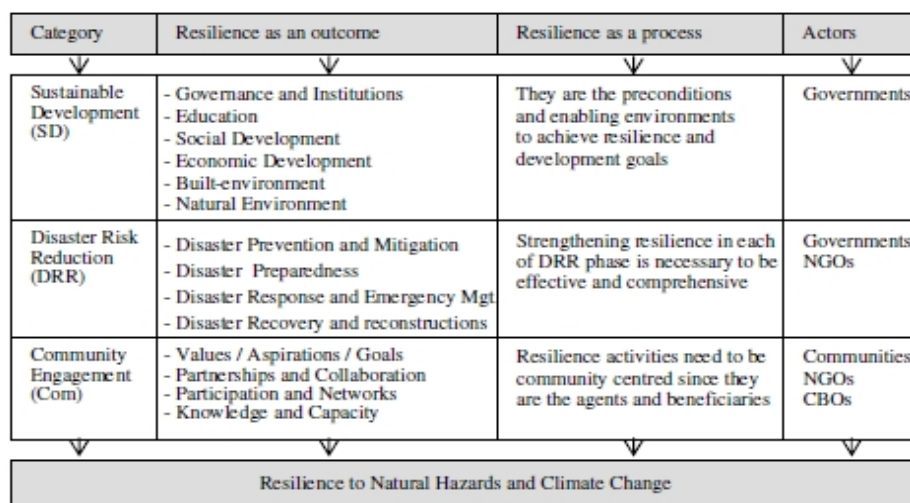


Figure 1 A multi-tiered resilience framework: important elements and processes.

social development, economic development, the built-environment as well as the natural environment. All these elements are necessary for resilience building since they can help to create enabling or supporting environments. The nation states have the primary responsibility for DRR and therefore it needs to be integrated into, and act as essential part of governments' investment for sustainable development.^{44,45} Governance can provide integrated frameworks for institutions at different levels and scales as well as encouraging multi-stakeholders participation and engagement. Education can be in forms of awareness raising and capacity building. Public awareness activities can foster changes which lead to a culture of safety and resilience. Developing capacity helps to build and maintain people's, organization's and societies' ability to manage risk successfully by themselves.

Social development should aim to reduce social vulnerabilities of communities. Reducing vulnerability means increasing resilience. Several factors that influence social vulnerability include levels of literacy and education, health service, social equity, provision of peace and security, values and beliefs. Economic development provides enabling environment for self-reliance of the community. Reducing risks can also be done through better management of the built-environment, through structural and non-structural measures. Natural resources are traditionally the common provider of goods and services to communities, which include food, resources, biodiversity. There have been extensive researches on ecological resilience in its role in supporting and influencing social resilience.^{46,47,48,49,50}

B. Resilience and disaster risk reduction (DRR) Elements included in this category are risk knowledge, disaster preparedness, disaster response, and disaster recovery and reconstruction. These offer a systematic approach to identifying, assessing and reducing the risks of disasters.²⁶ MCEER³⁷ argues that DRR thinking

enables us to view disasters as complex problems that require collective and integrated responses from different agencies and institutions. DRR considerations a crucial component in determining the characteristics of a disaster-resilient community since individual organisations need to prioritise their activities within the DRR approach and engage in partnerships and collaborations with other institutions. Hazard analysis as well as vulnerability and capacity assessment (VCA) are common methods used to gain comprehensive knowledge about the potential risks to multiple hazards faced by a community, and hence enables communities to design adaptive responses to eliminate or reduce the impacts of hazards. Risk knowledge also allows a community to bounce-back faster after the event.²⁸ Early warning systems provide opportunities to communities to take rapid actions to reduce risks and to learn from experience.²⁸ Emergency response plans can significantly help communities to bounce back faster after disasters.²⁸ Recovery and reconstruction plans influence resilience through helping to improve living conditions, helping to 'build back better' and using the event as an opportunity for learning and adaptation.²⁸

C. Resilience and community engagement Another way to promote social resilience to natural hazards is by increasing community capacities (institutions and mechanisms) that underpin resilience building. Community's values, capacities and networks, trust, partnerships, and capacity among them are all important factors in preparing communities not only to survive disasters but also to self-organise and recover from disasters. IFRC⁵¹ state that resilience concepts enable us to shift away from needs and vulnerabilities and to strengthen the capacities for resilience within the community. Focusing on resilience instead of vulnerabilities help community to emphasise what they can do for themselves and how they can strengthen their capacity.

4.2.2. The importance of resilience building processes

Importance of resilience processes has, indeed, been positively recognised by some key organisations in DRR. Nowadays cities and local governments all around the world are actively contributing for resilience building. Local governments are active collaborating, sharing, networking and learning from each other to build resilience to disasters and achieve sustainability in general. Regional cooperation for resilience building among countries has also become more of a norm nowadays. Non-government organisations and civil-societies have also been actively involved in this resilience building processes.

One notable example of these progresses is the UN/ISDR's campaign for 'Making Cities Resilient' as part of their World Disaster Reduction Campaign 2010–2011.⁵² ICLEI, an association of over 1200 local government member from 70 different countries, is actively collaborating with the UN/ISDR for this resilience cities campaign.⁵³ Global Network on DRR (GN-DRR)⁵⁴ also contributed to this

through sharing their experiences from grassroots monitoring of HFA's implementation.

4.3. Lessons learnt from implementing resilience frameworks

Various organisations reported lessons from implementing some of these frameworks. Key positive message raised from this is the ability to measure baseline resilience for communities or cities and also the opportunities to facilitate learning through the assessments. CDRC implementation reports stated that the framework exercise went further from merely introducing the framework to become a platform for discussions, interactions, learning and partnership building.^{55,56} Community involvement at any stage of resilience initiative is also crucial to ensure sustainability. The review of lessons learnt report of indeed emphasised the importance of participatory processes to ensure continuity and sustainability of the program. There are, however, some reported challenges in implementing these resilience frameworks. Even after six years after the 2004 tsunami, disaster risk reduction and community resilience to disasters are still considered to be relatively new and fairly abstract concepts to many local communities and local governments.⁵⁷ The World Bank lamented that a lack of reliable and updated data as well as a lack of capacity of authorities hindered progress. Level of achievement or resilience benchmarks and parameters also needs to be adapted to the national, sub-national or local contexts,^{58,59} while involvement of scientists, policy-makers and local communities in determining the local parameters are needed.⁶⁰

5. Conclusions and Implications for Further Research

Our examination shows that a comprehensive framework needs to 1) define resilience well, 2) address fundamental elements of sustainable development, DRR and community engagement and 3) consider resilience as an outcome and a process. We call this a multi-tiered approach to resilience. We suggest key lessons for resilience building in general. Resilience buildings are all about ability to absorb, resist, manage, bounce-back and learn from any types of risks. Clarifying the ultimate goals or the outcomes of the activities is also necessary to help focusing the overall objectives. Furthermore, all resilience elements also need to be considered to ensure comprehensive planning and implementation of resilience. Governments, non-government organisations and communities are the key actors for resilience. Governments need to provide the enabling environments and ensure that the resilience activities are in line with development goals and vice-versa. Non-government and community base organisations can help strengthening the supports to the communities, while the communities are the agents and beneficiaries of the activities. Therefore, there need to be mechanisms to ensure participation of these key actors, while learning and collaboration are also encouraged.

Our analysis of the twelve frameworks shows that the majority address these criteria, with CRC, HFA, CCR, CSR and CDRC being the most comprehensive ones. Indeed, these five frameworks have been implemented worldwide and reflected the respective organisations' knowledge and experiences. Positive outcomes noted from frameworks' implementation are the ability to promote learning and participation, as well as provide comprehensive overviews of resilience. However, some future challenges remain if we want to develop and implement these types of frameworks. These include how to create indicators and enabling environments that reflect local conditions, how to ensure sustainability, and also how to reduce heavy reliance on data and information.

We also propose three aspects for future resilience research. Firstly, a considerable gap remains between how resilience is defined conceptually and practically. Considering that resilience assessment methodologies, indicators, guidelines, procedures and tools for practitioners and decision-makers are largely developed based on experiences and knowledge by organisations working in DRR, it is important that more research is conducted to examine how science and practice can inform each other to enable knowledge integration. Secondly, vague description of risks suggests that resilience building is perceived to be a 'no-regret' investment, which is useful in a range of unspecified risks. Resilience is complex and multifaceted and therefore different characteristics are needed to cope with different kinds and severities of stresses. Thus, a better understanding of the risks against which resilience is to be built, might be required, in order to design more targeted activities. Lastly, Desirable outcomes in promoting resilience are still rarely articulated clearly. This leads to another open question on how resilience can be sustained over a longer period of time, considering the long-term nature of some of the hazards arising from climate change. Without a clearly defined and agreed desired state to aspire to, how can progress in building resilience be measured, monitored and evaluated?.

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CHAPTER 4

REVIEW OF THE STATE OF KNOWLEDGE ON TOOLS, STRATEGIES, AND PROGRESS FOR DRR AND CCA INTEGRATION

Djalante, R. (Under review). "Review of the state of knowledge on tools, strategies and progress for integrating disaster risk reduction and climate change adaptation." *International Journal of Disaster Resilience in the Built Environment*

4.1 Overview

Permission

This paper is under review at the *Journal of Disaster Resilience in the Built Environment*. The editors are Professor Dilanthi Amaratunga and Professor Richard Haigh of the Centre for Disaster Resilience, School of the Built Environment, University of Salford, United Kingdom. The scope of the journal encompasses research that examines the role of built environment in DRR. The journal is intended for researchers and academics, policy makers and other professionals.

Authors' contributions

The paper is the second-last paper submitted to a journal during my PhD, and one I decide to write as a single author, as my confidence develops throughout the PhD period. I am responsible for data collection, literature review, data analysis, writing the paper and the whole processes of journal submission. This involves identifying key literature, developing the structure of the paper, writing the drafts and submitting the paper to a journal.

Impacts of the paper

This paper is under review.

Introduction to the paper

One of the key papers influencing this paper is that of my Principal Supervisor, Thomalla et al. (2006), on the integration of DRR and CCA. I start writing the paper as my first literature review for the PhD, however, first I decide to write on the integration of DRR and CCA in Indonesia, to be submitted to a conference held by TDMRC (Tsunami Disaster Management Research Centre) at Syiah Kuala University, Banda Aceh, Indonesia, which calls for submission on Indonesian cases. I then collect further material in my literature search, and finally write this paper. During my fieldwork in Indonesia, many of the respondent practitioners ask if I could suggest to them tools or frameworks they could easily use as on-the-ground integration checklists while working with communities.

This paper finds that an integration of climate change issues needs to be incorporated within every aspect of the integrated disaster resilience framework found in Chapter 3. The next key finding utilises Birkmann and Teichman (2010) who suggest that the integration needs to occur at different norms, scales and knowledge (Figure 4-1).

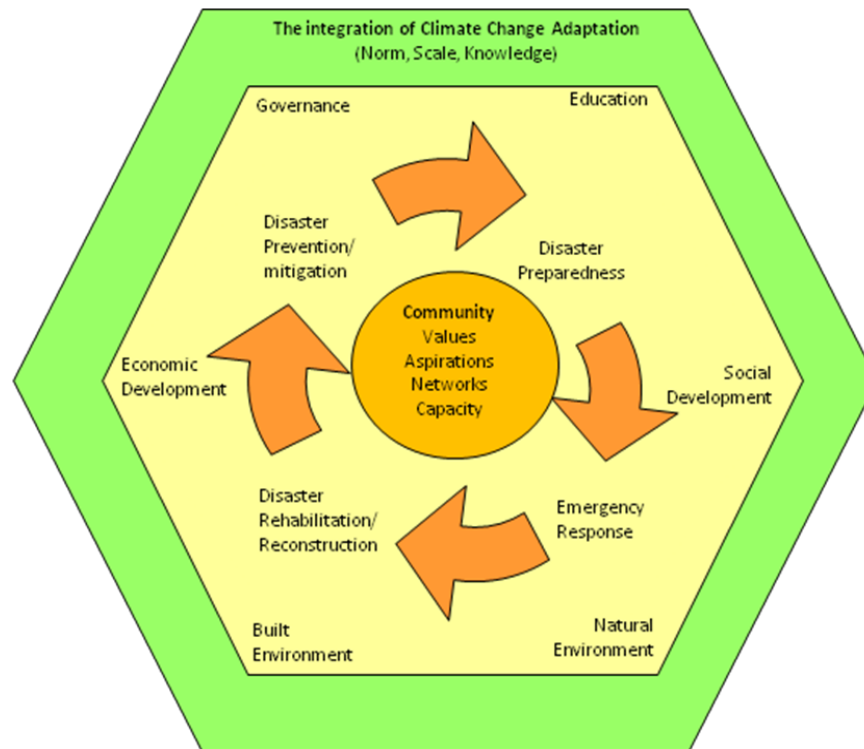


Figure 4-1: The Integration of CCA into the Disaster Resilience Framework (Modified from Djalante, Under review).

Findings from this paper, together with those in Chapters 8 and 9 (Part III), which examine the integration of DRR and CCA in the Indonesian context, are used in the development of Chapter 10 (Part IV) on pathways for adaptive and integrated disaster resilience.

4.2 The Paper (Under Review)

Title: Review of the State of Knowledge on Tools, Strategies and Progress for Disaster Risk Reduction and Climate Change Adaptation Integration.

Purpose – The objective of this paper is to review the latest stage of knowledge on tools, strategies and progress in integration DRR and CCA.

Design/methodology/approach – The study is conducted through review and analysis of academic, government and non-government organisations' reports to determine tools, strategies and progress in integrating DRR and CCA.

Findings – The main finding of this paper is that an integration of climate change issues needs to occur at different norms, scales and knowledge. The chapter also finds that in the context of developing countries, the integration can only be meaningful when it is integrated within the development issue.

Originality/value – This paper makes a highly valuable contribution to literature through documenting the latest knowledge on the proposed tools, strategies and progress in the integration, obtained from academic papers and organisational reports, in one coherent analysis. This is important since the study of DRR and CCA is extremely politically and practically relevant and hence a study that can integrate or utilise both sources of knowledge will greatly contribute to the overall advancement of resilience research.

Keywords: Disaster risk reduction, Climate change adaptation, Integration, Resilience.

Article Type: Review paper.

1. Introduction

The world is experiencing more frequent, deadly and intense disasters. Disaster is defined as “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources” (UNISDR, 2009c). Disaster impacts are measured in several ways: the number of deaths, the number of disasters, total number of people impacted, and loss in economical terms (EMDAT, 2012). In order for a disaster to be entered into the EM-DAT: OFDA/CRED International Disaster Database at least one of the following criteria has to be fulfilled: 10 or more people reported killed, 100 people reported affected, a call for international assistance, and declaration of a state of emergency (EMDAT, 2012).

There have been more than 11,000 disasters worldwide between 1900 and 2013, and they have caused approximately 23 million deaths, more than 6.9 million people affected, and damages equivalent to more than US\$ 2.36 Trillion (EMDAT, 2012). Amongst these disasters, hydro-meteorological disasters are comprised of 87% of the frequency of disasters, 88% of people killed, 97% of people affected and 70% of the total damage measured in dollars (EMDAT, 2012). Hydro-meteorological disasters is defined as a *“process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage”* (UNISDR, 2009c, p. 18). Hydro-meteorological hazards include tropical cyclones (also known as typhoons and hurricanes), thunderstorms, hailstorms, tornados, blizzards, heavy snowfall, avalanches, and coastal storm surges, floods including flash floods, drought, heatwaves and cold spells (UNISDR, 2009c, p. 18).

Disaster risk reduction (DRR) is defined as a wide range of activities aimed at minimising disaster risks and related vulnerabilities. These include efforts to prevent the risk of disaster and to limit the adverse impact of hazard when they occur, through disaster mitigation, preparedness and response (UNISDR). The UNISDR’s framework for DRR shows that DRR is influenced by the political, socio-cultural and ecosystem/environmental context and in general, within the sustainable context (UNISDR, 2007). DRR is interpreted as systematic processes, which consider risk factors, which influence vulnerability to hazards. This hence calls for vulnerability/capacity analysis as well as hazard analysis and monitoring, within a greater context of risk identification and impact assessment. Different stages of disaster management are important to be recognised, from preparedness, emergency management, to recovery. The internationally adopted DRR framework is the Hyogo Framework for Action (HFA) 2005-2015:

Building the Resilience of Nations and Communities to Disasters. This framework is adopted at the World Conference on Disaster Reductions and endorsed by the General Assembly of the United Nations (A/RES/60/1952). There are five priorities for HFA: Priority 1: Ensure that DRR is a national and local priority with a strong institutional basis for implementation, Priority 2: Identify, assess and monitor disaster risks and enhance early warning, Priority 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels, Priority 4: Reduce the underlying risk factors, Priority 5: Strengthen disaster preparedness for effective response at all levels. Climate change adaptation (CCA) is defined by the Intergovernmental Panel on Climate Change (IPCC) as “an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007a). Climate change is one of the biggest environmental threats in human history and is the defining human development challenge for the 21st century (IPCC, 2007b; Stern, 2007; World Bank, 2011; UNEP, 2012; World Bank, 2012). It is increasingly accepted that climate changes alter the occurrences of disasters in three ways: it increases the severity, frequency and the intensity (IPCC, 2007a; McBean and Ajibade, 2009).

It is important that climate risk management is tackled synergistically both through disaster risk reduction (DRR) and climate change adaptation (CCA). Linking DRR and CCA has been recognized as a significant step for reducing vulnerabilities to changing risks derived from climate change. The importance of strengthening the linkages between disaster risk reduction (DRR) and climate change adaptation (CCA) has been acknowledged by both international communities in DRR and CCA, for example through the recent documents of the UNFCCC (2008), the IPCC (2012), and UNISDR (2006). The Bali Action Plan of the UNFCCC parties highlights that existing knowledge, experience and capacities for reducing vulnerabilities and increasing preparedness to extreme weather events must be harnessed in adapting to climate change (UNFCCC 2007). The integration of the two approaches is also emphasized in the 2009 UNISDR-organised Global Platform on DRR (GPDRR, 2011). Conceptually, the need for a coherent, integrated approach to adaptation and risk reduction has been expressed in some of the key literature. Academic scholars note the benefits of an integrated DRR and CCA. They both aim to reduce vulnerability, increase resilience, support no-regret solutions that are pro-active, holistic and long term (Sperling and Szekely, 2005; Thomalla et al., 2006; Schipper, 2009). The potential financial, human and natural resource effectiveness from the integration is also another advantage for the integration (Schipper, 2009; Mercer, 2010). There are also reports by research organisations, which examine progresses that have been attained in the integration at different governance scales in different countries and regions.

The author finds that the research agenda is shifting to a more systematic analysis of the process, drivers, barriers, strategies and tools for DRR and CCA integration. However, these studies are documented separately and there are no yet reviews, which examine this integration in one coherent argument and put it in the academic domain of a research paper. Hence this study aims to fill the gap in literature. Specifically, the paper aims to review the following aspects of DRR and CCA integration: (1) rationale, (2) complementarities and synergies, (3) challenges and (4) strategies for integration, (5) tools for integration, and (6) current progress at different scales and sectors.

This study is conducted through extensive research from academic journals as well as from organisation reports. These materials are obtained through an Internet search with the keywords 'Disasters and Climate Adaptation, DRR and CCA, and integration of DRR and CCA'. The author finds there is a proliferation of materials written on the integration in a number of academic journals but most significantly by organisational reports. This paper reviews the latest state of knowledge on the strategies and progress, and comprehensively categorises them, which ultimately enables the author to propose a typology of publications on the DRR and CCA integration.

2. Framework of analysis

To assist the analysis of the state of knowledge in the integration, the author develops Figure 1 as a framework through which the literature on integrated DRR and CCA is analysed and categorised. This includes the drivers, complementarities, challenges, and strategies for integration. The drivers from the integration are first explained. Birkmann and von Teichman's (2010) framework for DRR and CCA integration is utilised to guide the analysis of the complementarities and challenges for the integration, by which they are categorised into three issues of: norms amongst actors, scales of problems and solutions, and knowledge. Norms such as legislative, cultural and behavioural norms are key factors including the functioning and the interaction of coupled social-ecological systems (SES). Differences in key actors' mandates, programmes and sets of measures can lead to difficulties when they want to develop an integrated strategy (Birkmann and von Teichman, 2010). Different scales of problems and solutions are another challenges for the integration while there has been also progress at different scales of governance. Knowledge is another issue by which progress has taken place but also lack of it hinders the integration. Each key component in Figure 1 is explained in the following sections.

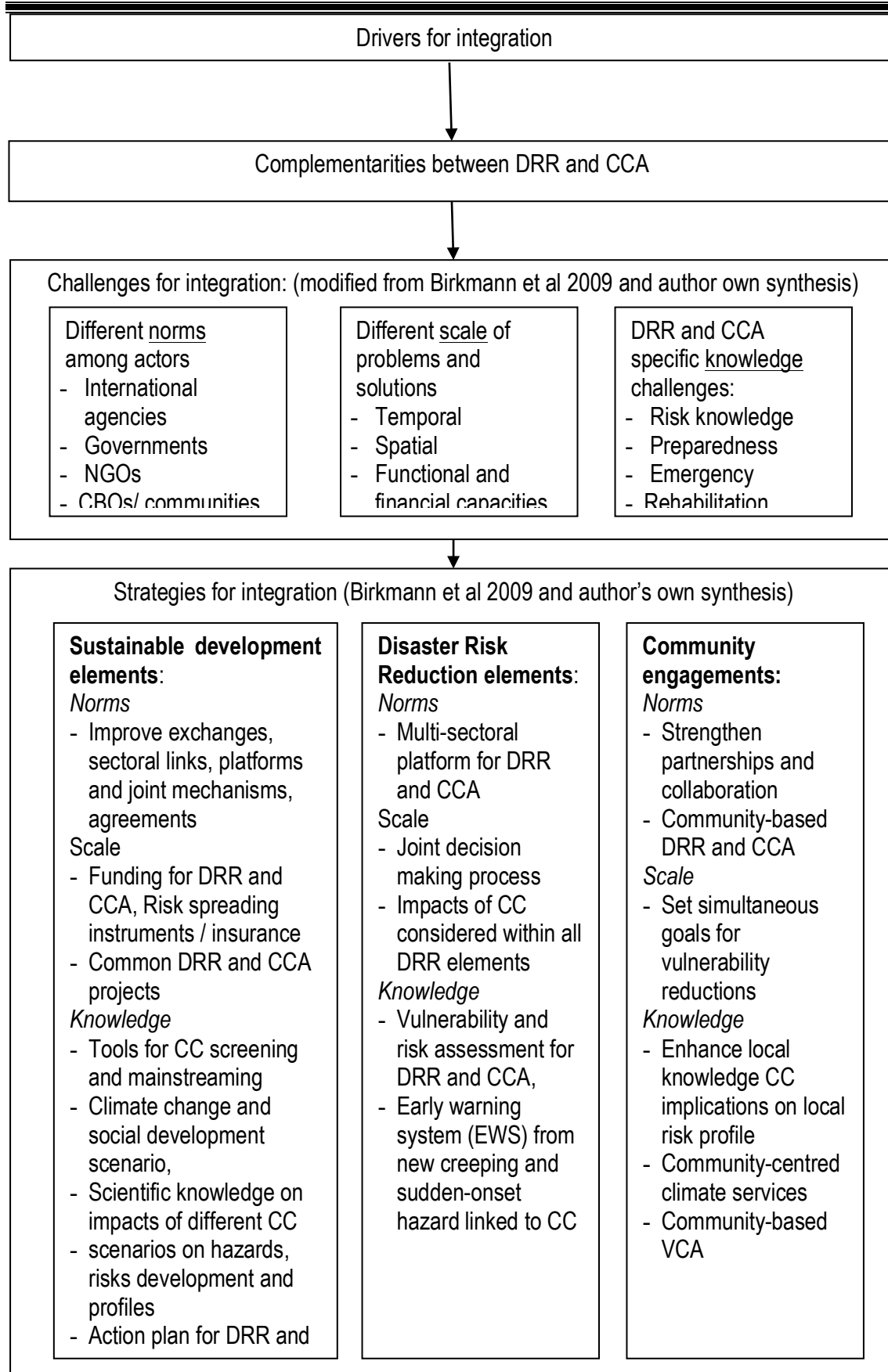


Figure 1: Framework to analyse DRR and CCA integration

3. Drivers for the integration

The key driver for the integration of DRR and CCA is that climate change impacts hazards in three different ways; it is expected to increase the frequency, variability and intensity of hazards (IPCC, 2007a). Globally, the frequency and magnitude of weather and climate-related hazards is increasing (IPCC, 2007b; EMDAT, 2011; World Bank, 2012), with flood being the most frequent disaster and affecting the most people (EMDAT, 2012). Results from the literature shows that the key drivers for integration can be categorised into five issues ranges which is mainly derived from the expected increase on impacts of climate change to disaster-related events.

a) *Climate change affecting disaster characteristics*

Linking DRR and CCA is important because climate change is likely to increase the frequency and severity of hydro-meteorological hazards (IPCC, 2007b).

b) *Cost effectiveness and sustainability of both approaches*

The simultaneous application of DRR and CCA also results in more efficient use of financial, human and natural resources and therefore increases the effectiveness and sustainability of both approaches. Climate change community is in danger of “wasting time and money in re-inventing the wheel” for conducting CCA activities separately (Schipper, 2009; Mercer, 2010).

c) *Reduction of climate related losses*

Venton and La Trobe (2008) argue that implementation of DRR activities linked with adaptation can result in a reduction of climate-related losses.

d) *Demand from practices / implementers*

Venton and La Trobe (2008) argue that growing demand from the applications side, where projects or plans want to address the full spectrum of risk as one (but currently fail to find proper guidance or documented experience)

e) *Demand from donor agencies*

Birkmann et al (2009) says that bilateral and multilateral donors can support emerging initiative for integrated knowledge, experience and guidance, by focussing on applications rather than theoretical explorations.

These discussions are summarised in Table 1.

Drivers	References
a) CC changes disaster characteristics	(IPCC, 2007b; IPCC, 2012).
b) Cost effectiveness and sustainability of both approaches	(Schipper, 2009; Mercer, 2010).
c) Reduction of climate related losses	Venton and La Trobe (2008)
d) Demand from practices / implementers	(Birkmann et al., 2009)
e) Demand from donor agencies	(Birkmann et al., 2009)

Table 1: Drivers for DRR and CCA integration

4. Complementarities between DRR and CCA

There is significant overlap between the theory, policy and practice of DRR and CCA. The paper identifies several different ways that DRR and CCA are synergised. Various strategies are highlighted to integrate the two processes but the key strategy is to focus on the commonalities and synergies between the two processes. These complementarities are analysed using Birkmann and von Teichman's (2010) framework for integration that includes analysis of norms amongst actors, scales of problems and solutions, as well as specific knowledge and information.

A. Norms amongst actors,

There are different kinds of norms such as legislative, cultural and behavioural norms. The author finds that key issues discussed in literature include commonalities in determining the purpose, influence of poverty and vulnerability, integration into development, appropriateness with environmental measures, and converging political agendas.

They have the same purpose of aiming to build resilience in the face of hazards (Proact Network, 2008). Both DRR and CCA emphasise vulnerability reduction and sustainable and flexible long-term strategies to build resilience to adverse impacts. Both also promote approaches that are pro-active, holistic and long-term, either before or after hazard occurs (Thomalla et al., 2006; Schipper, 2009). According to Mitchell and van Aalst (2008), the main synergy between the two is the management of hydro-meteorological hazards, where DRR needs to take into account changing hazards, and adaptation needs to build resilience. Both must be integrated into relief, recovery and development plans and policies and therefore require multi-stakeholder participation (Proact Network, 2008). The dynamic benefits of environmental management measures aid both current and less well understood future risk reduction needs (Proact Network, 2008). Despite earlier segregation, the policy debate is starting to emerge. Through DRR, the management of humanitarian consequences of climate change protect human security, through the systematic reduction of disaster risks (Proact Network 2008; UNISDR 2008). The Hyogo Framework for Action (HFA) aims to achieve a comprehensive, system-wide risk-reducing approach to CCA (UNISDR, 2007). The proactive and progressive risk management approach advocated by the DRR community fits well with CCA purposes (Venton and La-Trobe, 2008). Furthermore, integrated climate risk management could provide a framework to allow the disaster community to move beyond preparedness and response and for the CCA community to move beyond the design of hypothetical future adaptation strategies (UNDP, 2004).

B. Scale of problems and solutions.

Another category of complementarities between DRR and CCA is through management of scale of problems and solutions. Both DRR and CCA have a local-level importance and consider both present and future conditions. Measures to relieve risk and adapt to climate change must ultimately be effective at the local level and increasingly both recognise that the starting point is in existing/current conditions of risk and climate variability (Proact Network, 2008). Another commonality is that both DRR and CCA emphasize sustainable and flexible long-term strategies to reduce the risks of adverse impacts, either before or after hazards occur (Schipper, 2009).

C. DRR and CCA specific knowledge and information

The last category is through the availability of DRR and CCA specific knowledge and information, both requiring a basis in risk analysis for remedial actions to be effective. DRR can contribute to CCA through existing knowledge, approaches and tools that have been tried and tested by the DRR community to address the proximate and underlying causes of hazard vulnerability. Building upon existing mechanisms for DRR and risk management (Proact Network, 2008); (UNISDR, 2008b; Setiadi et al., 2010). DRR strategies are first line of defence against climate change. Both require a basis in risk analysis for remedial actions to be effective (Proact Network, 2008), while the CCA community can also learn from DRR approaches in how scientific and traditional knowledge can be integrated (Setiadi et al., 2010). The above discussion is summarised in Table 2.

Synergies	References
Synergy of norms among actors	
Increase resilience	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Vulnerability reduction	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Integration in development	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Appropriateness of environmental management	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Converging political agendas	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Synergy on scale of solutions	
Local level importance	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Emphases on present day conditions	(Proact Network, 2008; UNISDR, 2008b; Setiadi et al., 2010)
Synergy on knowledge and information	
Risk assessment basis	(Proact Network, 2008; UNISDR, 2008b; Prabhakar et al., 2009)

Table 2: Potential synergies for DRR and CCA

5. Challenges for the integration

The next key discussion in the literature focuses on the challenges for DRR and CCA integration. The challenges are analysed also using Birkmann and von Teichman's (2010) challenges for integration that includes analysis of differences of norms amongst actors, mismatch of scales of problems and solutions, as well as unavailability and uncertainty of knowledge and information.

A. Differences of norms amongst actors,

Climate change and disaster risk management communities have different origins in, approaches to and methods for addressing adaptation and DRR. These differences have acted as a barrier to closer collaboration. Schipper (2009) writes that the two fields promote their activities through different actors and institutions, different time horizons, policy frameworks and patterns of works. Thomalla et al. (2006) outline six distinct differences of DRR and CCA, in terms of approach, organisations and institutions, international conferences, assessment, strategies and funding. They argue that the main pragmatic difference of DRR and CCA is the approach toward the issue. DRR traditionally evolved from engineering and the natural sciences. Taking a traditionally short-term perspective, DRR focuses on the hazard event and on exposure to that hazard. CCA has developed from a strong scientific basis, is highly interdisciplinary, focuses on vulnerability and takes a long-term perspective. DRR and CCA are organised by two distinct institutional and strategic frameworks. The UNFCCC and Intergovernmental Panel on Climate Change (IPCC) are the two main bodies for CCA, while the UNISDR and the Global Platform for DRR (GP-DRR) are the main organisations responsible for DRR.

B. Differences in scale of problems and solutions.

The main challenge identified here is the differences in levels of spatial and temporal resolutions needed for DRR and CCA. While the scale of analysis for CCA mainly needs a longer time span, that for DRR usually need a very short time span to be useful for analysis. Functional scale mismatches refer to the organisation and management of crises and CCA by actors affiliated with different institutions, and the related distribution of responsibilities. Differences in their respective mandates, programmes and sets of measures on how to deal with climate change issues on the one hand, and DRR on the other hand, create great difficulties when developing a coherent and integrative strategy (Birkmann and von Teichman, 2010).

C. Unavailability of DRR and CCA specific knowledge and information

Unavailability of DRR and CCA knowledge seems to be the main challenge for the integration. This challenge includes lack of basic knowledge in certain areas, lack of tools and methodology, gaps and conflicts between scientific and traditional knowledge, as well as inability to measure desired outcomes and decide the limit of uncertainties. The above discussions are summarised in Table 3.

Description	References
Different norms among actors	
Origin and culture	(Venton and La-Trobe, 2008)
First era (1980s-2000) CC as environmental problems, environmentalists and natural scientists, Second era (from 2000) CC impacts are acknowledged, social scientists and development workers, Third era, CC issues as 'global justice' question: international legal and ethical experts	(Birkmann, 2011)
Political interest	(Venton and La-Trobe, 2008)
Funding streams	(Venton and La-Trobe, 2008)
Different attributes of DRR and CCA, practice and policy relevance. focus of policy funding streams	(AKP, 2013)
Required capacities by: Communities, Government and non-governmental disaster management personnel, Research and educational institutions	(DKKV, 2011)
Defining acceptable levels of risks	(Setiadi et al., 2010)
Political and cultural influence	(Setiadi et al., 2010)
Capacity limitations	(SIDA, 2010)
Economic limitations	(Christian Aid, June 2010)
Institutional challenges: lack of awareness at all levels, low capability, communication, cooperation and coordination among stakeholders	(Setiadi et al., 2010)
At the international policy processes, multilateral and bilateral institutions, regional level, state level, post disaster	(CSDRM, 2010b)
Different scale of problems and solutions	
Concerns span/period	(Venton and La-Trobe, 2008)
Level of spatial and temporal and resolution	(Setiadi et al., 2010)
Availability of DRR and CCA specific knowledge and information	
Definitions of key concepts	(Setiadi et al., 2010)
Tools	(Venton and La-Trobe, 2008)
Challenges in scientific discussion	(Setiadi et al., 2010)
Difficulty in measuring desired outcomes for integration,	(Setiadi et al., 2010)
Lack of basic knowledge in certain areas	(Birkmann and von Teichman, 2010)
Lack of common norms	(Birkmann and von Teichman, 2010)
Views on local and traditional knowledge	(Venton and La-Trobe, 2008)
Lack of information : hinders collaboration and communication	(Birkmann and von Teichman, 2010)
Lack of appropriate methodology and commitment to forecast social development at meso and micro-scales	(Birkmann and von Teichman, 2010)
Gaps and conflicts between scientific and local/traditional knowledge	(Birkmann and von Teichman, 2010)
Awareness of limits of knowledge (uncertainty and possible surprise)	(Birkmann and von Teichman, 2010)
Different hazard types	(Venton and La-Trobe, 2008)
Uncertainty in climate change risks	(Prabhakar et al., 2009)
Perception and awareness limitations	(SIDA, 2010)
Dealing with uncertainty	(Setiadi et al., 2010)

Table 3: Challenges for DRR and CCA integration

6. Strategies for the integration

This section discusses the strategies for the integration. There are many strategies proposed for the integration. The strategies are further analysed also using Birkmann and von Teichman's (2010) strategies for integration that includes how to overcome differences of norms amongst actors, how to do integration amongst spatial, temporal and functional scales, as well as provision of knowledge and information for the management of climate risks.

A. Norms amongst actors,

Table 4 shows in addressing the norm issue, that the integration needs to be done through providing an integrated funding, and by encouraging collaborations amongst actors. The measures to converge DRR and CCA include: focus on the characteristics of society and economy through localised vulnerability assessment, sustained alliance within good governance-based environments for DRR, and raising awareness of the benefiter of adaptation. Specifically, some suggest the need for a more flexible funding structure, others suggest for insurance or risk-transfer measures. There are also proposals to focus the disaster and climate adaptation funding to least-developed countries and small-islands developing states. The call for better and more effective collaboration is another major issue identified in the literature. In summary, coordination needs to involve as many stakeholders as necessary, such as governments, private sectors, civil societies, and communities. Activities for collaborations include promotions, advocacies, dialogues, workshops, facilitating new platforms and institutional settings.

B. Integration at different scales: spatial, temporal and functional.

Several strategies proposed to overcome scale (spatial, temporal and functional) mismatches include promotions of cross-sectoral, multi-scale and multi-sector approaches; promotions of multilevel, multidimensional and multidisciplinary cooperation and collaborations; and perform activities that encourage vertical and horizontal integration.

C. DRR and CCA specific knowledge and information

The discussions on provision of knowledge and information seem to be the focus of literature as the number one strategy for DRR and CCA integration. I categorise these strategies into three parts of: provision of tools, increased capacity, and the focus on risk knowledge. The above discussion is summarised in Table 4.

Description	References
Norms among actors	
Funding	
LLDC, LDC and SIDS need special focus on the adaptation funding mechanisms	(UNISDR, 2010)
More flexible funding structures	(Setiadi et al., 2010)
More flexible funding structures	(DKKV, 2011)
Financial mechanisms	(DKKV, 2011)

Risk transfer measures	(UNISDR, 2010)
Monitor the use of adaptation funding, insurance premiums and payouts	(Christian Aid, June 2010)
Insurance	(DKKV, 2011)
Collaboration	
Institutionally, responsibility for DRR and CCA should be brought into the central ministries of planning or finance	(UNISDR, 2010)
Promotion of the potential of DRR and CCA and long-term sustainability	(DKKV, 2011)
Recognise the critical need to engage the climate practitioners and processes	(DKKV, 2011)
Promoting regional cooperation	(SIDA, 2010)
Investigate further research to identify if and how public-private partnerships support	(Christian Aid, June 2010)
Ensure civil society and communities are key actors in adaptation	(Christian Aid, June 2010)
Include private sectors actors	(SIDA, 2010)
Recognise the critical need to engage the climate practitioners and processes	(DKKV, 2011)
Advocacy, dialogues and workshops	(DEWGA, 2008)
Community participation	(Setiadi et al., 2010)
Multi sectors to enhance coordination and learning	(SIDA, 2010)
Engaging private sector: governments to facilitate platforms	(SIDA, 2010)
Engaging private sector: governments to facilitate platforms	(SIDA, 2010)
Institutional settings to integrate DRR and CCA	(DKKV, 2011)
Enhance coordination and integration of stakeholder actions thought good communication	FCCC/TP/2008/14
advocacy, dialogues and workshops	(DEWGA, 2008)
Effective communication strategies	DKKV (2011)
Integration at different scales (Temporal, spatial, and functional)	
Promotion of cross-sectoral and multi-scale approaches	DKKV (2011),
Engage all levels of society in the implementation process	(DKKV, 2011)
Vertical integration	(CSDRM, 2010b)
Horizontal integration	(CSDRM, 2010b)
Achieve effective disaster reduction though multilevel, multidimensional and multidisciplinary cooperation and collaboration	(DKKV, 2011)
Promotion of cross-sectoral and multi-scale approaches (Spatial, Temporal, Functional)	DKKV (2011),
Cross cutting issues	DKKV (2011),
Availability of DRR and CCA specific knowledge and information	
Tools	
Promote the establishment of enabling mechanisms	(DKKV
Enhance coordination and integration of stakeholder actions thought efficient exchange of relevant and reliable information	(DKKV
Multidisciplinary approaches, exchanges and learning	(DKKV, 2011)
Enhancing knowledge sharing	(UNISDR, 2008b)
Data availability and communication	(AKP, 2013)
Improvement of information and knowledge basis	(DKKV, 2011)
Promote the establishment of enabling mechanisms	(DKKV, 2011)
Development of coherent norms and assessment tools	(DKKV, 2011)
Sustainable livelihood	(Setiadi et al., 2010)
Good governance	(Setiadi et al., 2010)
Traditional DM strategies and others are still beneficial to increase community and household resilience	(UNISDR, 2010)
Bottom up approach	(SIDA, 2010)
Ecosystem and environmental management	(SIDA, 2010)
Development of coherent norms and assessment tools	(DKKV, 2011)
Addressing poverty, vulnerability and causes (development)	(CSDRM, 2010b)
National planning for adaptation	(UNISDR, 2008b)
Institutional frameworks for adaptation	(UNISDR, 2008b)
Place prevention above insurance	(Christian Aid June 2010)
Emphasise the importance of additional planning	(Christian Aid June 2010)

PART II: THEORETICAL REVIEW

Capacity needs

Capacities required by various stakeholders for mainstreaming climate change concerns in disaster risk management: communities, government and non-governmental, disaster management personnel, research, and educational institutions (Prabhakar et al., 2009)

Supporting local actors (SIDA, 2010)

Use existing networks, strengthen regional capacity (SIDA, 2010)

Capacity building (Setiadi et al., 2010)

Enhance adaptive capacity (CSDRM, 2010b)

Address poverty and vulnerability and their structural causes (CSDRM, 2010b)

Enhance adaptive capacity (CSDRM, 2010b)

Streamline technical institutions capacities (UNISDR, 2008b)

Institutional capacities (DKKV, 2011)

Risk knowledge

Assessment of existing risk has to be the starting point (UNISDR, 2010)

Provide reliable risk information (hazard mapping and vulnerability assessment) to inform decision making (DKKV, 2011)

CC and SLR consideration for land-use planning and infrastructure (DEWGA, 2008)

Plans for DRR and CC, to identify structures, infrastructure and ecosystem at risk (DEWGA, 2008)

Tackle changing disaster risks and uncertainties (CSDRM, 2010b)

Data needs and information (AKP, 2013)

Improvement of information and knowledge basis (DKKV, 2011)

V and R assessment methods (Setiadi et al., 2010)

Integration for DRR and CCA in practice (tools) (Setiadi et al., 2010)

Tackling exposure to changing hazards and disaster impacts (CSDRM, 2010b)

Risk assessments. (UNISDR, 2008b)

Factoring risk reduction into development planning, land use, building and environmental management (UNISDR, 2010)

Correcting existing risk levels, (UNISDR, 2010)

Assessment of existing risk has to be the starting point for reducing and managing future risks (UNISDR, 2010)

CC and SLR consideration for land-use planning and infrastructure (DEWGA, 2008)

Plans for DRR and CC, to identify structures, infrastructure and ecosystem at risk (DEWGA, 2008)

Tackle changing disaster risks and uncertainties (CSDRM, 2010b)

Sector-specific risk reduction plans (UNISDR, 2008b)

Provide reliable risk information (hazard mapping and vulnerability assessment) to inform decision making (FCCC/TP/2008/14)

Identification and understanding of risks (DKKV, 2011)

Early warning systems (UNISDR, 2008b)

Focus on risk reduction and build a culture of prevention (Christian Aid, June 2010)

Focus on risk management strategy (Christian Aid, June 2010)

Reduction of underlying risk factors (DKKV, 2011)

Disaster preparedness and emergency management (DKKV, 2011)

Provide support for timely, reliable humanitarian response (Christian Aid, June 2010)

Involve communities and civil society at every stage of recovery (Christian Aid, June 2010)

Table 4: Strategies for DRR and CCA integration

7. Tools for the integration

The last category of literature proposes tools for DRR and CCA integration. These tools are systematic steps by which integration can be performed. There are eight documented tools proposed by different authors or organisations. Some of the tools suggest for the integration of climate change issues into disaster risk management actions while others consider both issues equally.

A. Mainstreaming climate change concerns in local level disaster risk management process (Prabhakar et al., 2009).

There are 6 steps suggested for the mainstreaming process. These include:

1. *Formation of local Climate Task Group*
2. *A flow-diagram for mainstreaming climate change into developmental and DRR plans and policy*
3. *Identification of vulnerable areas / hotspots*
4. *Climate change impacts and projections*
5. *Identification of necessary coupling points of climate change concerns into disaster risk management cycle*
6. *Set-out capacities needed by different stakeholders: governments, NGOs, and community*

B. Operational framework for integrating of risk reduction and climate change adaptation (Wamsler, 2009).

This operational framework is also complemented with a flowchart on how to operationalise the framework. There are three key steps within the framework and within each step points for achievements are outlined.

1. Designing a strategy for integrating RR and CCA

This includes: Direct stand-alone RR and CCA; Programmatic mainstreaming of RR and CCA; Organisational mainstreaming of RR and CCA; Internal mainstreaming of RR and CCA; Synergy creation for RR and CCA; and Educational mainstreaming for RR and CCA.

2. Measures for DRR and CCA

The measures of risk reduction and climate change adaptation need to be provided within all hazard cycles of prevention (or hazard reduction), mitigation, preparedness, and recovery.

3. Implementing and supporting/ financing the integration of RR and CCA

- Offering partner organisations technical support, links to specialists and/or funding
- Imposing funding conditions to enforce the implementation
- Offering programmes for which interested NGO's can apply, which include technical assistance and seed grants, for the purpose of guiding and accompanying the process

C. Methods and tools of DRR that can inform and advance CCA (DKKV, 2011).

This tool is proposed by DKKV. This tool builds upon the principles for DRR and considers climate change issues within DRR. The tools outline considerations of climate change issues within four key DRR approaches of the following:

1. *For identifying and understanding risks*

- National and local risk assessment
- Systems for monitoring hazards, vulnerability and risks
- Regional / trans-boundary risks included in national and local risk assessments
- Multi-risk assessment
- Cost-benefit analysis
- Inclusion of concepts in school curricula, educational material and training
- A public awareness strategy to stimulate a culture of resilience

2. *For the underlying risk factors in the context of CCA*

- DRR as an integral objective of environmental policies and plans
- Social development policies and plans to reduce the vulnerability of populations at risks, poverty reduction
- Policies and plans to reduce the vulnerability of economic activities (livelihoods)
- Incorporation of DRR into planning, including enforcement of building codes

3. *For disaster preparedness and emergency management*

- Disaster preparedness plans at all administrative levels and regular training drills
- Early warning systems
- Financial reserves to support effective response and recovery
- Procedures for exchanging relevant information during and after disaster

4. *For institutional capacities and financial mechanisms*

- Strengthening the governance
- National policy and legal framework for DRR
- A national, multi-sectoral platform for DRR and inter-institutional arrangements
- Internal institutional arrangements for DRR
- Accessibility of resource for DRR plans and activities
- Community participation

D. Climate Proofing for Development: Adapting to Climate Change, Reducing Risk (GTZ, 2010).

Methodological steps:

- Step 1 Preparation: Collecting climate information
- Step 2 Analysis: Determine effects of climate change
- Step 3 Options for action: Criteria to prioritise options for action (strategic relevance, urgency, side effect, no regret, flexibility, economic aspects, political and social acceptance)
- Step 4 Integration: Define, adapt or redesign the respective planning

E. Framework for City Climate Risk Assessment (Mehrotra et al., 2009).

Three vectors of risks:

- Hazards: (observed trends and projections for 2050s) determine climate variables at the level of city / watershed through downscaling techniques
- Vulnerability: estimating impacts and vulnerability through hydro-meteorological modelling, scenario analysis and GIS mapping
- Adaptive capacity: preparing a damage / loss assessment and identification / prioritising of adaptation option

F. Towards Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation (Turnbull et al., 2013).

Key groups for DRR and CCA:

- Children
- Women and men
- High-risk groups
- Checklist for participation of, and action by, key groups

Key sectors for DRR and CCA:

- Food security
- Livelihoods
- Natural resource management
- Water, sanitation and hygiene (WASH)
- Education
- Health
- Protection

Key contexts for DRR and CCA:

- Conflict settings
- Early recovery from a humanitarian crisis
- Urban contexts
- Slow-onset disasters

Creating an enabling environment for DRR and CCA:

- Governance
- Advocacy
- Advocacy networks

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Principles of an integrated approach to DRR and CCA:

1. Increase understanding of the hazard and climate change context:
2. Increase understanding of exposure, vulnerability and capacity
3. Recognize rights and responsibilities
4. Strengthen participation of, and action by, the population at risk:
5. Promote systemic engagement and change
6. Foster synergy between multiple levels:
7. Draw on and build diverse sources of knowledge:
8. Instil flexibility and responsiveness: As the effects and impacts of climate
9. Address different timescales: Analysis, strategies and programs should
10. Do no harm

G. Climate-Smart Disaster Risk Management (CSDRM) (CSDRM, 2013).

There are three pillars for CSDRM:

1. Tackle changing disaster risks and uncertainties
2. Enhance adaptive capacity
3. Address poverty and vulnerability and their structural causes.

The above discussion is summarised in Table 5.

Tools	References	Organisation
1. Mainstreaming climate change concerns in local level disaster risk management process	(Prabhakar et al., 2009)	-
2. Operational framework Integration of risk reduction and climate change adaptation	(Wamsler, 2009)	-
3. Methods and tools of DRR than can inform and advance CCA	(DKKV, 2011)	DKKV
4. Climate Proofing for Development: Adapting to Climate Change, Reducing Risk	(GTZ, 2010)	GTZ
5. Framework for City Climate Risk Assessment	(Mehrotra et al., 2009)	The World Bank
6. Towards Resilience: A Guide to Disaster Risk Reduction and Climate Change Adaptation	(Turnbull et al., 2013)	Catholic Relief Services
7. Climate-Smart Disaster Risk Management (CSDRM)	(CSDRM, 2013)	Institute of Development Studies

Table 5: Tools for DRR and CCA integration

8. Progress for integration

There is also literature that describes the progress based on strategies at different governance levels and by different countries and organisations. The following table shows progress in various activities from international, regional Asia and nationally in certain countries. This is developed based on review of progress by DKKV (2011), CSDRM (2010a) and author's own analysis.

The following Table 6, 7 and 8 show progress in the integration at different scale, in the learning processes, which include learning platform and key publications, respectively. Table 6 shows that there is more progress on the international scale, especially within the UNISDR system, the World Bank and UNDP.

Year	Progress in addressing norms at different scale		
	International scale	Regional scale (Asia and Southeast Asia)	National & local scale in Indonesia
2013	<ul style="list-style-type: none"> - Inclusion of disaster resilience within the 'Future We Want' document (UN, 2012a). - 4th Session of the Global Platform on DRR (GPDRR, 2013) 	-	-
2012	<ul style="list-style-type: none"> - Netherlands Red Cross: Partners for Resilience Alliance (PfR, 2012). 	-	-
2011	<ul style="list-style-type: none"> - 3rd Global Platform on DRR (GPDRR, 2011) 	<ul style="list-style-type: none"> - Coastal At Risk project - Rockefeller Foundation: The ACCCRN project 	- ACCCRN project
2010	<ul style="list-style-type: none"> - The mention of HFA in the Cancun Adaptation Framework (UNFCCC, 2011). - UNISDR Safer Cities and Urban risk for 2010-2011 - UCLG - Key negotiator and supporter of IPCC special reports - More consultations on integration of CCA into the HFA - 	<ul style="list-style-type: none"> - 4th AMCDRR: DRR through CCA (AMCDRR, 2010) - AMCDRR as the Asian Regional Platform for DRR - CCA and DRR institutional and policy landscape in Asia Pacific (UNISDR, 2010) - South east Asia : comprehensive disaster risk management frameworks - ASEAN regional Program on Disaster Management (ARPD; 2004-2010) launched by ASEAN committee for DM in May 2004. - ASEAN Climate Change Initiative (ACC) - UNISDR Asian Partnership for Disaster Reduction (IAP) 	
2009	<ul style="list-style-type: none"> - DRR Global Platform on DRR - GFDRR, SIDA, UNISDR, Stockholm 2009 Policy forum on Climate-smart DRR - WB GFDRR - COP 15 Copenhagen Accord - Working Group on Climate Change and DEE of ISDR - Climate Centre of the Red Cross/Red Crescent (IFRC and NRC, 2007). 	<ul style="list-style-type: none"> - AADMER (AADMER, 2011) - South-east Asia: Comprehensive Disaster Management Framework - The Philippines climate change Act 9729 which "ensures the mainstreaming of climate change, in synergy with disaster risk reduction, into the national, sectoral and local development plans and programs (RoP, 2009) 	<ul style="list-style-type: none"> - Indonesia Mid-Term development plan: DRR and CC as one of nine development priorities (GoI, 2010) -
2007	<ul style="list-style-type: none"> - UNFCCC: The Bali Action Plan (UNFCCC, 2007). 	-	-

Table 6: Progress at different scales of governance

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The progress in the knowledge integration for DRR and CCA shows strong promise. There are several learning platforms created to systematically document activities and progress for adaptation, and also to provide space to connect researchers, policy-makers, and practitioners (Table 7).

Learning Platform	Description	Organised by
1. Adaptation Knowledge Platform (AKP, 2013)	<p>The overarching goal of the Adaptation Knowledge Platform is to strengthen adaptive capacity and facilitate climate change adaptation in Asia at local, national, and regional levels. It focuses on three pillars:</p> <ul style="list-style-type: none"> - Establishing a regional system for sharing knowledge on climate change adaptation, making it easy to understand and available; - Generating new knowledge about adaptation that national and regional policymakers can use as they plan for climate change; and - Promoting the application of new and existing knowledge about climate change in Asia. 	- UNEP
2. Asia Pacific Adaptation Network (APAN, 2013)	<p>The most interactive knowledge-sharing platform on climate change adaptation in Asia and the Pacific is driven by users. APAN connects you with up-to-date resources, news, and events as well as a variety of field experts and practitioners. Some important benefits of this platform are:</p> <ul style="list-style-type: none"> - Connect people with common interests - Share information and experiences - Get tailored knowledge on demand - Learn from each other and grow professionally - Increase development effectiveness 	<ul style="list-style-type: none"> - ADB - MoE Japan - USAID - UNEP - AIT/UNEP - IGES
3. Asia Adaptation Knowledge Platform		<ul style="list-style-type: none"> - SIDA - SEI - SENSE - UNEP - AID/USEP RRC.AP
4. PreventionWeb	- DRR focus with some climate change issue sections	- UNISDR
5. Adaptation Learning Mechanism (ALM, 2013)	<ul style="list-style-type: none"> - Represents a collaborative, global learning process, with leadership, facilitation and strong participation by southern institutions. - Bridges knowledge gaps by bringing relevant knowledge and stakeholders together to exchange information, experiences, and expertise through a common platform for sharing and learning. 	<ul style="list-style-type: none"> - UNDP - UNFCCC - UNEP - The World Bank - FAO
6. Eldis (Climate Change) (Change, 2013)	- The Linking Climate Adaptation (LCA) Network is a community of over 900 practitioners, stakeholders, researchers and policy-makers exchanging information on climate adaptation research and practice around the globe via the Networks email list.	- CDKN
7. WeAdapt: Collaborating on Climate Adaptation (WeADAPT, 2013)	<ul style="list-style-type: none"> - An online 'open space' on climate adaptation issues (including the synergies between adaptation and mitigation) - A allows practitioners, researchers and policy makers to access credible, high quality information and to share experiences and lessons learnt with the weADAPT community to facilitate learning, exchange, collaboration and knowledge integration to build a professional community of research and practice on adaptation issues while developing policy-relevant tools and guidance. 	- SEI

Table 7: Learning platform for DRR and CCA

Table 8 shows that key publications are steadily discussing the integration over the years, especially since 2006. The conceptual development in literature for the integration is very strong in the last 5 years especially in the provision of organisations reports.

Year	Key publications	
	Organisational reports	Academic publications
2012	<ul style="list-style-type: none"> - The Future we want' which has excerpts on disaster resilience (UN, 2012a) - Resilient People Resilient Planet: A Future Worth Choosing (UN, 2012b) - Climate Risk Management (UNDP Indonesia, 2012) - Climate Change Adaptation and Disaster Risk Reduction in the Education Sector (UNICEF, 2012) - The Challenge of Integrating Climate Change Adaptation and Disaster Risk Management: Lessons from Bushfire and Flood Inquiries in an Australian Context (Howes et al., 2012) 	<ul style="list-style-type: none"> - Climate Hazards and Disasters: The Need for Capacity Building (McBean and Rodgers, 2012)
2011	<ul style="list-style-type: none"> - IPCC WG II on SREX (IPCC, 2012) - Climate Change, Disaster Risk, and the Urban Poor (World Bank, 2011). 	<ul style="list-style-type: none"> - Climate and Disaster Resilience in Cities (Shaw and Sharma, 2011)
2010	<ul style="list-style-type: none"> - Cancun Adaptation Framework which mention HFA (UNFCCC, 2011) - Mapping of climate change adaptation and disaster risk management and related governance (Strengthening Climate Resilience, Plan International Asia Regional Office) - MTR HFA on CC also discusses CCA (UNISDR, 2011) - World Development Report: Development and climate change - UNISDR Briefing Note number 3 on 'Strengthening climate change adaptation through effective disaster risk reduction - Disaster Risk Reduction and Climate Change Adaptation in the Pacific: The Challenge of Integration (Gero et al., 2010) - Strengthening CCA through Effective DRR (UNISDR, 2010) 	<ul style="list-style-type: none"> - Disaster Risk Reduction or Climate Change Adaptation: Are We Reinventing the Wheel? (Mercer, 2010) - Climate Change Adaptation and Disaster Risk Reduction: Contested Spaces and Emerging Opportunities in Development Theory and Practice (Ireland, 2010) - Climate Change Adaptation and Disaster Risk Reduction: Issues and Challenges (Shaw et al., 2010b) - Climate Change Adaptation and Disaster Risk Reduction: An Asian Perspective, (Shaw et al., 2010a) - Climate Hazards and Disasters: The Need for Capacity Building (McBean and Rodgers, 2010) - Integrating Disaster Risk Reduction and Climate Change Adaptation: Key Challenges—Scales, Knowledge, and Norms (Birkmann and von Teichman, 2010)
2009	<ul style="list-style-type: none"> - DKKV publication (Birkmann et al., 2009) - Commission on Climate Change and Development (CCD 2009) - Global Assessment Report: Risk and poverty in a changing climate (UNISDR, 2009b) - World Disaster Report: Focus on Early Warning, Early Action (IFRC, 2009) - Responding to a Changing Climate: Exploring How Disaster Risk Reduction, Social Protection and Livelihoods Approaches Promote Features of Adaptive Capacity (Jones et al., 2009) - Climate Change Adaptation, Disaster Risk Reduction and Social Protection: Complementary Roles in Agriculture and Rural Growth? (Davies et al., 2009) - Adaptation to Climate Change by Reducing Disaster Risks: Country Practices and Lessons (UNISDR, 2009a) 	<ul style="list-style-type: none"> - Journal of Environmental Hazards: Special Issue of Climate Change as Environmental and Economic Hazard (Environmental Hazards, 2009) - Schipper 2009 (Schipper, 2009) - Climate Change and Local Level Disaster Risk Reduction Planning: Need, Opportunities and Challenges (Prabhakar et al., 2009) - Climate Change, Related Hazards and Human Settlements (McBean and Ajibade, 2009) - Schipper and Burton 2009 - Climate Adaptation as Risk Management: Limits and Lessons from Disaster Risk Reduction, IHDP Update (Pelling and Schipper, 2009)

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|------|---|---|
| 2008 | - Tearfund's report "Linking climate change adaptation and disaster risk reduction (Venton and La-Trobe, 2008) | - |
| | - Global Environmental Change and Human Security (GECHS) report on "DRR, CCA and Human Security (O'Brien et al., 2008) | |
| | - UNFCCC technical paper on integrating practices, tools and systems for climate risk assessment and management, and strategies for DRR into national policies and programmes | |
| | - Incentives and Constraints to Climate Change Adaptation and Disaster Risk Reduction - a Local Perspectives (Christopolos, 2008) | |
| | - Links between Disaster Risk Reduction, Development and Climate Change (CCCD, 2008) | |
| | - Disaster Risk Reduction Strategies and Risk Management Practices: Critical Elements for Adaptation to Climate Change (UNISDR, 2008c) | |
| | - Closing the Gaps: Disaster Risk Reduction and Adaptation to Climate Change in Developing Countries (CCCD, 2009) | |
| | - CCA, DRR and Social Protection (Davies et al., 2008) | |
| | - Climate Change and Disaster Risk Reduction (UNISDR, 2008a) | |
| 2007 | - Human Development Report (UNDP, 2007/8) | - Editorial: Reducing Risks to Cities from Disasters and Climate Change (Hug et al., 2007) |
| 2006 | - Disaster Risk Management in a Changing Climate (Sperling and Szekely, 2005) | - Journal of Disaster special issue on DRR and CCA (Disasters, 2006)
- Reducing Hazard Vulnerability: Towards a Common Approach between DRR and Climate Adaptation (Thomalla et al., 2006)
- Climate Change and Disaster Management (O'Brien et al., 2006)
- Disaster Risk, Climate Change and International Development: Scope for, and Challenges to, Integration (Schipper and Pelling, 2006)
- Natural Disasters and Climate Change (Helmer and Hilhorst, 2006) |
| 2002 | - A climate risk management approach to DRR AND CCA (UNDP, 2002) | |
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Table 8: Progress in knowledge integration for DRR and CCA

9. Conclusion

The author has provided a state of knowledge on the integration of DRR and CCA. The key contribution of this paper was through presenting an analytic framework to examine DRR and CCA integration. It was acknowledged that there had been a strong step towards the integration and that this paper strengthened and repeated the calls. The study found that the majority of literature had focused on strategies in the knowledge and information provision of the integration. Moreover, there had been a mismatch on the suggested strategies and the challenges for integration. The study further found that the majority of proposed strategies focused on knowledge and information related to DRR and CCA, while the study has also shown that most of the challenges lay within the scale category. This would probably explain why progress has been slow on implementation.

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CHAPTER 5 ADAPTIVE GOVERNANCE AND MANAGING RESILIENCE TO NATURAL HAZARDS

Djalante, R., Holley, C., and Thomalla, F. (2011). "Adaptive Governance and Managing Resilience to Natural Hazards" *International Journal of Disaster Risk Science* 2 (4): 1-14.

5.1 Overview

Permission

The International Journal of Disaster Risk Science is an Open Access Journal managed by Springer. The chairs are Yanhua Liu, Chinese Academy of Sciences, China, and Roger Kasperson, Clark University, U.S.A. The editors-in-chief are Peijun Shi, Beijing Normal University, China, and Carlo Jaeger, Potsdam Institute for Climate Impact Research, Germany. The scope of the journal includes theoretical and methodological issues in disaster risk science: emergency response technology and risk management, risk governance policies and regulations from research or case studies.

Authors' contributions

Riyanti Djalante

My contribution to the research and paper: Concept - 90%; Data collection - 100%; Analysis - 80%; Writing - 90%; Total - 85%. I am involved in the development of the topics, developing the paper outlines, data collection and analysis as well as writing and preparing the paper for journal submission.

Dr Cameron Holley

Dr Holley of the Department of Law in Macquarie University, whose expertise is environmental governance, is the co-author for this paper, and is also the second associate-supervisor for my PhD. Dr Holley helps in refining the arguments, developing the paper outline, reviewing the paper drafts, and also responding to reviewers' comments.

Dr Frank Thomalla

As my principal supervisor, Dr Thomalla helps in refining the arguments, developing the paper outline, reviewing the paper drafts, and also responding to reviewers' comments.

Impacts of the paper

- This paper is cited by Pisano (2012) in the report for the European Sustainable Development Network located at the Vienna University of Economics and Business.
- The paper is also cited in the most recent work of Professor David Alexander 'Resilience and Disaster Risk Reduction: an Etymological Journey' (Alexander, 2013). Prof Alexander is an internationally renowned scholar in disaster studies who writes extensively in books and journals related to DRR (Alexander, 1996; Alexander, 1997; Alexander et al., 2011; Alexander, 2012; Alexander and Davis, 2012).

Introduction to the paper

My choice on the topic of governance is influenced by my current position working for the local government in Kendari City, South East Sulawesi Province, Indonesia. I started my PhD with a pre-identified need to explore the notion of governance and its impacts on disaster management and disaster reduction in general. Through my literature reviews, the one paper that is significantly inspirational to me is that of Folke et al's (2005) paper on 'Adaptive Governance and its Implications for Social-Ecological System', which shaped my decision to explore how AG can be applied in DRR. This paper is an eye-opener to the breadth of knowledge on governance, especially on environmental governance, in the disciplines of environmental sciences or management, and in the lessons taken from these literature reviews that are utilised to inform DRR. The main finding of this paper is that four important characteristics are important for AG to build resilience. These components are polycentric and multi-layer institutions, participation and collaboration, self-organisation and networks, and learning and innovation. Figure 5-1 shows the relationships between the key characteristics in AG in relation to disaster resilience. These four important factors of adaptive governance that can influence resilience to disasters and climate change were identified from the review of the literature discussed in Chapter 5. Findings from this paper are utilised to inform the development of the paper on the implementation of AG in Indonesia presented in Part IV Chapter 10, where the four AG characteristics are provided as mechanisms to increase the adaptiveness of a system, community or society to face future changes and uncertainties.

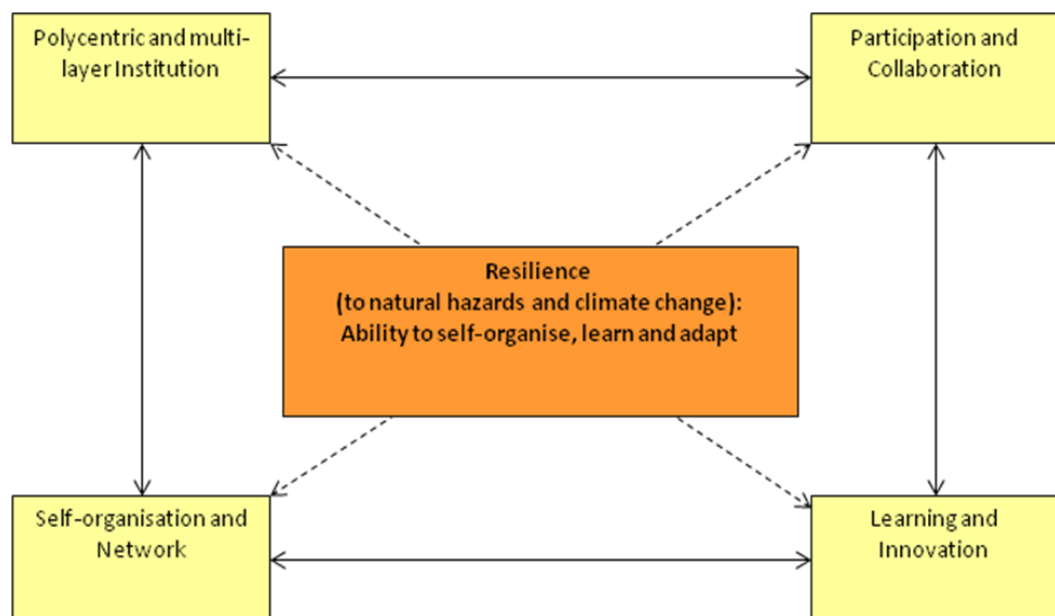


Figure 5-1: The Inter-linkages between Key Characteristics of AG in Relation to Building Resilience (Djalante et al., 2011).

5.2 The Paper in Published Format

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ARTICLE

Adaptive Governance and Managing Resilience to Natural Hazards

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Abstract The increasing frequency, intensity, and severity of natural hazards is one of the most pressing global environmental change problems. From the local to the global level, governments and civil society need to increase resilience to these hazards. Despite what is now a very sizeable literature on designing governance systems to produce resilience, a substantial gap in the natural hazards scholarship remains because most studies have lacked grounding in comparable theories on governing for resilience. This article contributes to interdisciplinary research on the conceptual understanding of the interlinkages of adaptive governance (AG), resilience, and disaster risk reduction (DRR). Through better understanding of diversity of terminology, terms, and characteristics, we take a step forward towards mutual learning and intellectual experimentation between the three concepts. Our review shows that there are four characteristics of AG that are important to help increase resilience to natural hazards. These are polycentric and multilayered institutions, participation and collaboration, self-organization and networks, and learning and innovation. The article examines the development, trade-offs, and benefits that arise from the implementation of the AG characteristics, and reviews their influence on resilience. Hazard and disaster case studies are then examined to see how each AG characteristic is viewed and implemented in disaster contexts. Based on this analysis, the contributions of AG to the DRR literature are identified, before outlining the implications for theory and further research.

Keywords adaptive governance, disaster resilience, disaster risk reduction, natural hazards

1 Introduction

The world is facing an increase in the frequency, intensity, and severity of natural hazards. Greater resilience is needed in human hazards management systems to cope with this environmental change problem. This goal can be attained by increasing the adaptability of current modes of governance to environmental change (Lebel et al. 2006). For many scholars, building resilience is the ultimate purpose of any disaster risk

reduction (DRR) governance activity. Designing governance systems to build resilience is, however, far from the exclusive domain of DRR studies. This article discusses a different strand of governance literature that so far has rarely been explored or employed together with DRR, but that offers substantial insights for the disaster field. Ignoring the interplay between related bodies of scholarship can lead to isolated evolution among different bodies of work. The result is to impede the development of effective environmental and natural disaster governance as mutually beneficial lessons are lost amongst scholarly differentiation (Slaviková, Khuvánková-Oravská, and Jilková 2010).

The intention of this article is to call attention to the separate evolution of a body of governance scholarship that like DRR is similarly concerned with building resilient and adaptive governance systems. Here we understand the term governance as meaning the intentional shaping of the flow of events so as to realize desired public goods (Parker and Braithwaite 2003). This is distinct from the concept of government, which we define as political authority / state control (Freeman 1997–1998). Adaptive approaches to governance have been described using a variety of terms and theories, but we use the term adaptive governance (AG) to emphasize environmental and natural resource governance approaches that share some or all of the following principles: polycentric and multilayered institutions, participation and collaboration, self-organization and networks, and learning and innovation. This article aims to highlight potential similarities and differences between AG and DRR and their discussion of designing adaptive governance systems that build resilience. By doing so, we seek to offer some new perspectives and links, and foremost, to open the field for future discussion.

We intend to answer several important questions: What are the important characteristics of AG that influence capacity to manage resilience? How are these characteristics perceived, implemented, and experienced in trying to build resilience to disasters, as documented in the DRR literature? What are the lessons from implementation of those identified characteristics in AG literature, which have been shown to increase resilience, but are not yet fully utilized in DRR planning and implementation?

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In the following section we review the AG literature and present our views on the relationships among four AG characteristics in helping to build resilience. Then we present the interlinkages between AG, resilience, and DRR. The key contribution of this review is our systematic analysis of each of these characteristics and the conceptual development, barriers, and opportunities that arise from their implementation, as discussed in AG literature. The next step involves a review of their influence on resilience. Case studies drawn from the hazard and disaster literatures are examined to see how each characteristic is perceived and implemented in these contexts. Finally, we analyze the wider implications of AG for DRR.

2 Review of Adaptive Governance Literature

The adaptive governance literature is not derived from a single school of thought or theory. Rather it stems from many diverse sources. Although there have been nascent discussions of AG at the international scale, the large majority of scholarship to date falls within three broad groupings: adaptive management, cooperative management, and collaborative governance. These groups of scholarship are outlined in turn below, before identifying some defining features of the AG approach.

The first broad area of AG scholarship emerged from work on social-ecological systems and adaptive management (AM). Holling (1978) proposed the AM concept as "active" scientific hypothesis testing "in the field." Management interventions in ecosystems could be treated as experiments from which managers and scientists can learn and adapt (Holling 1978; Dovers 2003a). The concept has since been applied more broadly. Walters and Hilborn (1978), for instance, proposed a distinction between passive and active management, by which they meant a difference in the extent of management interventions employed to reduce uncertainty and the recognition of learning within the management process (see also Walters 1986). Lee reviewed the AM concept (1993) and later appraised it as a policy implementation approach (1999). Gunderson (1999) subsequently proposed the concept of adaptive environmental assessment and management, which included tenets of learning, informal networks, and multiple stakeholders. Panarchy was subsequently developed (Gunderson and Holling 2002). This idea describes a nested set of adaptive cycles and multiple connections between changes that differ in speed and scale. Resilience comes from the nested cycles and interactions among "fast" and "slow" variables that impact adaptive cycles (Gunderson 1999; Plummer 2009).

The second major grouping of AG scholarship draws on the first to combine the insights of adaptive management with a cooperative approach to managing local resources. One prominent line of the cooperative management literature is

centered around the concept of comanagement, which traditionally focused on shared resources, such as fisheries and forests, and a form of power-sharing arrangement between the State and a community of resource users (Carlsson and Berkes 2005). The comanagement concept has since been broadened to include a wider array of management arrangements and models (Carlsson and Berkes 2005; Plummer and Fennell 2009), including comanagement as a continuous problem-solving process (Plummer 2009). This led to a concept of "adaptive comanagement," which combines AM and cooperative management (Olsson, Folke, and Berkes 2004). While there is no definitive model of adaptive comanagement, common principles include a management process that is dynamic, multilevel, polycentric, and seeks to find some balance between decentralized and centralized control (Olsson, Folke, and Berkes 2004; Folke et al. 2005; Plummer 2009). One of the key underlying foci of this concept is that changes within the environment are becoming more complex and that social and ecological systems are intertwined and therefore these systems as a whole need to be able to learn and adapt to change (Folke 2006). Resilience is adopted as a term describing this ability (Carpenter et al. 2001).

Another prominent line of theory within the cooperative management literature is the work of Ostrom and her collaborators that have used fieldwork and game theory studies to explore effective and sustainable comanagement of common pool resources (Ostrom 1990, 2000). This research has identified a range of conditions associated with an increased likelihood of cooperative self-governance arrangements in common pool resource contexts (Ostrom 1990). Ostrom has also integrated and built on this work to explore ideas of polycentricism (2010) and adaptive governance in complex large-scale systems (for example, climate change). In particular, Dietz, Ostrom, and Stern (2003) propose five requirements of AG (provide information, deal with conflict, induce rule compliance, provide infrastructure, and encourage adaptation) and eight strategies for meeting these requirements (devise rules relevant with ecological conditions, define boundaries of resources and users, set accountability mechanisms, apply graduated sanctions, establish low-cost mechanism for conflict resolution, encourage participation/analytic deliberation, apply nesting, and employ institutional variety).

The third and final group of AG scholarship is derived from legal and natural resource management scholarship and focuses on collaborative governance of environmental problems (Wondollock and Yaffee 2000; Sabatier et al. 2005; Holley, Gunningham, and Shearing 2011). Recent policy trends and theoretical ideas have informed this scholarship, including, ecosystem management (Odum 1953), adaptive and experimentalist learning (Dewey 1948 [1920]; Holling 1978; Walters 1986; Lee 1993), the discourse of "sustainable development" (Brundtland 1987), and the rise in popularity of participatory (Arnstein 1969), deliberative (Dryzek 2000), and civic (Putnam 1993) democracy. A range of novel

environmental governance theories have embraced these trends, including democratic experimentalism (Dorf and Sabel 1998), collaborative governance (Freeman 1997–1998), multilevel governance (Hooghe and Marks 2003), civic environmentalism (John 1994), collaborative ecosystem governance (Karkkainen 2001), adaptive governance (Brunner et al. 2005; Scholz and Stiffler 2005), and new environmental governance (Holley, Gunningham, and Shearing 2011). Although divergent in their theoretical pedigree, these theories are bound together through an engagement with forms of environmental policy that favor less rigid, less uniform, less prescriptive, and less hierarchical approaches to governing and embrace more collaborative, decentralized decision-making approaches that devolve control to participatory and multi-stakeholder groups, embrace flexibility and multilevel arrangements, and pursue explicitly adaptive and arguably more effective means of addressing complex environmental challenges (Holley 2010a).

There is great variation both within and across these bodies of scholarship. It is a broad and diverse field, containing many different terminologies, methodologies, and theoretical vantage points on adaptive forms of governance. For instance, some approaches have primarily focused on AG involving smaller-scale communities, while others focus on environmental management of much larger ecosystems. The theories also vary in ideas, some rooted in ecological systems, and others based on legal and governance traditions. Most importantly from the perspective of this article, there is also variation in the emphasis of resilience. In many AG theories, governing to build resilience remains at the forefront of normative design, particularly in the adaptive management and cooperative management groupings. In other theories, the emphasis on resilience itself is more implicit and intertwined with a focus on developing governance approaches that are flexible, adaptive, and capable of responding to new knowledge and change in social and ecological systems. Despite these differences, there is also integration across these scholarships, particularly as most draw on adaptive management concepts. Despite extensive variation, at a broad level there are characteristics that are common across most AG theories. Although there is no single AG model per se, each grouping of theory emphasizes an approach to governing that shares some or all of the following principles: polycentric and multilayered institutions, participation and collaboration, self-organization and networks, and learning and innovation. We use the term “adaptive governance” to group these diverse theories together. We acknowledge that the importance of these characteristics are contestable and, consistent with evolving understandings of AG, and not all of these characteristics need to be present for a particular theory or example of AG to fall within this category. We also recognize there is a risk of overgeneralizing and of obscuring divergent tendencies within the literature; it is important to remain alert to such differences.

3 Interlinkages between Adaptive Governance, Resilience, and Disaster Risk Reduction

Resilience is at the center of the exploration of AG and this concept becomes the bridge for our interdisciplinary examination of AG and DRR. The concept of resilience has been developed, adopted, and interpreted differently in different fields of study (Djalante and Thomalla 2011). It was originally developed in the field of ecology (Holling 1973) and subsequently in engineering (Wildavsky 1991), social-ecological systems (Folke 2006), natural hazards (see, for example, Paton and Johnston 2006; Tierney and Bruneau 2007), development studies (Gaillard 2010), psychology (Crittenden 1985; Norris et al. 2008; Van Vliet 2008), and is now used widely in the media. It is increasingly associated with research in vulnerability, and adaptive capacity (Gallopin 2006; Miller et al. 2010). We understand resilience as the ability to self-organize, learn, and adapt (Carpenter et al. 2001). Lebel et al. (2006) note that a capacity for self-organization means that a system needs the ability to maintain and recreate its identity and to buffer itself from outside impacts. The ability to learn and adapt means that a system is able to achieve its management objectives better over time and adjust those control measures should the context change.

So resilience as a concept is used both explicitly and to a lesser extent implicitly in AG scholarship. Resilience is the ultimate goal for reducing disaster risks (UNISDR 2007). In DRR, resilience is defined as the ability of a community or society exposed to hazards to resist, absorb, accommodate, and recover from hazards timely and efficiently (UNISDR 2009). We adopt the United Nations International Strategy for Disaster Reduction definition of DRR (UNISDR 2009, 10) as a systematic effort to reduce disaster risks through analyzing and managing the causal factors of disasters including the reduction of vulnerability and improved preparedness for adverse events.

Figure 1 shows the interlinkages between key characteristics of AG that help build resilience to natural hazards. The solid-line arrows show the main relationships among the characteristics. Polycentric and multilayered institutions are the key steps in the directions for AG. These arrangements, along with leadership, trust, and social capital, can enhance the likelihood for participation and collaboration. Self-organization can be done formally or informally by whichever social arena formed and practiced in different forms of networks. These networks in turn help enhance learning and innovation, which can create enabling conditions for building resilience. The dashed lines represent indirect relationships. The existence of polycentric and multilayered institutions helps to encourage self-organization and the formation of networks and vice versa, while participation and collaboration can further accelerate learning and innovation.

The discussion below explores each of these four characteristics. It does so with a number of key issues in mind.

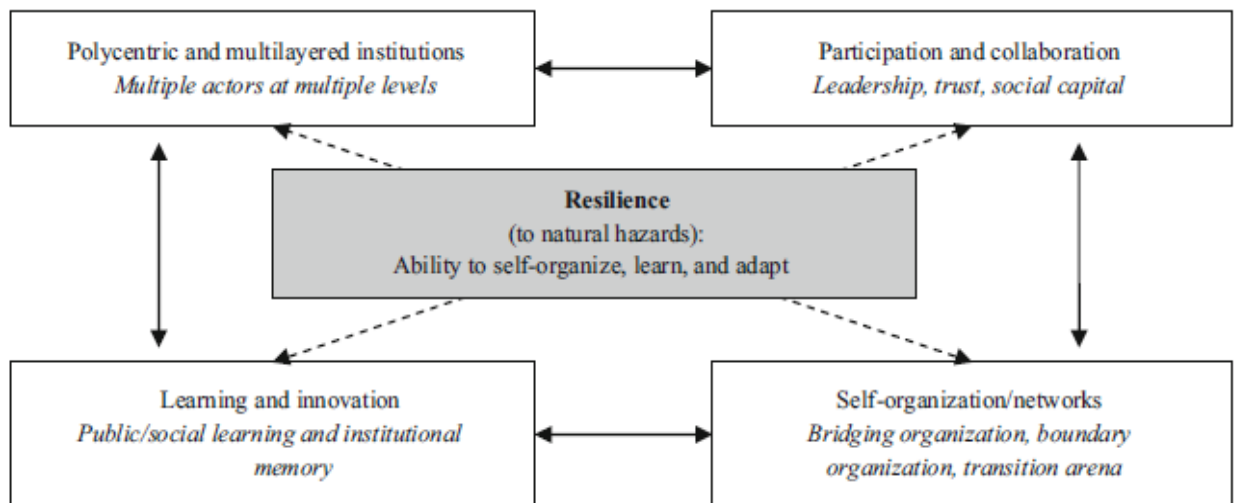


Figure 1. Interlinkages between key characteristics of adaptive governance (AG) in relation to building resilience

Initially, for each characteristic, the discussion briefly explains how the concept is understood in the AG literature. It then identifies some of the key lessons learned from the AG literature about its strengths, weaknesses, and trade-offs within the AG context. The discussion then examines the links between the characteristic and resilience from the perspective of the AG literature and explores whether and to what extent the characteristic has been recognized in DRR contexts and studies. Finally, the discussion identifies the insights for building resilience that can be taken from the AG literature, to enhance DRR planning and implementation.

3.1 Polycentric and Multilayered Institutions

Polycentric governance systems (McGinnis 1999) are characterized by the existence of various kinds of governing authorities at different governance scales. For example, a variety of non-state actors may assume administrative, regulatory, managerial, and mediating functions previously undertaken by a central government. This polycentric vision conceives of many centers of decision making and action that are formally independent of each other, but that can function either independently or constitute an interdependent system of relations (Ostrom, Tiebout, and Warren 1961).

Our review shows that polycentric and multilayered institutions have a very high potential to influence the capacity to manage resilience. The existence of different organizations at different scales allows for scale matching of organizational and ecological scales (Folke et al. 2005). These institutional arrangements improve the fit between knowledge, action, and social-ecological processes to help societal adaptation at the appropriate level (Lebel et al. 2006) and create possibilities for moderating vertical interplay among institutions (Young 2002). Lebel et al. (2006) observed that multiple and interdependent structures as suggested by polycentric institutions

allow for opportunities for local institutions which can better match the social-ecological contexts and dynamics. This arrangement can enhance trust and cooperation, and may achieve more effective, equitable, and sustainable outcomes (Toonen 2011). Opportunities for learning and innovation through utilization of local and multiple sources of knowledge can also lead to better adaptation strategies (Ostrom 2010). Through the pooling of knowledge, a comprehensive assessment of problems can be performed, uncertainties can be reduced, the results are more likely to be accepted, legitimacy is increased, and innovations can be expected (Berkes and Folke 2002). Polycentricism allows for institutional interactions to improve the diversity of responses and stimulate collaboration (Folke et al. 2005). Over the medium to long term, redundancy can be structurally increased and failure is likely to be reduced (Ostrom 2010).

There are some trade-offs in the context of polycentric and multilayered institutions. In the short term, multilevel and multiple decision-making centers can heighten transaction costs and decrease efficiency (Pahl-Wostl 2009) and opportunities for collective action can be missed (Folke et al. 2005). There can be inefficient overlapping of coordination and administrative responsibilities (Lebel et al. 2006), which can be potentially ineffective if lower government levels do not have power and resources (Bulkeley and Betsill 2005). Another challenge is joining up agencies and governments to willingly share power. Many studies in collaborative natural resource management and watershed management have provided evidence that cooperation at these higher levels poses one of the greatest challenges to the effectiveness of multilevel nested collaboration models (Freeman and Farber 2005; Margerum 2008). One way of overcoming this is for national governments to provide sufficient incentives (legal and economic) to ensure lower-level bodies have sufficient motivation to genuinely engage in joint governance processes

(Karkkainen 2001; Holley, Gunningham, and Shearing 2011).

Implications for resilience to natural hazards

The literature on DRR and climate change adaptation shows that multilevel climate risk governance has been proposed as one strategy to manage the impacts of climate change (Bulkeley and Betsill 2005; Corfee-Morlot et al. 2011). Cross-sectoral regional or urban development strategies implemented between local and national governments are likely to improve the effectiveness of policies that promote mitigation and adaptation to climate change (Corfee-Morlot et al. 2011). Although adaptation policy needs to be guided by national policy, implementation needs to take into account local priorities and contextual differences in the geophysical and socioeconomic environment (UNFCCC 2008; IFRC et al. 2009).

Governing for climate change requires the provision of an open, deliberative space for local stakeholders through which multilevel climate risk governance can provide such space. Hazard management case studies in Canada and India show that cross-scale institutional linkages are particularly effective means by which to build resilience in mountain social-ecological systems in the face of all hazards (Gardner and Dekens 2007). Adger et al. (2005) suggested that a multilevel governance system for disaster management enables enhancement of capacity to deal with uncertainties through mobilization of different sources of resilience. Taking the example of the 2004 Indian Ocean tsunami, they argued that the existence of formal and informal institutions as well as large-scale international response helped the affected countries to cope with and recover from the impacts quicker and better, and even permitted the use of the tsunami as a window of opportunity for building long-term community resilience.

There are, however, some obstacles for implementing these institutional arrangements for managing resilience. Devolution of power through decentralization is ineffective without transfer of specific authority and power. For example, a lack of technical capacity or access can hinder adaptation planning at the local level despite the existence of a nationally guided plan on climate change (Bulkeley and Betsill 2005; Corfee-Morlot et al. 2011). Thomalla and Larsen (2010) observed that local government agencies and NGOs can be locked in a power struggle if the roles and responsibilities of different actors are unclear or if the legitimacy of some stakeholders is questioned. During emergencies resulting from natural disasters, local governments and other local entities have crucial and difficult tasks to undertake. They must coordinate, facilitate, and encourage all local stakeholders to engage in response and recovery efforts. This organizational and inspirational role poses serious challenges at the best of times. But they constitute almost impossible demands because they arise at a moment when these institutions have neither the resources nor capacity to do so, and may have lost

both critical infrastructure and personnel as a result of the disaster's impact (King 2008; Brody, Kang, and Bernhardt 2010; Jabeen, Johnson, and Allen 2010).

The discussion above suggests that polycentric and multilayered institutional arrangements recognized in the AG literature have been equally canvassed within the DRR literature, not least because place matters in terms of how risks are perceived and socially constructed. The main obstacle tends to be how local actors are to be equipped with the necessary skills and resources, and in most cases such capacity building is generally expected to emerge through cooperation between higher-level institutions/organizations and lower-level actors. Experience from the AG literature suggests that this will be a difficult challenge, and it is one that has perhaps been downplayed in the DRR literature to date. Anticipating and responding to potential ineffectiveness and inefficiencies within the vertical and horizontal relationships between organizations is an issue that requires further attention from both policy makers and scholars, including exploring options such as the use of legal and economic incentives identified in AG, as well as other means to achieve more effective polycentric arrangements.

3.2 Participation and Collaboration

Participation is a multifaceted concept and debates vary depending on which feature of the participatory process is discussed (Fung 2006). For example, participation (that is, deliberation) as communication is a common area of concern in the literature. Deliberation can take place in many settings, both formal and informal, including through networks (Dryzek 1999). Generally, collaboration can be defined as a process where a group of diverse stakeholders, including government and nongovernment actors, and individuals and communities pool their knowledge and/or tangible resources to solve shared environmental or natural resource dilemmas (Parker and Braithwaite 2003). It can take place in different ways and involve different actors. Collaborative relationships may be one-off events, but many are ongoing processes, where stakeholders plan, implement, monitor, and adapt their actions over time. Some involve only government agencies, others involve only citizens, some involve both (Margerum 2008; Holley 2010b). Participation and collaboration favorably influence the capacity to manage resilience. The pooling of knowledge from multiple participants can allow for effective processes and better outcomes (Pahl-Wostl 2009).

The AG literature recognizes a range of factors that affect participation and collaboration. This includes leadership experience and quality, transactions costs, the extent to which solutions derived from collaboration bind all collaborating parties, and how group identities and allegiances are formed and organized (Karkkainen 2001). Equally important are the collective experiences of collaboration, and the external forces or influences that affect collaborative efforts (Heikkilä and Gerlak 2005). Ostrom's research on the effective and

sustainable comanagement of common pool resources (CPR) has identified a range of conditions (such as trust, severe environmental problems, and autonomy from external authorities) associated with an increased likelihood of successful self-organized collaboration in the CPR context (Ostrom 1990, 2000).

Effectiveness can be reduced because a participatory approach is resource-consuming (Pahl-Wostl 2009). When membership is not representative or involvement is not meaningful, the legitimacy of the processes and outcomes may also be challenged (Pahl-Wostl 2009). Bias and incomplete knowledge can undermine participation (Jasanoff and Wynne 1998). It can also lead to additional conflict and can result in lowest common denominator solutions and imprecision (Orts and Coglianese 2007). Free-riding, fear of future defection, lack of trust, and high transaction costs can all hinder collaboration (Heikkilä and Gerlak 2005; Raymond 2006; Holley 2010b).

In many instances, the initial challenge is getting relevant parties to the table. Many studies into collaborative forms of AG have found that the existence of external and institutional triggers are vital to opening the way to successful collaboration by creating the necessary incentives to engage stakeholders (Roux, Murray, and van Wyk 2007; Tompkins, Few, and Brown 2008; Hunt and Watkiss 2011). It is important to recognize that collaboration not only requires bringing actors together, but also maintaining participatory and collaborative responses over the longer term. Studies into collaborative forms of environmental management have emphasized the need for a strong ongoing governmental role, including funding and/or in-kind assistance to offset the inevitably high transaction costs that confront volunteers engaged in day-to-day decision making and action (Freeman 1997–1998; Freeman and Farber 2005; Holley 2009). Such support can be particularly vital when dealing with marginalized populations. In such situations, government will need to provide the necessary support to ensure that marginalized actors are given a voice in decision making (Freeman 1997–1998; Lane and Corbett 2005). The primary lesson to be taken from AG is that to successfully engage all stakeholders as volunteer partners requires funding to be commensurate with their time scarcity and financial needs. Without this, some groups, those with the least time and resources to spare, will not participate (Lane and Corbett 2005) or lose interest in the long term (Holley 2009; Thomalla and Larsen 2010). The long-term sustainability of disaster preparedness activities based on volunteerism is a particular challenge for DRR (Thomalla and Larsen 2010).

Implications for resilience to natural hazards

Many disaster studies have pointed out the importance of participation and collaboration by different stakeholders at different stages of the planning and management of disasters (Berke, Kartez, and Wenger 1993; Warner, Waalewijn, and Hilhost 2002; Sharp 2007; Warner 2008; Tran et al. 2009;

MacRae and Hodgkin 2011). Pearce (2003) argued that sustainable hazard planning and management can only be achieved through community participation within disaster management. The example of Portola Valley in the San Francisco Bay area is a case in point. The town is frequently hit by landslides because it is located on the San Andreas Fault. Pearce (2003) outlined how disaster management planning by the valley authority benefited from the involvement, leadership, and participation of several community members who formed a geologic hazard committee. A study in the Cayman Islands showed that stakeholder participation, access to knowledge, accountability, and transparency in DRR policy created a policy environment that is conducive to the kind of structural reform needed to build long-term adaptive capacity to climate-driven impacts (Tompkins, Lemos, and Boyd 2008). A coastal zoning study in eastern Quebec, Canada reported that efficiency in implementing various zoning measures was dramatically improved through close collaboration of scientists, management, government, and the public (Drejza, Bernatchez, and Dugas 2011).

Social capital, defined as the norms and social relations within societies' social structures that enable coordination and actions to achieve desired goals (Sharma and Patt 2012), has also been identified as an important element to help a community be more resilient to disasters. According to Aldrich (2011), social capital was the strongest and most robust predictor for population recovery after the 1995 Kobe earthquake in Japan. It was found that after the earthquake, social capital was manifest in terms of the creation of neighborhood-based civil society organizations within different wards in the city of Kobe and this helped to organize and coordinate faster recovery activities. Comparing two similar neighborhoods affected by the Kobe earthquake, Mano and Mikura, Aldrich found that stronger community networks in Mano helped to accelerate recovery after the disaster. The citizen fire brigade in Mano successfully fought post-quake fires compared to similar network in Mikura. People in Mano ward have also undertaken various community activities such as the rehabilitation of the community center (Machizukuri office), the establishment of a community-managed company to help the reconstruction processes (Manokko), the lobbying for housing for the elderly, as well as campaigning for the construction of public houses for people affected by the disaster. Mikura, which has been shown to have weaker community ties, has only conducted one activity—the creation of an organization called Machi Community to help accelerate the reconstruction processes.

Despite Coglianese's observation (Orts and Coglianese 2007) that collaboration and participation can sometimes augment conflict, it is generally viewed favorably in most post-disaster activities, especially in places with inequalities, conflicts, and ethnic divisions. Public participation after the Bam earthquake in Iran helped to reduce possible economic, social, political, and cultural conflicts in already highly vulnerable communities (Omidvar, Zafari, and Khakpour 2011). The inclusion of existing local networks for aid distribution

helped to improve ethnic neutrality and social harmony after the 2004 Indian Ocean tsunami in Sri Lanka (Amarasiri de Silva 2009).

These case studies show that participation and collaboration are recognized as important in both AG and DRR to improve effectiveness and efficiency, and to reduce uncertainties in managing complex environmental problems. Important issues that have not been addressed sufficiently in DRR include the nature and degree of participation, the transaction costs, and the extent to which existing and potential conflict can be avoided or reduced through participation.

3.3 Self-Organization and Networks

A network is a self-organized and typically informal governance system in which diverse actors are knitted together across organizational levels to focus on common problems (Folke et al. 2005, 450). Networks are actualized through boundary organizations, bridging organizations, or epistemic communities.

Boundary organizations are described as the arenas for multiple entities to reach a common understanding of issues (Corfee-Morlot et al. 2011). A boundary organization is a place for scientists and decision makers to meet to create a boundary arena that is acceptable and accountable to all parties involved (Guston 2001). A bridging organization has a broader scope than a boundary organization (Brown 1991). Examples of a bridging organization include an assessment team composed of different actors in a social-ecological system, NGOs that create a social arena, and the scientific community that can facilitate and control adaptive management processes (Garmestani, Craig, and Cabezas 2008). An epistemic or policy community is a governance system consisting of different agents operating at different levels, formed through a similar interest in influencing and implementing policies (Folke et al. 2005). It can exist in the form of a formal collaboration or a comanagement structure in which management authority is shared by multiple stakeholders. Such a comanagement arrangement is often used by governments to increase legitimacy and manage conflicts without the devolution of power (Carlsson and Berkes 2005). Another known form of self-organization is the transition arena, in which problems and possible solutions are deliberately confronted and subsequently integrated to come up with an innovative and visionary agenda (Rotmans and Loorbach 2009).

Several challenges are identified in the literature to the flexible comanagement approach. Agencies themselves might resist change and refuse to have different forms of coordination beyond their mandates (Freeman and Farber 2005). Accountability can be difficult to determine and measure in a flexible arrangement. If a new institution is formed, new layers of accountability can emerge (Freeman and Farber 2005). Duit et al. (2010) warned that heavy reliance on self-organized networks in managing social-ecological systems can lead to government failure since its empirical applications are still rare.

Implications for resilience to natural hazards

There is an increasing emphasis in the literature on the need for flexible organizations, policies, and institutions in managing and reducing disasters (Bull-Kamanga et al. 2003; Klein, Nicholls, and Thomalla 2003; King 2007; Warner 2008). An abundance of case studies of community self-organization at different stages of disaster management exist (see, for example, Paton and Johnston 2001; Menoni 2001; Nakagawa and Shaw 2004; Srinivas and Nakagawa 2008; Surjan and Shaw 2009; Aldrich 2011). In Australia, King (2007) observed a "plethora of organizations" by which a community organizes itself after a disaster, reassigning priorities and using existing organizations and networks for new purposes. In Japan, *jishu-bosai-soshiki*, translated as the "autonomous organization for disaster reduction," takes effect during emergency situations (Bajek, Matsuda, and Okada 2008). This neighborhood association is actively involved in community preparedness and rescue activities throughout Japan.

Humanitarian organizations, NGOs, and civil society organizations have extremely important roles in DRR. The flexibility in their operations, generally in terms of ability to speed-up deployment of resources without having to pass long bureaucracy than what formal governments normally have to face, enables them to support communities at every stage of the disaster management cycle (prevention, mitigation, emergency, and recovery) (Telford and Cosgrave 2007) and climate change adaptation strategies (Bulkeley and Kern 2006).

The importance of a multi-stakeholder forum in helping to create space for collaboration and learning has been acknowledged by the UNISDR. The Global Platform for DRR was established in 2007 along with six regional and 60 national platforms worldwide (UNISDR 2011). A report by the United Nations Development Program (UNDP) revealed that the Indonesian national platform for DRR was formed smoothly because of the existence of a previous analogous entity and because it was supported by the recently passed law 24/2007 on Disaster Management (UNDP Indonesia 2008). Without these preconditions, the formation of such a platform might have been difficult to initiate. Based on similar cases of multi-stakeholder forums in Ica and Ayacucho in Peru, Warner and Oré (2006) warned that without larger institutional stability such platforms might not be sustainable in the long term. In line with Berkes' (2009) observation, the multi-stakeholder participation in Ayacucho was created as a strategy for the national government to increase its legitimacy and manage conflicts without the devolution of power.

There is an increasing recognition of the role of alternative governance systems in addressing global environmental changes and risks. Local governments around the world are actively involved in innovative networks to encourage the sharing of experience and lessons learned. These include Cities for Climate Protection by the International Council for Local Environmental Initiatives (ICLEI),⁴ Climate Resilience Cities by the World Bank,⁵ and the Resilient Cities campaign

by the UNISDR,³ to name but a few. All of these are networks of cities in developing and developed countries that have come to the realization that local actors are the first respondents against any impacts of natural disasters or climate change risks. Because cities have a great potential in implementing both mitigation and adaptation to climate change simultaneously, direct links between them enables the transfer of knowledge and facilitates social learning.

That a transition arena can help to create innovation in DRR is demonstrated by the San Diego Fire Recovery Network. This is a community self-organized network that was formed due to a perceived inability of the government to respond to disasters in a timely fashion (Goldstein and Butler 2009). It is considered an innovation since it altered residential knowledge practices and identity and reshaped governance relationships. Nonetheless, Rotmans and Loorbach (2009) remind us that a transition arena still needs to be supported with a mechanism to assess and evaluate performance, otherwise capacity to innovate further can be undermined.

The above discussion shows that self-organization and networks are important and have been considered extensively in DRR. Many benefits that demonstrate how self-organization and networks help to build community resilience locally or internationally have been documented. Although beyond the scope of this article, it is possible that these documented experiences could contribute useful insights to the AG literature on self-organization and networks. Some issues identified in the AG literature, such as the resistance of organizations to change, and the challenges of identifying who is accountable for what within loose and informal networks, do not appear to have been fully recognized or addressed within the DRR literature.

3.4 Learning and Innovation

Learning emphasizes active social participation and dynamic integration between people and the environment to construct meaning and identity (Lave and Wenger 1991). One key term developed for continuous learning is public or social learning. Public learning implies an ability to learn the consequences of one's action to the broader public (Scholz and Stiffler 2005), sometimes termed social, institutional, or organizational learning. It is a form of public learning within formal, informal, or loosely defined organizations (Folke et al. 2005). Social learning is facilitated through the accumulation of social-ecological learning and understanding—this is also referred to as “social memory.” It is essentially accumulated experiences, values, debates, and decision-making processes that have been used as strategies to continually deal with change. When this memory is stored within institutions, it is called institutional memory or a knowledge system, or reservoir, of long-term social-ecological adaptation to change (Berkes and Folke 2002). Resilience is greatly enhanced through learning and innovation (Folke et al. 2005). Learning allows for diverse access to a new kind of knowledge and diverse assessments (Pahl-Wostl 2009). It also creates arenas

for novelty and innovation (Folke et al. 2005). Continuous learning is necessary to keep up with change and uncertainty in complex adaptive systems (Carpenter and Gunderson 2001; Englehardt and Simmons 2002).

Another prominent form of learning is an adaptive management approach to dealing with natural resource and environmental problems. Within AG, documented instances of successful adaptive management of natural resources are rare (Doremus et al. 2011). Studies into groundwater and surface water (Holley and Sinclair 2011), the Florida everglades (Gunderson and Light 2006; Walters, Gunderson, and Holling 1992), species and habitat conservation (Gunderson 1999; Karkkainen 2003; Doremus et al. 2011), and natural resource management (Wondollock and Yaffee 2000) have identified a number of practical challenges that have stood in the way of establishing successful learning. Acknowledging these failures and the conditions that have produced them can ensure that DRR can confront these challenges head-on and avoid pitfalls.

One significant practical problem for achieving learning in the context of AG is the technical, logistical, and financial challenges that often stymie the collection of baseline environmental data (for example, the precise quality or quantity of groundwater) on which to judge whether a management action by a given body is effective in producing the desired result (Steinzor 2000). Thomalla and Larsen (2010) observed within community-based DRR, that a similar practical challenge is to identify, agree on, and measure a desired outcome of resilience building.

A lack of government investment, coordination between agencies, and a culture that lacks the flexibility needed for learning (Gunderson 1999), or prefers on the ground outcomes to investment in long-term monitoring has also been shown to be a particular problem (Holley 2010a). Others have explored the conditions under which local collaborations will be capable of being effective ongoing monitors of their own actions and the impacts of these actions on environmental conditions (Fung and Wright 2003; Holley 2009). The tasks of monitoring can also raise a range of complex issues for local collaborations, including clarity about the causal relationships between management actions and changes to environmental conditions and the time frame of changes to environmental conditions in response to management interventions (Dovers 2003b).

A range of challenges prevent effective monitoring, including insufficient resources and training provided to citizen volunteers to conduct comprehensive monitoring; insufficient internal expertise to conduct learning and adaptation (for example, hydrological staff to not just carry out robust monitoring, but equally to compile, interpret, and analyze collected data); and the sheer complexity and scope of environmental problems that spread over large geographical areas (Holley and Sinclair 2011). Frequently, short-term project planning and implementation does not allow for the monitoring and evaluation of long-term processes. These experiences from practice suggest comparable investment

and support is needed to substantially increase the extent and effectiveness of basic monitoring of the environment and management actions in order to better support learning approaches (Doremus et al. 2011).

Overcoming a lack of coordination, relevance, and access to government monitoring data that has plagued AG approaches similarly demands clarity on why data are collected, who is to collect it, and who has access to it (Karkkainen 2006). In particular, many have recommended legislating detailed statutory mandates for collecting and sharing data across bureaucratic fiefdoms (Camacho 2007; Benson and Garmestani 2011; Doremus Forthcoming). Others have proposed creating a separate monitoring agency or establishing an expert monitoring panel, NGO, or other intermediary organization to pool, network, and diffuse monitoring and learning information which enjoys the trust, respect, and attention of both knowledge producers and knowledge consumers (Gunderson 1999; Wondollock and Yaffee 2000; Doremus Forthcoming). Alternatively, proposals suggest looking beyond agencies to better incentives, to fund and support nongovernment actors to collect data.

The experience to date suggests that policy makers should, at the very least, carefully assess the expectations they place on community or collaborative bodies to perform learning tasks, particularly the scope and detail of monitoring and evaluation that can and should be deployed (Dart and Davies 2003). Any community-driven data gathering processes to establish baselines and to demonstrate intermediate outcomes in adaptive processes will require that sufficient support is provided (Karkkainen 2003). Alternatively, government may look to harness (through monetary or regulatory incentives) more well-resourced actors like industries that have been shown to be better equipped at fulfilling monitoring tasks (Dovers 2003b; Karkkainen 2003; Holley 2010a).

Ultimately, a primary lesson from AG is that processes for establishing learning arrangements do not emerge spontaneously. Simply layering learning processes and goals on top of governance programs demonstrably does not provoke meaningful learning. They have to be explicitly and effectively designed, supported, and encouraged (Head 2009; Ruhl 2011).

Implications for resilience to natural hazards

Learning is seen as a positive characteristic in the DRR literature. A study that examined social learning within communities in flood-prone areas in Puerto Rico found that social learning can be promoted through building on existing knowledge. By combining local community knowledge about flood hazard coping strategies with scientific information on how flood characteristics are affected by human activity and climate change more effective management practices emerged (López-Marrero and Tschakert 2011). A case study of the Cayman Islands showed that persuasion, public education, and prior disaster experience lead people to change their attitude toward climate risk management, which resulted in the formation of informal action groups (through the

participation of volunteers) and increased collective action (Tompkins 2005). In many places, local knowledge and practices have helped communities to cope with and respond to natural hazards and environmental change for generations. These local/indigenous knowledge and practices need to be integrated with scientific knowledge when designing local disaster preparedness and adaptation strategies (Mercer et al. 2009).

Social memory is a critical element in helping to reconstruct past adjustments to climate change. In the case of Hurricane Katrina this basic management tool was ignored. Historical records compiled after Hurricane Betsy in 1965 were neglected and this led to devastating impacts during Hurricane Katrina in 2005 (Colten and Sumpter 2009). In a recent study on building resilience to disasters in Indonesia, Djalante et al. (In Press) found that in areas affected by major and frequent disasters, local government agencies and NGOs tend to have more awareness on the importance of DRR. Sharma and Patt (2012) examined the effect of personal experience of hurricanes on peoples' responses to early warnings and demonstrated the importance of three factors: the severity of the past impact, past experiences with false alarms, and past experiences with evacuation services.

Even though the experience in AG shows that learning creates arenas for novelty and innovation, the latter might be difficult to achieve in a disaster setting. A study in Sri Lanka after the 2004 tsunami revealed that innovations in disaster recovery require distinct approaches, resources, and competence. The combination of ineffective government, weak markets, civil war, and the enormity of the tsunami recovery needs all undermined the ability to innovate (Koria 2009). Voss and Wagner (2010) found that institutional learning from small-scale disasters rarely takes place because the stakeholders' focus remains on only one governance level. They argued that learning lessons from small disasters (for example, a flash flood in a small town) is extremely important to help reduce possible damage and even catastrophic disasters in the future. This has strong implications for DRR. For example, the Intergovernmental Panel on Climate Change (IPCC 2007) expects an increase in the number of small-scale, incremental disasters due to climate change. If institutions cannot learn from these incremental disasters, their resilience might be eroded and they might not have the capacity to cope with a succession of small-scale events or sudden and/or large-scale events. Eroded resilience and increased vulnerability can easily turn small-scale hazards into catastrophic disasters (Wisner et al. 2004). It is also equally important to facilitate learning at all stages of the disaster cycle (Berke, Kartez, and Wenger 1993; Murphy 2007; Pelling 2007; Chang and Chang 2010; Paton et al. 2010). There are abundant examples of learning failures from the AG literature that can provide lessons for DRR, including how learning can be more systematically supported, adopted, and implemented. There are also issues of learning that may be specific to a particular disaster context. This may warrant further exploration to test and refine the lessons from AG in the DRR context.

The previous discussion is summarized in Table 1. It shows the potential of the four AG characteristics in increasing disaster resilience, the direction of the contributions between the two bodies of literature, and some examples of the potential contributions from AG to DRR.

4 Conclusion

We have outlined how adaptive governance (AG) can increase resilience to natural hazards. We have reviewed the basic concepts of AG and disaster risk reduction (DRR), and examined the four important characteristics for managing resilience (polycentric and multilayered institutions, participation and collaboration, self-organization and networks, and learning and innovation). We have also identified the important interlinkages between these characteristics. While some aspects of AG we have reviewed have long been considered within DRR, there is scope for more lessons to be learned.

The importance of polycentric governance for DRR has been recognized and implemented worldwide. However, the experience from AG shows that the higher levels of

government need to provide considerably more technical and financial support to agencies and organizations operating at the lower governance levels.

Effective participation and meaningful collaboration between all stakeholders, governments, NGOs, and communities has also been pursued as an important element of DRR. An increased recognition of the roles and responsibilities of local stakeholders in managing disasters and climate change risks is crucial. A key lesson from AG is that preexisting inequalities, a lack of trust, and ineffective government can significantly hamper participation and collaboration. The increasing focus on climate change adaptation creates a window of opportunity to rethink development and DRR (Ireland 2010) and to create innovative partnerships between public and private-sector organizations.

The role of self-organization and networking is acknowledged in DRR to some degree but more lessons can be inferred from AG. For communities affected by disasters, reorganization is often taken to be a coping mechanism once a disaster has struck, rather than an element of longer-term building of resilience. The process of forming a network is important, since it can create cohesion and help to increase

Table 1. Relationships and directions of contributions in literature between adaptive governance (AG) and disaster risk reduction (DRR)

AG Characteristics	Implications for Resilience	Direction of Contribution of Literature	Potential Contributions from AG for More Effective DRR	Practical Example Identified in DRR Literature and Potential for Learning Based on AG Literature
Polycentric and Multilayered Institutions	Very high	DRR needs to learn more from AG.	Not many discussions in DRR literature were found on how the potential for ineffectiveness and inefficiencies can be overcome.	UNISDR system from global to local level, involving multitude of actors from global to local level. As suggested in AG literature, ineffectiveness and inefficiencies in implementing polycentric structures can be overcome through higher level governments providing incentives (legal and economic) to increase engagement of lower level actors.
Participation and Collaboration	High	There have been documented cases in AG and DRR literatures.	Three important issues that have not been addressed extensively within the DRR literature on participation are: (1) quality of participation; (2) issues of transaction costs; and (3) the extent to which conflict can be reduced through participation in a disaster-stricken place.	Public participation after the Bam earthquake has been recognized to reduce conflicts amongst the economically and socially segregated communities. As the AG literature suggests, it is therefore important that governments provide necessary support to make sure that the voices of marginalized groups within the community can be heard and that these groups can be involved in decision-making processes to help reduce further conflicts.
Self-Organization and Networks	High	There are many cases of the application of flexible networks in DRR. This can help enrich AG discussion.	DRR reviews showed that self-organization matters at the local level, and that network characteristics are different at different stages of disaster management.	Resilience cities program by the International Council for Local Environment Initiatives (ICLEI) has been extensively implemented in both developed and developing countries. Cities learn from each other on experiences and innovations in dealing with disasters and climate change risks. As revealed by the AG literature, willingness of higher level government agencies to collaborate or coordinate with the cities as well as accountability of these networks appear to be important areas to examine further.
Learning and Innovation	High	Experiences from AG are still underutilized for DRR.	There are also disaster-specific learning issues to be explored further. Furthermore, DRR needs to incorporate from AG how learning can be systematically adopted and implemented.	The multi-stakeholder platform for DRR in Indonesia has been able to help increase coordination as well as sharing of experiences of various organizations working on DRR. As suggested in AG literature, more systematic learning needs to be explicitly and effectively designed, supported, and encouraged to ensure that the experiences can be captured and learning can take place effectively and long term.

community resilience. Bridging organizations in the form of multi-stakeholder platforms for DRR are an example of innovative networks that have recently been established in many parts of the world. The success of Al Gore's Climate Project and Bill Clinton's Climate Leadership Groups demonstrates that we need more forms of flexible organizations that are composed of private actors with a strong interest in current environmental issues, and are implemented through local organizations. DRR at the local level can further benefit from an epistemic community consisting of local community and research institutions working together to identify local hazards and risks.

Learning and innovation are important elements of AG that have a high potential to contribute most strongly to DRR. While they are formally enshrined in one of five Priorities for Action within the global framework for DRR—the Hyogo Framework for Action (UNISDR 2007)—they have not been pursued consistently by the DRR community in practice. Little progress has been made in documenting systematically how and what organizations and nations have learned from past disasters, what innovations have resulted from them, and how learning can be better monitored and evaluated. Examples of innovations in DRR do exist but the documentation and dissemination of such successes remains poor. We advocate that more attention be paid to the lessons emerging from the AG literature, and that more research be conducted on how communities learn and innovate from different types of disasters and within all stages of DRR.

Ultimately, we have sought to open a space for DRR practitioners and scholars to pause for thought, to reconsider, and to reformulate their understanding of and orientation toward governing to build resilience. Through an interdisciplinary approach, we have highlighted novel perspectives and identified links between the DRR and AG literature. Our hope is that this approach will motivate others to look to AG and elsewhere to build a better and more robust theory for resilience governance in DRR. Building the resilience of communities and societies to natural hazards and climate change impacts is not just an outcome, but also a (long and challenging) process (Djalante and Thomalla 2011). It is imperative to consider the lessons of AG and other related environmental governance fields in order to help broaden, strengthen, and fast-track our understanding and implementation of resilience.

Notes

- i <http://www.iclei.org/index.php?id=about>.
- ii <http://www.worldbank.org/eap/climatecities>.
- iii <http://www.unisdr.org/english/campaigns/campaign2010-2015/>.

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PART III CASE STUDY OF INDONESIA

"Disaster risk reduction is our top national priority."

Opening speech of Susilo Bambang Yudhoyono at the Fifth Asian
Ministerial Conference for DRR in Yogyakarta, Indonesia, 2012
(UNISDR, 2012b).

In Part III of the thesis, the findings from Part II are used to examine progress and challenges in building resilience in Indonesia. Part III is developed to meet the second objective of the research:

“To review successes and challenges in building resilience to natural hazards and climate change in Indonesia, one of the most vulnerable countries in the world”.

Much of the development of these papers takes place after I conduct my fieldwork, from November 1999 to January 2010, October 2010 to January 2011 and throughout 2011, when I frequently visit Indonesia in between attending conferences. The ethics approval, from Macquarie University, as well as the consent forms both written in English and Bahasa Indonesia, are listed in Appendices 1 to 3. Originally, there should only have been three chapters in this part, each corresponding to the three chapters written in Part II. However, during the course of writing this part, an opportunity to participate in an online KLIMA 2011 conference comes up, which calls for papers related to integrated climate change and disaster management. Hence, four chapters are developed in this part, with three published in academic journals and one published as a book chapter.

- Chapter 6 presents the progress and challenges in building resilience in Indonesia using the Hyogo Framework for Action as the tool of analysis. This chapter utilises the finding from Chapter 3 in Part II, which examines 15 frameworks related to DRR and finds that HFA is the most comprehensive.

There are two chapters written on the integration of DRR and CCA in Indonesia. Chapters 7 and 8 use the findings from Chapter 4 in Part II for proposing a framework to examine DRR and CCA integration.

- Chapter 7 examines the progress and challenges for DRR and CCA integration in Indonesia and proposes strategies for the integration.
- Chapter 8 extends the analysis made in Chapter 7 to look deeper into those governance characteristics within DRR and CCA in Indonesia that can hinder or allow for DRR and CCA integration. This chapter uses the Earth System Governance Framework by Biermann et al. (2010) to analyse the integration. This chapter is written and presented during the KLIMA 2011 conference.
- Chapter 9 reviews the roles of multi-stakeholder platforms in building resilience, and utilises the results from Chapter 6 on resilience and AG.

Findings from each chapter are employed in Part IV Synthesis and Conclusion, Chapter 10, on the Adaptive and Integrated Disaster Resilience (AIDR) framework. The discussions on the implications of the pathways for AIDR in Indonesia build on findings from this part of the thesis.

CHAPTER 6

BUILDING RESILIENCE TO NATURAL HAZARDS IN INDONESIA: PROGRESS AND CHALLENGES IN IMPLEMENTING THE HYOGO FRAMEWORK FOR ACTION

Djalante, R., Thomalla, F., Sinapoy, M. S., Carnegie, M. (2012). "Building resilience to natural hazards in Indonesia: progress and challenges in implementing the Hyogo Framework for Action." *Natural Hazards* 62(3): 779-803.

6.1 Overview

Permission

Permission to include the paper in this thesis is given by the publisher, Springer. *Natural Hazards* journal has an impact factor of 1.639. The editors are Thomas Glade, Department of Geography and Regional Research, University of Vienna, Austria, Tad S. Murty, Department of Civil Engineering, University of Ottawa, Canada and Vladimir Schenk, Institute of Rock Structure and Mechanics, Academy of Sciences, Prague, Czech Republic. The scope of the journal includes “*original research work on all aspects of natural hazards, including the forecasting of catastrophic events, risk management, and the nature of precursors of natural and technological hazards*”. It also calls for closer interaction between science and practices. I specifically plan for this paper on Indonesia to be published in *Natural Hazards*, as a journal, which is well accepted and within the communities of DRR research.

Authors' contributions

Riyanti Djalante

My contribution to the research and paper: Concept - 100%; Data collection - 95%; Analysis - 80%; Writing - 85%; Total - 90%. I am involved in the development of the paper structure, data collection, analysis and the journal submission processes.

Dr Frank Thomalla

Dr Frank Thomalla is involved in reviewing the structure, arguments, data analysis and in guiding me through the process of responding to reviewers' comments. As the main supervisor, he also assists me in preparing for the ethics applications for this research and developing the semi-structured interview questions.

Mr Sabaruddin Sinapoy

Mr Sinapoy has expertise in Indonesian law and regulation. He assists with data collection and interviews, especially in identifying key stakeholders, and reviewing the national government structures.

Dr Michelle Carnegie

Dr Michelle Carnegie, who is my associate supervisor, is involved in reviewing the draft of the paper especially when the comments from reviewers are received. She also assists me in preparing for the ethics applications for this research and in developing the semi-structured interview questions.

Impacts of the paper

This paper is cited by other authors seven times.

- Marfai and Hadmoko (2012) discuss flood management in Indonesia. These authors are affiliated with the Department of Disaster Studies in University of Gadjah Mada, one of the best universities in Indonesia.
- There are two papers presented at the IDRC Davos conference in 2012 on the topic of "Integrative Risk Management in a Changing World - Pathways to a Resilient Society" that quote this paper. The IDRC conference is one of the largest and most respected conferences in the field of DRR. The first paper is by Udu-Gama et al. (2012) from Macquarie University, on the role of an early-warning system in building community resilience. Another paper in the IDRC Davos 2012 is by Di Mauro et al. (2012) from Earth Observatory of Singapore, Nanyang Technological University, who discuss integrating science with practice to advocate tsunami risk reduction interventions in the city of Padang, Indonesia.
- Mahtab Hussein, a master's student from Bangladesh, cites the paper in his thesis "Storm surges and coastal erosion in Bangladesh - State of the system climate change impacts and 'low regret' adaptation measures" (Hussein, 2012). The approach used in this paper is also utilised as one of the analytical approaches in analysing progress in implementing the HFA in Bangladesh.
- Prof. David Alexander (Alexander, 2012), editor-in-chief of the *International Journal of Disaster Risk Reduction* and one of the most highly-respected experts in disaster studies, cites this paper when he writes on 'Disaster risk reduction: An alternative viewpoint' to mark the introduction of the newly established journal.
- Miao, X., Banister, D., et al. (2013) cite this paper in their paper on 'Embedding resilience in emergency resource management to cope with natural hazards'.

This paper is recommended by Henny Vidiarina, within the Bencana Indonesia Mailing List (<http://groups.google.com/group/bencana>), which has a membership of 3,236 mainly of NGOs and international organisations. Ms Vidiarina is one of the Presidium members of MPBI (The Indonesian Society of Disaster Management) and is also senior advisor for capacity building for the GITEWS project. I also send the link of this paper to all my respondents who are helping me in developing my studies and hence this paper. The three most important stakeholders of this paper are, Bappenas (National Development Agency), World Bank, BNPB, and UNDP.

Introduction to the paper

I consider this paper as the highlight of my PhD. I feel that I am able to contribute intellectually to improving resilience in Indonesia. This paper marks the results of my fieldwork in Indonesia conducted mainly in 2010. This is the first and longest paper written about Indonesia. This paper corresponds to the findings of the paper in Chapter 4, which states that the Hyogo Framework for Action (2005-2015): Building the Resilience of Nations and Communities, is the most comprehensive framework that meets the need for integrated disaster resilience. Hence the HFA is utilised in this paper to examine the progress, challenges and also to identify emerging challenges in building disaster resilience in Indonesia. Chapter 6 is on the assessment of the progress in building resilience to disasters in Indonesia, based on the HFA. The chapter finds that building disaster resilience in Indonesia is, to a large extent, driven by the existence of the necessary regulatory policies and frameworks and the participation of various non-government stakeholders. Lack of capacity and capability for DRR at the local government level, a lack of systematic learning and a lack of commitment from government to mainstream DRR into broader development agendas still hinders the resilience building. Emerging pressing issues that are likely to challenge future resilience building activities include the integration of DRR and CCA and urban risk governance. Findings from this paper are utilised in the discussion on the implications of the pathways for AIDR in Indonesia (Chapter 10, Part IV).

Post Scriptum Correction

The word OFXAM in page 180 should be changed to OXFAM

6.2 The Paper in Published Format

Nat Hazards
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ORIGINAL PAPER

Building resilience to natural hazards in Indonesia: progress and challenges in implementing the Hyogo Framework for Action

Riyanti Djalante · Frank Thomalla · Muhammad Sabaruddin Sinapoy · Michelle Carnegie

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Abstract Over the last 50 years, the cost of natural disasters has increased globally and in Indonesia (EM-DAT 2012). We therefore need more systematic efforts in trying to reduce disaster risks. In 2005, the United Nations International Strategy for Disaster Reduction created the Hyogo Framework for Action (HFA) 2005–2015: ‘Building the Resilience of Nations and Communities’, in order to enable a more systematic planning, implementation and evaluation of disaster risk reduction (DRR) activities. In this paper, we examine Indonesia’s success in improving DRR by reviewing the country’s progress in implementing the HFA Priorities for Actions. This includes an analysis of the drivers, challenges and emerging issues in building resilience to natural hazards. The study is undertaken through literature reviews and interviews with 26 representatives of key organisations in DRR and climate change adaptation (CCA) in Indonesia. Our findings indicate that the building disaster resilience in Indonesia has been, to a large extent, driven by the existence of the necessary regulatory policies and frameworks and the participation of various non-government stakeholders. Impediments to process include a lack of capacity and capability for DRR at the local government level, a lack of systematic learning and a lack of commitment from government to mainstream DRR into broader development agendas. Emerging pressing issues that are likely to challenge future resilience building activities include the integration of DRR and CCA and urban risk governance.

Keywords Disaster risk reduction · Resilience · Hyogo Framework for Action · Indonesia · Progress · Challenges

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1 Introduction

Disasters caused by natural hazards are currently occurring more frequently, and with both increased human and financial costs (EM-DAT 2012). More comprehensive and systematic efforts at the international, national and local levels are needed to reduce disaster risks. International activities for disaster risk reduction (DRR) received worldwide attention when the 1990s were declared as the International Decade for Natural Disaster Reduction (IDNDR) (1994). In 1994, the 'Yokohama Strategy for a Safer World: Guidelines for Disaster Prevention and Mitigation' was adopted through the United Nations at the World Conference on Natural Disaster Reduction (IDNDR 1994). It was agreed that disaster should be managed holistically from prevention, mitigation through to rehabilitation and reconstruction. The global commitment for DRR reaffirmed. The UN International Strategies for Disaster Reduction (UNISDR) define DRR as:

The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events' (2009 p. 10).

The 2004 Indian Ocean earthquake and tsunami was an unprecedented event in historic times that revealed how vulnerable nations and communities are to natural hazards. However, this event also offered a window of opportunity for DRR both at the international and at national scale in Indonesia. Soon after this event, during the United Nations World Conference on Disaster Reduction in 2005 in Japan, the Hyogo Framework for Action (HFA) 2005–2015: 'Building the Resilience of Nations and Communities' was adopted (UNISDR 2007b). The concept of resilience was utilised as the underlying approach in reducing disaster risks, and resilience is defined by the UNISDR:

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions (UNISDR 2009c, p. 24).

In this paper, we aim to examine Indonesia's progress in implementing the HFA. We analyse the drivers of implementation, opportunities and challenges, and emerging issues. Specifically, we intend to answer the following questions:

- (1) What progress has been made in addressing in the HFA Priorities for action;
- (2) Which of the HFA Priorities for Action have achieved the most and the least progress;
- (3) What the challenges are in implementing all indicators within the HFA priorities;
- (4) How does process in achieving the HFA Priorities help to increase disaster resilience in Indonesia;
- (5) What are the emerging issues pertaining to future HFA activities and lastly;
- (6) What policy recommendations can help to improve the process of building resilience

This paper conducts a comprehensive analysis of the progress and challenges in building disaster resilience in Indonesia. We acknowledge that there have been two reports published in 2009 and 2011, on the progress of HFA implementation for building disaster resilience in Indonesia (BNPB 2009, BNPB 2011c). These reports were submitted by the National Disaster Management Agency (BNPB) to the UNISDR as part of the worldwide

HFA reporting processes. This paper adds value to the information through our critical analysis of the current progress, complemented by perceived challenges by DRR actors. Stakeholders interviewed were from national and local governments, as well as representatives of international agencies and non-government organisations. We also conducted an extensive review of the ‘grey literature’ and academic papers to support our analysis in the later part of the paper. We then utilised Folke et al.’s (2003) propositions on four conditions to help building resilience and to assess the HFA progress. There are two reasons why we chose the HFA as the tool for the analysis. *First*, the HFA is an internationally agreed framework for DRR to increase the resilience of nations and communities. The framework has been well received, well adopted in order to have a comprehensive analysis on how countries implement various DRR activities. *Second*, Djalante and Thomalla (2011) examined several frameworks for building resilience to disasters developed by various development and humanitarian organisations, and demonstrated that the HFA is the most comprehensive framework for building resilience.

The paper is structured as follows. The introduction presents the background and rationale for the paper. In Sect. 2, we provide background information on the concepts of resilience, the HFA, DRR in Indonesia, and the study methodology. Table 1 shows the HFA structures, the five priorities for action and the indicators and their measurement approach. Figure 1 shows the relative progress of Indonesia in implementing the HFA compared to the rest of the world, and Table 2 lists the organisations interviewed. In Sect. 3, we review Indonesia’s progress in building disaster resilience. In the discussion section, we analyse the extent to which progress in achieving the HFA Priorities has helped to build disaster resilience. We apply Folke et al.’s (2003) four propositions for resilience to analyse the progress against the HFA. Finally, in our recommendations, we outline policy-relevant suggestions for more effective DRR planning and implementations to accelerate the HFA implementation.

2 The Hyogo Framework for Action 2005–2015: ‘Building the Resilience of Nations and Communities’ to disasters

Resilience is defined as a system’s ability to absorb change, to self-organised and to bounce back, learn and adapt (Carpenter and Walker et al. 2001). The concepts of resilience has been studied, reviewed and adopted in various fields since its early development (Djalante and Thomalla 2011). It is closely associated with concepts of adaptation, vulnerability and adaptive capacity (Gallopín 2006; Smit and Wandel 2006; Miller, Osbahr et al. 2010; Nathan 2011). Its strong relationships with vulnerability and adaptive capacity make the resilience concept very relevant in the field of DRR. Reducing disaster risk is about reducing the underlying causes of risks which are closely related to vulnerability. However, increasing resilience also means looking at what is available and accessible to individuals, households and communities and building on those existing capacities. For this reason, the concept of resilience has been examined and implemented extensively in advancing understandings in the field of humanitarian aid and livelihood improvement (Buckle et al. 2000; Paton and Johnston 2001; IFRC 2004). The concept of resilience received worldwide attention in the DRR field through the adoption of the HFA at the World Disaster Reduction Conference in 2005 in Japan (IDNDR 1994). The HFA is a ten-year global strategy to make the world safer from natural hazards and provides the first systematic and comprehensive approach to reducing disaster risks and losses. Table 1 summarises the strategic goals, priorities for

Table 1 Summary of strategic goals, priorities for action, indicators of progress, reporting process, key documents, and supporting mechanisms of the HFA

Mechanism	Description
3 Strategic goals	<p>More effective integration of disaster risk consideration into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reductions</p> <p>The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level that can systematically contribute to building resilience to hazards</p> <p>The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery program in the reconstruction of affected communities.</p>
5 Priorities for action	<p>HFA 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation</p> <p>HFA 2: Identify, assess and monitor disaster risks and enhance early warning</p> <p>HFA 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels</p> <p>HFA 4: Reduce the underlying risk factors</p> <p>HFA 5: Strengthen disaster preparedness for effective response at all levels</p>
22 Indicators of progress	<p>HFA 1: 4 indicators (Existence of institutional and legal frameworks for DRR; Availability of resources; Community participation; Functioning national platform)</p> <p>HFA 2: 4 indicators (Risk assessment and vulnerability information; Hazard and vulnerability information system; Early warning system; National, regional/ trans-boundary and local risk assessments)</p> <p>HFA 3: 4 indicators (Disaster information sharing and dissemination systems; School curricula and educational materials on DRR; Research, tools, analysis for risks assessments; public awareness strategy)</p> <p>HFA 4: 6 indicators (DRR as part of development policies and plans; Social policies to reduce vulnerabilities; Policies that reduce economic vulnerability; Inclusion of DRR into built-environment planning; DRR consideration into recovery and reconstructions; Risk screening for major development projects)</p> <p>HFA 5: 4 indicators: Policy and mechanisms for disaster management; Disaster preparedness and contingency plans with training and drills; Financial reserves and contingency mechanisms; Procedure for information exchange during response and recovery)</p>
5 Levels of progress	<p>Level 5: Comprehensive achievement has been attained, with the commitment and capacities to sustain efforts at all levels</p> <p>Level 4: Substantial achievement has been attained, but with some recognised deficiencies in commitment, financial resources or operational capacity</p> <p>Level 3: There is some commitment and capacities to achieving DRR but progress is not substantial</p> <p>Level 2: Achievements have been made but are relatively small or incomplete, and while improvements are planned, the commitment and capacity are limited</p> <p>Level 1: Achievements are minor and there are few signs of planning or forward action to improve the situation</p>
Reporting process	<p>Progress reports: Regional, National, Thematic reports, Global Assessment Reports</p> <p>Monitoring and review: Regional HFA monitor, National HFA monitor, Local HFA monitor, HFA mid-term review</p>

Table 1 continued

Mechanism	Description
Selected key documents ^a	Words into action: a guide to implementing the HFA (UNISDR 2011c) Indicators of progress: guidance on measuring the reduction of disaster risks and the implementation of the HFA (UNISDR 2008) Guidelines: National platforms for disaster risk reduction (UNISDR 2007a)
Supporting UNISDR systems	Partners: Governments, United Nations system, regional bodies, International Financial Institutions, Non-governmental actors Mechanisms: Global Platform for Disaster Risk Reduction, National Platforms, Regional Platforms, Thematic Platforms, ISDR Support Group, ISDR System, Management Oversight Board, Inter-Agency Group, Scientific and Technical Committee, Secretariat

Source UNISDR (2011g)

^a For full lists of UNISDR publications, see <http://www.unisdr.org/we/inform/publications>

action, indicator of progress, reporting process, key documents and supporting mechanisms of the HFA.

The Global Assessment Report (GAR) published in 2011 reviewed the latest developments, progress and challenges experienced by countries in implementing the HFA (UNISDR 2011c). The procedure for implementing and measuring the HFA is outlined in the report 'World into Action: the Guidance for Implementing the HFA' (UNISDR 2007c). Each country is required to self-assess its progress towards the Priorities for Action based on the requirements outlined for each indicator. The self-assessment process is conducted through discussions with and inputs from various DRR national and sub-national DRR stakeholders. In Indonesia, the review process is coordinated at the national level by the National Disaster Management Agency (BNPB). It coordinates the involvement of other government agencies, private organisations and non-government organisations in the assessment (BNPB 2011c).

The degree of progress against all 22 indicators is defined on a scale of 1 (lowest) to 5 (highest). These values are then averaged to assess the progress for each HFA priority. The scores of all five HFA Priorities are averaged again to obtain a single score for each country. Figure 1 shows the overall score of progress towards the HFA for a number of

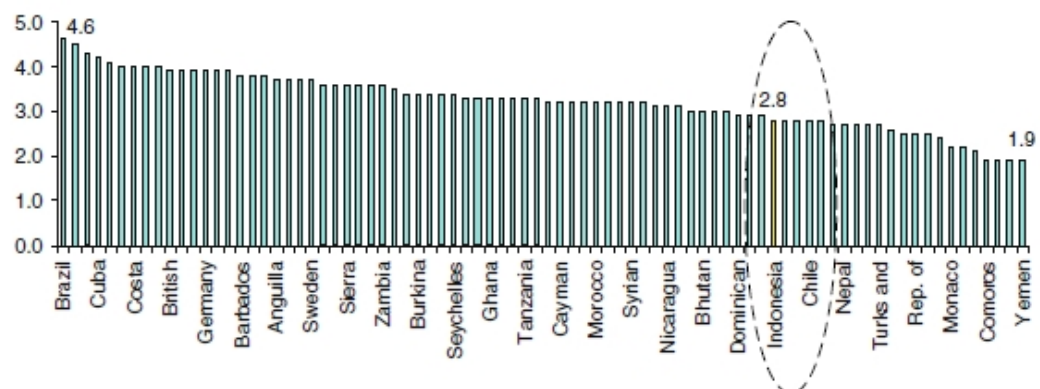


Fig. 1 Relative position of Indonesia's progress in implementing HFA compared to the world (modified from UNISDR 2011c)

countries in 2011. Indonesia is ranked at the lower mid-point of the progress spectrum, with a score of 2.8, while the world average is 3.0 (UNISDR 2011c). Brazil and Switzerland are the two countries with the highest achievement with scores of 4.6 and 4.5 out of 5, respectively. The lowest progress, with a score of 1.9, was achieved by some of the least developed countries such as Comoros and Yemen.

2.1 Natural disasters and DRR in Indonesia

Indonesia is located in South-East Asia. It is the world's largest archipelago consisting of more than 17,000 islands with a population of ca. 240 million inhabitants (GoI 2010b). It is located at the intersection of the Pacific, Eurasian and Australian tectonic plates, known as the 'ring of fire' which makes the country extremely prone to volcanic activity and earthquakes (GFDRR 2009). Since 1900, there have been more than 400 natural disasters that have resulted in more than 263,000 deaths, affected more than 29.4 million people and costed almost USD 29 billion (EM-DAT 2011). Indonesia is affected by both geophysical and hydro-meteorological disasters. Of the 400 disasters since 1900, climate-related disasters accounted for 57, 63% of the total number of people affected, while geo-physical-related disasters have caused 92% of the total people in the disaster zone to die and shared the costs equally with the hydro-meteorological disasters (calculated based on data from EM-DAT 2011). Climate change is expected to exacerbate hazard vulnerability (IPCC 2007; UNDP Indonesia 2007; Yusuf and Francisco 2009). Indonesia's social and economical circumstances contribute greatly to the dynamics of the people's vulnerabilities. Indonesia ranks 124 out of 187 countries in the Human Development Index (UNDP 2011b), and 18.7% of people live below \$1.25 per day (UNDP 2011a). The country has a highly decentralised political system with 33 provinces and 497 local governments as at 2010 (MoHA 2012).

DRR in Indonesia has come a long way since the country's independence in 1945. The 'Office for War Victims Families' (BPKKP) was created in 1945 (BNPB 2011b), and since then there have been six changes in the organisational structures and functions to the newly established 'National Disaster Management Agency' BNPB and its provincial and local level equivalent (BPBD) in 2008 (BNPB 2011b). In 2008, there were 645 DRR organisations (governments, non-governments and donor agencies) listed in the UN Office of Coordination of Humanitarian Affairs (OCHA) Indonesia 3 W—Who What Where—database (UNTWG-DRR 2008) and 155 of these are actively working on HFA implementation in Indonesia (DRR Convergence Group 2011). The regulatory framework for DRR has evolved with the recent Law number 24/2007 on Disaster Management which brought a fundamental change to DRR in Indonesia. The Law recognises the need for a comprehensive reduction of risks, shared responsibility between national and local governments, as well as the importance of the roles of non-government actors (internationally or nationally), and the communities (GoI 2007b). Another significant shift brought by the law was a shift of responsibility in DM from the national to the local governments.

2.2 Methodology

Data for this paper were collected through desktop literature review and in-depth interviews with DRR stakeholders in Indonesia. Journal articles and organisational reports were analysed to identify components for building disaster resilience and to review DRR activities in Indonesia. We critically examine progress towards the HFA Priorities for

Action through a systematic detailed analysis of achievements and challenges against the HFA progress indicators.

In-depth semi-structured interviews were conducted with 26 representatives of key organisations engaged in DRR and CCA nationally and locally. Interviews took place between October 2010 and January 2011. The purpose of the interviews was to determine four topic areas: (1) the interviewee's organisation's activities relating to DRR and CCA, (2) the interviewee's perceptions on the progress in building disaster resilience in Indonesia, (3) the interviewee's views on the integration of DRR and CCA and (4) the interviewee's opinion on the integration of DRR and CCA into broader development agenda.

Table 2 lists the organisations represented in the interviews and their respective role. These include government organisations, NGOs, United Nations organisations and various funding institutions. Participants were selected using the following methods: (1) At the national level, government organisations were chosen based on their mandates, tasks and functions related to DRR and CCA planning and implementation. (2) At the sub-national government levels, participants were selected in Makassar city because of their involvement in a related project on CCA conducted by the *Commonwealth Scientific and Industrial Research Organisation (CSIRO)*¹ (Larson et al. 2010) and in Kendari City because of previous working relationship of the first author within the provincial and local government. (3) International and national NGOs and funding organisations working on DRR and CCA in Indonesia were identified through a Google search employing key words 'disaster risk reduction' and 'climate change adaptation' and 'Indonesia' performed both in English and Bahasa Indonesia. Key personnel within these organisations who are responsible for specific DRR and CCA projects and programmes and who are willing to participate in the research were selected for interview. (4) Several key informants within government and NGOs were identified through first author's existing professional network. Ethics approval for this research was granted through Macquarie University's Ethic Committee. (5) Finally, the 'snowball sampling technique' was used by which the authors utilised information obtained during interviews to identify potential informants from the same and/or other organisation.

3 Implementing the HFA Priorities for Action in Indonesia: progress and challenges to date

Overall, Indonesia has achieved considerable progress in building resilience to disasters. This was strongly acknowledged at the Third Global Platform meeting on the UNISDR in May 2011 in Geneva during which Indonesia's president, Susilo Bambang Yudhoyono, was pronounced the Global Champion for DRR (UNISDR 2011d). In this section, we analyse in detail the country's progress in implementing the five HFA Priorities for Action. The procedure is as follows: For each of the Priority for Action, we briefly describe the key issues addressed in that priority and the indicators used for measuring progress and score achieved by Indonesia, as listed in the UNISDR (2011c). We follow this with an extensive discussion based on our research findings on how government and other organisation conduct DRR activities in Indonesia. For each of the Priority for Action and the corresponding progress indicators, we discuss the progress made and the challenges

¹ The first author was involved in the Makassar city project as part of the CSIRO Climate Change Adaptation Flagship (<http://www.csiro.au/Organisation-Structure/Flagships/Climate-Adaptation-Flagship/ClimateAdaptationFlagshipOverview.aspx>).

Table 2 Lists of organisations represented in the interviews

No	Organisation	Category	Roles	Level of operations
1.	BAPPENAS	Government	National Development Planning Agency	National
2.	BNPB	Government	National Disaster Management Agency	National
3.	DNPI	Government	National Council on Climate Change	National
4.	BMKG	Government	Meteorology, Climatology and Geophysics Agency	National
5.	Mendagri	Government	Ministry of Home Affairs-Coordination local governments	National
6.	Ministry of Environment	Government	Environmental management	National
7.	Ministry of Research and Technology (RISTEK)	Government	Research	National
8.	Member of national parliament	Parliament member	Commission VIII on social welfare	National
9.	The World Bank	Funding organisation	Funding for DRR and CCA	National
10.	UNDP	UN	Funding for DRR and CCA	National
11.	World Vision Indonesia	International NGO	Advocacy	National
12.	SCDRR	Multi stakeholder	DRR projects	National
13.	Planas PRB	Multi stakeholder	National platform for DRR	National
14.	University of Gadjah Mada	Research	Research on DRR	National
15.	UNESCO—community preparedness	Multi stakeholder	DRR advocacy	National
16.	MPBI	NGO	DRR and CCA advocacy	National
17.	HFI	NGO	DRR and CCA advocacy	National
18.	OFXAM	International NGO	DRR and CCA advocacy	National
19.	Mercy Corps	International NGO	DRR and CCA advocacy	National
20.	WWF	International NGO	CCA advocacy	National
21.	IFRC	International organisation	DRR and CCA advocacy	National
22.	PMI (Indonesia red cross)	National organisation	DRR and CCA advocacy	National
23.	Vice Governor of South-East Sulawesi Province	Government	Leadership	Local
24.	Bappeda Kota Makassar	Government	Local development planning	Local
25.	Major of Kendari	Government	Leadership	Local
26.	Bappeda Kota Kendari	Government	Local development planning	Local

encountered. Where possible, we present quotes from interviews to illustrate stakeholder perceptions. Insights or progress achieved are primarily based on an analysis of the literature while insights on challenges are predominantly derived from the interviews.

3.1 Priority action 1: ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation

Policy, legislative and institutional frameworks for DRR need to be developed by countries, so that they have greater capacity to manage risks, to achieve consensus for engagement and to ensure compliance with DRR measures across sectors of society (UNISDR 2007b, p. 8). There are four indicators for Priority Action 1: (1) The existence of institutional and legal frameworks for DRR, (2) The availability of resources, (3) Community participation and (4) The functioning of a national platform for DRR (UNISDR 2008). Indonesia achieved a score of 3 out of 5 for this Priority Action (BNPB 2011c; UNISDR 2011c). This means that there is some level of commitment and capacity for achieving DRR, but that the progress is not substantial.

Indicator 1 calls for the existence of an institutional and legal framework for DRR at the national and the local level. Law number 24/2007 on Disaster Management (DM) has brought fundamental shifts in the way DM is framed and viewed in Indonesia (GoI 2007a). The three key paradigms adopted in this law are that DM is viewed as a comprehensive process of mitigating, managing and responding to disasters, that effective DM requires participation of all stakeholders and communities and that local government has authority and responsibility for DM (GoI 2007a). Our findings suggest that while the legal framework for DRR has been adopted and well established, national and local governments have achieved vastly different levels of progress in planning and implementing DRR programmes. Of the 26 agencies interviewed, all recognised the national disaster management agency (BNPB) as the responsible agency for DM in Indonesia, while BPBD was recognised as the local counterparts. In our opinion, BNPB has been very successful in guiding, coordinating and improving DRR. However, one challenge identified in relation to national implementation is on the coordination of DRR activities between related sectoral agencies. A representative from BNPB stated that:

As the responsible agency for DRR, we need information on the extent that related sectoral ministries have programmed and budgeted for any related DRR activities. Getting this information is sometimes difficult, as is with the sectoral coordination processes for DRR mainstreaming to all government development agendas.

The lack of horizontal coordination between sectoral agencies at the national level was also identified in other countries and was documented in the mid-term review of the HFA (UNISDR 2011e). We therefore suggest that Bappenas, as the leading and coordinating agency for development planning, mandated in Law No. 25/2004 on the Development Planning System (GoI 2004) should play a more active role in this integration. A respondent from Bappenas suggested that the opportunity for better sectoral integration could also be achieved through stronger roles of the World Bank and UNDP as they are the leading funders for many DRR and other sectoral development programmes in Indonesia.

For example:

UNDP is currently funding the SC-DRR project as well as actively involved with the Ministry of Environment and DNPI in developing climate change adaptation and mitigation strategies and we know that DRR and CCA are closely related in reducing

vulnerability to climate-related hazards. Moreover, the World Bank has a division of 'environment and sustainability' which manages both DRR and CCA activities. Hence, both UNDP and the World Bank can encourage better sectoral agencies coordination in managing DRR and CCA synergistically.

The success of forming institutions for DRR at the national level has not yet been duplicated at the local level. While all 33 provinces have established their provincial BPBDs, only 144 of 497 local governments have so far developed their BPBDs (BNPB 2011c). This is contrary to the mandate and BNPB's target that by 2009 all local governments would form disaster management agencies. A representative of BNPB commented as follows:

It is true that BNPB have targeted that by 2009, all local governments can have their BPBDs, and almost 30% (of local governments) have established their BPBDs. Some do not create a separate office but put the DM mandate to already established agencies such as fire departments or Kesbanglinmas (Office of civil security). However, this is also part of the challenge for BNPB to change the paradigms of these local governments that disasters should not just be focussed on emergency management but the whole issue from risk identification to disaster recovery.

One representative of the Kendari City local government suggested that slow progress at the local level might be due to a lack of perceived importance of DM and because of competing issues such as poverty alleviation.

I think disaster management is important but it is not our priority at the moment. We have never really experience big flood or earthquake here. I am more concerned about how to reduce poverty through our key programs of 'Persaudaraan Madani (pairing wealthy and poor households)' and BLUD (micro financing scheme) as stipulated in the mid-term planning of Kendari city.

Indonesia is struggling to achieve strong progress on indicator 3. Even though some local governments have formed BPBDs, the work is curtailed by a lack qualified personnel, technical and financial capacity, leading to a heavy reliance on national government and international NGOs support. A respondent for BPBD stated that:

The budget allocated from the local government of Makassar city is very limited and it is mainly for our salary only; we can only manage to conduct some activities mostly with funding from BNPB.

An interview with several key government organisations for DRR at the national level indicated that DRR activities are particularly far advanced in some highly vulnerable areas such as Aceh, Padang and Yogyakarta. This strong achievement can be attributed to a large extent to technical and financial support received through international projects in the aftermath of high-impact disasters and to strong local institutions, either NGOs or universities. In Padang, for example, since the 2009 7.6-magnitude earthquake (USGS 2010b), KOGAMI (tsunami-alert society) has been actively involved in increasing the disaster awareness and preparedness of communities (KOGAMI 2011). In Yogyakarta, after the 6.3 magnitude earthquake in 2006 (USGS 2010a), various activities were conducted which is done through collaboration between local, national and international organisations (Hadi 2008; Oxfam 2011). Several NGOs and local universities such as the University of Gadjah Mada (UGM) and University of Pembangunan Nasional (UPN) have long been involved in building expertise on DM in the region (UGM 2009; UPN 2011). Local governments do

not have access to such direct support from local, national or the international level and have limited or no opportunities to engage in for DRR project or programs.

The third HFA progress indicator measures the degree of community participation and decentralisation through the delegation of authority and resources at all levels. Indonesia has been actively involved with various donor agencies and international organisations dealing with many aspects of DRR. There are many examples of projects and activities in which the national government collaborates with international agencies in financing and planning the project. One such example collaboration is through the 'Safer Communities through Disaster Risk Reduction in Development' (SCDRR) project by which Bappenas, BNPB, Ministry of Home Affairs and UNDP are implementing DRR activities in 8 provinces in Indonesia. One such activity is the support for the formation of the National Platform and Local Platform for DRR in Yogyakarta and Padang and also the implementation of community-based DRR projects (e.g. SCDRR 2008). Other organisation that has been very active in advocating for the importance of community and civil society organisations is the Indonesia Society for DRR (MPBI). Since its inception in 2003, MPBI has been contributing to several important DRR activities, such as the initiation and drafting of the Law 24/2007 on Disaster Management and the development of a community-based disaster risk management framework. MPBI actively engages with the government and with international organisations and conducting DRR training for local governments and local NGOs (MPBI 2009).

The last indicator for Priority Action 1 is the functioning of multi-stakeholder platforms for DRR. According to a representative interviewed, the National Platform for DRR (*Planas PRB*) was established in 2009. *Planas PRB* is a multi-stakeholder forum for organisations consisting of government agencies (such as BNPB, Bappenas), civil society organisations media, academic institutions, Red Cross national society and business sectors (Planas 2009). Donor organisations and international NGOs also contribute to the activities and discussions within the forums. Of course, the existence of a forum does not mean that it is well functioning or that there has been improved coordination. While we are not in a position to assess these aspects, the establishment of the forum is a positive step towards achieving Priority Action 1.

3.2 Priority action 2: identify, assess and monitor disaster risks and enhance early warning

Identification, assessment and monitoring of disaster risks and enhancement of early warning are the starting point for DRR, as well as the key to trying to promote a disaster resilience culture. Knowledge about hazards and vulnerabilities needs to be constantly monitored since it changes in the short and long term (UNISDR 2007b, p. 9). There are four indicators for HFA Priority Action 2: (1) Risk assessment and vulnerability information, (2) Hazard and vulnerability information system, (3) Early warning system and (4) National, regional/trans-boundary and local risk assessments (UNISDR 2008). Indonesia's score is 3.3 (BNPB 2011c; UNISDR 2011c), which means that there is some commitment and capacities to achieving DRR, but progress is not substantial (UNISDR 2008).

Indicators 1 and 2 require the availability of risk assessments at the national and local level and the existence for monitoring and disseminating hazards and vulnerabilities. Several government agencies are tasked with conducting research and collecting and analysing hazard and risk information. These include the Indonesia Institute of Science (LIPI), the Ministry of Research and Technology (RISTEK), the Bureau of Meteorology (BMKG) and the Geological Research Bureau (BGMV). BMKG has been successful in

developing and introducing its roles to the Indonesian public. It has the mandate, knowledge and capacity to assist other organisations with its data, management and dissemination (BMKG 2011). The 'Aceh Tsunami Digital Repository' was developed by the Tsunami Disaster Mitigation Research Centre (TDMRC 2011). Other hazard warning systems have also been initiated. Informants in Jakarta and Makassar described a landslide warning system on Mount Merapi, which was developed with strong involvement of the Yogyakarta community. The Japan International Collaboration Agency (JICA) supports the landslide warning system of Mount Bawakaraeng in South Sulawesi. Despite the existence of these data, our experience was that they are difficult to locate and obtain. Official descriptions of the types of data being held, and the research conducted by each of these organisations are rarely disseminated in the form of research reports. There is little evidence that the data are integrated and accessible to all agencies in order to enable better coordination and more targeted actions. In order to obtain information on the types of data and their availability, one needs to approach each organisation individually. Moreover, all of these organisations are at the national level. It is even more difficult to obtain hazard and risk data at the local level. Improved data provision could be achieved by integrating data collected by different agencies in the Indonesia Disaster Information and Database (DIBI), managed by BNPB (2011a).

The third indicator for Priority Action 2 is the presence of early warning systems (EWS) with outreach to communities. Our insights indicate that the current EWS program still focuses exclusively on tsunami hazards. Since the 2004 Indian Ocean tsunami, considerable international funding has been directed towards the provision of such a system. Projects include the Indonesia Tsunami Early Warning System (INATEWS) (JTIC 2010), the German-Indonesia Early Warning System (GITEWS 2011b) and the Indian Ocean Tsunami Warning by the US/IOTWS (2008). All of these are collaborative projects between international and Indonesian agencies, which include installation of tsunami early-warning technology, the establishment of dissemination systems and the provision of technical support and staff training (GITEWS 2011a). There are many research opportunities for Indonesian scholars on tsunami warning and DRR in general (UNU-EHS 2010; ADS Indonesia 2011; GITEWS 2011a). However, some researchers (Lassa 2008; Letz and Spahn 2009; Thomalla and Larsen 2010) remind us that the social dimensions of the tsunami warning system have not yet properly addressed in Indonesia. Many communities do not know which organisation is authorised to disseminate warnings, where to get the information from, and, most importantly, what needs to be done should any warning be raised. Hoppe and Mahadiko (2010) analysed the institutional and community response to the 2009 Padang earthquake in West Sumatra Province and raised concerns about the lack of community awareness and preparedness. In our opinion, community outreach should be the main concern for future early warning system development in Indonesia.

The fourth indicator for Priority Action 2 calls for the provision of risk assessments that take into account regional and trans-boundary risks and hence regional cooperation for DRR. It is difficult to find a specific programme that would satisfy this indicator. One example of trans-boundary collaboration on risk management is that of the Merapi Forum established in 2008 among four regencies and two provinces (Yogyakarta and Central Java) exposed to risks of Merapi explosion (UNISDR 2009a). This forum consists of two provincial and four local governments with several international and local organisations. These governments collaborate in terms of emergency management, evacuation processes and especially refugees' management (UNISDR 2009a). However, this forum is an exception rather than the norm in Indonesia, and there needs to be much more

collaboration on risk assessments, especially in highly vulnerable regions in Sumatra and Java Island.

3.3 Priority action 3: use of knowledge, innovation and education to build a culture of safety and resilience at all levels

Relevant knowledge and information on hazards, vulnerabilities and capacities needs to be collected, compiled and disseminated in order to inform and motivate people. These actions will, in turn, lead to a culture of disaster prevention and resilience (UNISDR 2007b, p. 11). There are four indicators for Priority Action 3: (1) Disaster information sharing and dissemination systems; (2) School curricula and educational materials on DRR; (3) Research, tools, analysis for risk assessments; and (4) Public awareness strategy (UNISDR 2008). Indonesia's score for Priority Action 3 is 2.8 (BNPB 2011c; UNISDR 2011c). This means that achievements have been made but are relatively small or incomplete, and while improvements are planned, the commitment and capacity to implement them are limited (UNISDR 2008).

On indicator 1 of Priority Action 3, to improve disaster information sharing and dissemination, BNPB, supported by the SCDRR project, has developed a hazard and disaster database called DIBI (disaster data base Indonesia), which was launched in 2009 (BNPB 2011a). DIBI allows users to determine the number, frequency and impacts of different types of hazards in different locations and at different scales (provinces, districts and sub-districts) across Indonesia and to construct their own maps. However, there are several challenges: Because DIBI is an Internet-based system, its accessibility and application might be limited considering that only 8.7 out of every 100 people (in 2009) have access to the Internet (World Bank 2011). DIBI also needs to better describe the validity, source and collection methods of the data. Finally, DIBI's future is uncertain as supports from the SCDRR project is finalising in 2011. An example of a successfully maintained and widely utilised disaster database is the Emergency Event Database (EM-DAT) created in 1988 by the World Health Organisation, the Centre for Research on the Epidemiology of Disasters and the Belgian Government. It includes data for more than 18,000 disasters from around the world from 1900 to the present and is compiled from UN agencies, NGOs, insurance companies, research institutes and press agencies (EM-DAT 2011). To ensure DIBI's sustainability, it will need to be maintained, utilised and funded through collaboration between several government agencies, NGOs and research organisations.

Our examination of Indonesia's progress in increasing disaster awareness (indicator 2) shows promise. A recent report was published by the UNISDR documented the latest progress on school safety in Indonesia and several other countries (UNISDR-TPKE 2011). This report documented major activities conducted to increase disasters awareness at schools. The United Nations Educational, Scientific and Cultural Organization (UNESCO) in Indonesia cooperates with the Indonesian Institute of Science (LIPI) in building community preparedness to disasters (CBDP 2011). As a result of strong advocacy of the Consortium of Disaster Education (CDE) (CDE 2010; KerLiP 2011), the National Ministry of Education has issued circular No. 70a/SE/MPN/2010 on the inclusion of disaster issues in the school curriculum (GoI 2010a). Several publications relating to DRR have been distributed to schools across Indonesia. These include teaching modules for landslides (Kadariyah and Karnawati 2009), for floods (Sursiyamtini and Maryono 2009), for fire risk reduction (Wirantho and Sardi 2009) and a safe-school rehabilitation guide (MPBI 2011). However, these efforts have only recently been initiated, and the uptake by teachers and students in schools is unclear. The university consortium for DRR (FPT-PRB) initiates

research activities on DRR (MPBI and UNDP 2009), but dissemination of research activities and findings remains limited. Universities conducting research on DRR are mostly large, well-known educational establishments located on Java Island. We were unable to obtain similar activities in smaller universities or those outside Java.

The third indicator of progress towards Priority Action 3 is the development of research methods and tools for multi-risk assessments and cost-benefit analysis. We were unable to find any information on related activities either by government or other organisations. To meet the fourth indicator, Indonesia has pledged to increase the safety of 13,861 schools and 154 hospitals as part of its commitment to the 'One Million Safe Schools and Hospitals Campaign' launched globally by the UNISDR in 2010 (UNISDR 2010; UNISDR 2011a, b, f). However, the results of this pledge are not disseminated well, and it is unclear to what extent it has been translated into action. Two of 497 cities and districts (Makassar and Banda Aceh) are formally involved in the 'Resilient Cities' campaign of the UNISDR (Makassar City Mayor 2010; Banda Aceh City Mayor February 28th, 2011). In our interview with a representative of the Makassar city government, we were not able to obtain any insights into the impacts of this campaign. A range of other efforts to build a culture of safety and resilience through DRR activities are undertaken by the International Federation of Red Cross and Red Crescent (IFRC), the Indonesian Red Cross (PMI) (2011), Oxfam (2011) and Mercy Corps (2011), amongst others. These organisations also aim to address climate change issues within their DRR activities. NGOs have done significant efforts in advancing DRR in Indonesia. However, these activities are mostly driven by international or national actors and advocacy happens mostly at the national level. A more systematic strategy is needed to increase the awareness and advocacy for DRR for local NGOs, community organisations and the communities themselves (Thomalla and Larsen 2010).

3.4 Priority action 4: reduce the underlying risk factors

Reducing the underlying risk factors requires consideration of disaster risks into long-term development planning and disaster reconstruction (UNISDR 2007b, p. 12). Disaster risks are complex interactions between social, economic and environmental conditions and land use, as well as the impacts of geological, hydro-meteorological and climatic hazards (UNISDR 2007b, p. 12). There are six indicators for Priority Action 4: (1) DRR as part of development policies and plans; (2) Social policies to reduce vulnerabilities; (3) Economic policies that reduce economic vulnerability; (4) The inclusion of DRR into built-environment planning; (5) The inclusion of DRR into recovery and reconstruction; and (6) Risk screening for major development projects (UNISDR 2008). Indonesia's score for this priority action 4 is 2.8 (BNPB 2011c; UNISDR 2011c), which means that 'achievements have been made but are relatively small or incomplete, and while improvements are planned, the commitment and capacity are limited (UNISDR 2008). Indonesia must work harder to reduce the enormous social, economic and environmental challenges that contribute to the country's vulnerability to natural hazards. The fact that this priority action has the largest number of progress indicators (six) illustrates the complex challenges faced.

Since 2010, DRR is formally integrated into development policies and plans. The most important strategy is the mainstreaming of DRR within the mid-term National Development Planning Agenda of 2010–2014 (GoI 2010c) in which disaster and climate change issues are considered as one of nine development priorities (GoI 2010c). Our interview at the local government level, the Kendari City Mid-Term Development Planning 2008–2012

indeed acknowledged disasters and climate change issues and the importance of their integration with education and economic sectors, especially to achieve poverty reduction.

With respect to indicator 2, no formal social policy to reduce vulnerability currently exists. However, an economic safety net and insurance mechanisms are provided to communities affected by disasters (BNPB 2011c). Widespread poverty is one of the most important factors contributing to the vulnerability of people to natural hazards (UNISDR 2009b; The World Bank 2011). The budget for DRR has indeed increased five-fold each year since 2001 to about almost 2.5 Trillion Rupiah (equivalent to almost 0.25 billion US Dollars) by 2007 (GFDRR 2009), but more money is spent on rehabilitation and reconstruction. As listed in the Indonesia Disaster Management Plan 2010–2014, Indonesia needs almost 64.5 Trillion Rupiah (equivalent to almost 6.44 billion US Dollars) to finance DRR between 2010–2014 (BNPB 2010b). A representative of Bappenas suggested in an interview that DRR should receive 1% of the national budget. The Indonesia's national budget expenditure for 2011 is about 1,202,046 billion rupiah (MoF 2011), but we have not been able to obtain exact figure for the fraction of money budgeted for DRR.

Indonesia has initiated the integration of DRR into environmental management through the risk-based approach of Law 26/2007 on land use and urban planning (GoI 2007b) and the recognition of disaster mitigation issues within Law 27/2007 on Small Islands and Coastal Areas Management (GoI 2007c). While considerable progress in policy formulation has been made, enforcement to the associated regulation and commitment to providing resources remain poor (Firman 2009). This situation is further complicated by local regulations that often contradict national law in the name of decentralisation and the need to improve local revenues through natural resources exploitation (SCDRR-D 2008; Firman 2009).

Globally, mandatory risk screening is being implemented by various development funding agencies, and methods and tools for doing so have been developed (Olhoff and Schaer 2010). Interview with representatives from major international funding organisation supporting activities in Indonesia confirm that risk screening has begun in Indonesia. For example, the Global Funding for Disaster Risk Reduction (GFDRR), one of the major funding bodies for DRR, recommends mandatory risk screening for DRR project in various countries including Indonesia (GFDRR 2010). However, we were unable to obtain an example of a project that incorporates risk screening from its inception.

3.5 Priority action 5: strengthen disaster preparedness for effective response at all levels

Disaster preparedness and response is the key to reducing disaster impacts and losses. Authorities, individuals and communities in hazard-prone areas need to be well prepared, ready to act and supported with knowledge and capacity for managing disasters (UNISDR 2007b, p. 14). There are four indicators for Priority Action 5: (1) Policy and mechanisms for disaster management; (2) Disaster preparedness and contingency plans with training and drills; (3) Financial reserves and contingency mechanisms; and (4) Procedure for information exchange during response and recovery (UNISDR 2008). Indonesia's score for Priority Action 5 is 2.0. This is the lowest score of all progress indicators (BNPB 2011c; UNISDR 2011c), which means that 'achievements have been made but are relatively small or incomplete, and while improvements are planned, the commitment and capacity are limited' (UNISDR 2008).

Progress on the first indicator on the existence of policy and mechanisms for disaster management is demonstrated by several national strategic plans issued by the relevant

government agencies working for DRR. These include the National Action Plan on DRR 2010–2012 (BNPB 2010a), National Disaster Management Plan 2010–2014 (BNPB 2010b), National Guidelines for Disaster Management 2010–2014 (BNPB 2010c).

Progress on the second indicator on preparedness and contingency plans has also been achieved through the development of preparedness and contingency plans coordinated by UN/OCHA and adopted in the cluster/sectoral approach (agriculture, health, food and nutrition, education, shelter, early recovery and protection, water sanitation and logistic and communication) (OCHA Indonesia 2011). An Indonesia Inter-Agency Contingency Plan (OCHA Indonesia 2009) and local contingency and preparedness plans also exist (BNPB 2011c). However, it is unclear as to whether these plans are regularly monitored, updated or tested. One respondent from BNPB stated:

We rely on the local governments to provide information and supply data relating to their progress in implementing DRR. Some local governments have reported that they have preparedness and emergency plans but we cannot verify whether they have tested or constantly monitored and revised the plans.

Of the two local governments agencies interviewed, neither had developed preparedness and contingency plans.

We have had and received workshops and training from BNPB on how to prepare local preparedness and emergency plans. However, we still need to ask for the funding from APBD (local government budget plan) to develop and implement the program ourselves. We proposed it in the last financial term but it was rejected in the DPRD (Local Parliament Office).

Some organisations have conducted simulation exercises and disaster drills. For example, as part of the GITEWS program 2005–2009, tsunami drill exercises were conducted in high-risk areas such as Padang, Bali, and Banten. Regional exercises include the Inter-Agency Contingency Planning Exercise (Protection Cluster 2008a, b), the Indian Ocean Wave Exercise (GTZ 2009; IOC/UNESCO-NOAA 2009), and the Disaster Relief Exercise of the ASEAN Regional Framework (ASEAN 2011). There is also an Inter-Agency Contingency Planning exercise. However, most of these exercises are driven by international activities at specific localities in Indonesia. What needed is locally driven activities on disaster preparedness and planning in, which communities are actively taking part in the planning and implementation.

According to our interview with Bappenas, progress in the provision of financial reserves and contingency mechanisms has been made by allocating contingency funding for disasters. However, some national-level NGOs stated that the procedure by which these funds are disbursed is unclear and too bureaucratic. One local government representative confirmed that budgets for contingencies exist at the local level, but noted that their use is not exclusively for disaster management:

Yes, we have some contingency funding allocated in our APBD (annual development budget). However, it is not entirely for any future natural disasters. It can also be used for example when there are urgent infrastructure repairs works.

Further, allegations of corruption concerning disaster funding have been made in Nias District (Pristiyanto 2010) and in Merangin District (Pristiyanto 2010; Pristiyanto 2011). The member of parliament responsible for social issues (including the management of disasters) stated in an interview that the national government is currently preparing new regulations on the nature and magnitude of disasters that qualify as national disasters and

thereby enable disbursement of the national contingency funds. This raises an important issue: What happens when a disaster is not large enough to qualify for national disasters funding yet its impacts exceed the coping capacity of the local government? In this case, it becomes the responsibility of the provincial and the local governments' to provide immediate post-disaster relief and longer-term reconstruction. The reliance of local governments on national contingency funding can also create disincentives to implement DRR policies locally. In an interview with an official from Kendari City, they stated:

We acknowledge that it will always be the responsibility of us as local governments to work immediately during an emergency situation. I guess local governments can always ask for the provincial government's or national government's assistance.

We were unable to document progress in developing procedures for information exchange during response and recovery as we were unable to identify any documents dealing with this issue.

3.6 Emerging challenges for DRR

The HFA Mid Term Review reported a number of emerging issues that warrant further attention. These include the integration of climate change issues within the HFA and governance for DRR at the local level. We observe similar needs in Indonesia (Djalante et al. 2010; Djalante 2011). Several studies have highlighted the rationale for and importance of linking DRR and CCA (Sperling and Szekely 2005; Schipper and Pelling 2006; O'Brien et al. 2008). Thomalla et al. (2006) outlined propositions as to why DRR and CCA have initially been hard to integrate. It is very important to consider climate change issues within DRR, considering that more than half of the disaster events and casualties in Indonesia are climate-related (EM-DAT 2011). While DRR has been receiving considerable attention, responses to climate change remain dominated by mitigation due to the Indonesian Government's pledge to reduce greenhouse gas emissions of 26% by 2030 (DNPI 2011; GoI 2011). DRR is managed by BNPB, whereas climate change is addressed by the Ministry of Environment and the National Council on Climate Change (DNPI). In our interviews, representatives of both BNPB and DNPI indicated that collaboration between these national agencies has been initiated. We see an opportunity for Bappenas, and international agencies such as UNDP and the World Bank, to play a strong role in planning and implementing integrated DRR and CCA in Indonesia (Djalante and Thomalla, in press).

Another emerging issue is the need for serious consideration of urban risk management and coastal zone management as part of DRR. Governance challenges in managing urban disasters have been the subject of various studies (Bulkeley and Betsill 2003; 2005; Thomas et al. 2009). Indonesia's coastal zones have been centres of rapid economic development, urbanisation and environmental degradation in coastal areas (Dahuri 2006). It is estimated that 65% of Indonesia's population lives within 50 kilometres of the coastline and 75% of the country's cities are located on the coasts (Dahuri 2006). Urbanisation coupled with climate change impacts along coastal areas needs to be managed carefully and urgently. The city of Jakarta (Firman, Surbakti et al. 2011) and Semarang (Marfai and King 2008) are two of documented examples where urbanisation, accelerating sea level rise and land subsidence are creating complexities for DRR and CCA in urban areas. The Indonesia government GoI developed Law 27/2007 on the Integrated Management of Small Islands and Coastal Areas along with its supporting regulations which also address the importance of DRR in Indonesia's coastal areas (GoI 2007c).

However, investment in DRR within the Ministry of Marine and Ocean Affairs is still minimal compared to its efforts in community empowerment and livelihood diversification (MOAF 2011). More research is needed on how city governments can improve their capability and capacity in simultaneously addressing the challenges of increasing natural hazards, climate change impacts, urbanisation and poverty reduction.

4 Discussion

In this paper, we have provided a critical and comprehensive analysis of Indonesia's progress and challenges in implementing the five HFA Priority Actions for building safer and more resilient communities. Folke et al. (2003) suggest four necessary factors to build resilience: (1) Learning to live with change and uncertainty; (2) Nurturing various types of ecological, social and political diversity for increasing options and reducing risks; (3) Increasing the range of knowledge for learning and problem-solving; and (4) Creating opportunities for self-organisation, including the strengthening of local institutions and building cross-scale linkages and problem-solving networks. In the following discussion, we utilise these factors to examine how Indonesia's progress in implementing the influences the country's resilience.

4.1 Learning to live with change and uncertainty

We have shown in our assessments of HFA Priority Action 5 that the learning to increase disaster awareness and preparedness in Indonesia remains limited. In fact, Indonesia achieved the lowest score for this Priority Action (UNISDR 2011c). In our opinion, local government agencies and NGOs need to be given more support to implement national guidelines and policies at the local level and to develop their own strategies and plans.

4.2 Nurturing various types of ecological, social and political diversity for increasing options and reducing risks

Diversity is important component of resilience. A diversity of responses can also improve fit (Ostrom 2010) and allow for institutional interactions and hence collaboration (Folke et al. 2005). Our analysis of Priority Action 1 indicates that the participation of a wide range of stakeholders can support the planning and implementation of DRR. More active collaboration between local governments and other stakeholders including the communities at risk would be beneficial for building resilience at the local level. Indonesia achieved the second-lowest score for implementing the HFA in Priority Action 4 (Reduce the underlying risk factors). Many studies suggest that in developing countries, DRR is principally a development problem since poor planning and inappropriate development contribute to the vulnerability of communities (Schipper and Pelling 2006; Thomalla et al. 2006; O'Brien et al. 2008). Therefore, international funding institutions, development agencies and humanitarian organisations play an important role in mainstreaming DRR in their overseas development assistance. Some scholars (e.g. Mitchell 2003; La Trobe 2005) suggest on the earmarking of climate change funding as development funding more generally, as a way of mainstreaming DRR into the development agenda.

4.3 Increasing the range of knowledge for learning and problem-solving

Risk knowledge is an important element for DRR. The pooling of knowledge from different sources can help to reduce uncertainty (Ostrom 2010) and also allow better identification of thresholds (Lebel et al. 2006). Through utilising local and multiple sources of knowledge, problems can be assessed more comprehensively, and this in turn can lead to reduced uncertainty (Berkes and Folke 2002) and better resilience/adaptation strategies (Ostrom 2010). The country's progress towards the HFA is in Priority Action 2 (identify, access and monitor disaster risks and enhance early warning) (UNISDR 2011c), largely due to the development of the national tsunami early warning system. Much of this can be attributed to the international funding and logistic support Indonesia received in the wake of the 2004 Indian Ocean tsunami. Multi-hazard risk assessments are urgently needed to be undertaken at the sub-national and local levels. Indonesia has a long history of community-based disaster risk management (CBDRM) (Yayasan 2007; UNDP 2010), and this experience needs to be better harnessed in order to facilitate community level learning. Our analysis of Priority Action 3 (use of knowledge, innovation and education to build a culture of safety and resilience at all levels) shows that, education and learning focuses predominantly on increasing disaster awareness and preparedness. A more systematic approach to learning is needed whereby lessons learnt from previous disasters are better incorporated into strategies, and communities have an opportunity to contribute their own knowledge, experience, values and practice. Many recent studies have highly demonstrated the importance of social capital and collective action in enabling and empowering communities to help themselves (Adger 2003; Aldrich 2011; Larsen et al. 2011).

4.4 Creating opportunities for self-organisation, including strengthening of local institutions and building cross-scale linkages and problem-solving networks

The issue of scale is extremely important in building resilience since the existence of different organisations at different scales allows for the matching of organisational and ecological scales (Folke et al. 2005). As we have shown in our analysis of Indonesia's progress towards Priority Action 1 (ensure that DRR is a national and a local priority with a strong institutional basis for implementation), enormous changes in DRR governance have been brought about by several recent new laws and regulations and the establishment of new institutions. The formation of BNPB (the national agency for disaster management) and Law 24/2007 on Disaster Management have been the key drivers for progress in DRR. However, we have also revealed that local stakeholders are progressing considerably slower and at vastly different rates compared with their national counterpart. An imperative now is to improve the capacity and capability of local actors to manage resilience. A recent study on the required capacity for DRR conducted by one local government indicates that institutional factors, human resources, policy for effective communication and financial and technical leadership are all important factors (Kusumasari and Alam 2010).

5 Recommendation

In this paper, we have reviewed Indonesia's progress and challenges in implementing the five HFA Priorities for Action. We have then discussed how the progress can help to increase disaster resilience using the four necessary factors for building resilience introduced by Folke et al.'s (2003). Building on these discussions, we put forward several

recommendations for research and policy aimed at helping to accelerate and further improve progress in building resilience in Indonesia. Our first recommendation is to strengthen the participation and coordination of multiple stakeholders at the national level and to formulate a coordinated funding mechanism to improve DRR (as well as CCA) coordination between different national ministries. The national government holds the key to creating the vision to enable systematic and coordinated efforts. Bappenas and funding organisations can help to improve horizontal coordination (including DRR and CCA integration) between sectoral agencies through joint funding and project arrangements. Based on Folke et al.'s (2003) argument, strong national planning, coordination and implementation are crucial in nurturing conditions of social and political diversity, which can in turn help to build resilience. Our second recommendation is to improve the capacity and capability of local governments, especially with regard to programme implementation. The role of local governments is extremely important since they are at the frontline when a disaster occurs. It is hence important to determine what capacities already exist locally, who has what capacity and how to access these when needed. A strong local government is not only likely help nurture political diversity. It can also help to create opportunities for self-organisation at the local level, by which, resilience can be enhanced.

Our third recommendation is to encourage the participation of a wide range of stakeholders at the sub-national and local levels and to support community-based DRR. Three things can be achieved through local participation: (1) improved capacity and capability for DRR of local governments; (2) improved learning processes through shared knowledge and experiences of different stakeholders; and (3) strengthening of local disaster preparedness and response. Hazard characteristics are locally specific, and the capacity to prepare and respond to those hazards is also locally determined. Regional collaboration needs to be looked at, since regional bodies may be the first point of support when an impact exceeds the capacity of the local community. Strong, well-coordinated and well-connected regional and local actors can help to increase political diversity, to increase opportunities for learning through knowledge exchange and to create opportunities for self-organisation (Djalante et al., in press). All of these are necessary factors for increasing resilience. Our fourth recommendation is to develop methods and tools for mainstreaming DRR into local development planning that is suitable to local conditions and acceptable to local governments. This is a crucial first step towards reducing the underlying risks of disasters. These methods and tools need to acknowledge that DRR is only of many perceived issues that include education, economic and livelihood improvement, urbanisation and poverty alleviation.

Examining Indonesia's progress in DRR through the HFA enabled us to obtain a comprehensive overview of the country's recent achievements. We have also demonstrated how this progress has helped to creating the necessary conditions for building resilience as suggested by Folke et al.'s (2003). Our recommendations show that it is important that the planning and implementation of the HFA Priorities for Action occurs not only at the national government level, but that local government and non-government actors need to be involved in the process. However, local governments also need to view DRR as an integrated system that addresses all phases of DRR cycle, from prevention to rehabilitation. Most importantly, DRR is closely linked to development. Indonesia can no longer afford to delay the mainstreaming DRR into its development plans. It needs to strategically support long-term development efforts guided by the Millennium Development Goals (United Nations 2011) and sustainable development (Brundtland 1987).

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CHAPTER 7
DISASTER RISK REDUCTION AND
CLIMATE CHANGE ADAPTATION IN
INDONESIA: INSTITUTIONAL
CHALLENGES AND OPPORTUNITIES FOR
INTEGRATION

Djalante, R., and Thomalla, F. (2012). "Disaster Risk Reduction and Climate Change Adaptation in Indonesia: Institutional Challenges and Opportunities for Integration." *International Journal of Disaster Resilience in the Built Environment* 3(2): 166-180.

7.1 Overview

Permission

Permission to include the paper in this thesis is given by the publisher, Emerald. The editors are Professor Dilanthi Amaratunga and Professor Richard Haigh, of the Centre for Disaster Resilience, School of the Built Environment, University of Salford, United Kingdom. The scope of the journal encompasses *research that examines the role of built environment in DRR*. The journal is intended for researchers and academics, policy makers and other professionals.

Authors' contributions

Riyanti Djalante

My contribution to the research and paper: Concept - 100%; Data collection - 100%; Analysis - 95%; Writing - 95%; Total - 95%.

I am involved in the development of the paper structure, analysis and the journal submission processes.

I am also involved in the literature review processes and conducting data collection in Indonesia.

Dr Frank Thomalla

Dr Frank Thomalla assists me in reviewing the paper and strengthening the arguments made.

Impacts of the paper

It is listed in the Australian Emergency Management Library. This paper is chosen as a Highly Commended Award Winner at the Literati Network Awards for Excellence 2013 from Emerald Insight Publisher.

Introduction to the paper

This paper is related to Chapter 4 that discusses the latest knowledge on the integration of DRR and CCA. This is the first of three papers that are written to explore the progress and challenges for the integration of DRR and CCA in Indonesia. Based on the finding of the previous paper on Indonesia (Chapter 4), one of the impediments to current resilience progress is the lack of horizontal collaboration and coordination amongst sectoral agencies, especially at the national level. Hence, I decide to focus the analysis on the challenges and opportunities for integration amongst the institutions involved in DRR and CCA in Indonesia.

7.2 The Paper in Published Format



The current issue and full text archive of this journal is available at
www.emeraldinsight.com/1759-5908.htm

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Disaster risk reduction and climate change adaptation in Indonesia

Institutional challenges and opportunities for integration

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Abstract

Purpose – The purpose of this paper is to examine how past experiences in implementing disaster risk reduction (DRR) activities can be harnessed to conceptualise effective and appropriate climate change adaptation (CCA) programs in Indonesia. The authors propose a conceptual framework for integrating DRR and CCA in managing climate-related risks and explain the need for joint implementation.

Design/methodology/approach – The study is conducted through review and analysis of academic, government and non-government literature to determine the Indonesian experience in integrating DRR and CCA. Interviews were conducted with 26 DRR and CCA stakeholders in Indonesia.

Findings – The authors make three propositions in this paper. First, there needs to be a re-orientation of the institutional arrangements for DRR and CCA, to increase the effectiveness of planning and implementation. Second, DRR and CCA activities needed to be stronger supported at the local level, with a specific aim to reduce the underlying causes of vulnerability of communities at risk. Third, non-government organisations play a very important role in integrating DRR and CCA through community-based initiatives.

Research limitations/implications – While this paper focuses specifically on Indonesia, the findings are relevant to other countries with similar geographical and socio-economic conditions, as they are likely to face similar challenges.

Practical implications – The paper provides practical suggestions on what steps government actors, at all political levels, can do to support the integration of DRR and CCA planning and implementation activities in Indonesia.

Originality/value – The paper is one of the first to document progress in integrating DRR and CCA in Indonesia.

Keywords Indonesia, Climate change, Disasters, Risk analysis, Disaster risk reduction, Climate change adaptation, Integration, Institutions

Paper type Research paper



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1. Introduction

Natural disasters are becoming more frequent, deadly and costly (United Nations International Strategy for Disaster Reduction (UNISDR, 2011)). Within the period of 1900-2010, there have been a five-fold increase in the number of natural disasters reported, taking its peak within the 2000-2010 period (EM-DAT, 2011a, b). While there is a gradual reduction in the number of death, the number of people reported affected

increased rapidly in the last 40-50 years, averaged more than 300 million by 2010 (EM-DAT, 2011a, b). The costs of natural disasters have increased sharply since the 1980s and the average costs peak at just below US\$100 billion by 2010 (EM-DAT, 2011a, b). Globally, the frequency and magnitude of weather and climate-related hazards is increasing (IPCC, 2007a, b; EM-DAT, 2011a, b), with flood as the most frequent disaster and affected most people. The anticipated increase in the frequency, intensity and severity of climate-related disasters therefore calls for better integration of disaster risk reduction (DRR) and climate change adaptation (CCA) to reduce vulnerability and increase resilience to natural disasters.

The UNISDR (2009) defines DRR as “systematic efforts to reduce disaster risks through analysing and managing the causal factors of disasters including the reduction of vulnerability, and improved preparedness for adverse events”. The “Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters” was adopted in 2005 as the international framework for DRR (UNISDR, 2007). CCA is defined by The Intergovernmental Panel on Climate Change (IPCC) as “an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007a, b).

There are three aims of this paper. First is to review the global conceptual/theoretical literature on the integration of DRR and CCA in managing climate-related risks in policy and practice. The second aim is to review barriers and opportunities for this integration in Indonesia, and third is to provide recommendations for how the integration of DRR and CCA can build resilience to a wide range of hazards in Indonesia.

We employed variety of methods in conducting the study. These include an extensive review and analysis of the global academic and “grey” literature on DRR and CCA. Non-academic documents on DRR and CCA policies and strategies, planning guidelines, and project implementation in Indonesia were sourced from international development agencies operating in the country, the Government of Indonesia (GoI), and national and sub-national non-government organisations (NGOs). We also conducted interviews of 26 representatives from key stakeholders in Indonesia. They are of government, non-government and community-based organisations at the national and the local level.

The paper is organised accordingly. In the Introduction we outline the context, aims, and methods for our research. In Section 2 we present a rationale for integration and similarities, differences and progress in integration. In Section 3 we provide a review of climate-related disasters in Indonesia and explore challenges and opportunities for DRR and CCA integration at the national, local, and community levels. In the final section we outline our policy recommendations for a more effective integration of DRR and CCA planning and implementation in Indonesia.

2. DRR and CCA integration: theoretical concepts and global progress

We argue that we have passed the stage of justifying WHY the integration of DRR and CCA should take place, to the question of HOW the integration should be done. Calls for this integration have been extensively discussed by various scholars and organisations, focusing on the rationale, similarities, differences, and how the two can contribute to each other (Sperling and Szekely, 2005; Thomalla *et al.*, 2009; Mitchell and van Aalst, 2008; Venton and La-Trobe, 2008; Schipper, 2009; Birkmann *et al.*, 2009;

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Mercer, 2010; Mitchell *et al.*, 2010). Others discuss the integration with development (Schipper and Pelling, 2006; CCCD, 2008; Ireland, 2010; Kelman, 2010), social protection (Davies *et al.*, 2009), and human security (O'Brien *et al.*, 2008). There are also increasing contributions to developing tools and methods for integration (McBean and Rodgers, 2010; Mercer and Dominey-Howes, 2007; Birkmann *et al.*, 2009, 2011; Collier *et al.*, 2009; Mercer *et al.*, 2009; Prabhakar *et al.*, 2009), and analysing how integration could take place in developing or developed countries (Djalante *et al.*, 2010; Gero *et al.*, 2010; Prabhakar, 2010; Setiadi *et al.*, 2010).

The underlying rationale for the integration is that climate change is likely to increase the frequency and severity of hydro-meteorological hazards (IPCC, 2007a, b). There are significant similarities in the theory, policy and practice of DRR and CCA approaches. Both aim to manage hydro-meteorological hazards by reducing vulnerability and building resilience (Schipper and Pelling, 2006; Mitchell and van Aalst, 2008; O'Brien *et al.*, 2008; Venton and La-Trobe, 2008). Both also promote approaches that are pro-active, holistic and long-term either before or after hazards occur (Sperling and Szekely, 2005; Thomalla and Downing, 2006; Schipper, 2009). Simultaneous application can lead to a more efficient use of financial, human and natural resources and therefore increases the effectiveness and sustainability of both approaches (Schipper, 2009; Mercer, 2010).

However, integrating DRR and CCA in practice remains a challenge because they originated and are maintained in different communities of research and practice using different approaches and conceptual frameworks, tend to be planned and implemented by different government agencies, institutions and organisations, and tend to receive funding from different sources (Venton and La-Trobe, 2008; Birkmann *et al.*, 2009; Schipper, 2009; Mitchell *et al.*, 2010).

Despite these differences, there has been considerable progress in integrating DRR and CCA, particularly following the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties COP 13 in Bali in 2007 which recognised the linkages between disasters and climate change, as stated in the UNFCCC Decision 1/CP.13 and UNFCCC/CP/2007/6/Add.1, paragraph 1(c) (ii and iii) (UNFCCC, 2007). The UNFCCC and the UNISDR are actively engaged in linking the two issues (UNFCCC, 2007). The UNFCCC was ratified in 1992 as an international environmental treaty "to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (IPCC, 2007a, b). The IPCC is a scientific intergovernmental body tasked with reviewing and assessing the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change (www.ipcc.ch). Mitchell *et al.* (2010) outline in more details the latest progress in the integration by which progress are actively happening at the international, regional, national and local level, planned and implemented by government, non-government, international and development funding institutions.

3. The case for DRR and CCA integration in Indonesia

In this section we focus on the rationale for the integration of DRR and CCA in Indonesia and provide an analysis of the current governance of DRR and CCA at the national and sub-national levels.

3.1 The rationale for integrating DRR and CCA

Indonesia is the world's largest archipelago with more than 17,000 islands. With 240 million inhabitants it is the fourth most populous country. Data derived from

CRED-EMDAT (2011) shows that in the last 100 years 400 disasters occurred in Indonesia killing almost 241,000 people, affecting almost 28 million people, and costing US\$24 billion. These events were predominantly geological and climate-related disasters (Figure 1).

While climate-related disasters occurred more frequently and affected more people, geological disasters were the deadliest. Recent publications on climate change risks indices such as the World Risk Index (Buendnis Entwicklung Hilft and UNU-EHS, 2011) or the Global Climate Risk Index (Germanwatch, 2011) and vulnerability indices such as the Climate Change Vulnerability Map (Maplecroft, 2011) and the Multiple Climate Hazard Index (Yusuf and Francisco, 2009), show that Indonesia is at the top end of the spectrum of most vulnerable country to natural hazards.

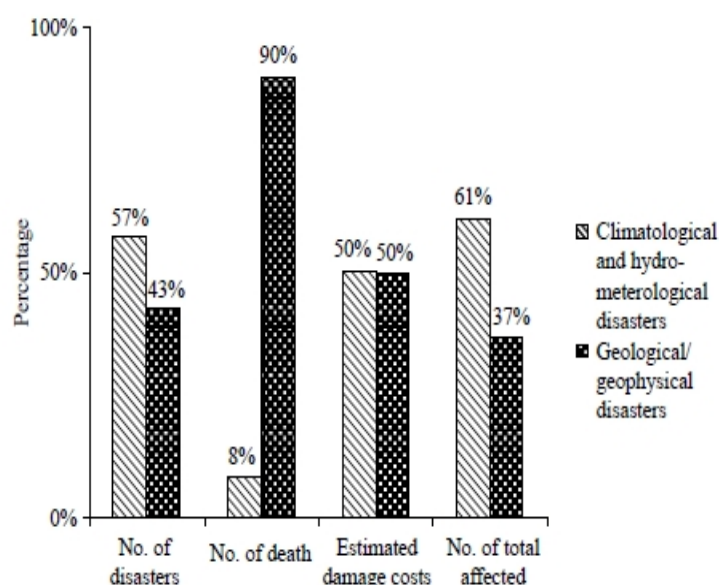
DRR and CCA in Indonesia

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3.2 DRR governance in Indonesia

3.2.1 Governance at the national government level. The Indonesian government has established a number of legal documents concerning DRR. The most important one is Law Number 24 Year 2007 on Disaster Management (GoI, 2007). This law recognises the need to increase hazard awareness and to develop a more systematic and integrated approach to DRR. It introduces fundamental paradigm shifts on DRR from reactive to proactive approaches, formally acknowledges that DRR is an important part of the people's basic right to protection and needs to be mainstreamed within government administration and development (UNDP Indonesia, 2008a, b). The basic principles addressed in this legislation include public participation, public-private partnership, international collaboration, a multi-hazards approach, continuous monitoring, national and local dimensions, financial and industrial dimensions, an incentive system, and education (ADPC, 2008; UNDP Indonesia, 2008a, b).

Key guiding documents for DRR in Indonesia include the first National Action Plan for Disaster Risk Reduction published in 2006 (BNPB, 2006). This was followed by the National Guidelines for Disaster Management 2010-2014 and the National Action Plan



Source: Modified from EM-DAT (2011)

Figure 1.
Comparing impacts of
climate-related and
non-climate related
disasters in Indonesia
(1990-2011)

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for Disaster Risk Reduction 2010-2012 (BNPB, 2010a, b). The national disaster management agency (BNPB) acts as the lead agency for DRR coordination. Its head is appointed directly by the president. BNPB has 19 permanent members, ten representing the various government ministries and nine experts/professionals representing non-governmental stakeholders such as practitioners, researchers, NGOs and community-based organisations (CBOs) (BNPB, 2009). There is also a National Platform for DRR (Planas-PRB) which consists of organisations of the United Nations DRR teams, universities, and international and Indonesian NGOs. The establishment of BNPB, its local counterparts (BPBD), and the National Platform have been important recent steps to enhance coordination amongst DRR stakeholders (UNDP Indonesia, 2008a, b).

3.2.2 Governance at sub-national government levels. As a consequence, of the decentralisation of governance in Indonesia, provincial and local government authorities now have greater autonomy in determining their own administrations. As noted by UNDP Indonesia (2010) decentralisation does bring positive benefits of better allocation of revenues and resources as well as more effective and targeted development results. However, a lack of capacity in human and financial resources at the provincial and district/municipal levels has resulted in different levels of progress between local governments towards reducing disaster risks (UNDP Indonesia, 2009a, b, c). Unlike its national counterpart, few provinces and district governments have to-date developed their DRR agencies and plans. 30 (out of 33) BPBDs currently exist at the provincial level while only 144 among of 497 local governments have their local disaster management agencies (BNPB, 2011).

A number of factors influence the level of progress or challenge the formation of BPBDs: first, provinces perceived to be highly vulnerable to natural hazards tend to prioritise the formation of BPBDs or DRR regulations. Examples are the local governments of Sumatra and Java. The province of West Sumatra was the first to enact its Local Regulation (Perda) on Disaster Management for West Sumatra 2008-2012 (Pemerintah Provinsi Sumatera Barat, 2008). The municipal government of Kota Padang formed its BPBD in 2008 (Pemerintah Kota Padang, 2008). This province was chosen as a pilot case study for the development of the tsunami early warning system by several international organisations (GITEWS, 2008). Second, some local governments have not yet formed their own BPBD but have allocated DRR responsibilities to existing agencies such as the Office of Community Emergency and Protection or the Fire Emergency Services. This makes coordination and authority for DRR tend to focus for emergency management only. Third, awareness of, commitment to and progress in DRR at sub-national levels tend to be greatly influenced by external factors such as the availability of funding and assistance. This would explain why some local governments are far advanced and others have not yet started, as some may have received direct external assistance through international organisations while others depend on national government for support.

3.3 CCA governance (nationally and locally)

The first milestone to address climate change was the formation of the National Committee on Climate Change (KNPI) in 1990 (Muhammad, 2009a, b). Indonesia signed and ratified the UNFCCC in Rio de Janeiro in 1992. In 2005, Indonesia ratified the Kyoto Protocol (Muhammad, 2009a, b). The National Council for Climate Change (DNPI) was

formed in 2008 to address the complexity and the need for better integration and coordination to address climate change. The council is managed by the President with the Minister of the Environment (MoE) acting as the daily leader. DNPI oversees six working groups (adaptation, mitigation, technology transfer, funding, Post Kyoto 2012, forestry and land use), and others as needed (Sekretariat Negara RI, 2008).

Indonesia's response to climate change remains dominated by mitigation[1] activities, especially through the REDD program[2] (www.redd-indonesia.org/). The Indonesian Climate Change Trust Fund (ICCTF) was created in 2009 to build on the policy framework for climate change mitigation and adaptation and to support its implementation (UNDP Indonesia, 2009a, b, c). The formation of the ICCTF addresses three major targets: conducting low-carbon economic development, promoting national resilience to climate change, and achieving effective CCA (UNDP Indonesia, 2009a, b, c). Indonesia's First National Communication submitted to the UNFCCC in 1999 included a national emissions inventory of greenhouse gases (GHG), described sectoral measures to reduce GHG emissions and provided other important information related to climate change (GoI, 1999). The Second National Communication published in 2009 reported Indonesia's progress in adapting and mitigating to climate change and provided a detailed plan for GHG emissions reduction of 26 percent by 2020 (MoE, 2009; UNDP Indonesia, 2009a, b, c).

Adaptation activities to-date focuses on the planning and formulation of key strategic documents. The 2007 National Action Plan for Climate Change (RAN-PI), aims to create development systems that are resilient to climate change and climate variability, and to implement more sustainable development that decreases the rate of environmental destruction (MoE, 2007). This action plan outlines Indonesia's strategies on mitigation and adaptation. The plan specifically states that the country's current capacity to cope with climate change will strongly affect its capacity in the future, and that it is therefore important to incorporate Indonesia's current RAN-PRB within the RAN-PI. Bappenas (National Development Planning Agency) outlines in its report "National Development Planning: Indonesia Responses to Climate Change" (Indrawati, 2009) the possible impacts of climate change on Indonesia, sectoral targets for climate change activities and possible funding mechanisms. It also provides a climate change sectoral roadmap (ICCSR) which identifies nine development priorities that will be strongly linked with climate change mitigation and adaptation activities (Bappenas, 2009): energy, forestry, transportation, industry, waste treatment, agriculture, marine and fisheries, water resources, and health.

The provincial government of West Nusa Tenggara (NTB) is the only sub-national government to-date that has started to formally regulate the mainstreaming of CCA issues within its local development planning through the Task Force for CCA Mainstreaming into Local Development Planning (LG NTB, 2007) in partnership with World Wildlife Fund – Indonesia (Fawzia, 2008; Muhammad, 2009a, b).

3.4 International, regional and NGOs working in DRR and CCA

The HFA emphasises the urgency of promoting participation and therefore calls for multi stakeholder partnerships (UNISDR, 2005). The development of DRR and CCA policies in Indonesia has been strongly influenced by international and regional activities. According to the latest data obtained from the United Nations' Office of Coordination of Humanitarian Activities (UN-OCHA) 3W ("Who does What Where?")

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database, there are more than 100 organisations working on DRR in Indonesia. These are mainly the United Nations organisations, national NGOs, international organisations and international NGOs, Red Cross and Red Crescent Societies, and donor agencies (OCHA Indonesia, 2011).

In the United Nations Partnership for Development Framework 2011-2015 for Indonesia, the integration of DRR and CCA is one of the three main objectives to “strengthen national and local resilience to climate change, threats, shocks and disasters” (GoI and UN, 2011). The main UN organisations involved in DRR in Indonesia are the United Nations Development Program (UNDP), UNOCHA/Technical Working Group (TWG), and the United Nations for Education, Economy and Social Cooperation (UNESCO). UNDP has been actively involved in the development of the Disaster Management Bill No. 24/2007 and in establishing and supporting the various activities of BNPB and BPBD (UNDP Indonesia, 2008a, b, c). It has also supported the development of CCA by assisting the GoI in preparing the National Communication to the UNFCCC, providing small grants for community forests management, and funding various small scale projects on energy-efficiency (UNDP Indonesia, 2007a, b). The project “Safer Communities through Disaster Risk Reduction (SC-DRR)”, implemented from 2007 to 2010, aims to improve institutional capacity for planning for natural hazards including climate-related hazards has been particularly influential in helping the integration through its trainings and capacity development programs for DRR and CCA actors nationally and locally (<http://sc-drr.org/index.php>).

One international funding agency that has played an important role in supporting DRR and CCA in Indonesia is the World Bank. Together, with other donor agencies, the World Bank has implemented a Global Facility for Disaster Reduction and Recovery (GFDRR) track II (mainstreaming DRR) and track III (DRR in recovery). The GFDRR supports the formulation of the NAP-DRR 2010-2012 and capacity building for BNPB and BPBDs (GFDRR, 2011). An example of a specific activity focusing on the integration of DRR and CCA is technical assistance and pilot initiatives for disaster and climate proofing building codes and standards (GFDRR, 2011). The Association of South East Asian Nations (ASEAN) activities on DRR have also been influential for the integration. Initiatives of ASEAN include the Committee for Disaster Management, ASEAN-UNISDR Technical Cooperation, Agreement on Disaster Management and Recovery, Coordinating Center for Humanitarian Assistance, and the DRR Online Knowledge Platform (www.aseandrr.net). Another significant activity in the region was the 4th Asian Ministerial conference on DRR which resulted in the “Incheon Regional Roadmap and Action Plan for DRR through CCA in Asia and the Pacific” (AMCDRR, 2010).

Various coordination platforms such as the Convergence Group for DRR, the Consortium for Disaster Education (CDE), and the National Platform for Disasters have all started to consider CCA within their DRR programs. The Convergence Group for DRR formed to enable better coordination of actors, to create joint collaborations, and to exchange lessons learnt and best practices among stakeholders (UNTWG, 2010). A CDE aims to pool best practices and lessons learnt on school disaster education and awareness and to advocate the integration of disaster education in the Indonesian school system. The CDE also acts as a coordinating forum for NGOs working on school-related disaster management programs in Indonesia (UNTWG, 2008). Several community-based organisations and NGOs have been actively involved in DRR and

the formation of the National Platform for DRR in 2009 strengthened and acknowledged the importance of their roles in DRR and increasingly in CCA (Planas PRB, 2009). The Indonesian Red Cross (PMI), like many other humanitarian organisations, is currently expanding its activities to include climate-risk reduction. PMI is conducting two leading programmes of community-based first aid and integrated community-based risk reduction to climate change in west and east Jakarta to improve community adaptive capacity to climate change and disasters through vulnerability and capacity assessments (PMI, 2005; IFRC, 2012). The Indonesia Disaster Management Society (MPBI) plays a significant role in DRR and CCA. MPBI has been engaged with international organisations on various DRR activities as well as conducting training for local governments in developing their disaster management plans. It organises online forums and holds annual meetings for practitioners to enable knowledge sharing, networking and the development of more effective frameworks for CBDRR and CCA (MPBI, 2009).

4. Recommendations for building resilience

In this section we make three recommendations for achieving more effective DRR and CCA integration in Indonesia, targeting the national, sub-national and local levels.

4.1 Reorient the institutional structure of the national government

Our analysis indicates that considerable coordination challenges exist in terms of defining the responsibilities and institutional arrangements for implementing DRR and CCA, either individually or addressing both issues in an integrated way. The foremost challenge is the establishment of a clear coordination mechanism between different government and NGOs operating at all levels. Cooperation between BNPB, DNPI and MoE needs to be strengthened. Nationally, DRR is managed by BNPB while climate change mitigation and adaptation are coordinated by DNPI and the MoE. Examining the structure of the three agencies, we can identify several inconsistencies in terms of their relative structure within the national governmental ministries and mandates. While the head of BNPB has a ministerial level status with a clear mandate for coordination to its sub-national counterparts, DNPI is lead by the President of the Republic of Indonesia and only exists at the national level. There is currently no clear arrangement for coordinating responses to climate change between the national and the sub-national government levels. Different opinions exist on the most appropriate future institutional arrangement. For example, the expert advisor of the Ministry of Environment suggested that a new climate change institution should be formed while others advocate a stronger role of DNPI with support from the related ministries (2010). No fewer than five ministries (internal affairs, health, energy and mineral resources, public works and transportation) are currently involved in the working groups supporting BNPB and DNPI. We suggest that these ministries can serve as connectors in bridging DRR, CCA and development. This can be considered what Pelling and Schipper (2009) describe as “boundary organizations” that act as mediators by facilitating better and more effective integration.

Bappenas, UNDP Indonesia and the World Bank play crucial roles in creating stronger linkages between DRR and CCA. These organisations are the key planner, coordinator and implementer for DRR projects such as the SC-DRR or key documents such as the National Guidelines for DRR in Indonesia (BNPB, 2006, 2010a, b). They are

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also the creator, planner for key CCA documents and program such as the National Action Plan for Climate Change, the Trust Fund for Climate Change (MoE, 2007; UNDP Indonesia, 2007a, b, 2009a, b, c). UNDP Indonesia (2009a, b, c), which is currently managing the SC-DRR programme has been appointed as the interim trustee for the newly formed ICCTF. Within the World Bank operations in Indonesia, DRR and climate change are managed simultaneously through the organisation's core engagement in environmental sustainability and disaster mitigation (The World Bank, 2009).

The roles of Bappeda (Local Development Planning Agency) are also crucial for this integration since it is the agency mandated for development coordination at the local government level (GoI, 2004), which include coordination for environmental management, poverty reduction, livelihood creation, which as all related to DRR and CCA issues at the local level. In our opinion, Bappeda should be given more coordinating power through appropriate legal frameworks to increase its awareness and capacity. A starting point would be closer coordination of Bappenas's sub-structures and Bappeda, since they are the coordinating agencies for all planning activities related to development.

Finally, effective communication and exchange of information between various stakeholders should occur through the National Platform for DRR. CCA activities should utilise this existing channel, rather than creating a new one. Through this mechanism, knowledge, experience and guidance on DRR from the government can complement the knowledge and experience of NGOs and CBOs and a vertical mismatch of competencies, awareness and knowledge can be avoided.

4.2 Strengthen technical and financial support to local governments

Many studies suggest that synergies between DRR and CCA are most apparent at the local level (Adger, 2003; Brooks *et al.*, 2005). Local authorities and communities are at the forefront of disasters and climate change impacts and are required to act with or without support from higher levels of government (Bulkeley and Betsill, 2003). Sub-national government authorities across the country have achieved very different levels of progress in implementing DRR activities. In our view, differences in risk perception, priorities, and resources (local and external) are the main causes of these differences (Thomalla *et al.*, 2009).

Since the progress in formation of a single lead organisation for DRR has been slowly taken by majority of sub-national government authorities, efforts to strengthen DRR should focus on improving the coordination between existing institutions. Unfortunately, the recent formation of the DNPI does not address the coordination issue at the sub-national level. This can be counter-productive and can strongly undermine overall national progress. A lack of awareness among governments and politicians of the long-term impacts of climate change pose a hindrance the inclusion of CCA into the development agendas of sub-national governments. We therefore suggest that DRR activities should focus more strongly on improving risk knowledge. The better the risks are understood, the more likely it is that DRR activities are initiated. Most local governments do not consider DRR as a high priority, as education, health, community development, the economy and natural resource management are considered more important on a day-to-day basis (Thomalla *et al.*, 2009). CCA is often even lower on the agenda because climate change impacts tend to be perceived to occur a long time into the future and to have unknown consequences for a particular community.

There is a need for local government actors to understand the importance of mainstreaming DRR and CCA into development planning to underpin poverty reduction, resilience building and sustainable development. DRR and CCA need to be perceived by local authorities not as additional burdens. Rather, the co-benefits to poverty reduction, livelihoods improvement, natural resources management, tourism and general sustainable development need to be emphasised.

4.3 Recognise the importance of NGOs and community based initiatives

Many local case studies on climate change emphasise the need for promoting and strengthening community-based adaptation (Adger *et al.*, 2005; Brooks *et al.*, 2005). A considerable number of international, national and local NGOs have engaged in disaster preparedness, response and recovery for many years (UNTWG, 2009; UNDP Indonesia, 2008a, b) and have extensive experience in community-based DRR (ADPC, 2008). CCA activities should utilise these networks, knowledge and institutions rather than reinventing new initiatives. Indeed, especially after the Indian Ocean 2004 tsunami, organisations working on DRR have changed their perspectives on the way they respond to disasters, in perceptions to risks, and in the awareness of the value of environmental systems (Miller *et al.*, 2006; Birkmann *et al.*, 2010). NGOs and CBOs shifted their focus from disaster relief and recovery to more proactive approaches of reducing hazard vulnerabilities and building community resilience to shocks and surprises (ADPC, 2008).

In conclusion, we hope to have demonstrated the importance of integrating DRR and CCA in Indonesia by making a strong case for this integration, by mapping the institutions, policies and activities, and by identifying challenges and progress to-date. We have proposed three recommendations for building resilience to natural hazards and highlighted the importance of commencing the identified opportunities immediately. We expect that the forthcoming United Nations Conference on Sustainable Development (Rio + 20) in 2012 (www.earthsummit2012.org/) will set an important milestone in terms of accelerating global synergy for combating poverty, environmental degradations, increasing threats from climate change, all of the factors that form the underlying cause of risks and vulnerability to hazards and disasters.

Notes

1. Climate change mitigation is defined as "An anthropogenic intervention to reduce the sources or enhance to sinks of greenhouse gasses" (IPCC, 2007a, b).
2. REDD stands for "reducing emissions from deforestation and forest degradation" (www/red-indonesia.org).

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CHAPTER 8
IDENTIFYING DRIVERS, BARRIERS AND
OPPORTUNITIES FOR INTEGRATING
DISASTER RISK REDUCTION AND
CLIMATE CHANGE ADAPTATION: AN
ANALYSIS BASED ON THE EARTH SYSTEM
GOVERNANCE FRAMEWORK

Djalante, R. (2013). "Identifying Drivers, Barriers and Opportunities for Integrating Disaster Risk Reduction and Climate Change Adaptation in Indonesia: An Analysis Based on the Earth System Governance Framework." In: Leal Filho, W. (Ed.) *Climate Change and Disaster Risk Managements*, Springer Berlin Heidelberg, Berlin.

8.1 Overview

Permission

Permission to include the paper in this thesis is given by the publisher, Springer.

Authors' contributions

Riyanti Djalante

I am responsible for data collection, literature review, data analysis, writing the paper and the whole process of journal submission. I also acknowledge the role of Dr Cameron Holley who helps to review the paper during the resubmission processes.

Impacts of the paper

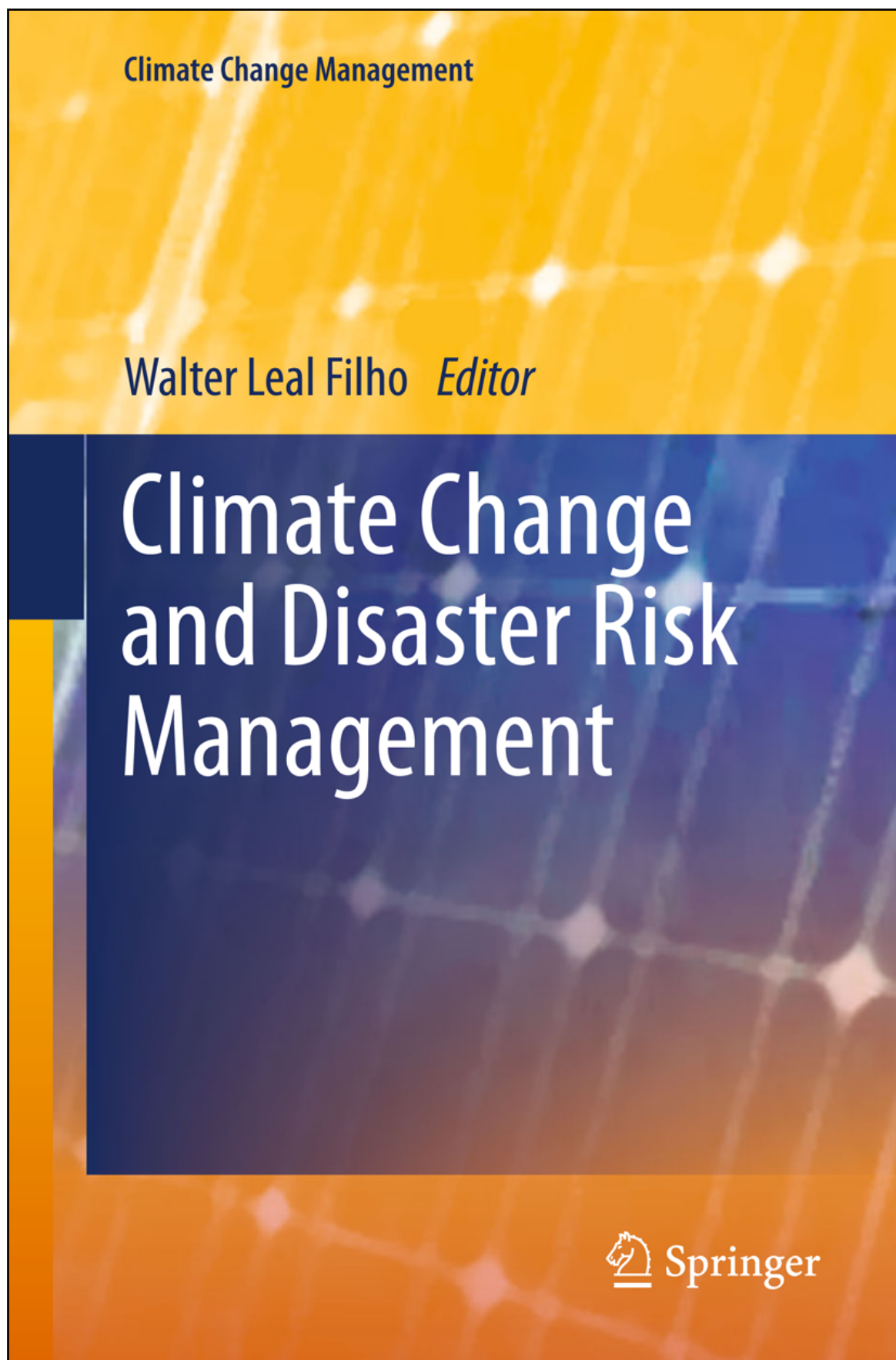
There is no citation for this paper yet. This is the second paper to focus on the integration of DRR and CCA in Indonesia. The paper is written in response to a call when an online conference on climate change and disaster management came up, organised by Hamburg University (<http://www.climate2011.net/>) with Professor Walter Leal Filho as the conference convener. Papers presented in this conference are later published in a book called '*Climate Change and Disaster Risk Management*' which is part of the Springer book series on *Climate Change Management* (Filho, 2013). The book has three main features: it presents the latest scientific findings on climate variations and climate change and their links with disaster management, it showcases case studies on the inter-linkages between developed and developing countries, and with different stakeholders, and it exposes current and future challenges as well as submitting opportunities for DRR and CCA integration.

Introduction to the paper

A paper that strongly influences me in writing this paper is that of Biermann et al. (2010) on their proposal of the Earth System Governance Framework. Moreover, I attend a conference on Governing Climate Change in Asia Pacific, organised by the Australian National University, where I have the opportunity of participating in a session on another topic on the use of the ESG framework for analysis of DRR and CCA integration in the Pacific (Gero et al., 2010). Utilising the ESG framework enables me to conduct a more systematic analysis for DRR and CCA integration; beyond that which I conduct in the paper in Chapter 7. While the analysis in Chapter 7 focuses only on the issues of architecture and agency, this paper expands the analysis to include other factors such as adaptability, accountability, and, allocation and access.

This chapter examines drivers, barriers and, most importantly, opportunities for institutional integration for DRR and CCA in Indonesia. It is argued that the Indonesian government's institutional capacity and arrangements can be both the main barrier and the driver for integration. It is established that the main barrier to integration is at the national government level, where separation of government organisations and sectoral ministries leads to uncoordinated planning for CCA and DRR. Strong relationships between key government organisations in DRR and non-governmental and international organisations, involved both in DRR and CCA, hold the key to the integration of policy and practice. Moreover, opportunity for integration is even greater at the local government and community level. However, more financial and technical support from the national, international and non-government sectors is needed at the local level in order to make use of this opportunity.

8.2 The Paper in Published Format



Chapter 9

Identifying Drivers, Barriers and Opportunities for Integrating Disaster Risk Reduction and Climate Change Adaptation in Indonesia: An Analysis Based on the Earth System Governance Framework

Riyanti Djalante

Abstract Climate change is expected to increase the frequency, severity and intensity of disasters. Indonesia is known to be one of the countries most vulnerable to natural hazards. It is located in the “Pacific Ring of Fire”—a highly active geological area and scene of many incidents of volcanic eruptions and earthquakes. In addition, more than half of all disaster events in Indonesia are climate-related. There have been increasing and stronger propositions for integrated disaster risk reduction (DRR) and climate change adaptation (CCA) to reduce vulnerability to natural hazards and climate change. This chapter utilises the Earth System Governance (ESG) framework to analyse the integration of DRR and CCA in Indonesia. Journal articles and organisational reports are reviewed. This chapter examines drivers, barriers and, most importantly, opportunities for institutional integration for DRR and CCA in Indonesia. It is argued that the Indonesian government’s institutional capacity and arrangements can be both the main barrier and driver for integration. It is established that the main barrier to integration is at the national government level where separation of government organisations and sectoral ministries leads to uncoordinated planning for CCA and DRR. Strong relationships between key government organisations in DRR and non-governmental and international organisations involved both in DRR and CCA hold the key to integration of policy and practice. Moreover, opportunity for integration is even greater at the local government and community level. However, more financial and technical support from the national, international and non-government sectors is needed at the local level in order to make use of this opportunity.

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Integration of Disaster Risk Reduction and Climate Change Adaptation: Conceptual Development

Rationale for Integration

Linking Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) is important because climate change is likely to increase the frequency and severity of hydro-meteorological hazards (IPCC 2007). The simultaneous application of DRR and CCA also results in more efficient use of financial, human and natural resources and therefore increases the effectiveness and sustainability of both approaches. The climate change community is in danger of “wasting time and money in re-inventing the wheel” by conducting CCA activities separately (Schipper 2009; Mercer 2010). Venton and La Trobe (2008) argue that implementation of DRR activities linked with adaptation can result in a reduction of climate-related losses. DRR can contribute to CCA through existing knowledge, approaches and tools that have been tried and tested by the DRR community to address the proximate and underlying causes of hazard vulnerability. The CCA community can also learn from DRR approaches how scientific and traditional knowledge can be integrated (Mercer et al. 2009).

Similarities

There is significant overlap between the theory, policy and practice of DRR and CCA. According to Mitchell and van Aalst (2008), the main synergy between the two is the management of hydro-meteorological hazards, where DRR needs to take into account changing hazards, and adaptation needs to build resilience. Both DRR and CCA emphasise vulnerability reduction and sustainable and flexible long-term strategies to build resilience to adverse impacts. Both also promote approaches that are pro-active, holistic and long-term either before or after hazards occur (Thomalla et al. 2006; Schipper 2009). The Hyogo Framework for Action (HFA) aims to achieve a comprehensive, system-wide risk-reducing approach to CCA (UNISDR 2007). The proactive and progressive risk management approach advocated by the DRR community fits well with CCA purposes (Venton and La-Trobe 2008).

Differences

Schipper (2009) writes that the two fields promote their activities through different actors and institutions, different time horizons, policy frameworks and patterns of works. Thomalla et al. (2006) outline six distinct differences of DRR and CCA, in terms of approach, organisations and institutions, international conferences, assessment, strategies and funding. They argue that the main pragmatic difference between DRR and CCA is the approach toward the issue. DRR traditionally evolved from engineering and the natural sciences. Taking a traditionally short-term perspective, DRR focuses on the hazard event and on exposure to that hazard. CCA has developed from a strong scientific basis, is highly interdisciplinary, focuses on vulnerability and takes a long-term perspective (Thomalla et al. 2006). DRR and CCA are organised by two distinct institutional and strategic frameworks. The UNFCCC and Intergovernmental Panel on Climate Change (IPCC) are the two main bodies for CCA, while the UNISDR and the Global Platform for DRR (GP-DRR) are the main organisations responsible for DRR.

International Progress and Challenges for DRR and CCA Integration

Policies

The need to link DRR and CCA has been gaining stronger international momentum. It was formally initiated at the United Nations Framework Convention on Climate Change (UNFCCC) meeting in Bali. The Bali Action Plan agreed by the parties present at the UNFCCC meeting in Bali recognises that existing knowledge, experience and capacities for reducing vulnerabilities and increasing preparedness to extreme weather events must be harnessed in adapting to climate change. As stated in the UNFCCC Decision 1/CP.13 and UNFCCC/CP/2007/6/Add.1, para 1(c) (ii and iii) (2007), both UNFCCC and the UNISDR are actively engaged in activities aimed at linking the two issues. The UNISDR Working Group on Climate Change and DRR were heavily involved in the negotiation of the adaptation pillar of the post-2012 framework under the UNFCCC (Venton and La-Trobe 2008). The 2009 and 2011 Global Platform on DRR reiterates importance of synergies between the two (UNISDR 2009, 2011). The IPCC Working Group II is currently preparing for a special report on “Extreme Events and Disasters: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation” which will provide input for the IPCC’s Fifth Assessment Report (IPCC 2011).

Implementation Progress at International Level

A number of international organisations are actively involved in integrating DRR and CCA in humanitarian and development programmes. The Red Cross Climate Centre supports the International Federation of Red Cross and Red Crescent Societies (IFRC) in understanding and addressing the humanitarian consequences of climate change and extreme weather events (IFRC and The Netherlands Red Cross 2007). Various financial and development agencies (for example the World Bank, USAID, AusAID, and DANIDA) have developed guidelines on climate-proofing their development agendas (Ministry of Foreign Affairs of Denmark 2005; AusAID 2009; The World Bank 2010; USAID 2010). Various organisations and documents have highlighted the need for simultaneous implementation of DRR and CCA. These include (to name but a few): the Vulnerability and Adaptation Resource Group (VARG) (Sperling and Szekely 2005), the UNISDR publication “On better terms” (UNISDR 2006), the World Bank (Burton and van Aalst 2004), Tearfund’s report “Linking climate change adaptation and disaster risk reduction” (Venton and La-Trobe 2008), the Global Environmental Change and Human Security (GECHS) report on “DRR, CCA and Human Security” (O’Brien et al. 2008), and a similar DKKV publication (Birkmann et al. 2009). There are also activities that aim to examine how DRR and CCA can be effectively undertaken together. The Nairobi Work Programme on impacts, vulnerability and adaptation to climate change calls in its Call for Action No. 12 for the assessment DRR and CCA (UNFCCC 2008). UNDP produced a climate risk management (CRM) approach and conducted the Caribbean Risk Management Initiative (UNDP 2004, 2010).

The Earth System Governance Framework

Focus on Governance

The author analysis of various organisational reports pointed out that governance is one of major issues driving the possibility for DRR and CCA integration. Governance is broadly defined as the means of interaction patterns of actors, their sometimes conflicting objectives, and the instruments chosen to steer social and environmental processes within a particular policy area (Duit et al. 2010). The shifts from government to governance is generally driven by factors such as increasing decentralisation, growth of public–private partnerships, influences of non-governmental organisations on policy processes and increased impacts on multilateral agreements on domestic policy (Duit and Galaz 2008; Duit et al. 2010). It has been largely acknowledged that current environmental problems have become very complex, such that there is no single approach that serves as the panacea for those complexities, including governance approaches (Ostrom 2008).

A differentiated framework that combines elements of adaptive governance and collective actions is needed. This can be, for example, through a system of multi-level governance (Underdal 2010) or “hybrid modes” of governance (Lemos and Agrawal 2006).

The Earth System Governance Framework

The Earth System Governance framework (ESG) is used as the tool for analysis. This framework has been applied in various cases examining environmental changes. It has been examined within social science perspectives (Biermann 2010), and in connection to its relationship with democracy (Drzek and Stevenson 2010). It has been used to examine floodplain management along the Tisza River in Hungary (Wemers et al. 2009) and DRR and CCA integration in the Pacific (Gero et al. 2010). The latest application of the framework includes the ESG project strategy paper in navigating the anthropocene (Biermann et al. 2010).

There are also studies that investigate separate analytical problems of the framework. “Architecture” is examined in terms of the roles of NGOs to fill in gaps in global climate governance (Dombrowski 2010). The issue of “agency” has been closely examined in various contexts (Schroeder 2010; Benecke 2011; Bouteligier 2011; Dellas et al. 2011). “Adaptability” is examined in terms of social learning for water management (Lebel et al. 2010a, b), while “accountability and allocation” are also explored in water and climate governance (Gupta and Lebel 2010; Kanie et al. 2010).

This framework was initially developed by Biermann (2007), and then subsequently refined through the Earth System Governance Project (Biermann et al. 2010). The project (ESGP 2011) defines ESG as:

the interrelated and increasingly integrated system of formal and informal rules, rule-making systems, and actor-networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change and, in particular, earth system transformation, within the normative context of sustainable development.

The Earth System Governance framework is conceptualised into three main analyses of problem structure, governance principles and research challenges, as shown in Table 9.1. *Problem structure* deals with characteristics of earth system transformations. The transformations tend to be uncertain, inter-dependent with functions, time and space, and extreme. These problems’ characteristics are unprecedented in the governance of human affairs and therefore they need certain *principles of governance* which are credible, stable, adaptive, and inclusive. *Five research challenges*, of architecture, agency, adaptability, accountability and allocation, can help in guiding the quest for earth system governance (Biermann 2007).

Table 9.1 Conceptualisation of earth system governance (Biermann et al. 2010a)

<i>Problem structure</i>	- Uncertainty
Earth system governance must cope with at least five characteristics of earth system transformation	- Intergenerational dependencies
	- Functional interdependence
	- Spatial interdependence
	- Extraordinary degree of harms
<i>Governance principles</i>	- Credibility
Four core principles of earth system governance	- Stability
	- Adaptability
	- Inclusiveness
<i>Research challenges</i>	- Architecture
Five interdependent analytical problems	- Agency
	- Adaptability
	- Accountability and legitimacy
	- Allocation and access
<i>Crosscutting themes</i>	- Power
Four crosscutting themes have been selected for closer examination within the Earth System Governance Project	- Knowledge
	- Norms
	- Scale

Drivers, Barriers and Opportunities for DRR and CCA Integration in Indonesia: Applying the ESG Framework

Problem Structure: Drivers for DRR and CCA Integration

Biermann et al. (2010a) stated that earth system governance must cope with at least five characteristics of earth system transformation. These problems are uncertain, interdependent and extreme. This chapter argues that problem structure, in terms of Indonesia's vulnerability to natural hazards and climate change, is the main driver for DRR and CCA integration. The underlying aim of those activities is to reduce vulnerability. Everything comes together as a recipe for natural hazards to turn into disasters. Indonesia is highly exposed to danger, is extremely sensitive to shocks and has low adaptive capacity.

Indonesia is the world's largest archipelago with more than 17,000 islands and around 240 million inhabitants, making it the fourth most populous country in the world (BNPB 2011). Its geographical position at the intersection of the Pacific, Eurasian and Australian tectonic plates makes it extremely prone to volcanoes and earthquakes (BNPB 2011). Some of the more recent geological disasters include the 2004 Indian Ocean tsunami, which caused more than 230,000 casualties in Aceh and North Sumatra provinces. In 2010 alone, Indonesia suffered great casualties due to the tsunami which hit the Mentawai Island, flood in Wasior, West Papua and the eruption of Mount Merapi in Yogyakarta (BNPB 2011). The Intergovernmental Panel on Climate Change reported that the number of hydro-meteorological disasters has doubled in the last 5 years, whereas geological hazards have remained the same (IPCC 2007). The increasing impacts of climate

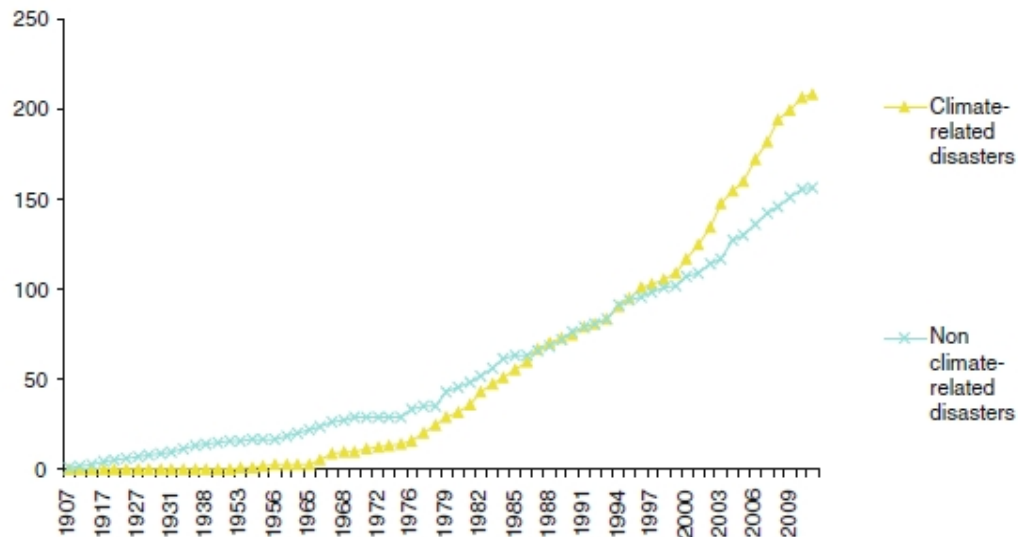


Fig. 9.1 Comparison in (cumulative) numbers of disasters due to climate-related and non-climate related disasters in Indonesia from the period 1907 to 2010 (*Source* modified from EM-DAT)

changes are expected to greatly increase the frequency, intensity and severity of disaster in Indonesia. Climate change will only exacerbate these existing problems in the country (UNDP Indonesia 2007). Several studies reiterate Indonesia's high vulnerability to climate disasters (Yusuf and Francisco 2009), with Jakarta coming only after Dhaka in Bangladesh as the most vulnerable city in WWF's climate vulnerability ranking of major cities in Asia (WWF 2009). Using data from "EM-DAT: The OFDA/CRED International Disaster Database", the numbers of disasters due to climate-related and non-climate related disasters in Indonesia from the period 1907 to 2010 are compared (see Fig. 9.1), and climate-related disasters affected 63 % of the 27 million people affected by climate-related disasters (EM-DAT 2011) (see Fig. 9.2).

Governance Principles: Barriers for DRR and CCA Integration

Biermann et al. (2010a) stated that there are four core governance principles needed to govern the earth system. These are credibility, stability, adaptability and inclusiveness. The second argument in this chapter is that ineffective governance hinders the possibility of DRR and CCA integration. Socially and economically, Indonesia is still struggling to fight poverty and social inequalities (World Bank Indonesia 2011). Lack of credible, stable and adaptive governance has created the underlying risks that lead to vulnerability to natural hazards in the first place (BNPB 2011). Even though strong progress on DRR has been observed in Indonesia, it only happens at the national level (BNPB 2011). Furthermore, while there have been many reports on strong collaboration between governments and NGOs, this tends to

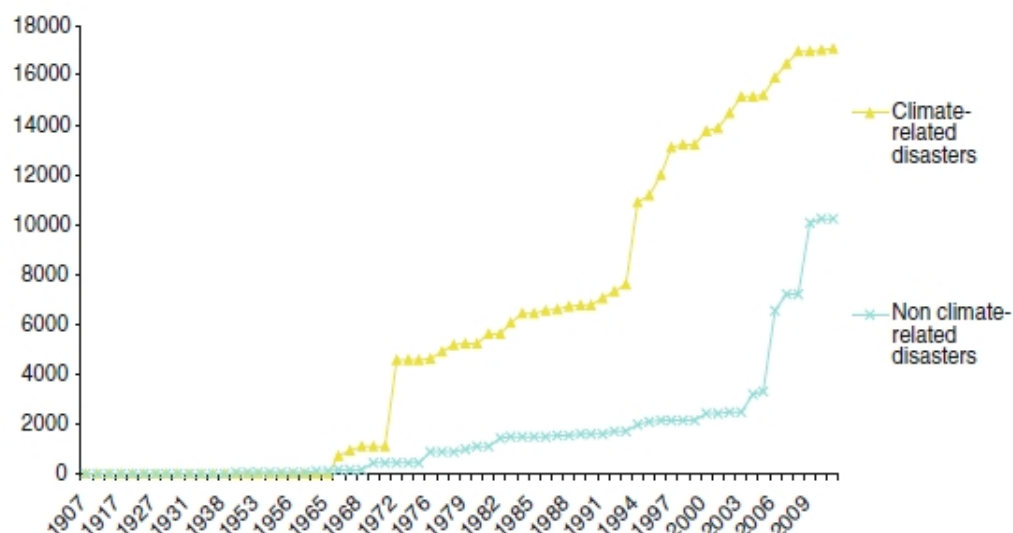


Fig. 9.2 Comparison in (cumulative) numbers (in 000) of people affected by disasters due to climate-related and non-climate related disasters in Indonesia from the period 1907 to 2010 (Source modified from EM-DAT)

happen only at the national level. There are few reports informing collaboration between the two at the local level.

There is insufficient support provided to the local governments to manage DRR and CCA, and decentralisation, while it has had some positive outcomes in terms of delegation of power, leaves local governments to fend for themselves. They, as the first respondents to disasters, just do not have the necessary skills and capability to manage disasters and to plan for long-term adaptation. They tend to rely heavily on financial and technical support from national governments (BNPB 2011). The results from the author interviews and the literature review suggest that local governments still have a very low capacity and capability to develop plans for climate change resilience (Thomalla et al. 2009; Thomalla and Larsen 2010; BPBD Makassar City, October 2010). The so called ‘big-bang’ of decentralisation in Indonesia has created difficulty in coordinating and aligning national and local planning and policies (Sudarmo and Sudjana 2009). Local governments tend to view climate change as an additional burden on top of more pressing problems such as education, social and economic development, and poverty alleviation.

Research Challenges: Barriers and Opportunities for DRR and CCA Integration

Biermann et al. (2010a) proposed five interdependent analytical problems in a quest for a better governance of the Earth System. They are architecture, agency, adaptability, accountability and legitimacy (the “Five As”). Furthermore, within each of these analyses, issues of power, knowledge, norms and scale need to be

considered. The last argument in this chapter is that in Indonesia, the Five As can be analysed as both the barriers to and opportunities for DRR and CCA integration.

Architecture: Nested Arrangements and Policy Frameworks

Biermann et al. (2010a) define governance architectures as the overarching system of public or private institutions, principles, norms, regulations, decision-making procedures and organisations that are validly active in an issue. Architecture is defined as the structure and the interlocking web of principles, institutions and practices that shape decisions by stakeholders at all levels. It spans global, regional, national and local governance and concerns the emergence, design and effectiveness of the systems. There are several questions to be answered when analysing architecture. One needs to understand how environmental institutions functions through their nesting and multi-level actions within larger or smaller architectures; how non-environmental governance systems affect the environment; how instances of “no governance” can be observed; and signs of overarching and crosscutting norms of earth system governance.

Table 9.2 shows the architecture for DRR and CCA at global, regional, national and local levels. As can be seen from the table, the architecture of these institutions has been established, and can continue to provide opportunities for integration. International organisations and NGOs (internationally and locally) have a crucial role in planning and implementing integrated activities.

In Indonesia, policies, plans, activities and institutions for DRR and CCA have traditionally evolved separately, as shown in Table 9.3. It can be seen that DRR activities have been formally conducted by the government since Indonesian independence in 1945. International influences on DRR and CCA policies have also come at a later stage. Indonesia was a signatory to the Climate Convention in 1992 and its subsequent actions clearly describes how international activities influence national policies for CCA. The 2004 Indian Ocean tsunami also strongly influenced international and Indonesian efforts in DRR. The “Hyogo Framework for Action: Building the Resilience of Nations and Communities to Disasters” was agreed during the World Disaster Reduction Conference in 2005 in Japan (UNISDR 2007). HFA is a ten-year plan to make the world safer from natural hazards and a first systematic and comprehensive approach in reducing disaster risks and losses (UNISDR 2007).

Agency: Review of Indonesia Key Policies and Institutions

The next issue to be analysed is “agency”. Agency encompasses all stakeholders from government agencies, non-government organisations, and private and community organisations. Biermann et al. (2010a) have stated that to effective

Table 9.2 Key institutions for DRR and CCA in Indonesia, from global to local level

Level	DRR	Integrated DRR and CCA	CCA
Global	<ul style="list-style-type: none"> - UNISDR - GFDRR - Global platform for DRR 	<ul style="list-style-type: none"> - Bali action plan on DRR and CCA - Nairobi plan - Cancun agreement (CCA also for DRR) - SREX report - International organisations and NGOs (international) initiating integrated DRR and CCA projects 	<ul style="list-style-type: none"> - UNFCCC - IPCC
Regional	<ul style="list-style-type: none"> - Asia DRR - ADRC - Asean DRR 	<ul style="list-style-type: none"> - Fourth Asian ministerial conference on disaster risk reduction through climate change adaptation (4AMCDRR) - Incheon REMAP - International organisations and NGOs (international) initiating integrated DRR and CCA projects 	<ul style="list-style-type: none"> - Asian adaptation platform
National	<ul style="list-style-type: none"> - Bappenas - BNPB - National platform for DRR 	<ul style="list-style-type: none"> - Funding agencies - UN organisations - International organisations and NGOs (international and national) initiating integrated DRR and CCA projects 	<ul style="list-style-type: none"> - Bappenas - DNPI - Ministry of eEnvironment
Local	<ul style="list-style-type: none"> - Bappeda - BPBD - NGOs - CBOs 	<ul style="list-style-type: none"> - International organisations and NGOs (international) initiating integrated DRR and CCA projects - CBDRM (include CC issues) 	<ul style="list-style-type: none"> - Bappeda - Environmental department - NGOs - CBOs

understanding earth system governance requires understanding of agents that drive it and that needed to be involved. Furthermore, Biermann et al. (2010b) suggested several core questions in ESG project such as what agency is, who the agents of earth system governance (especially beyond the nation state) are, how different agents exercise agency in earth system governance and how we can evaluate their relevance.

While the need to link the two approaches has been highlighted by many researchers, the operationalisation and implementation have so far been limited. Mitchell and van Aalst (2008) outlined several obstacles for convergence of international policy processes, multi-lateral and bi-lateral institutions, financing mechanisms, and implementation at national level. In developing countries, adaptation and disasters issues are usually managed by different institutions, each with their own inter-sectoral coordination groups (Mitchell and van Aalst 2008). This is also the case in Indonesia. Despite acknowledgement that disasters and climate change are one of the nine Indonesian development priorities, there has been little integration of sectoral agencies. While DRR is managed by the National Agency for Disaster Management (BNPB), CCA is managed by the National Council for Climate Change (DNPI) and the Ministry of Environment (MoE). There has been recognition of the integration of DRR and CCA by these agencies (Bappenas 2010; BNPB 2010; DNPI 2010b), but there has been little formally

Table 9.3 Policy frameworks for DRR and CCA in Indonesia

Guidelines, policies, strategies and activities relating to DRR and CCA		
Years	DRR	CCA
2011	- Third Global Platform for DRR - Indonesia named Global Champion for DRR	- UNFCCC COP 17 (to come) - SREX report to be published
2010	- National Guidelines for Disaster Management (Renas PB) 2010–2014 - National Action Plan for Disaster Risk Reduction (RAN PRB) 2009–2012	- UNFCCC COP 16: Cancun agreement - Indonesia Second National Communication (SNC) to the UNFCCC
2009	- Second Global Platform for DRR - Indonesian National Platform for Disaster Risk Reduction (Planas PRB)	- UNFCCC COP 15: Copenhagen Accord - Indonesia Climate Change Sectoral Map (ICCSR) - Indonesia Climate Change Trust Fund (ICCTF)
2008	- National Disaster Management Agency (BNPB) - Sub-National Disaster Management Agency (BPBD)	- UNFCCC Nairobi Work Programme - National Council for Climate Change (DNPI) - National Development Planning: Indonesia Response to Climate Change
2007	- Disaster Management Law No 24 Year 2007 - First global platform for DRR	- UNFCCC COP 13 in Indonesia - The Bali Road Map/Action Plan - National Action Plan Addressing Climate Change (RAN-PI) - First Sub-National Task Force on Climate Change Adaptation
2006	- National Action Plan for Disaster Risk Reduction (RAN PRB) 2006–2009	–
2005	- The National Coordinating Board for Disaster Management (Bakomas-PB) - Tsunami relief, rehabilitation and reconstructions started - Hyogo Framework for Action (HFA) - World Conference on Disaster Reduction (WCDR)	–
2004	- Indian Ocean Tsunami hit Aceh and Nias Island	- Indonesia ratified the Kyoto Protocol
2001	- The National Coordinating Board for Disaster Management and Refugees (Bakornas PBP)	–
1999	–	- First Indonesia's National Communication to UNFCCC
1997	–	- The Kyoto Protocol - Adaptation Fund established
1994	–	- Indonesia ratified the UNFCCC
1992	–	- Indonesia signed the Climate Convention

(continued)

Table 9.3 (continued)

Guidelines, policies, strategies and activities relating to DRR and CCA

Years	DRR	CCA
1990	–	– National Committee on Climate Change (KNPI)
1979	– The National Coordinating Board for Disaster Management (Bakornas PBA) and similar provincial agency (Satkorlak PBA)	–
1967	– The National Coordination Team for Disaster Management (TKP2BA)	–
1966	– The National Board for Disaster Management (BP2BAP)	–
1945	– The National Board for War Victim Supports (BPKKP)	–

managed collaboration. BNPB is not a formal member of the DNPI Adaptation Group while DNPI is not part of the National Platform for DRR (DNPI 2010a, 2011) nor be active in any BNPB-led DRR activities (BNPB 2010).

The latest figures from the United Nations Technical Working Group on DRR (UNTWG-DRR 2011) show that there are currently 154 organisations working on DRR in Indonesia, as set out in Fig. 9.3. As Fig. 9.3 shows, the organisational landscape for DRR is dominated by national and international NGOs. This indeed shows their significance and importance in driving DRR and also in initiating climate change issues within their DRR activities. To enable better coordination of a large number of agencies, several initiatives such as the UNTWG-DRR or Convergence Group for DRR, or lately, the National Platform for DRR are formed (Bappenas 2010). CCA activities should start with these DRR establishments.

Adaptability

Biermann et al. (2010a) stated that adaptability means a condition by which a state is able to adapt internally and externally to large-scale transformations of its natural environment. They explained that earth system governance must respond to the inherent uncertainties in human and natural systems, through combining stability to ensure long-term governance solutions with the flexibility to react quickly to new findings and developments. Some issues to be explored in understanding adaptability are: the politics of adaptability; the governance processes that foster it; the attributes of governance systems that enhance capacities to adapt; and, lastly, how, when and why does adaptability influence earth system governance. In Indonesia, adaptability seems to be driven by non-government organisations. These organisations have been involved in various pressing issues such as poverty alleviation, environmental management, gender strengthening and governance (IFRC 2010; Mercy Corps 2011;

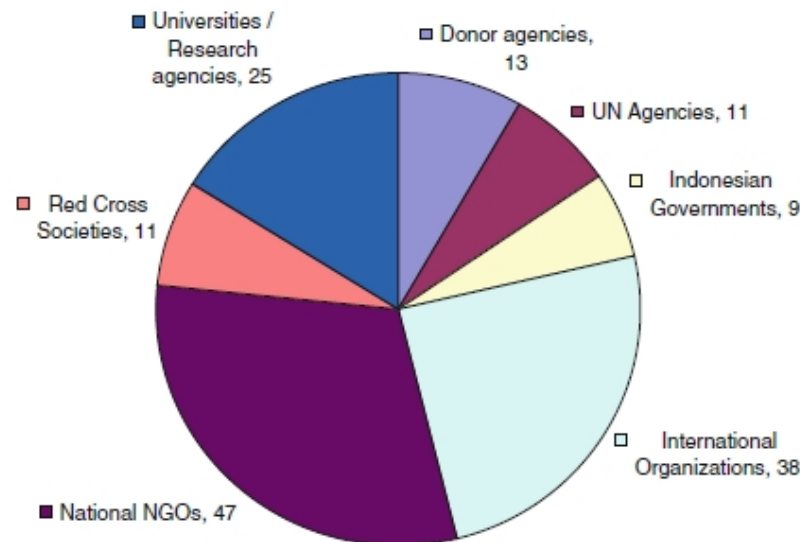


Fig. 9.3 Agencies and organisations involved in DRR and CCA in Indonesia (Source UNTWG-DRR 2011)

Oxfam 2011; PMI 2011). These experiences equip the organisations to be flexible yet robust enough to respond to changes and uncertainties. Interviews with these organisations revealed that there is strong collaboration and coordination happening at local and national level (IFRC 2010b; Mercy Corps 2010; PMI 2010). They have also acknowledged that DRR and CCA need to be practised together in the field. However, barriers still exist; organisations working traditionally for DRR generally have this understanding about integration. Furthermore, DRR has been on the whole better developed and implemented than CCA in Indonesia. Therefore any CCA activities should utilise the existing knowledge, practices, and networks.

Accountability

In understanding accountability, Biermann et al. (2010a) suggested that the complex character of earth systems confronts accountability and legitimacy of governance. Some key questions to be explored are the sources of accountability and legitimacy in earth system governance, the effects of different forms and degrees of accountability and legitimacy for the performance of governance systems, the mechanisms of transparency in ensuring accountable and legitimate earth system governance, and how institutional designs can produce the accountability and legitimacy of earth system governance in a way that guarantees balances of interests and perspectives. It is observed that decentralisation in Indonesia creates difficulty in coordinating and aligning national and local policies for DRR and CCA (Sudarmo and Sudjana 2009; BNPB 2011).

Allocation and Access

The last research challenge is that of allocation and access. Biermann et al. (2010a) suggested that earth system governance and other means of governance are basically concerned with distribution and allocation of goods. Governance is therefore a system that makes sure that these distributions are justifiable, fair and equitable. Questions to be answered include how can we reach interdisciplinary conceptualisations and definitions of allocation and access, what (overarching) principles underlie allocation and access, and how allocation can be reconciled with governance effectiveness. In Indonesia, allocation and access seems to be more of a problem at local government level. Indonesia's mid-term review of HFA stated that, while the national government was progressing quite well in DRR, local governments lagged behind. The reason for this is the lack of technical and financial support received by local governments from the national government or international organisations (BNPB 2011).

Discussions and Conclusion

Drivers, barriers and opportunities of DRR and CCA integration in Indonesia have been analysed in this chapter. The problem structure analysis shows that uncertainty and increasing extremity of climate-related disasters are the key drivers for integration. Examination of governance principles needed for effective integration of DRR and CCA shows that most principles still act as barriers to that integration. Next, the Five As are examined closely in this chapter. Accountability and allocation still act as barriers, while architecture, agencies and adaptability serve both as barriers to and opportunities for DRR and CCA integration. It is very important that Indonesia uses these identified opportunities to push integration forward. Roles of non-governmental organisations and international agencies have been successful in helping DRR and CCA at national level and these efforts should be directed more at the local government level.

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Author Biography

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CHAPTER 9

ADAPTIVE GOVERNANCE AND RESILIENCE TO DISASTERS: ROLES OF MULTI-STAKEHOLDER PLATFORMS FOR DISASTER RISK REDUCTION

Djalante, R. (2012). "Adaptive Governance and Disaster Resilience: the Role of Multi-Stakeholder Platforms in Disaster Risk Reduction." *Natural Hazards and Earth System Sciences* 12:2923-2942

9.1 Overview

Permission

The *Journal of Natural Hazards and Earth System Sciences* (NHES) is an Open Access Journal managed by Copernicus Publications on behalf of the European Geosciences Union. This paper is part of the Special Issue of *Natural hazard resilient cities*, edited by D. Serre, B. Barroca, and M.-C. Llasat. The executive editors are Fausto Guzzetti, Bruce D. Malamud, Stefano Tinti and Uwe Ulbrich. The NHES has an impact factor of 1.751. NHES is an interdisciplinary and international journal dedicated to the public discussion and open-access publication of high-quality studies and original research on natural hazards and their consequences. The most related scope of NHES to the paper is “*the design, implementation and critical evaluation of mitigation and adaptation strategies to reduce the impact of hazardous natural events on human-made structures and infrastructure, to reduce vulnerability, and to increase resilience of individuals and societies; and the analysis of the impact of climatic and environmental changes on natural hazards and their consequences*”.

Impacts of the paper

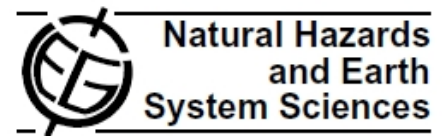
The paper is cited in the IFRC calls for submission Term of Reference document for 'Strategic research into national and local capacity building for disaster risk management' (IFRC, 2013). The IFRC provides US\$ 1.2 million to fund research on the roles of governance and institutions in strengthening national and local capacity building.

Introduction to the paper

This paper is related to Chapter 5, which explores the conceptual relationships and implications of AG concepts in building disaster resilience, in which four important characteristics (polycentric governance, participation, self-organisation and learning) are used as the key factors in analysing how the AG concept is implemented in Indonesia. I employ another Biermann et al. (2007) work to analyse the effectiveness of the MSPs, as through my interviews with a number of stakeholders in Indonesia, I recognise the importance of MSPs in helping to build resilience. The development of the MSPs is highly influenced by the United Nations (UN) International Strategy for Disaster Reduction's system operating at different levels. Particularly in Indonesia, the MSPs are further influenced by the UN and international organisations' operations.

9.2 The Paper in Published Format

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Review Article:

“Adaptive governance and resilience: the role of multi-stakeholder platforms in disaster risk reduction”

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Abstract. Disaster impacts are more frequent, deadly and costly. The social and environmental consequences are increasingly complex and intertwined. Systematic as well as innovated strategies are needed to manage the impacts. Disaster Risk Reduction (DRR) is a systematic approach to manage disaster risks while adaptive governance (AG) is suggested as an alternative approach for governing complex problems such as disasters. The author proposes that the AG can be practicalised through a mechanism of multi-stakeholder platforms (MSPs), interpreted as multiplicity of organisations at different scales of governance working towards more coordinated and integrated actions in DRR. Ten MSPs are selected at the global, regional, national and local level, focussing on the Indonesian MSPs. The literature reviews and in-depth interviews with key respondents in Indonesia show that the international and regional MSPs tend to have more human, technical and financial capacity than national and local MSPs. The author finds that most MSP roles focus on the coordination amongst multitudes of organisations. Only those MSPs that are able to generate new funding have the capacity to implement direct risk reduction activities. The development of the MSP is highly influenced by the UNISDR system operating at different levels. Particularly in Indonesia, MSP are also influenced by the operations of various UN and international organisations. Finally, the paper suggests the need for more provision of technical supports to local MSPs, more linkages with established networks in DRR and broader stakeholders involvement within the MSPs.

1 Introduction

There is a global concern that natural disasters are becoming more frequent, deadly and costly (UNISDR, 2011a; EM-DAT, 2010; Germanwatch, 2010; UNU-EHS, 2011; IFRC, 2010; Maplecroft, 2010). Disasters are also more complex and the impacts to the society and the environment are increasingly more intertwined. Disaster Risk Reduction (DRR) has been proposed as a systematic mechanism to reduce disaster risks by analysing and managing the causal factors of disasters including the reduction of vulnerability and improved preparedness for adverse events (UNISDR, 2011a). The Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities is the internationally agreed framework to guide the comprehensive and systematic application of DRR activities (UNISDR, 2007b). Resilience to disasters is defined as the ability of a community or society that is exposed to hazards to resist, absorb, accommodate and recover from hazards quickly and efficiently (UNISDR, 2009a), and building resilience has increasingly been adopted as the ultimate goal for DRR (UNISDR, 2011d).

Many researchers are calling for more innovative and integrated governance approaches in dealing with complex problems posed by disasters (Renn, 2008; Fung, 2006; Ikeda et al., 2008; IGRP, 2010). In this paper, governance is defined as the intentional shaping of the flow of events to realise desired public needs (Parker and Braithwaite, 2003), differentiated from government, which is taken to mean political authority or state control (Freeman, 1997). An adaptive governance (AG) approach is put forward as an alternative method of managing complex social-environmental problems including disasters (e.g. Brunner et al., 2005; Folke et al., 2005;

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Dietz et al., 2003; Djalante et al., 2011). AG calls for new governance systems that are “less rigid, less uniform, less prescriptive and less hierarchical, and promise a more innovative but effective way of dealing with complex environmental problems” (Holley, 2010). One proposed innovation for more flexible and participatory methods of governance is through the multi-stakeholder platform (MSP), defined by Steins and Edwards (1999, p. 244) as:

“Decision making bodies (voluntary or statutory) comprising different stakeholders who perceive the same resource management problem, realise their interdependence for solving it, and come together to agree on action strategies for solving the problem.”

The United Nations International Strategy for Disaster Reduction (UNISDR) explains the MSP as a mechanism that serves as an advocate for DRR towards coordination, analysis and advice on areas of priority needing concerted action (UNISDR, 2007a). The author similarly defines the MSP as a multiplicity of organisations at different scales of governance working towards more coordinated and integrated actions in DRR. Recent global reviews on the progress in DRR, such as the Mid-Term Review of the HFA (UNISDR, 2011e) and the Global Assessment Report (UNISDR, 2011a), stated that MSPs play important roles in integrating DRR into sustainable development policies and supporting less developed countries in implementing the HFA (UNISDR, 2011a). However, despite increasing recognition of the role of MSPs, there have been no studies that comprehensively examine the roles, interlinkages and collaborations between MSPs to build disaster resilience. This paper establishes that MSPs can be an alternative mechanism to implement AG, which can in turn help to build resilience to disasters.

Taking the global, regional (Asia) and Indonesia MSPs as the case studies, the paper asks the following two questions:

1. How are MSPs formed, organised and coordinated?
2. How are the MSPs linked, when do they collaborate, and to what extent do the global and regional MSPs support the Indonesian MSPs in building disaster resilience?

The first question is addressed by applying the proposition of Djalante et al. (2011) on the relationships between the key characteristics of AG (polycentric and multi-layer institutions, participation and collaboration, self-organisation and networks, and learning and innovation) and their implications in building disaster resilience. This framework is utilised since it is the only framework that specifically and systematically reviews the relationships between AG and disaster resilience. The following analytical questions are in reference to

1. Polycentric and multi-layer institutions: How do the MSPs complement existing forms of DRR governance?

2. Participation and collaboration: To what extent are these MSPs inclusive of diverse members of society?
3. Self-organisation and networks: Are these MSPs actively mapped into the broader networks of inter-MSP collaboration?
4. Learning and innovation: How do experiences from past disasters affect the development and operation of MSPs?

The second set of questions is addressed by applying the Biermann et al. (2007) framework on partnership implementation deficit. The framework is the one that specifically examines the effect of collaboration and partnership in development sector. The original analytical factors are slightly modified in this paper, forming the following questions:

1. Do the MSPs have the required capacity (human/organisations and technical resources) to implement their programmes and support other MSPs?
2. Do the MSPs generate new sources of funding and to what extent do these funds evolve to other MSPs?
3. Do the MSPs focus on direct effects in reducing disaster risks or target more vulnerable groups?

Indonesia is selected as the case country because of its vulnerability to multiple natural hazards, mainly geophysical and hydro-meteorological (EM-DAT, 2011; Maplecroft, 2010; The World Bank, 2005). There have been approximately 400 natural disasters that have killed close to 241 000 people, affected almost 28 million people and cost approximately US\$24 billion (EM-DAT, 2011). Another reason for selecting Indonesia amongst other countries in the region is that there has been strong progress and proliferation of MSPs at the national and local level, and also thematically for HFA, which makes the country stand out amongst others. To provide a comprehensive overview by which the MSPs operate, the analyses include those at the southeast Asian and Asian regions within which Indonesia is located. Selecting the region is also important considering that it is most vulnerable to natural hazards (UNU-EHS, 2011; EM-DAT, 2010; Germanwatch, 2011) and climate change (Maplecroft, 2011; IPCC, 2007).

This paper is part of the larger study that examines the interlinkages between the concepts of AG, resilience and DRR, and apply those concepts to examine activities and institutions involved in building resilience to disasters and climate change in Indonesia. Several related publications include important processes and components of disaster resilience (Djalante and Thomalla, 2011), AG and DRR (Djalante et al., 2011), progress in building resilience in Indonesia through the implementation of the HFA (Djalante et al., 2012), and integration of DRR and climate change adaptation (CCA)

in Indonesia (Djalante, 2013; Djalante and Thomalla, 2012). This paper contributes to the larger study through utilising the key findings from the paper on the relationships between AG and disaster resilience (Djalante et al., 2011) to analyse the roles of MSPs in DRR, to build resilience in Indonesia.

2 Methodology

This paper utilises a combination of methods for data collection. Discussions of MSPs were sourced from the academic literature as well as from reports published by organisations with experience in implementing or researching MSPs in different sectors. The author conducted Internet searches using the keywords “multi-stakeholder platforms or forums for DRR” performed both in English and Bahasa Indonesia. In-depth key informant interviews were conducted with 8 personnel of key organisations related to the Indonesian MSPs (Table 1). The interviews took place between October 2010 and January 2011, focussing on collecting information on

1. activities related to DRR and CCA,
2. progress in building disaster resilience and
3. the roles of MSPs in building disaster resilience in Indonesia.

3 Multi-stakeholder platforms for disaster risk reduction

3.1 Conceptual review

MSPs increasingly receive a great deal of attention in literature. MSPs are researched and implemented in natural resource management in general (e.g. Lockwood et al., 2010) or in specific sectors, such as water (e.g. Leach et al., 2002; Warner, 2005, 2006; Pahl-Wostl, 2008; Moellenkamp et al., 2010; Hemmati, 2002b) and forests (e.g. Elbakidze et al., 2010; Christensen et al., 2008). There are three key elements of MSPs: “multi”, “stakeholder” and “platform” (Warner, 2006). “Multi” refers to the diversity of stakeholders (Warner, 2006). “Stakeholders” are individuals, groups or organisations that have stakes or interests, directly or indirectly, in the resources or problems at hand (World Bank, 2007). “Platform” means “dialogues, fora, partnerships and learning alliances” (Warner, 2006).

The objective of an MSP is mainly to create a space for the empowerment and active participation of common stakeholders intending to search for solutions to a common problem (Faysse, 2006). This is further differentiated into three key strands: “a mechanism of alternative dispute resolution, for adaptive management and as a vehicle for democracy and emancipation” (Warner, 2006). It is expected that an MSP

will create a space for better and more acceptable decisions than those made without stakeholder participation (Hemmati, 2002a) or through one-to-one negotiations (Warner, 2006). Furthermore, Bäckstrand (2006) added that MSPs can achieve positive outcomes provided that there are clear linkages between institutions, agreement, clear targets, accountability, and mechanisms of evaluation to assess processes.

There are, however, several challenges in implementing MSPs. Faysse (2006) identified five main issues affecting the implementation of MSPs. These are power relationships, platform composition, stakeholder representation and capacity for meaningful participation, mechanisms for decision-making, and the cost of creating a MSP. Faysse (2006) further identified that “unfavourable circumstances” for MSPs are social inequalities, a state with a political structure that is either too strong or too weak to support a MSP processes or decisions, disorganised stakeholder groups, and a lack of financial and technical capacities to implement MSPs.

3.2 A proliferation of MSPs from a global to a local levels

There is a proliferation of MSPs worldwide, especially within the UNISDR system. There is one global, seven regional, (Africa, the Americas, Arab States, Asia, Europe, the Pacific), and 75 national platforms (PreventionWeb, 2011d). These are complemented with a multitude of thematic platforms, groups of DRR community with specific technical expertise focussing on the implementation of the HFA (include risk identification, vulnerability assessment, early warning, El Niño, drought, floods, water risks, wild land fire, environment, climate change, education, vulnerability assessment, disaster recovery, and capacity development) (UNISDR, 2012b). In Indonesia there are approximately 8 documented MSPs: 1 national; 3 local, mostly established in high-risk and frequently disaster-affected areas such as Aceh, Padang and Yogyakarta; a university forum; an education thematic platform at the national level; and thematic platform focussing on particular regional hazards, for example, the Merapi Volcano Forum and the Bengawan Solo River Forum (UNDP Indonesia, 2008).

Ten MSPs were selected for this study, three at the international level, two at the regional level and five MSPs from Indonesia. Consistent with the study’s goal to explore the interlinkages of the MSPs and to examine the extent by which the global and regional MSPs facilitate the Indonesian MSPs in implementing DRR, the 10 MSPs are selected to capture diversity along the following dimensions: (a) they have strong progress at their respective level, (b) they have different mandates and roles, (c) they have the most diverse memberships, including governments, international organisations, non-government organisations (NGOs) and funding organisations, and (d) these MSPs have strong links to the selected Indonesian MSPs.

Table 1. List of organisations included in the interviews on MSPs in Indonesia.

No	Organisation	Category	Role	Level of operations
1.	BAPPENAS	Government	National Development Planning Agency	National
2.	BNPB	Government	National Disaster Management Agency	National
3.	The World Bank	Funding organisation	Funding for DRR and CCA	National
4.	UNDP	UN	Funding for DRR and CCA	National
5.	SCDRR (Safer Communities through Disaster Risk Reduction)	Multi-stakeholder	DRR projects	National
6.	Indonesia National Platform (Planas PRB)	Multi-stakeholder	National Platform for DRR	National
7.	MPBI	CSO	DRR and CCA advocacy	National
8.	IFRC	International organisation	DRR and CCA advocacy	National

Table 2 lists the scale, year formed, members, goals and mandates as well as example of the MSPs' key activities. The three MSPs at the international level vary in mandates, memberships, and activities. The Global Platform (GPDRR) is the foremost forum for stakeholders working, researching, planning and implementing DRR (UNISDR, 2012c). It is a non-binding declaration of intent that focuses on the vulnerability and resilience of a population or territory, rather than on the nature and intensity of the hazard. The Global Network for Disaster Reduction (GNDR) is initiated, run and coordinated by NGOs, civil society and community-based organisations to strengthen their roles in working together to improve the lives of disaster-affected communities (GNDR, 2011a). The Global Facility for Disaster Reduction and Recovery (GFDRR) operates as a financial institution that comprises donor countries and international organisations under the coordination of the World Bank (GFDRR, 2011). It is a financial mechanism and a partnership which leverage technical ability together with funding support (GFDRR, 2012g).

The Asian Regional Platform (ARPDrr) and the Asian Cooperation on Disaster Management (ACDM) are the largest and most diverse gathering of DRR organisations in the region. The ARPDrr acknowledges both the Asian Ministerial Conference on DRR (AMCDrr) and the ISDR-Asia Partnership (IAP), an informal group that aims to promote regional coherence and DRR coordination in the Asia region (UNISDR-AP, 2010). The ACDM is under the auspice of the ASEAN to accelerate and synergise DRR activities and improve diplomacy among the members (ACDM, 2009). Though ACDM is an ASEAN inter-governmental process, this study considers it a MSP due to the importance of committee in the region and active involvement other international partners in ACDM meetings and activities. Indeed, the UNISDR states that Inter-governmental collaboration is key to addressing DRR at a regional level (PreventionWeb, 2011a).

All Indonesian MSPs are created to improve the DRR coordination in the country. The National Platform aims to help coordinating DRR stakeholders in Indonesia and to influence national government policies (Planas PRB, 2009). The UNTWG-DRR was formed in 2002 to improve UN coordination to promote and facilitate DRR in Indonesia (UNTWG, 2006a). The CDE is a thematic platform to coordinate DRR stakeholders working on disaster education and advocate for disaster education consideration within Indonesian curriculum (UNTWG, 2008). Locally, the Yogyakarta Forum is a collaboration space for DRR stakeholders in Yogyakarta (YLPDRR, 2011), while the Merapi Forum (2006–2008) encompasses two local governments and NGOs working in the aftermath of the Merapi volcanic activity (UNDP Indonesia, 2008).

4 Analysis

4.1 Multi-stakeholder platforms as a way to implement adaptive governance

Different schools of thought influence the development of adaptive governance (AG) theories. Holling (1978) introduced his works on social-ecological systems and adaptive management, which was developed further into the notion of cooperative management and collaborative governance (e.g. Plummer and Fennell, 2009; Carlsson and Berkes, 2005). Then the concept of adaptive co-management is developed, combining adaptive management and cooperative management (Olsson et al., 2004). One major theoretical contribution to AG literature stems from the works of Ostrom and colleagues who extensively explore issues of common pool resources, polycentricism and adaptive governance of complex systems (Dietz et al., 2003; Brunner et al., 2005; Ostrom, 1990). Some of the more current studies are on multi-level governance (Hooghe and Marks, 2003), new

Table 2. Multi-stakeholder platforms for disaster risk reduction from a global to a local level.

No	Platform	Scale/ year formed/ members	Goal(s)/Mandate(s)	Example of key activities
1.	GPDRR	Global/ 2005/ 152 governments and 137 organisations	To sustain worldwide momentum to build the resilience of nations and communities to disasters	Has held 3 meetings since 2007 Supports 6 regional and 78 national platforms
2.	GNDR	Global/June 2007/ 78 NGOs/CSOs (community-based groups, national and international NGOs, research institutions)	To work together to improve the lives of people affected by disasters worldwide	"Views from the Frontline" (global and independent measurement of HFA progress at the local level) "Actions at the Frontline" "Texts from the Frontline"
3.	GFDRR	Global/ 2006/ 38 countries and 7 international organisations	To help developing countries particularly those identified as the most vulnerable to natural disaster to enhance their capacity for DRR.	Track I: to enhance global and regional partnerships Track II: to mainstream DRR into development Track III: standby recovery financing facility
4.	ARPDOR	Asia/ 2003/ 37 active institutions (donors, IGOs, CSOs, UN, international organisations, and media)	To improve regional coordination and coherence in DRR activities and HFA implementations	The AMCDOR is the "political arm" and the ISDR-Asia Partnership (IAP) is the action arm AMCDOR has been held four times since 2005.
5.	ACDM	Southeast Asia/ 2003/ 10 ASEAN member states and partners (UN, OCHA, UNHCR, UNICEF, IFRC, ADPC, ADRC)	To accelerate and synergise DRR activities, foster dialogue, promote confidence and preventive diplomacy	ASEAN Disaster and Emergency Response ASEAN Coordinating Centre for Humanitarian Assistance ASEAN Regional Programme on DM 2004–2010

environmental governance (Holley et al., 2011) or adaptive governance of social-ecological systems (Folke et al., 2005).

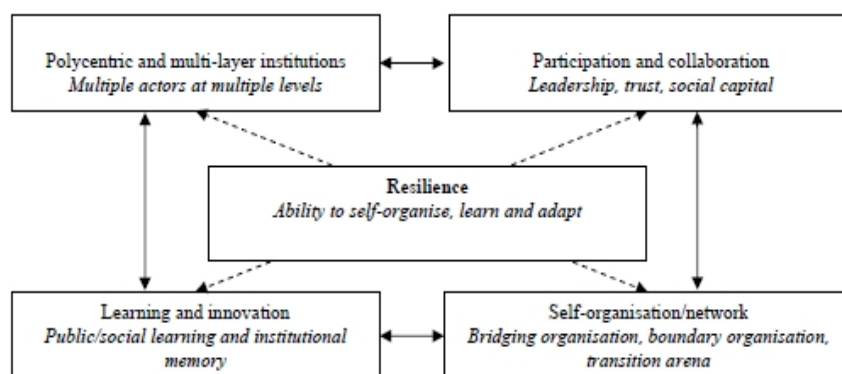
The relationships between AG and DRR is explored in detail by Djalante et al. (2011), utilising resilience to bridge the two concepts together. The application of resilience in DRR studies gained worldwide interest specifically after the adoption of the concept in the HFA. Resilience is interpreted essentially as the ability to self-organise, learn and adapt (Carpenter et al., 2001). It is researched, applied and understood differently in different schools of thought (Djalante and Thomalla, 2011; Manyena, 2006; Klein et al., 2003). Holling (1973) pioneered the application of resilience in the field of ecology, while other scholars examined engineering resilience (e.g. Wildavsky, 1988), economic resilience (e.g. Rose, 2007) or social-ecological resilience (Folke, 2006). Resilience in DRR matters, not only as an outcome, but also as a process (Djalante and Thomalla, 2011), is measured differently (e.g. Bruneau et al., 2003), and needs to be considered as an integrated approach (e.g. Paton and Johnston, 2006) of disaster preparedness (e.g. Paton and Johnston, 2001), mitigation (Tobin, 1999), emergency

management and response (Van der Torn and Pasman, 2008) to recovery (CCE, 2000). There are also large volumes of DRR literature that offer frameworks on how to build community resilience (e.g. Cutter et al., 2008; Norris et al., 2008; US/TOTWS, 2007; IFRC, 2008; Twigg, 2007).

Djalante et al. (2011) suggested four AG characteristics that are important for disaster resilience: polycentric and multi-layer institutions, participation and collaboration, self-organisation or flexible networks, and learning and innovation (see Fig. 1). They stated that polycentric and multi-layer institutions are considered the most important factor in this depiction. This particular institutional arrangement, supported by leadership, trust and social capital, is crucial for participation and collaboration. They further suggested that self-organisation could be materialised formally or informally in different types of arenas and networks. These networks could help enhance learning and innovation, and ultimately create supporting environments for building disaster resilience (Djalante et al., 2011).

Table 2. Continued.

No	Platform	Scale/ year formed/ members	Goal(s)/Mandate(s)	Example of key activities
6.	Indonesia National Platform	National/ 2009/ Government, CSOs, academia, international communities, media, private organisations	To support and facilitate cooperation among stakeholders on DRR in Indonesia	Advocacy on policy, planning and institutions, promoting educations for DRR Involved in HFA progress reviews 2009 and 2011
7.	UNTWG-DRR	National/ 2002–2010/ OCHA and UNDP are the co-chairs	To improve coordination and enhance the UN roles in promoting and facilitating DRR	Convergence Group Aceh and Nias recovery and reconstruction Capacity building
8.	Consortium for Disaster Education	National/ 2006/ 48 NGOs	To coordinate various actors on DRR education in Indonesia	Advocacy for the integration of DRR within the school curriculum Drafting of disaster education mainstreaming
9.	Yogyakarta Forum for DRR	Sub-national (Province)/ 2009/ 38 local government agencies, 40 NGOs	To serve as platforms for all stakeholders concerned with DRR in Yogyakarta	Emergency management: Merapi volcano eruption (2010) Yogyakarta DM Guidelines and Action Plan for DRR 2011–2013
10.	Merapi Forum	Local/ 2006–2008/ 4 local governments, 8 NGOs and international organisations	To increase synergy and collaboration among the local governments and other organisations	This is a good example of ecosystem-based management for DRR Emergency management: Merapi eruption (2006)

Fig. 1. Relationships between adaptive governance and resilience (Source: Djalante et al., 2011)¹

The following sub-sections interrogate the MSPs in relation to each of the four characteristics to help answer the first question of the paper on how MSPs are formed, organised and coordinated. Each sub-section systematically discusses the MSPs from a global, regional, national and local level.

4.1.1 Polycentric and multi-layer institutions: how do multi-stakeholder platforms complement existing forms of governance for disaster risk reduction?

McGinnis (1999) states that polycentric government systems essentially involve different types of governing authorities at various levels, by which in such systems, many of the roles previously held by a central government are now carried out by non-state actors, including administration, regulation, management and mediation. One of the most notable

¹Solid line arrows represent the main relationships, while the dashed lines represent the indirect relationships between the characteristics.

characteristics of MSPs is that they comprise various organisations: government, non-government, local and international agencies. This is a significant step toward greater involvement of non-government entities in DRR planning and implementation in a traditionally government-driven activity.

Table 3 summarises the key events in the MSPs development. DRR received international attention in the early 1990s. The UN declared the period as the International Decade for Natural Disaster Reduction (IDNDR), driven by the increasing impacts of disasters on human casualties as well as property and economic damage in the 1980s (United Nations, 1989). One of the IDNDR outcomes was the adoption of the “Yokohama Strategy for a Safer World: Guidelines for Disaster Prevention, Preparedness and Mitigation” during the UN World Conference on Natural Disaster Reduction (WCNDR) in 1994 (IDNDR, 1994). It was a big shift in the disaster management paradigm from prevention to preparedness and mitigation. The Yokohama strategy called for systematic and comprehensive vulnerability reduction and stakeholder involvement including those who are the most vulnerable. Therefore, the role of technology supported by a strong political commitment to reduce disaster risk needs to be pushed forward (IDNDR, 1994). The early period of the MSP establishment progressed mainly at the international level. In 1999, the International Strategy for Disaster Reduction (ISDR) was established to support DRR efforts internationally (UNISDR, 2011d). In lieu of the ISDR formation, multi-stakeholder collaborations were initially implemented through the formation of the Inter-Agency Task Force on Disaster Reduction (IATF-DR) (UNISDR, 2000a). The development of the IATF-DR created a shift in the management of DRR. The mandated was intended to serve as the main forum within the UN systems in DRR and to convene ad hoc meetings of experts on issues on DRR (UNISDR, 2000b). During the period of 2000–2005, the members included the Under-Secretary-General for Humanitarian Affairs and the Director of the ISDR Secretariat, 16 UN agencies/organisations/programmes, 10 regional entities and 8 civil society organisations (UNISDR, 2000a).

The year 2005 marked the enormous progress on the establishment of key frameworks and institutions for DRR following the establishment of the UNISDR systems. The HFA was adopted during the 2005 WCNDR in Kobe (UNISDR, 2005). The UNISDR established the Global Platform as the successor for the IATF-DR (UNISDR, 2011b). The GFDRR was later formed in 2006 as the key financial institutional support which also build partnerships and leverage technical capacity in DRR for the recipient countries (GFDRR, 2011). The formation of this Global Platform marked the greater and more extensive involvement of stakeholders beyond those originally involved in the IATF-DR. Through the UNISDR system, regional platforms are established worldwide (Africa, the Americas, Arab States, Asia, Europe, the Pacific) (PreventionWeb, 2011b). Further, the global and regional platforms conduct more reported activities than na-

tional platforms. Based on data from PreventionWeb, by October 2011 there have been seven key events, two regional ministerial meetings, four regional HFA progress reports and 13 key documents submitted (PreventionWeb, 2011c). These events, meetings and documents exhibit considerably uniform progress among the six regional platforms. The operation of the Asia Regional Platform involves building and gathering support from sub-regional institutions such as the south Asian Association for Regional Cooperation, the ASEAN Secretariat and the Secretariat of the Pacific Community (UNISDR-AP, 2010).

Currently, 78 out of the 224 nations and territories involved in the Global Platform have their own national platforms (PreventionWeb, 2011d). However, only seven (Indonesia, Iran, the Philippines, Colombia, China, Sri Lanka and Afghanistan) of the 15 countries with the greatest risk according to the Natural Disaster Risk Index 2010 (Maplecroft, 2010) have their own national platforms (PreventionWeb, 2011d). The structures of the MSP at the national level vary across countries: some national platforms are parts of governments, while others are not. For example, of the 18 national platforms established in Europe, two are NGOs and 15 are governmental bodies, while France combines the two (UNISDR, 2011f). In Asia, there are only seven countries (China, Japan, Iran, the Philippines, Sri Lanka, Kazakhstan and Indonesia) that have formally established their national platforms (UNISDR, 2009b). The establishment of national platforms was requested in an UN Economic and Social Council Resolution (ECOSOC) resolution of 1999/63 and in three General Assembly resolutions of A/RES/56/195, A/RES/58/214 and A/RES/58/215 (UNISDR, 2011h). The ECOSOC 1999/63 “called on all Governments to maintain and strengthen established national and multi-sectoral platforms for natural disaster reduction in order to achieve sustainable development goals and objectives, with the full utilisation of scientific and technical means”. This is complemented with the UN General Assembly Resolution A/RES/59/231 in 2005 which “called upon governments to establish national platforms or focal points for disaster reduction, encouraged government to strengthen platforms where they already exist, urged United Nations system to provide appropriate support to those mechanisms” (UNISDR, 2011h).

The interview with the Indonesian National Platform representative stated that the platform’s 2009 organisational structure consists of a directing board (3 members), supervising board (3 members), executive board (5 members) as well as 5 coordinating sections on institutions and organisations, education, information and public awareness, partnerships and capacity development. Personnels filing in the structure represent BNPB (The National Disaster Management Agency), the Indonesian Red Cross, several UN organisations (UNDP, UNESCO), universities, international and national NGOs as well as those from media and private agencies (MPBI, 2011). This structure was revised in 2011, con-

Table 3. Important timelines for multi-stakeholder platforms from global to local scale.

Year	Activities
2012	–5th AMCDRR to be held in Yogyakarta, Indonesia
2011	–Third Session of the GPDRR meeting in Geneva, hosted concurrently with the World Bank for the World Reconstruction Forum –Indonesian President received the honour of “The Global Champion for DRR” from the UN Secretary General –HFA Mid-Term Review –ARF DiRex disaster relief exercise in Manado, Indonesia – <i>The Japan Earthquake, Tsunami and Fukushima Nuclear Crisis</i>
2010	–4th AMCDRR meeting in Incheon, Korea on DRR and CCA integration, resulted in Incheon Declaration –The ACDM adopted the AADMER work programme for 2010–2015 –AHA Centre created and centred in Indonesia – <i>Mt Merapi volcanic eruption in Yogyakarta, Indonesia</i>
2009	–Second Session of the GPDRR meeting in Geneva: Creating Linkages for a Safer Tomorrow –1st GAR report on DRR launched –Indonesia National Platform established –Yogyakarta Provincial Platform for DRR formed
2008	–3rd AMCDRR meeting in Kuala Lumpur (KL declaration on MSPs for DRR) –Cyclone Nargis in Myanmar
2007	–First Session of GPDRR meeting in Geneva: Acting with common purpose –GNDR was officially launched during the GPDRR meeting –AMCDRR 2nd meeting in New Delhi, India, which adopted AMCDRR as the “political arm” and the ISDR-Asia Partnership (IAP) as the “action arm” of the Asian Platform

sisting of 9 members of the directing board and 26 for the implementing board (BNPB, 2011b). In total, the representatives are comprised of 3 governments, 4 academies and universities, 13 civil societies and national NGOs, 2 media, 5 business, 1 red-cross and 6 religious based organisations, which show more involvement of national NGOs as well as private organisations than the 2009 structure. The local MSPs in Indonesia seemed to still be nominated by local government agencies that have responsibility for directing, managing and financing DRR programmes and activities. Hence, the local MSPs do not appear to play a greater role beyond those that are supposed to be government responsibilities. The activities are also project based, implemented and finance through a international project, following high scale disasters. For example, the Yogyakarta platform is developed through the SCDRR project. Yogyakarta is one of the six priority locations for the project, especially following the 2006 and 2010 earthquakes and volcanic eruptions (SCDRR, 2008). Bappeda (the local planning agency) leads the platform and holds the secretariat (YLPDRR, 2011).

In summary, the MSPs are to some extent able to complement DRR activities beyond what is traditionally the responsibility of governments. MSPs bring new nuance by which

inclusion and participation of other agencies is recognised, strengthened and enhanced. This, however, tends only to happen at the global, regional and national level. At the local level in Indonesia, the role of the MSPs seems to be on the administrative and structural sphere only, and the extent to which they influence decision making in DRR planning and implementation is still unclear.

4.1.2 Participation and collaboration: to what extent are these multi-stakeholder platforms inclusive of diverse members of society?

One of the underlying reasons for the formation of MSPs is to enable better participation and coordination, especially among diverse members of civil society. Figure 2 shows the number of NGOs and government organisations represented in different MSPs, which demonstrates the importance of NGOs and other international organisations that have been considered important players and have taken on major roles in building disaster resilience worldwide.

The highest level of involvement of these non-government entities is at the international level, especially within the GPDRR. NGOs comprise the entire network of GNDR, the Indonesia National Platform and CDE. Almost equal

Table 3. Continued.

Year	Activities
2006	<ul style="list-style-type: none"> –GFDRR established –CDE formed in Indonesia –Merapi Forum formed in Yogyakarta, Indonesia –Yogyakarta Earthquake
2005	<ul style="list-style-type: none"> –UNISDR System established –Global Platform formed as the successor of the IATF/DR –WCDR conference, Kobe, Japan –The Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters developed –GFDRR established; charter revised in 2010 –AMCDRR 1st meeting in Beijing –AADMER ratified by 10 ASEAN countries –UNTWG-DRR in Indonesia co-chaired by OCHA and UNDP
2004	<ul style="list-style-type: none"> –ACDM developed an ASEAN Regional Programme on Disaster Management (ARPDM) 2004–2010 –The Indian Ocean tsunami
2003	<ul style="list-style-type: none"> –IAP formed –ACDM established
2002	–UNTWG-DRR formed in Indonesia
1999	<ul style="list-style-type: none"> –ISDR adopted by the UN General Assembly –IATF/DR launched
1994	–World Conference on Natural Disaster Reduction and Yokohama Strategy and Plan of Action for a Safer World adopted
1989	–The General Assembly of the United Nations designated the 1990s as the International Decade for Natural Disaster Reduction (Resolution 44/236)

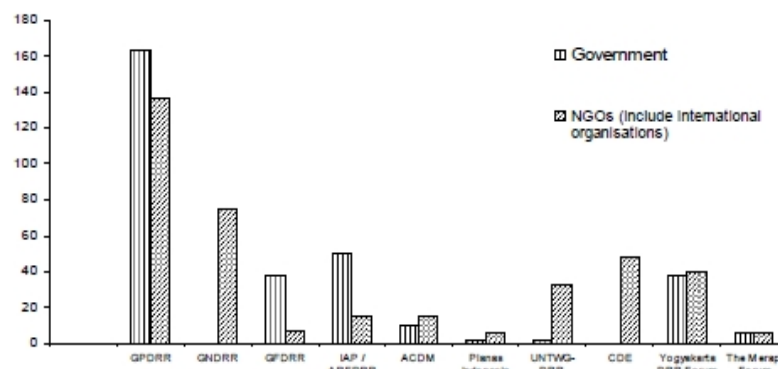


Fig. 2. Number of government and NGO members in different MSPs (source: calculated from GPDRR, 2011a; GNDR, 2012a; GFDRR, 2012g; ACDM, 2009; Planas PRB, 2009; UNTWG, 2006b; YLPDRR, 2011; UNDP Indonesia, 2008).

representation between the government and NGOs is observed within the ACDM, Yogyakarta Platform and the Merapi Forum. The NGOs are comprised of mostly international and local NGOs, and to a lesser extent, media and private agencies. Active representation of NGOs as well as international and community-based organisations within the MSP is a positive step towards participation and collaboration. However, the way by which the organisations are involved and influence the decision-making processes is still not clear within the MSPs and for DRR in general.

4.1.3 Self-organisation and flexible networks: Are these multi-stakeholder platforms actively mapped into broader networks of collaboration among other stakeholders?

Networks are typically informal, self-organised governance systems, which can include a variety of actors from different organisational levels working together with a common purpose (Folke et al., 2005, p. 450). There are several examples by which the MSPs have actively mapped themselves into the broader network of inter-MSP collaboration. The IATF, formed in 2000, was considered the embryo of the GPDRR (UNISDR, 2000). The third meeting of the GPDRR was held concurrently with the World Reconstruction Forum, hosted by the World Bank and the GFDRR (UNISDR, 2011h). The GNDR is another example of self-organisation in MSPs, as it provided an avenue through which the NGOs involved in the GPDRR could strengthen their presence and voice as well as giving NGOs stronger representation at the grassroots level (GNDR, 2012a).

Rather than creating new entities with similar functions, the Asia Ministerial Conference (AMCDRR) was adopted as the “political arm” of the Asia Regional Platform on DRR, and the IAP was adopted as its “action arm” (UNISDR-AP, 2010, p. 11). The Asia partnership functions were revised in 2005 to also serve as the UNISDR-managed Asia Regional Platform for DRR (UNISDR-AP, 2010).

The formation of the Indonesia National Platform was, to a certain extent, facilitated by the already established Convergence Group, managed by the UNTWG-DRR. Moreover, the CDE is the education working group within the Convergence Group. Most Merapi Forum members then became actively involved in the Yogyakarta Platform for DRR (YLP-DRR, 2011).

The above discussions show that the MSPs, to certain degree, actively mapped themselves into the broader network of inter-MSP collaboration. What is needed now is a greater capacity for the MSPs to be able to strengthen their internal capacities so that they can take advantage of the opportunities to implement their mandates and purposes.

4.1.4 Learning and innovation: how do experiences from past disasters affect the development and operation of the multi-stakeholder platforms?

Lave and Wenger (1991) define learning as the process of active social participation and dynamic integration of people with their environment to construct meaning and identity. Table 3 shows some key activities undertaken by the selected MSPs, complemented with key events influencing DRR planning and policies. Several key disaster events highly influenced the development of MSPs in Indonesia, Asia and also globally: the 2004 Indian Ocean tsunami, the Yogyakarta earthquake and Merapi volcanic eruption, and lately the Great Tohoku triple disaster of earthquake, tsunami and nuclear crisis in Japan.

The Indian Ocean tsunami in 2004 affected 13 countries mostly in Asia and Indonesia was impacted by the tsunami the most. There were 165 708 deaths, almost 533 000 people affected, and costed US\$ 4 451 600 000 damage to the country (EM-DAT, 2012). The catastrophic tsunami elevated awareness as well as created greater political commitment for DRR, globally and especially in the Asian region.

In Asia, the AMCDRR first meeting was held in 2005, as the official international conference of ministers and experts involved in disaster management in Asia. The 10 southeast Asian countries involved in ACDM immediately adopted and ratified the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) (ASEAN, 2005). The ASEAN Secretary stated in his speech in the 2005 Asian Leadership Conference in Seoul that the experience of the first regional collective disaster response following Cyclone Nargis in Myanmar in 2008 has led to the realisation that ASEAN must strengthen its regional DRR mechanisms through AADMER (Yong, 2005). The Secretary further added that ASEAN would continue learning from various experiences of responding to, managing and recovering from current disasters in the region, and also expressed ASEAN willingness to share those experiences with neighbouring regions (Yong, 2005).

Some of the initiatives taken within the ACDM are influenced by the progress of similar initiatives in ASEAN countries, especially Indonesia. For example, the AADMER, the AHA and also the ARF DiReX are located or held in Indonesia (Kamal, 2010). The establishment of the UNTWG-DRR in 2002, to improve coordination among the UN organisations in Indonesia, marked the recognition of the importance of MSPs in increasing coordination for DRR (UNTWG, 2006a). It was originally managed by The Office of Coordinating Humanitarian Affairs (OCHA), and later co-chaired with the United Nations Development Program (UNDP), after the 2004 Indian Ocean tsunami (UNTWG, 2006a). In subsequent years, the Indonesia National Platform was formed. Following the Yogyakarta earthquake and Merapi volcanic eruption, both the local MSPs were created (UNISDR-AP, 2010).

Referring back to the question of how experiences from past disasters affect the development and operation of MSPs, the author has shown that the understanding is taking place between the MSPs. Large scale or high impact disasters which frequently hit Asia and Indonesia created and brought enormous changes to DRR systems for the increased political commitments to the DRR institutions and frameworks. However, the author sees the need for more systematic learning from disaster experiences, a term that is frequently termed single, double and triple loop learning (Argyris and Schoen, 1974). Many studies in DRR express the need for (Jabeen et al., 2010; Goldstein, 2008; Josef, 2007; Voss and Wagner, 2010; Farazmand, 2007) systematic learning from disasters. This is also the case in Indonesia, whereby a finding from another paper (Djalante et al., 2012) found that the abundance of material published on lessons learned from the 2004 tsunami are not accessible to most of the decision makers at the local government level, nor is it evident that the systematic learning system is developed locally.

To summarise Sect. 4.1, the discussion in each of the three questions show that MSP can be considered a mechanisms that allow for the implementation of AG. The MSPs are organised through polycentric and multi-layered institutions from the global to the local level. They are often formed through reorganisation or previous entities created with similar purposes. MSP members are largely comprised of government agencies and international as well as non-government organisations. There is, though limited, evidence that shows learning and innovation is taking place; however, some challenges remaining, which include involvement of non-government entities within the DRR decision-making processes and the extent by which the operation the MSPs can influence the processes, the strengthening of the mandate, the function of the MSPs, and the need for systematic learning from past disaster experiences.

4.2 Roles, interlinkages and collaborations between the multi-stakeholder platforms to build disaster resilience

This sub-section presents the author analysis on the roles, interlinkages and collaborations between the MSPs, utilising Biermann et al. (2007) framework on partnership implementation. Figure 3 shows the relationships between the selected MSPs, horizontally (on the same geographical scale) and also vertically (across different scales). The arrows represent different activities and types of support between the MSPs: financial resources, technical capacity and assistance in DRR coordination. In general, there are more horizontal connections at the global level while the vertical relationships between the MSPs have mainly developed along the lines of the formation of the GPDRR, and the supporting regional, national and local MSPs, as part of the UNISDR system.

²Arrows – full arrow: involvement in management, dotted arrow: financial support, dashed arrow: partnerships and coordination

The next section discusses the roles, interlinkages and collaborations between the MSPs, and in particular, the extent by which the global and regional MSPs support the Indonesian MSPs in building disaster resilience.

4.2.1 Do the multi-stakeholder platforms have the required capacity to implement their programmes and support other MSPs?

MSPs at the international level tend to have enormous human and technical capacity to implement their intended purposes and to support other MSPs. The GPDRR is the world's largest gathering of DRR stakeholders. During its third session in 2011, there were over 2600 delegates representing 163 governments, 25 intergovernmental organisations (IGOs) and 65 NGOs as well as parliamentarians, representatives of the private sector, members of local government, academics, civil society members and international organisations (UNISDR, 2011h). It was created as part of the UNISDR's mandate to be the focal point within the UN systems in coordinating and ensuring synergies among DRR activities (UNISDR, 2011b). This mandate is implemented through four key activities: coordinating, campaigning, advocating and informing different aspects of DRR (UNISDR, 2011b).

The GNDR membership currently includes a broad range of organisations, such as CBOs, national and international NGOs, and academic and research organisations (GNDR, 2012b). The GNDR activity on the ground has received a "Letter of Commendation" from the UN Sasakawa Award Jury, confirming the GNDR's ability and capacity for networking and coordination of local organisations (GNDR, 2011a). In its worldwide surveys of "Views from the Frontline", GNDR had been able to mobilise 20 000 people in 69 countries, with over 90 case studies presented (GNDR, 2012b). Following these surveys, other world scale activities were conducted, such as "Action at the Frontline" (GNDR, 2012c) and "Text from the Frontline" (GNDR, 2012c).

These global scale MSPs are closely linked and seem to support each other strongly. The UNISDR, as the coordinator for the GPDRR, has strongly supported the GNDR in various ways. It facilitated the official launch of the GNDR during the first GPDRR meeting in 2007 (GNDR, 2012a). It has further facilitated and connected the GNDR with other civil society networks and intergovernmental stakeholders on DRR within the UNISDR system. The UNISDR also provide and exchange DRR-related information that is of high concern to NGOs and CSOs (GNDR, 2012a). The UNISDR also highly supports the GNDR global scale surveys of the HFA "Views from the Frontline" report, which focuses on NGO and community views on HFA effects at the grassroots level (GNDR,

support, curved arrow: influence in policy formulation, dash-dot arrows: supports to increase technical capacity. Shapes – Full square box: current MSP, dashed square box: the MSP has ceased operation.

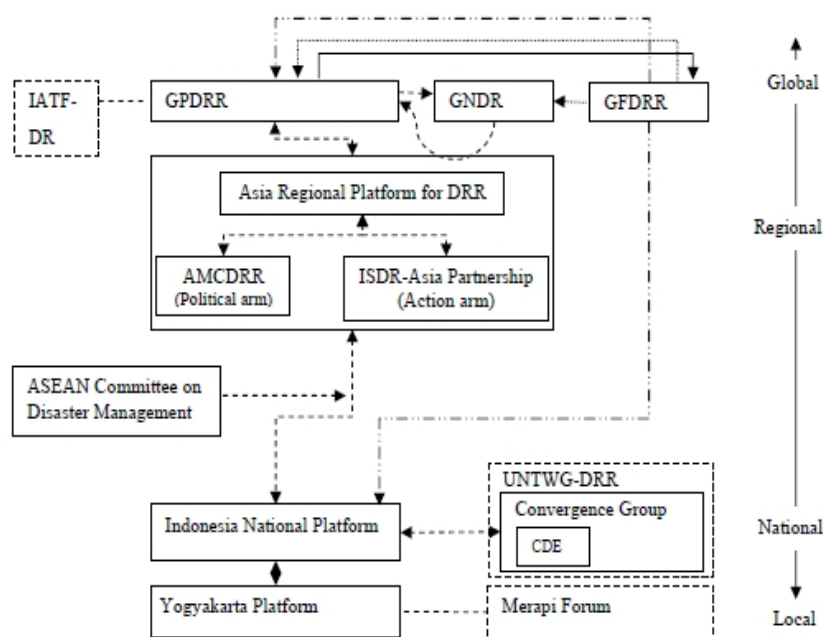


Fig. 3. Relationships between selected MSPs. ²

2012c). Conversely, the results of these surveys significantly influence the directions of UNISDR's DRR policies and their implementation, focusing on HFA implementation at the local level (UNISDR, 2011j).

The GPDRR also works closely with the GFDRR, especially within its governance structure. Along with representatives from donor and recipient countries, the chair of the International Strategy for Disaster Reduction (ISDR) system is part of the GFDRR consultative group. The director of the ISDR secretariat is part of the GFDRR's Result Management Council (GFDRR, 2012b). There are three main tracks of GFDRR operations: track I refers to global and regional partnerships, track II refers to mainstreaming DRR in development and track III refers to disaster recovery funds (GFDRR, 2012e). Track I is run jointly with the UNISDR, by which since 2007 US\$5 million has been allocated annually to support UNISDR's activities in improving partnerships of a wide range of DRR stakeholders, including governments, the UN, multilateral banks, regional organisations and civil society partners (GFDRR, 2012f). Another connection at the global level is between the GNDR and the GFDRR. The GFDRR has contributed US\$150 000 to the Global Network's operations (GNDR, 2012b).

The supports received by the Global Platform from the UNISDR also evolve regionally, by which the UNISDR highly support the operation of the Asian Regional Platform, which include the AMCDRR and the IAP. These regional MSPs received technical, coordination and financial support from the UNISDR and the GPDRR (UNISDR, 2012c). For

example the UNISDR and its Asia-Pacific secretariat have helped the IAP to run and organise AMCDRR meetings since 2005, and the outcomes of these meetings were, in turn, used to inform discussions during the meetings of the GPDRR (UNISDR, 2012c).

The Indonesian National Platform presence in the regional and local MSPs is highly recognised. The interview with the SCDRR project representative stated that through SCDRR support, the National Platform actively attended and contributed to the three global platform meetings through presenting Indonesia's experience in the reconstruction processes following big disaster events. The Indonesian president Yudhoyono was also inaugurated as the "Global Champion for DRR" during the third Global Platform meeting (UNISDR, 2011h).

The in-depth interviews between all the respondents show that in Indonesia, there are strong horizontal relationships between the Convergence Group, CDE and the National Platform. The Indonesia National Platform as well as the Yogyakarta, Padang and Aceh local platforms were formed through the (SCDRR) project, and was implemented collaboratively by the Indonesian Government and the UNDP, and supported by the GFDRR (UNDP Indonesia, 2012). The SCDRR key informant stated that the support given to the MSPs includes financial and technical support in the initiation, formation and operation of the MSPs. For example, the SCDRR coordinated NGOs and financially supported the meetings leading to the formation of the Indonesia National Platform.

Key personnel from BNPB explained that secretariat of the platform is hosted within the office of the BNPB; while the BNPB and Bappenas both have representatives in the Indonesia National Platform. Further, the interview with the key personnel from Bappenas (The National Development Planning and Coordination Board) stated that Bappenas, the World Bank, UNDP and National Disaster Management Agency (BNPB) were the key organisations involved in the project. The respondents expressed that the support to the MSPs demonstrated the Indonesian government's commitment to helping mainstream DRR within its development strategies, which were formally mandated stating that disaster and climate change issues are included in the Indonesian government's nine national development priorities. Furthermore, a strong government commitment to various DRR initiatives in Indonesia has also been facilitated by longstanding DRR operations by the UN in Indonesia, especially through various DRR operations run by the UNDP and the OCHA. In answering the author's question on platforms' technical capacity, the representative from the National Platform expressed the need for more technical and financial support especially on the need for a dedicated personnel and funding to support the day-to-day operation of the platform. Another issue raised was the lack of sectoral agencies involvement within the platform that hinders effective DRR coordination and resource provision by sectoral agencies.

In summary, the author has shown that the MSPs at different level have different capacities. MSPs at the international level tend to have enormous human and technical capacity to implement their intended purposes. It is not quite clear since there is no data available or accessible on how regional MSPs implemented their activities beyond coordination. In Indonesia, the MSPs tend to be project-based and their sustainability remains unclear should the projects cease operations.

4.2.2 Do the multi-stakeholder platforms generate new sources of funding and to what extent do these funds evolve into other MSPs?

MSPs at the international level tend to have higher capacity for generating funding to implement their intended purposes. The UNISDR's entire source of funding is through voluntary contributions, which are channelled through The United Nations Trust Fund for Disaster Reduction created in 2000 (UNISDR, 2012d). The UNISDR 2010 financial report stated that in total, US\$28.6 million has been contributed and expended through the trust fund (UNISDR, 2010a). Out of this total amount spent, almost half of the funds were spent on regional work programmes, approximately one-third was spent on global work programmes, and the remainder was split between thematic works and management expenditure (calculated from UNISDR, 2010a). However, there is no data publicly available on how much money is allocated to support these MSPs, globally to locally. The GFDRR is essentially a funding organisation, established in 2006 under

the leadership of the World Bank. With the partnerships of 39 countries and eight international organisations, GFDRR's aim is to reduce vulnerability to hazards by mainstreaming disaster reduction and recovery in development strategies (GFDRR, 2010c). In its last six years of operation, GFDRR has received a total of US \$324 million from its 18 donor countries and organisation (Australia, Brazil, Canada, Denmark, European Commission, France, Germany, Ireland, Italy, Japan, Luxembourg, Norway, Spain, Sweden, Switzerland, the Netherlands, the United Kingdom and the United States) (GFDRR, 2012a). The fund was then distributed accordingly: 69 per cent was allocated to supporting mainstreaming DRR and CCA, 17 per cent was allocated to financing global and regional partnerships and 14 per cent was allocated for recovery (GFDRR, 2012b). The GNDR receives support from various donors, with the United States Agency for International Development and Swedish International Development Agency among its largest contributors. As of 2010, the GNDR has been able to secure almost US\$3.9 million in donor funding (GNDR, 2012b). There is no supporting data obtainable on how the GFDRR directly supports the local MSPs, nor data on the extent to which the national and local MSPs have secured funding from other organisations. In sum, the author suggests that the upper level MSPs tend to have better ability to generate and secure new sources of funding than their lower level counterparts. This is, however, based on the limited data obtained by the author. Transparency on use and availability of funding information is an important aspect that is systematically lacking amongst the large majority of MSPs.

4.2.3 Do the multi-stakeholder platforms focus on direct effects in reducing disaster risks or target more vulnerable groups?

Reducing the underlying risk factors requires the consideration of disaster risks into long-term development planning and disaster reconstruction. Disaster risks are complex interactions between social, economic and environmental conditions and land use, as well as the effects of geological, hydro-meteorological and climatic hazards (UNISDR, 2007b). There are some notable examples of MSP activities on this theme.

The GFDRR has demonstrated a great deal of commitment in financing DRR programmes and activities that reduce disaster risks, both directly and indirectly, through its tracks I, II and III funding. For example, the GFDRR spent almost US\$1.25 million on track II, "Mainstreaming DRR in Indonesia" (GFDRR, 2010a). The funds were spent on direct risk reduction projects, such as improved basin retention and an enhanced drainage and water supply system. The GFDRR has also conducted an initiative called the "South-South Cooperation Program", which directly targets the most vulnerable groups; in this case, low- and middle-income disaster-prone countries. In this project, the GFDRR

distributed grants to create a partnership with three disaster-prone cities (Makati, Philippines; Kathmandu, Nepal and Quito, Ecuador) and provided grants to three NGOs located in India, Guatemala and Honduras, focusing on women and DRR issues (GFDRR, 2012d). The GFDRR project in Indonesia has been implementing programmes strengthening regulatory provisions for earthquake-safe building codes (2011). Its other projects that indirectly reduce disaster risks include the formulation of key DRR planning documents, such as the National Action Plan for DRR and capacity building for DRR at the national and sub-national levels (GFDRR, 2010a). All respondents from the interview stated that through the support of the World Bank and UNDP, the Indonesia National Platform has been actively working with the BNPB and Bappenas in developing several key documents on DRR in Indonesia, namely the National Guidelines for DRR 2010–2014, the National Action Plan for DRR 2007–2009 and 2010–2012. At the local level, the Yogyakarta Platform has been working with the government of the Yogyakarta province in developing the Local Law on Yogyakarta Disaster Management (YLPDRR, 2011).

Emergency preparedness and response is another theme that has accorded high priority on the agenda of some MSPs. The GFDRR track III funding has been set-up as the “standby recovery financing facility” should any major disasters occur (2010b). Emergency management is also one of the main foci of the MSPs in the Asian and southeast Asian regions, through the formation of the ASEAN coordinating centre for Humanitarian Assistance (AHA centre) (ACDM, 2009). Through the AADMER, there is a provision for “Standby Arrangements for Disaster Relief and Emergency Response” to increase preparedness and improve management of emergencies (ASEAN, 2005). The Yogyakarta Platform formed the communication centre for emergency coordination concurrently with the local government during the Merapi eruption in 2010 (YLPDRR, 2011). The CDE is the only MSP that implements activities that aim to reduce disaster risks directly. The CDE has conducted extensive activities aimed at influencing policy, capacity building and training to increase awareness of disaster risks. For example, one of the key NGOs within CDE, the Kerlip foundation, has collaborated with the local government in the Cianjur district to conduct related workshops (UNISDR, 2010b).

In summary, GFDRR is the only MSP that is able to significantly conduct activities that are able to directly reduce risks and target more vulnerable populations. This is, however, understandable since the GFDRR is essentially a funding organisation with ability to secure and generate finances from other organisations.

To summarise Sect. 4.2, the discussion in each of the three questions above shows that there are strong linkages and collaboration among the MSPs. It was shown that international scale MSPs have greater technical and financial capacity to implement the intended programmes; hence, they are able to collaborate and support other MSPs. The Global Platform

hold a key role in the operation, development and, most importantly, the coordination with other MSPs. MSPs at the regional level seem to focus their activities on better coordination of DRR actions and hence, there is no specific information on how they directly support MSPs at the national and local level. The SCDRR project in Indonesia has facilitated the development of the National Platform and the local platform in Yogyakarta. These actions, however, are still project based and externally supported as there are currently only two local governments (West Sumatra and Yogyakarta provinces) that have already developed their MSPs with the support from the SCDRR project (Planas PRB, 2009).

5 Recommendations and conclusion

5.1 Recommendations

The main finding derived from this study is that MSPs at the international and regional level tend to have more technical, financial and coordinating capacity than lower scale MSPs. Particularly for Indonesia, to encourage and increase MSPs roles in helping to build disaster resilience, the author reinforces the need for a greater provision of resources (human, technical and financial) to be directed to the local MSPs, in addition to strengthening relationships between MSPs and other existing stakeholders and networks in DRR.

5.1.1 Provide more support to local multi-stakeholder platforms

The importance of building resilience at the local level has been increasingly emphasised in the DRR literature (IFRC, 2004; Djalante et al., 2012; Tanner et al., 2010; Rose et al., 2006; Cutter et al., 2008; Mette, 2012). Capacity and capability of local actors can increase due to improved availability of resources (e.g. Kusumasari and Alam, 2012). Involvement of various stakeholders can lead to and facilitate information and knowledge sharing. Furthermore, availability of resources can also increase local preparedness and response. The GPDRR has continuously been supported by the UNISDR. Through this support, it has been able to carry out its tasks to increase collaboration between stakeholders in DRR, to support regional, national and local DRR platforms, and to create stronger links with other related organisations and networks. The evaluation of DRR platforms in the Asia-Pacific region also highlighted the requirement for more support from governments for local platforms to gain legitimacy and recognition (UNISDR-AP, 2010). The progress of Indonesian MSPs is an exception rather than a norm in the region, due to the MSPs gain strong support from the government. This level of support needs to be extended specifically to enhance the participation of communities and groups at the grassroots level and, in particular, the need to support capacity of local governments and local NGOs as well as facilitating for focal point/champions.

5.1.2 Create more links with established networks especially those based thematically on the HFA priorities

These relatively new MSPs should not overlook the existing structures and networks in trying to increase engagement and cooperation among DRR actors. The author found that engagement with other established networks tends to happen more at the international and regional level, and less or even none at the national and local level. Recent reports on HFA implementation, such as the Mid-Term Review (UNISDR, 2011e) and the regional (UNISDR-AP, 2010) and national (BNPB, 2010) progress reports for DRR platforms emphasise the need to increase the role of thematic regional and inter-governmental organisations (IGOs) in enhancing cooperation.

There are several key thematic platforms at the different levels. Globally, there is the International Recovery Platform (IRP, 2011). There are also hazard warning networks, such as the Pacific Tsunami Warning Centre (NOAA, 2011), the International Tsunami Information Centre (ITIC, 2011), drought networks (e.g. DRI, 2011) and earthquake initiatives (e.g. USGS, 2011; EMI, 2011). Despite the existence of these thematic platforms, engagement seems to happen only at the international level especially within the Global Platform. Hence, the regional and national platforms need to initiate better communication with the thematic platform. There is also an increasing recognition of the importance of knowledge provision and education, as demonstrated by the proliferation of knowledge platforms (e.g. PreventionWeb, 2011c), the adaptation platform (e.g. weADAPT, 2011), Indonesia Disaster Database (BNPB, 2011a) and the 3W platform in Indonesia (UNTWG, 2006b). This is a very positive step towards building disaster resilience. However, there is less progress in other parts of the region. The CDE is the only MSP engaged in the education sector in Indonesia. During their second meeting in 2010 in Jakarta, the members agreed that the CDE needs to be positioned strategically within the working mechanisms of DRR, within other global thematic platforms on education, with the UNISDR, with other educational clusters of humanitarian organisations, with the national platform on education and science, and with other NGOs specialising in disaster education (CDE, 2011).

The role of the Red Cross/Red Crescent (RC) movement has been extremely important in DRR. It is the world's largest humanitarian network, and it aims to provide "protection and assistance to people affected by disasters and conflicts" (IFRC, 2011). The movement was founded in 1919, and currently has 100 million members, volunteers and supporters in 186 nations. It also has the necessary human and financial capacities and government support to implement various DRR activities (IFRC, 2011). It is important that the MSPs coordinate with RC activities. The success of the movement in broadening and sustaining its networks should be harnessed by the newly established DRR platforms.

There are also various networks on the city scale that have important roles in building the resilience of cities to climate change. Networks such as the Cities and Climate Change Initiatives (HABITAT, 2011), C40 Cities Climate Leadership Groups (C40Cities, 2011), Cities Alliance (2011) and Cities for Climate Protections (ICLEI, 2011) are all important stakeholders in the planning and implementation of various programmes in DRR (as well as other areas, such as development, poverty reduction, climate change and gender issues).

Despite all these existing networks, what is also important are the mechanisms or ways by which local MSPs are able to tap into these existing wealth of resources and knowledge.

5.1.3 Broaden and strengthen engagement with "non-traditional" stakeholders

This paper reiterates the need for stronger engagement with "non-traditional" stakeholders. These stakeholders have not previously been extensively involved in DRR, and can include sectoral organisations, parliamentary members, scientific and academic communities and the private sector. Similar to the previous recommendation, broad and extensive engagement with various stakeholders seem to happen only at the international level especially within the Global Platform. Parliamentarians should also play a stronger role in setting policies and legislation and in the creation of enabling environments for DRR. An excellent example of parliamentarian involvement is the appointment of Senator Legarda from the Philippines, as the first "champion" of the United Nations Regional Champion for DRR and CCA Asia-Pacific Global (UNISDR, 2008). The engagement of parliamentarians is particularly important, because support from the necessary political authority will help in the implementation of DRR across sectors (GPDRR, 2011a). Despite a recent study by the author on DRR in Indonesia showing that parliament plays an important role in the government's development budget allocation for DRR activities (Djalante et al., 2012), there is still no involvement of the member of the national parliament within the organisations structure of the Indonesian National Platform. There is also a lack of involvement of key sectoral organisations. There is only one government agency, BPPT (Research and Technological Development Board), involved in the platform beside BNPB (National Disaster Management Agency) (BNPB, 2011). Another important stakeholder is the private sector, which is the provider and leader in the construction of resilient infrastructure, sustainable development of urban areas, energy safety and the protection of critical resources (GPDRR, 2011a). While private organisation presence in the Global Platform are highly acknowledged, the Indonesian National Platform is just initiating this inclusion and no private entities in the local platforms were identified.

6 Conclusions

The author has highlighted a number of important insights. *First*, MSPs play an increasingly important role in DRR; in particular, the international MSPs in improving coordination between multiple stakeholders working at different levels, implementing key activities and in their technical and financial capacities. This MSP mechanism is indeed a useful form of adaptive governance. It allows for involvement of multi-stakeholder actors at different level with different agendas, it creates space for participation and collaboration, it is often formed through reorganisations, and finally, it creates space for learning and sharing. These are the key contributing factors to build disaster resilience. *Second*, it has been discussed through the paper that despite the notable progress achieved by the MSPs, several challenges remain in terms of technical capacity and the ability to generate funding to support the activities of the national and local MSPs. This, however, should be understood with care that there are limits of the study's generalisability since it has only focused on Indonesia and Asia. Unavailability of published data has made it particularly difficult to determine the specific capacity or resources allocated to the MSPs at the regional level and in Indonesia. Availability of data is an important factor in ensuring accountability of the MSPs and to enable better and more enhanced coordination in the planning and implementation of DRR activities worldwide.

Utilising Warner's proposition (2008a), the MSPs play a key role in delivering more adaptive management and democratic processes rather than for conflict resolution. Accountability and determination of targets/roles (Bäckstrand, 2006) to position MSPs within the existing DRR governance are two issues that need to be clarified in order to ensure these MSPs can achieve positive outcomes. In the long term, MSPs need to be dynamic mechanisms by which DRR momentum is maintained and the call to build community resilience is strengthened through new alliances with local actors and governments, young people, children, civil societies as well as the private sectors. MSPs need to continue their presence in supporting DRR activities under the current HFA, as well as post-HFA efforts after 2015 (UNISDR, 2012e). They also have key roles in overseeing the alignment of the DRR agenda with sustainable development, especially after the "Rio+20 meeting", where reducing risks and building resilience is one of the 12 issues in the agenda (UNCSD, 2012) and vital to meeting of the Millennium Development Goals targets (United Nations, 2011).

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PART IV SYNTHESIS AND CONCLUSION

"Make everything as simple as possible, but not simpler."

(Albert Einstein, no date)

Part IV is the final part of the thesis, developed to meet the third objective of the research, that is:

“To develop a set of adaptive governance strategies aimed at helping to achieve integrated disaster risk reduction and climate change adaptation in both policy and practice.”

This part summarises and presents the analyses utilising the results from Part II, Theoretical Review, and Part III, Case Study of Indonesia. There are two chapters in this part:

- Chapter 10 presents the analysis of the theoretical review and results from chapters on the case study in Indonesia through a paper chapter titled ‘The adaptive and integrated disaster resilience framework’.
- Finally, Chapter 11 presents the conclusions of the thesis. There are four sub-sections in this chapter. Section 11.1 examines how the research question and research objectives are answered and met. Section 11.2 discusses the limitation of the research. Section 11.3 and 11.4 outline contributions to knowledge, and recommendations for policy, for DRR in Indonesia and also for future studies, respectively.

CHAPTER 10

PATHWAYS FOR ADAPTIVE AND INTEGRATED DISASTER RESILIENCE

Djalante, R., Holley, C., Thomalla, F., Carnegie, M., (2013). "Pathways for Adaptive and Integrated Disaster Resilience." *Natural Hazards*, Doi: 10.1007/s11069-013-0797-5

10.1 Overview

Permission

The paper is currently under second review at the *Journal of Natural Hazards*. *Natural Hazards* journal has an impact factor of 1.639. The editors are Thomas Glade, Department of Geography and Regional Research, University of Vienna, Austria, Tad S. Murty, Department of Civil Engineering, University of Ottawa, Canada, and Vladimír Schenk, Institute of Rock Structure and Mechanics, Academy of Sciences, Prague, Czech Republic. The scope of the paper includes "*original research work on all aspects of natural hazards, including the forecasting of catastrophic events, risk management, and the nature of precursors of natural and technological hazards*". It also calls for closer interaction between science and practices. This is the second paper that is submitted in this journal. I specifically plan for this paper to be published in *Natural Hazards* considering that this journal has published my previous paper on the progress of implementing HFA in Indonesia and is one of the best, highly cited and widely disseminated journals.

Authors' contributions

Riyanti Djalante

My contribution to the research and paper: Concept - 100%; Data collection - 100%; Analysis - 85%; Writing - 90%; Total - 95%.

I am involved in the development of the paper structure, analysis and the journal submission processes.

I am also involved in the literature review processes and conducting data collection in Indonesia.

Dr Cameron Holley

Dr Cameron Holley assists me in reviewing the paper and strengthening the arguments made.

Dr Frank Thomalla

Dr Frank Thomalla assists me in reviewing the paper and strengthening the arguments made.

Dr Michelle Carnegie

Dr Michelle Carnegie assists me in reviewing the paper and strengthening the arguments made.

Impacts of the paper

There is no yet citation for this paper.

Introduction to the paper

This is the last paper of my PhD. The results from the previous papers are utilised to inform the development of this paper. This paper is the most difficult one to write. I find it most challenging to conceptually describe the relationships between the three concepts adopted (DRR, CCA and AG) into the overarching concepts of resilience. Finding my own voice and clarifying the key arguments amongst existing sources is particularly difficult. It is seven months in the writing process with all of my supervisors providing reviews throughout the writing and analysis processes.

The key literature that inspires me in developing this framework is that of Lebel et al. (2006) which set out the direction and the relationships between governance and resilience. I feel that I found my 'Eureka' moment with my PhD after reading the paper. The other key scholar influencing the development of this paper, and also heavily referred in this paper is that of Pahl-Wostl's works on adaptive water management (e.g. Pahl-Wostl et al., 2007). Reading her works immediately helps me to clarify the relationships amongst the key concepts and also to explore what and how AIDR should be conceptualised.

During the last period of writing this thesis, an edited book by Kapucu et al. (2013) titled "Disaster Resilience: Interdisciplinary Perspectives" is published. In this book, "Adaptive Resilience Framework" is proposed, which develops around three propositions that: the design and planning of resilient communities are highly complex and require interdisciplinary perspectives; the importance of planning processes and regulation for disaster resiliency calls for adaptability and context-sensitivity in long-term planning; the importance of network in building disaster-resilient communities means that stakeholders from multi-jurisdiction and multi-sectors need to be involved in the planning and implementation for disaster resilience (Kapucu et al., 2013). This framework goes along similar lines to the AIDR framework proposed in this thesis which also calls for institutional processes that function across sectors and scales, engaging multiple stakeholders, and promoting social learning.

The key findings of this paper are on the AIDR framework (Figure 10-1). There are three layers within this framework. The inner and middle layers are overlaid and then placed in the centre of the outer layer to form the new AIDR framework. The inner layer (yellow) describes the conceptualisation of integrated disaster resilience, which shows the three important elements of sustainable development (SD), DRR, and community characteristics (see Figure 3-1 shown previously). The middle layer describes the integration of DRR, development and climate change. It shows the importance of considering climate-change issues in the context of all factors influencing resilience (See Figure 4-1 shown previously).

The outer layer shows the four key characteristics that can significantly influence disaster resilience: polycentric and multi-layer institutions, participation and collaboration, self-organisation and networks, and learning and innovation (see Figure 5-1 shown previously). The conceptualisation of the AIDR framework is shown in Figure 10-1 below. Moreover, seven pathways or strategies to achieve AIDR in Indonesia are also given (Table 1 in this paper). The pathways suggested for implementing AIDR in Indonesia utilise findings from Part III, on the case study of Indonesia, as well as further literature review to identify latest developments in theories and practices.

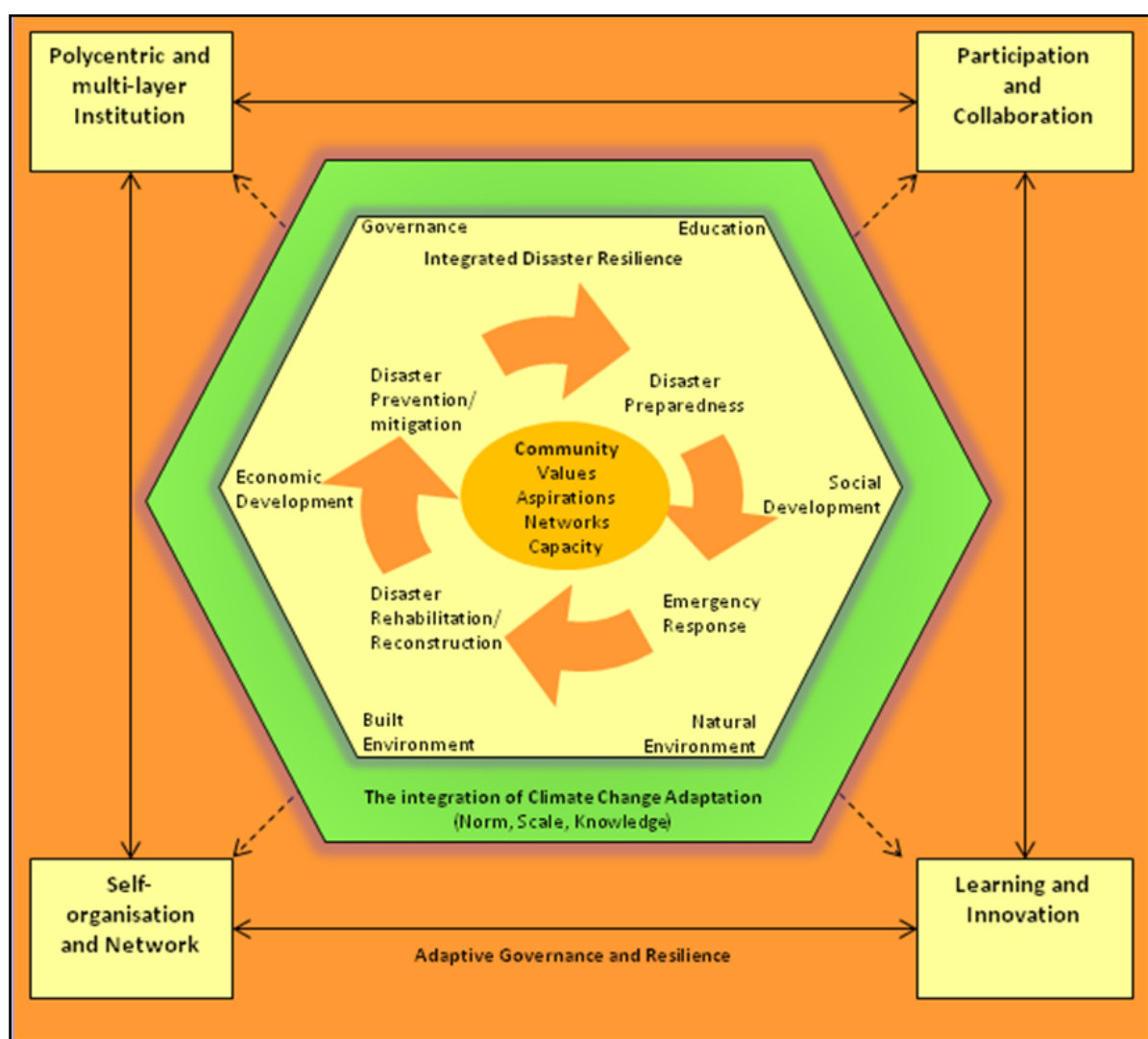


Figure 10-1: The Adaptive and Integrated Disaster Resilience Framework (Djalante et al., 2013).

10.2 The paper in Published Format

Author's personal copy

Nat Hazards
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ORIGINAL PAPER

Pathways for adaptive and integrated disaster resilience

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Michelle Carnegie

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Abstract The world is experiencing more frequent, deadly and costly disasters. Disasters are increasingly uncertain and complex due to rapid environmental and socio-economic changes occurring at multiple scales. Understanding the causes and impacts of disasters requires comprehensive, systematic and multi-disciplinary analysis. This paper introduces recent multidisciplinary work on resilience, disaster risk reduction (DRR), climate change adaptation (CCA) and adaptive governance and then proposes a new and innovative framework for adaptive and integrated disaster resilience (AIDR). AIDR is defined as the ability of nations and communities to build resilience in an integrated manner and strengthen mechanisms to build system adaptiveness. AIDR provides the ability to face complexities and uncertainties by designing institutional processes that function across sectors and scales, to engage multiple stakeholders and to promote social learning. Based on the review of existing academic and non-academic literature, we identify seven pathways to achieve AIDR. These pathways are a conceptual tool to support scholars, policy makers and practitioners to better integrate existing DRR strategies with CCA and more general development concerns. They describe institutional strategies that are aimed at dealing with complexities and uncertainties by integrating DRR, CCA and development; strengthening polycentric governance; fostering collaborations; improving knowledge and information; enabling institutional learning; self-organisation and networking; and provision of disaster


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risk finance and insurance. We also examine the implications of these pathways for Indonesia, one of the most vulnerable countries to natural hazards and climate change impacts. Our findings suggest that there is an urgent need to commit more resources to and strengthen multi-stakeholder collaboration at the local level. We also argue for placing the community at the centre of an integrated and adaptive approach to DRR and CCA.

Keywords Integrated disaster resilience · Resilience · Disasters · Climate change · Indonesia · Pathways · Adaptive Governance

1 Introduction

The increasing recognition of global environmental changes and risks has led to calls for greater consideration of increasing uncertainties and complexities (UNEP 2012). Complexity arises when a problem lacks transparency, is comprised of many variables with significant connectivity, and there is a time delay between causes and impacts (Frensch and Funke 1995). Uncertainty is related to human's incomplete knowledge of complex problems which leads to an inability to predict future dynamics (Berkes 2007) or the likelihood and impact of a decision (Milliken 1987). Addressing these complexities and uncertainties requires an integrated analysis of human–environment or social–ecological systems (SES) (Holling 2001; Turner et al. 2003).

The International Disaster Database (EMDAT–CRED) shows that, while the number of fatalities caused by disasters has decreased significantly in the past century, the number of people affected and the socio-economic effects have increased significantly (EMDAT 2012). The impacts of disasters are socially and environmentally interconnected (Adger 2006; O'Keefe et al. 1976; Wisner et al. 2004). Disasters are becoming more complex and uncertain due to the complex interactions between increasing populations, poorly planned urbanisation and economic development, environmental degradation and climate change (UNEP 2007; UNISDR 2011a; WEF 2012). Increasing population and urbanisation lead to more people living in high-risk areas, while increasing economic development has increased economic exposure to disasters (World Bank and United Nations 2010).

Integrated approaches to complex environmental problems have long been discussed in literature, particularly in environmental and resource management focusing in particular on water (e.g. Huntjens et al. 2011; Pahl-Wostl 2008), coastal (Cicin-Sain 1993), marine and protected areas (Pollard and du Toit 2008). The need for integrated approaches has also been recognised in disaster studies. Scholars such as Paton and Johnston (2006), Klinke and Renn (2011) have examined and advocated for more integrated approaches to DRR. This involves considering not only the frequency and magnitude of hazards, and the geophysical processes that create them, but also understanding the causes of vulnerability, resilience and impacts across SES. This approach is multidisciplinary, using both the natural and social sciences, and takes into account different temporal and spatial scales, multiple sectors and stakeholders, as well as expert and local knowledge (Wisner et al. 2012). However, much work remains to be done to determine how an integrated approach to DRR can best be advanced (IDRC 2012; Klein et al. 2003; Paton and Johnston 2006). In particular, challenges exist in identifying appropriate pathways to better integrate DRR with related policy areas, particularly climate change and development (United Nations 2010, 2012b).

An emerging approach to increase the ability of societies to cope with, and adapt to, such risks is to increase the overall adaptiveness of the SES (Lebel et al. 2006).

Adaptiveness refers to the “capacity of a social actor or social–ecological system to adapt in response to, or in anticipation of, changes in the environment” (Lebel et al. 2010, p. 333). Increasing the adaptiveness to deal with future complexities and uncertainties has been extensive discussion of this concept across a range of literatures, particularly environmental management (e.g. Brooks et al. 2005; Gallopín 2006; Holling 1978; Nathan 2011; Pahl-Wostl 2009; Smit and Wandel 2006). However, calls to increase system adaptiveness within the DRR literature are much more recent and most are theoretical and normative in nature (e.g. Tompkins et al. 2008; Wamsler and Lawson 2011). There are very few studies (e.g. Amendola et al. 2008; ICSU 2008; IRG 2010) of DRR strategies that are aimed at increasing system adaptiveness in practice.

The concepts, methods and a comprehensive knowledge base for integrated and adaptive approaches in DRR concerned with global environmental change are not yet well developed. Responding to this research gap, we argue that there is a need for an analytical tool that allows for a systematic examination of the links between environmental, social and economic changes and risks in SES and the influences of uncertainties and complexities on current efforts to reduce such risks. Our research questions are as follows: (1) What factors make DRR approaches more integrated and adaptive? (2) What are the pathways to achieve an integrated and adaptive approach to building resilience? and (3) How can a country such as Indonesia that is highly vulnerable to disasters implement these pathways in practice?

We present our analysis in three stages. *First*, we briefly review the current state of knowledge on adaptive approaches and integrated approaches to manage social–ecological systems in DRR. This informs our conceptualisation of adaptive and integrated disaster resilience (AIDR). *Second*, we develop and present a new and innovative framework that integrates the concepts of resilience, DRR, climate change adaptation (CCA) and adaptive governance (AG). We explain the key factors and processes included in the framework. Building on the definition of disaster resilience by the United Nations International Strategy for Disaster Reduction (UNISDR) (2009b), we define AIDR as the ability of communities or nations to build resilience to disasters in an integrated, systematic and adaptive manner. Integration and system adaptiveness are the two underlying principles. Integration relates to the linking of DRR with climate change and development and the synergies between the different pathways for AIDR. Adaptiveness is concerned with the need to develop institutional mechanisms within an SES that are able to deal with uncertainties and complexities of current and future disasters. *Third*, we identify and describe seven pathways for AIDR. They are intended as strategies to assist policy makers, practitioners and scholars to reorient current DRR approaches to be more integrated with climate change and development and provide a conceptual underpinning to better understand and respond to complexities and uncertainties.

An important aim of our analysis is to examine the implications of the pathways for countries that are highly vulnerable to disasters. To do this, we focus on Indonesia as a case study because its strong progress in DRR has recently been highlighted (UNISDR 2011c) and because the country is highly vulnerable to a range of natural hazards (UNU-EHS 2012) and climate change impacts (Maplecroft 2012). Our research indicates that despite considerable advances in establishing adaptive and integrated approaches to DRR at the international and to a lesser extent national level, progress has been much slower at the local level. We provide important insights for policy and practice by proposing strategies for implementing AIDR in Indonesia based on the proposed seven pathways. Our findings are based on an extensive review of the academic literature across several related disciplines that has documented the range of adaptive and integrated approaches that draw

concepts of vulnerability, resilience, DRR, CCA, ecology, environmental governance and management. We have also reviewed organisational reports and information related to experiences in policy and practice to inform our analysis of the progress and challenges of the proposed seven pathways for AIDR. The literature on Indonesia is sourced from journal articles and reports published by the Indonesian government and other organisations engaged in activities relating to DRR, CCA and development.

2 Adaptive and integrated analyses in DRR

In the DRR literature, the importance of integrated analysis has long been considered. Vulnerability research draws on an integrated approach since understanding vulnerability requires an analysis of exposure, sensitivity and adaptive capacity and the interaction of physical and social characteristics and processes in the creation of disasters (Alexander 1993; O'Keefe et al. 1976; Timmerman 1981; Wisner et al. 2004). The changing paradigm of DRR from hazard to vulnerability assessment, from natural science to integrated natural and social science and humanities, from single to interdisciplinary, and from relief and recovery to preparedness and prevention also demonstrates a growing trend of integration (Alexander 1997; Christoplos et al. 2001; Henstra and Gordon 2005; McEntire 2001; Pelling 2003).

The nature of hazards and risks are also constantly changing (WEF 2012) and are more complex and uncertain than in the past (Renn 2008). Natural and man-made hazards might occur at the same time (Okada et al. 2011), and hazards occurring at one scale can have unexpected and profound impacts at different scales (Cosgrave 2007). The consequences of today's actions or inactions in DRR are likely to be felt in the short and long term (Mechler 2003). Such insights have led to increasing calls to create institutions that are more adaptive and thus better able to accommodate uncertainties and complexities (Ahrens and Rudolph 2006; Carreño et al. 2007; O'Brien et al. 2008).

Many suggestions have been put forward to improve the integration and adaptiveness of current DRR efforts, and many are driven by concerns over climate change (Birkmann et al. 2011; Heltberg et al. 2009; Schipper and Pelling 2006; Thomalla et al. 2006). For example, Wisner et al. (2012) argue that DRR should be undertaken across multiple sectors and scales, include actions that are both top down and bottom up, be informed by the assessment of knowledge ranging from the present and short term to centuries past as well as projections into the future, and that it requires dialogue between experts with scientific knowledge and people with local knowledge. Klinke and Renn (2011) propose the concept of adaptive and integrated risk governance and define it as the ability of creating institutional settings that are able to resolve cognitive, evaluative and normative problems and conflicts in responding to risks, relating to complexity, scientific uncertainty and social-political ambiguity. Birkmann (2012) similarly suggests that adaptive DRR requires a multi-hazard approach, the consideration of changes in time and spatial scales of DRR, and an evaluation of the adaptiveness of DRR measures. While each of the above proposals is unique in approach, they notably share a common emphasis on fostering adaptiveness in DRR through supporting decision making in dynamic environments, increasing the role of knowledge to inform learning processes and the need for resilient risk-governing institutions.

Other scholars have focused on integrated approaches within specific issues in DRR such as mitigation (Delladetsima et al. 2006), knowledge (Jonkman et al. 2008; Mercer et al. 2009), governance (Cash and Moser 2000; May and Plummer 2011) and post-disaster recovery (Chang et al. 2011; Sudmeier-Rieux et al. 2011). Some studies have shown that a

lack of integration has increased vulnerability in coastal communities (Duxbury and Dickinson 2007; Pelling and Manuel-Navarrete 2011) and urban areas (Birkmann et al. 2010). The relevance of the work presented in this paper is the importance of systematically assessing and preparing for risks across the spectrum of DRR issues.

Concurrent with these developments in the academic literature, there have been notable emerging global policy initiatives to examine natural hazards and other risks in an integrated and adaptive manner. These include the Integrated Risk Governance (IRG) Project (IGRP 2010), the Integrated Research on Disaster Risk (IRDR) Project (ICSU 2008) and the Integrated Framework for Disaster Management (IDRIM) (Amendola et al. 2008; Ikeda 2004). The IRG Project focuses on improving understanding disasters within an integrated social-ecological system, the dynamic patterns of agents and their learning, and how to strengthen institutional capacities when dealing with catastrophic or complex disaster events (IGRP 2010). Similarly, the IRDR focuses on the characterisation of hazards, vulnerability and risks, understanding decision making in complex and changing risk contexts, and reducing risks and losses through knowledge-based actions (ICSU 2008). IDRIM's goal is to promote an overall improvement in the quality of community safety and security through integrated disaster planning and management, that is, proactive, anticipatory and precautionary approach to risk, adaptive management, comprehensive policy and bottom-up governance (Amendola et al. 2008; Okada 2009). While each of these developments confirms the importance of integration and adaptiveness in DRR, the sheer novelty of these policy approaches means that there is much scope to improve our understanding of how these goals can be achieved in practice.

3 Towards a new and innovative framework for adaptive and integrated disaster resilience

This section builds on the theoretical development of the integration and adaptiveness in DRR research described above to introduce a new and innovative conceptual framework for AIDR (see Fig. 1).

A major task in developing a new framework is the integration of different conceptual analyses addressing specific aspects into a meaningful whole (Pahl-Wostl 2007). There are three layers within this framework. The *inner* layer describes integrated disaster resilience and builds upon previous work of Djalante and Thomalla (2011). The *middle* layer describes the integration of climate change within DRR strategies, based on work by Djalante (2013b). The *outer* layer describes the relationships between resilience and AG. It includes four factors relating to AG that facilitate system adaptiveness (Djalante et al. 2011). The inner and middle layers are overlaid and then placed in the centre of the outer layer to form the new AIDR framework presented in this paper. We discuss each layer below in more detail.

3.1 Integrated disaster resilience

The inner layer of Fig. 1 describes the conceptualisation of integrated disaster resilience. Integrated disaster resilience calls for the integration of DRR strategies with development while placing the community at the centre of these efforts. Resilience is generally defined as the ability of a system to self-organise, learn and adapt (Carpenter et al. 2001; Folke 2006). In the context of disasters, resilience is understood as the ability of a community or society to resist, absorb, accommodate and recover from disasters timely and efficiently



Fig. 1 An adaptive and integrated disaster resilience framework

(UNISDR 2009b). The resilience concept received international attention in DRR after the adoption of the Hyogo Framework for Actions (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters (UNISDR 2007). DRR offers a systematic and comprehensive method of identifying, assessing and reducing the risks of disaster within disaster management cycle from prevention, mitigation, emergency management to rehabilitation (UNISDR 2007).

The conceptualisation of integrated disaster resilience is based on a review of the conceptual development of resilience from its early application in the fields of ecology, psychology and engineering to more recent interpretations and applications in the fields of disaster studies and humanitarian aid. Djalante and Thomalla (2011) argue that the resilience concept should be considered both a process and an outcome and identify three important elements of integrated disaster resilience: sustainable development (SD), DRR and community characteristics. The SD components provide a supporting environment for resilience building to take place and represent key elements of development: governance and institutions; education, awareness and capacity building; social and economic development; the built-environment (physical infrastructure); and the natural environment (ecosystems). In the context of disasters, effective resilience building activities need to target the different stages of DRR (risk knowledge, mitigation, preparedness and

emergency management, and recovery and reconstruction). In all of these efforts, the community needs to be considered as an active agent of change because disaster effects are locally determined and context-specific (Djalante and Thomalla 2011).

3.2 Integrating DRR and CCA

The middle layer of Fig. 1 describes the integration of DRR, development and climate change. It shows the importance of considering climate change issues in the context of all factors influencing resilience. The Intergovernmental Panel on Climate Change (IPCC) defines CCA as “an adjustment in natural and human systems in response to climatic stimuli and their effects in order to reduce harm or obtain benefits” (IPCC 2001, p. 869). In its Fourth Assessment Report, the IPCC stated that the frequency, variability and intensity of hydro-meteorological hazards are likely to increase due to climate change (IPCC 2007). It is therefore crucial that there are strong synergies between the goals, strategies, frameworks, measures, tools, methods and funding mechanisms of DRR and CCA (IPCC 2012b). The recent IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Adaptation (SREX) suggests that to increase resilience, diversification and a combination of incremental and transformational changes are needed to reduce vulnerability to current and future climate extremes (IPCC 2012b).

Djalante (2013b) proposes that climate risk considerations should be integrated with the three key components and processes for building resilience, SD, DRR and the community. This integration can also take place in the different spheres of norms, scale and knowledge (Birkmann et al. 2011; Birkmann and von Teichman 2010). For example, for the SD component, an integration of norms can take place by improving exchanges, links, mechanisms and agreements between key development sectors that are highly sensitive to hazard and climate change impacts, such as agriculture, health, public works and infrastructures. For the DRR component, DRR and CCA can be integrated by providing knowledge on vulnerability and risk assessments for DRR and CCA, as well as developing an early warning system for both slow- and sudden-onset hazards linked to climate change. For the community component, integration can take place by enhancing local knowledge by considering climate change implications on local risk profiles or providing community-centred climate services (Djalante 2013b).

3.3 Adaptive governance and resilience

The outer layer of Fig. 1 describes the characteristics of AG that can help to increase system adaptiveness to future uncertainties and complexities. AG is characterised by notions of governance that are more flexible and innovative and that encourage learning to better manage uncertainties and system complexities (Brunner et al. 2005; Dietz et al. 2003; Folke et al. 2005). AG derives from three major areas of work: adaptive management (Holling 1978; Lee 1993), cooperative management (Olsson et al. 2004) and collaborative governance (Holley et al. 2011; Ostrom 1990, 2000).

Four key characteristics can significantly influence disaster resilience: polycentric and multi-layer institutions, participation and collaboration, self-organisation and networks, and learning and innovation (Djalante et al. 2011). While other characteristics of governance also contribute to resilience (e.g. Ahrens and Rudolph 2006), these four are highly relevant to building disaster resilience and enhancing system adaptiveness. Djalante et al. (2011) argue that polycentric institutions influence the capacity to manage resilience, due to the existence of different organisations at different scales, which allows for a better

matching of organisational and ecological scales (Folke et al. 2005), an improved fit between knowledge and action (Lebel et al. 2006), and the moderation of vertical interplay (Young 2002). Participation and collaboration can improve effectiveness and efficiency and reduce uncertainties in managing environmental problems (Lane and Robinson 2009). Self-organisation and networks are important to build resilience especially at the community level (Kendra and Wachtendorf 2003). Agency (Larsen et al. 2011), collective action (Ireland and Thomalla 2011) and social capital (Adger 2003; Pelling and High 2005) are all important in positively influencing the ability to self-organise and build networks and have been shown to increase community adaptiveness to environmental risks (Kithia 2011). The process of social learning (Lave and Wenger 1991; Scholz and Stiffler 2005) enhances resilience by providing access to knowledge (Ostrom 2010; Pahl-Wostl 2009) and platforms for coordination, negotiation and knowledge sharing (Thomalla and Larsen 2010). The process of inter-organisational learning during emergency situations and stress can lead to innovation (Comfort and Kapucu 2006; Comfort et al. 2004).

The proposed AIDR framework is designed to meet the need for integration through consideration of CCA and development within DRR strategies and to strengthen system adaptiveness through creating institutions and governance mechanisms that are polycentric and participatory and enable self-organisation and learning.

4 Pathways for implementing adaptive and integrated disaster resilience

In this section, we present strategies to implement our conceptual AIDR framework in practice. We propose seven pathways (Table 1) that are intended as guidance to researchers, policy makers and practitioners on how existing DRR strategies can be better integrated with CCA and development efforts and how institutions in DRR can be better designed to deal with the complexities and uncertainties arising from a range of environmental changes and risks.

In the following sections, we define and describe each pathway in more detail, explain how each pathway relates to the AIDR framework, how it addresses integration and/or strengthens system adaptiveness, and identify the relationships between the pathways. Following this, we undertake a global review of current developments on initiatives and activities conducted by organisations working on DRR, CCA and development. These provide the rationale for selecting the pathways as important strategies with which to build resilience and system adaptiveness in DRR using an integrated approach. We conclude by discussing each pathway in the context of Indonesia, focussing on documenting current progress and challenges, and identifying strategies that would help Indonesia to improve its progress along the pathways for AIDR.

4.1 Pathway 1: integrate DRR with CCA and development strategies

This pathway addresses the inner and middle layers of the AIDR framework which places development, DRR and the community at risk at its core and advocates the integration of DRR and CCA. This integration is vital for successful and sustainable DRR. Climate change, disaster management and international development are key areas where an interdisciplinary and integrated approach is needed (McBean 2011; Schipper and Pelling 2006). Reducing losses of weather- and climate-related hazards, meeting development objectives, as well as developing successful CCA approaches can be only be accomplished in an integrated manner (Cannon and Müller-Mahn 2010; Thomalla et al. 2006). DRR is

Nat Hazards

Table 1 Seven pathways for adaptive and integrated disaster resilience

Focus	Pathways for adaptive and integrated disaster resilience
Integrated agendas	1. Integrate DRR, CCA and development strategies
Governance	2. Strengthen polycentric governance architecture for DRR
Sectoral integration	3. Increase and coordinate cross-sectors and multi-stakeholders collaborations
Information management	4. Improve knowledge and information through comprehensive and systematic assessments of hazards, risks, vulnerability and impacts
Institutional learning	5. Facilitate institutional learning from implemented policies and experiences
Self-organisation and networks	6. Encourage and nurture self-organisation and networking
Finances and risk	7. Develop comprehensive disaster risk finance and insurance using a broad set of private and public instruments

essentially a development issue since least developed countries tend to be the ones most vulnerable to disasters (UNU-EHS 2012).

The interlinkages between these agendas have been acknowledged in various global activities by the UN organisations, international development agencies and international finance institutions. Natural hazards and climate change are part of the thematic areas and cross-sectoral issues within the sustainable development framework (United Nations 2012a). Addressing poverty and improving livelihoods are frequently the focus of this integration (ADB et al. 2011; Few et al. 2006; IISD 2003; Kok and de Coninck 2007; Mitchell et al. 2010; O'Brien et al. 2006; UNISDR 2009a, 2011a, b; World Bank 2011a, b). Benson and Twigg (2007) note that mainstreaming includes awareness raising, creating an enabling environment, developing tools, training and technical support, changes in operational practice, measuring progress and learning and sharing experience. Overall, there has been considerable progress in such mainstreaming. Many countries have acknowledged DRR and CCA issues within their development planning, including the Philippines (RoP 2009) and Indonesia (GoI 2010). International funding institutions, humanitarian aid and development agencies increasingly include DRR and CCA in their operations [e.g. AusAID (2013a); USAID (2012)], and tools for assessing climate and disaster-related activities in development programmes have been developed (Klein et al. 2007; Olhoff and Schaer 2010). This progress has largely occurred at the global level and now needs to be further advanced at the national and sub-national levels.

4.1.1 Implications for Indonesia

The strong progress at the global level has brought positive influences to the integration of DRR strategies in countries vulnerable to hazards and climate change impacts, including Indonesia. International agencies, non-government organisations (NGOs) and other stakeholders increasingly acknowledge the importance of integrating DRR and CCA within pre-existing development strategies and programmes. The appointment of the President of the Republic of Indonesia, Susilo Bambang Yudhoyono, as the Global Champion for DRR (UNISDR 2011c) and a member of the High Level Panel of eminent persons on the Post-2015 Development Agenda (United Nations 2012d) has created momentum for stronger integration in the country. At the national level, natural hazards and climate change are recognised as one of the nine development priorities in the current mid-term development plan (GoI 2010). Djalante et al. (2012) observe that key

government stakeholders such as Bappenas (the development agency), BNPB (national disaster management agency), the Ministry of Environment and DNPI (climate change council) all acknowledged the importance of these linkages. However, many challenges remain at the local level. For example, Djalante et al. (2012) find that the experience in the two local governments of Kendari and Makassar show that addressing disaster risk is considered less important than addressing other priorities such as poverty reduction and economic development. There is a considerable gap between DRR planning and implementation in that there remains a strong focus on emergency management and post-disaster response, rather than preparedness and risk reduction through improved development and other social economic strategies (Kusumasari and Alam 2012; Lassa 2011). Lassa (2011) suggests that recurrent and frequent disasters, as well as a current lack of capacity for DRR, makes it especially difficult for local governments to develop and implement DRR policies in an integrated fashion and to place the community at the centre of the strategies.

In our view, strategies to facilitate a better integration of these issues should include the training of local stakeholders in development planning (that integrates DRR and CCA), the implementation of more resilience building projects through local governments and NGOs (funded from higher level agencies) that are also embedded with development and the provision of incentives for local integrated approaches to DRR.

4.2 Pathway 2: strengthen polycentric governance architecture for DRR

This pathway describes the outer layer of AIDR that focuses on polycentric governance. It relates to the governance component of integrated disaster resilience (inner layer). Ostrom et al. (1961) use the concept of polycentric governance system to describe the traditional pattern of government in a metropolitan area with its multiplicity of political jurisdictions. McGinnis (1999) characterises it through the existence of various kinds of governing authorities at different governance scales. Creating a polycentric structure is important for AIDR because it is the catalyst for enabling other pathways. It increases system adaptiveness by enabling scale matching between different social and ecological scales (Folke et al. 2005), improves the fit between knowledge, action and societal processes (Lebel et al. 2010), increases opportunities for learning (Ostrom 2010) and collaboration (Folke et al. 2005) and allows the pooling of knowledge (Berkes and Folke 2002).

There are currently 5,134 organisations worldwide engaged in DRR, including government agencies, NGOs, international organisations and private sector (UNISDR 2012d). These operate at different scales of governance (Lassa 2011) which suggests a high level of polycentricity. An important recent development is the existence of transnational municipal networks (Bulkeley and Betsill 2005) such as the Climate Resilient Communities (ICLEI 2012), the Resilient Cities Network (UNISDR 2012b), United Cities and Local Governments (2013) and Local Leadership for Climate Action (UN-HABITAT 2011), all of which actively promote resilience and adaptation amongst their members.

We suggest that to increase system adaptiveness, polycentric structures need to be strengthened by diverting resources and decision making power over the use of resources to local governments and communities since they are most affected by disasters (Cosgrave 2007), tend to be the first responders, provide safeguards for people and infrastructure, are the coordinators between stakeholders and have the best local knowledge of hazards and vulnerability (King 2008). Strengthening the capacity of local actors involves increasing human capacity, mobilising resources and engaging relevant public/private organisations,

providing financial and technical support and building local leadership (Kusumasari et al. 2010).

4.2.1 Implications for Indonesia

Indonesia has recently undergone a major transformation in DRR most importantly through the formation of BNPB (National Disaster Management Agency) and the Disaster Management Law 24/2007. A polycentric governance arrangement is now established and is marked by the presence of 786 organisations officially involved in different aspects of DRR (OCHA 2012) at different scales of governance (Lassa 2011). Despite these positive developments, there is an urgent need to further bolster polycentric arrangements by improving the capacity of local stakeholders. Institutional capacity varies widely between national and local governments and also within the local governments. Studies on DRR on some local governments reveal a lack of capacity to implement DRR; a low understanding of the importance of strategies to integrate DRR and CCA into development; a lack of financial resources to implement integrated approaches; competing agendas of poverty reduction and local economic development; and a focus on post-disaster management (Djalante et al. 2012; Lassa 2011). Chang-Seng (2010) argues that polycentric institutions build resilience by providing support for development of tsunami early warning system technology and increased national government capacity for planning and operation. He also highlights a need to develop local capacity in operationalising the warning system and strengthening responses and evacuation. Spahn et al. (2010) add that strengthening the institutional capacity of local government is also needed to ensure the sustainability of the tsunami early warning system.

The roles of multiple stakeholders are increasingly recognised and their efforts are significant at the local level. National and international NGOs represent more than half of the organisations working in DRR in Indonesia (OCHA 2012). The availability of resources (financial and technical) and the ability to disburse them quickly, experience working with communities and more flexible institutional structures enable NGOs to respond more quickly and effectively than more rigidly structured and sometimes less resourced governments agencies (Acosta et al. 2011; UNISDR 2006). There is a great potential for increasing the role of NGOs in Indonesia through better coordination to avoid overlaps, increase synergies, improve trust and collaboration between local governments and NGOs and recognise NGOs' efforts in local policy formulation and planning.

4.3 Pathway 3: increase and coordinate cross-sectoral and multi-stakeholder collaboration

This pathway describes the outer layer in the AIDR framework relating to the collaboration characteristics of AG. It also relates to the middle layer of the framework since collaboration between sectors working on DRR and CCA is important. This pathway is closely related to Pathway 1 on integrating DRR with CCA and development since cross-sectoral collaboration is the key to ensure that integrated DRR is achieved. This pathway is also related to Pathway 2 on polycentric governance, since strong multi-stakeholder collaboration can increase redundancies of polycentric structures, which in turn increase system adaptiveness to future complex problems (Ostrom 2010). This pathway seeks to capture the processes within the DRR architecture. Collaboration is characterised by processes in which various stakeholders pool their resources to solve shared problems or dilemmas

(Shaw and Goda 2004). This is important in building system adaptiveness to future changes and complexities since it creates mechanisms to increase redundancies.

Sectoral integration between agencies has received significant recognition in international DRR strategies (UNISDR 2009a, 2011b). The HFA Mid-Term Review states that sectoral integration is of concern at the national level where agencies in DRR, CCA, development and environment still work in silos and hence sectoral fragmentation exists widely (UNISDR 2011b). This calls for over-arching authority at a government level which can set policies, drive the process and ensure budget allocations for all different aspects of DRR (UNISDR 2011b). A more promising collaboration seems to take place at the local level where networks work together to build resilience in new and innovative ways. Examples are the Asian Cities Climate Change Resilience Network (2012), the Coastal Cities at Risk Network (2012) and Climate Resilient Cities (World Bank 2009a). Common characteristics of these initiatives include the collaboration between different stakeholders, funding and technical expertise by international organisations and implementation through local institutions (universities and NGOs). They also frequently involve conducting hazard, risk and vulnerability assessments, collaboration with local government agencies to support disaster and climate change planning, and capacity building of local actors.

4.3.1 Implications for Indonesia

There is urgent need for better sectoral collaboration in Indonesia. Despite the recognition of the importance of integrating DRR and CCA within national development planning, collaboration between sectoral agencies involved is not yet significant (Djalante 2013a; Djalante and Thomalla 2012). Bappenas, UNDP and the World Bank play crucial roles in this integration (Djalante and Thomalla 2012). Bappenas facilitates national integration through development planning (GoI 2004). UNDP and the World Bank are involved in the financing, planning and operations of DRR, CCA and development (UNDP Indonesia 2007, 2012; World Bank 2009b). Better coordination is required to achieve more comprehensive DRR efforts in mitigation, emergency management, recovery and reconstruction. Flood management is an example where considerable overlaps of mandate hamper coordination and collaboration. The management of watershed and catchment areas is under the Ministry of Forestry (MoF 2010), water resources and flood protection is under the Ministry of Public Works (MoPW 2010), emergency management for flood hazard is overseen by BNPB (GoI 2008b), and the Search and Rescue Office can also be involved during disaster emergency (Basarnas 2012). These blurred lines of responsibility between these various agencies cause significant confusion and inaction, which in turn hinder collaboration and lead to poorly integrated DRR. Sectoral coordination and collaboration is better at the local level because the structures and mandates are not as complicated as those at the national level. While there are 34 ministerial agencies (GoI 2009), local government structure is developed based on local needs (GoI 2004) and is hence simpler. Bappeda (local development planning), BPBD (local disaster management) and the environment department play an important role in supporting integration and collaboration at the local level (Djalante 2013a; Djalante and Thomalla 2012).

In our view, better coordination is needed so that overlaps of mandates do not lead to a vacuum of responsibility or to a shifting of blame. Strategies to increase collaboration could include provision of financial and other incentives, the showcasing of innovation in practice that has arisen through the pooling of knowledge and resources, and the creation

of umbrella organisation responsible for coordinating the activities of different stakeholders.

4.4 Pathway 4: improve knowledge and information through comprehensive and systematic assessment of hazards, risks, vulnerability and impacts

This pathway describes the outer layer of the AIDR framework which focuses on learning and knowledge. This pathway relates to the inner layer on education, and the need for improved knowledge in the risk mitigation stage of the DRR cycle. It also addresses the core of the framework, which is the inclusion of the community and its own knowledge in the assessments of hazards, risks, vulnerabilities and impacts. Comprehensive assessments also need to take account the interlinkages between DRR, CCA and development (Pathway 1) and foster cross-sectoral collaboration in order to integrate different types of knowledge (Pathways 2 and 3). By diversifying the sources and processes in the production of knowledge, it is more likely to be more accurate, relevant and appropriate.

A considerable amount of research on knowledge of hazards, risks, vulnerabilities and impacts has been undertaken, and a multitude of different assessment methods exists (PreventionWeb 2012a). Several recent initiatives aim to implement comprehensive and systematic assessments; these include the Earth System Science Partnership (Leemans et al. 2009) and the Future Earth initiative (Future Earth 2012). Data for such assessment are provided by the Global Framework for Climate Services (WMO 2012) and the Emergency Database (EMDAT 2012). Other data portals, online platforms and communities include WeADAPT (2012), PreventionWeb for DRR (2012b), World Bank Data (2012), United Nations Data (2012c), the IPCC data distribution centre (2012a) and the Global Risk Information Platform (2013). Information is increasingly presented in the form of dynamic and interactive Internet-based reports (UNEP and UNISDR 2012) that are available to anyone, and indigenous knowledge is increasingly recognised and acknowledged in CCA (IPCC 2007) and DRR (UNISDR 2008). These developments represent a positive and innovative change towards the provision of knowledge. A lot of knowledge is now freely available (Curron et al. 2007), easily accessible from the Internet (Birney et al. 2009), presented in a more interactive and dynamic form, customisable and more user friendly (Bullinger et al. 2002). Previously, many hazard and risk assessments were copyright protected, had to be purchased and were presented in a form not easily understood. Data are no longer produced exclusively by universities, research institutes and government agencies, but also increasingly by NGOs, Civil Society Organisations (CSOs) and the private sectors (e.g. Germanwatch 2012; Maplecroft 2012). These changes have the potential to increase the role of different types of knowledge in informing decision making (Kates et al. 2001), in being more relevant in practice and in improving communication to the general public (Vogel et al. 2007).

4.4.1 Implications for Indonesia

The majority of documented data on Indonesia are accessible from global database. The challenge is to make them more accessible for Indonesian stakeholders and more applicable within their operational contexts. Notable progress on government-led data provision includes the Indonesian Disaster Database (DIBI) (BNPB 2012). Some recent studies (e.g. DESDM et al. 2012a, b; OCHA-ROAP 2011; Yusuf and Francisco 2009) represent a positive step in the provision of hazard information since they were conducted collaboratively between international and Indonesian agencies, and the results were distributed

free of charge through the Internet. However, many of these assessments are still ad hoc in nature rather than being planned systematically across Indonesia. Djalante et al. (2012) review the country's progress in implementing the HFA and observe that data on hazards, risks and vulnerabilities tend to reside within certain organisations without being available to others.

In our view, research agendas for DRR need to be developed that identify existing research on hazards and better integrate a range of other changes and risks, including climate change. A data platform is needed in which data from all relevant government authorities are collected and are made accessible to other stakeholders. There is also a need to strengthen collaboration and networking between research agencies and universities, nationally and internationally, local governments and communities, to provide comprehensive data that can be utilised to inform decision making for resilience and climate adaptation. Finally, Indonesians have traditionally lived in the coastal areas, and knowledge of how traditional communities survived earthquakes or tsunamis needs to be better documented and utilised.

4.5 Pathway 5: facilitate institutional learning based on implemented policies and experiences

This pathway describes the outer layer of the AIDR framework, which focuses on the learning characteristics of AG. It also relates to the importance of education in integrated disaster resilience of the inner layer and to the need for learning in the different stages of the DRR cycle. The relationships with the other pathways can be described as follows: diversity in learning can be facilitated by a polycentric governance system (Pathway 2), while cross-sectoral collaboration (Pathway 3) can enable and strengthen learning processes. The availability of knowledge (Pathway 4) is both a prerequisite and a result of learning. Learning is crucial to ensure adaptiveness, because it enables feedback on current policies and strategies which can help to revise existing or create new strategies (Pahl-Wostl 2008).

Theories of learning include social learning (Bandura 1977), organisational learning (Argyris and Schoen 1974), situated learning (Lave and Wenger 1991) and institutional learning (Folke et al. 2005). Bandura (1977) states that learning occurs from experimenting with the environment. Wenger (1998) proposes 'communities of practice', in which stakeholders share their concerns and interact through practice to advance knowledge. In organisational management, Argyris and Schoen (1974) propose a theory of learning called 'double-loop learning' (in contrast to 'single-loop learning'), which calls for changes in the underlying values and assumptions. Single-loop learning refers to routine learning, whereby small adjustments are made in response to errors. Double-loop learning involves changes to protocols and norms when errors are detected (Argyris 1976), and triple-loop learning involves fundamental changes within management or governance processes (Keen and Mahanty 2006).

For the purpose of this paper, we consider all of these definitions within the concept of institutional learning. The occurrence of institutional learning has been shown to help increase disaster resilience and improve system adaptiveness (Gunderson 2010; Gupta et al. 2010) by reducing information uncertainty, empowering stakeholders in choosing appropriate resilience strategies, reducing conflicts and improving fairness of decisions and actions (Lebel et al. 2010). The process of learning is also important in the disaster recovery phase because it enables critical reflection on the appropriate interventions for transforming a recently disturbed system into a more resilient state (van Oudenhoven et al.

2011). In her research on organisational learning during crises and disasters, Comfort (1985, 1994, 2005) suggests that continual inquiry, informed action and adaptive learning is a more flexible and robust strategy rather than command and control practices.

Suggested strategies to improve learning in DRR include a 'Transition and learning-zone', in which single-loop learning used in the conventional disaster management cycle is replaced by double-loop learning in which resilience building is approached by conducting institutional review and focussing on pre-disaster planning (O'Brien et al. 2010). A 'Shared-learning-dialogue' (Reed et al. 2011; Tyler and Moench 2012) is a stakeholder deliberation and learning processes in which different actors, knowledge and perspectives are deliberated and negotiated in order to achieve a common understanding, build trust and enable responses to different interests. A 'Scenario-based learning' involves the discussion of sets of scenarios of different hazards, exposures and vulnerabilities (Tsubokawa et al. 2008). Finally, learning by communities and local organisations can be facilitated by strengthening leadership, creating opportunities for dialogue and providing incentives for learning (Marschke and Sinclair 2009).

Boyd and Osbahr (2010) observe how organisations learn to consider CCA issues within a development programme and identify the following challenges: incorporating scientific uncertainties into planning, scaling up climate information based on local experiences, a lack of local knowledge of the system, an inability to process new scientific knowledge and limited resources (time and money).

4.5.1 Implications for Indonesia

Despite the recognised importance of learning and the abundance of literature on social learning, our impression is that institutional learning in Indonesia focuses more on outcomes than processes. Most publications on disasters in Indonesia report on the lessons learnt from disasters (Cosgrave 2007; Josef 2007; Schiller et al. 2008), not on how learning processes could be improved (e.g. Corbacioglu and Kapucu 2006; Moore et al. 2009). O'Brien et al. (2006) observe that lessons learnt (from DRR) are rarely incorporated into wider governance processes. Rather than critically reflecting on the underlying causes of disasters, the focus tends to be on how to better respond to anticipated risks.

Moving from single- to double-loop or transformative learning is critical in building resilience. A rare example in which double-loop learning occurred is the ACCCRN project in Semarang and Bandar Lampung. In this project, a 'shared-learning-dialogue' (SLD) was conducted through which the local governments from the two cities collaborated in developing a hazard and vulnerability assessment (ACCCRN 2012). But even here, the learning was driven by external stakeholders, and it is unclear to what extent the results from the SLD influenced the two local governments in developing their climate resilience policies. Another approach is to develop complex, but locally contextualised, disaster scenarios (e.g. a high magnitude earthquake, coinciding with an extreme flood, a high tide and/or a terrorist attack) for a major city like Jakarta. Learning could be strengthened amongst local actors, governments and NGOs, through the use of such scenarios. Community learning can take place in the context of efforts aimed at increasing public awareness and education (IFRC 2011) if these initiatives are conducted in a way that promote self-reliance (YEU and GN-DRR 2009), include local training opportunities (e.g. community-based disaster risk management, search and rescue, first aid) (ADPC 2008; YEU and GN-DRR 2009) and prioritise disaster preparedness activities at the community level (James 2008). For such initiatives to be effective, they need to be participatory

(Pelling 2007), utilise locally accepted methods, have relevance to local needs and priorities (YEU and GN-DRR 2009) and employ popular social media (Shankar 2008).

4.6 Pathway 6: encourage and nurture self-organisation and networking

This pathway describes the outer layer of the AIDR framework. It is relevant to stages of disaster risk management and usually involves communities at risk (inner layer). The relationships with the other pathways can be described as follows: networking can be facilitated by a polycentric governance system (Pathway 2), while cross-sectoral collaboration (Pathway 3) can strengthen self-organisation and networking. Networks are closely interlinked with knowledge/information (Pathway 4) and learning (Pathway 5) and to facilitate transformational processes for AIDR. Self-organisation is interpreted as a process by which a group of people organise themselves to pursue a common cause (Humphrey 2000). A network is a self-organised, usually informal system of governance that contains multiple actors that relate together to focus on common problems (Folke et al. 2005).

Networks can be utilised to buffer perturbations or shocks (Folke et al. 2002) or to deal with more complex problems at larger scales (Berkes 2009). In practice, networks tend to involve boundary organisations (Guston 2001), bridging organisations (Brown 1991) or epistemic communities (Folke et al. 2005). A boundary organisation is an arena for actors to reach a common understanding (Corfee-Morlot et al. 2011), for example, a forum for scientists and decision makers (Guston 2001). A bridging organisation is similar to a boundary organisation but has a broader scope of issues (Brown 1991), for example, an assessment team composed of different actors in a particular social-ecological system (Garmestani et al. 2008). An epistemic community is comprised of different actors with similar interests, in a formal collaboration or co-management structure of shared authority (Folke et al. 2005).

The UNISDR has developed networks of organisations working in DRR called Multi-Stakeholder Platforms (MSPs) for DRR (UNISDR 2012e). There is the Global Platform, 5 regional MSPs and 78 National MSPs (UNISDR 2012a). There are also local level MSPs and Thematic Networks based on the HFA on warning, hazard assessment and recovery networks/platforms. Djalante (2012) examines the roles of these MSPs and finds that while higher level MSPs tend to have more resources, local level MSPs have more direct impacts in building resilience locally.

Comfort (1994) states that in the DRR context, communities need sufficient flexibility and capacity for self-organisation to manage their own risk, and hence, efforts are needed to invest in building community capacity for rapid and effective self-organisation. The availability and dissemination of information is the key to building the capacity for self-organisation. It requires a system that allows the exchange of accurate and timely information, as well as giving feedback to participants and revising actions based on new information (Comfort 1994). Building a community's capacity for rapid transition in the event of a disaster is fundamental to effective disaster response. Documented cases of self-organisation focus more on network reorganisation during the emergency stage of DRR. For example, in Japan, communities reorganised themselves in the wake of the Kobe earthquake, and neighbourhoods with stronger community involvement and organisations reportedly coped and recovered better (Bajek et al. 2008). A study on inter-organisational reorganisations in the wake of the September 11 attack in the United States shows that the capacity for network coordination depends upon the availability of information to support decision-making processes (Comfort and Kapucu 2006). These examples demonstrate that self-organising networks can be critical during emergency periods and that the availability and flow of information to affected communities and organisations working in the emergency situation is crucial to foster an effective network and response.

If community self-organisation can be strengthened and maintained over a longer period of time, it can be an opportunity to initiate institutional change for coping with and increasing adaptiveness to future hazards and climate change impacts (McSweeney and Coomes 2011). Goldstein and Butler (2009) give an example of such institutional change within the United States Fire Learning Network (FLN). In this case, the ongoing fire threat became a driver for the FLN to engage in 'collaborative, landscape-scale ecological fire restoration'. The FLN extended its engagement processes, innovated through the use of technology and media (thereby enhancing information flow and access) and developed imaginary scenarios for future fire hazards. Goldstein and Butler (2009) state that these processes helped to create another cycle of innovation in collaboration which in turn helped to reform fire management institutions and fire-adaptive ecosystem in the US.

4.6.1 Implications for Indonesia

Despite the recognised importance of self-organisation and networking in building resilience, very little research has been conducted on these issues in Indonesia. Indonesia has established its National Platform for DRR and has two MSPs, in Yogyakarta and Padang (Djalante 2012). There are also the Indonesia National Network as part of the World Economic Forum Disaster Resource Partnership (APEC 2011a, b) and the Disaster Management Partnership Network of engineering and construction companies (UNISDR 2012c). However, it is not clear how they contribute to DRR activities. Two examples of self-organisation at the community level following emergency situations include Jalin Merapi (Merapi information network) and Padang community radio. Jalin Merapi was formed during the Merapi eruption in 2006 by three community radio stations in the area (Jalin Merapi 2012). In 2010, following another eruption, the network expanded to include NGOs and community-based organisations (CBOs) from the neighbouring Central Java province and to link to the Yogyakarta DRR platform (Jalin Merapi 2012). Information on the extent of damages, evacuations processes and community conditions onsite was distributed not only through radio, but also through a website, Twitter and Facebook, SMS, telephone and volunteers in the field. The Padang community radio was formed after the West Sumatera earthquake in 2009. Because of a perceived lack of the ability of the government to handle the emergency, four community radio stations in Padang city formed a network to provide information to the public on evacuation places and routes (RKPS 2012).

These examples show that community-based networks are able to form and self-organise within a short time-frame in response to hazards and that they are able to connect with more formal networks for DRR. While more research is needed to understand how such forms of self-organisation are initiated and maintained and how they contribute to disaster resilience, it is clear that such networks play an important role in building resilience and opportunities to foster them should be a strategic goal. Existing community networks should be strengthened by connecting them with other strategic networks such as the HFA thematic networks (UNISDR 2013) and by enhancing their continuity and sustainability and relevance through targeted resources and assistance.

4.7 Pathway 7: develop comprehensive disaster risk finance and insurance through private and public instruments

The provision of adequate financial resources is an important economic factor of integrated disaster resilience (inner layer of AIDR framework). The financing for DRR and CCA needs to be better integrated (middle layer) and calls for greater collaborations of multiple

stakeholders (outer layer). This pathway is strongly influenced by all other pathways. Funding for DRR can be potentially sourced from CCA and development funding (Pathway 1). The existence and collaborations of organisations within the DRR polycentric governance can help pooling of funding (Pathways 2 and 3). Improved risk assessment can help to facilitate design of the financial and insurance instruments (Pathway 4). Learning from successful funding schemes in one place can be replicated in other places (Pathway 5), and especially at the community level, micro-finance can be sourced through self-organisation and networks of affected communities (Pathway 6).

The diversification of financial resources from private and public instruments is vital to deal with complexities and to anticipate uncertain impacts from hazards and climate change. The global economic losses from disasters are enormous, totalling US\$ 3.5 trillion in the last three decades and weather-related disasters account for US\$ 2.6 trillion of the losses (GFDRR 2012b). Increasing population and economic growth, and the growing impacts of climate change, can be expected to increase the costs of disasters in the future (Bouwer 2011; Tol 2003).

The current debate on the financing of CCA focus on the calculation of the contributions to be made by countries to global adaptation financing mechanisms and the separation of adaptation from traditional development funding (Ayers and Huq 2009; Bouwer and Aerts 2006; Huq and Burton 2003; Kelly and Adger 2000). Klein (2010) compares the benefits of stand-alone and mainstreamed adaptation and states that calculating the 'new and additional funding needs' may be easier in stand-alone adaptation, but this can involve higher administrative costs and be in conflict with development. Klein (2010) argues that mainstreamed adaptation has the potential to bring more efficient and effective development, but this would require reorganisation within the current Official Development Assistance (ODA) funding.

The United Nations Framework Convention on Climate Change (UNFCCC), through the Copenhagen Accord and Cancun Agreement calls for developed countries to support the transition of developing countries to low carbon futures through the provision of 'new and additional' finance from public and private, bilateral, multilateral and alternative sources, of US\$ 100 billion annually by 2020 (UNFCCC 2009). The Climate Policy Initiative (CPI 2011) observes an imbalance between the funding allocated for climate change mitigation and adaptation, US\$ 93 billion of US\$ 97 billion are used for mitigation while adaptation only receives US\$ 4.4 billion.

In stark contrast to the billions available for CCA in the near future, there is very little international commitment for DRR funding. As Thomalla et al. (2006) describe, the little funding available for DRR usually comes from national civil defence/emergency responses, international humanitarian funding (for instance, UN Office for the Coordination of Humanitarian Affairs (OCHA)), multilateral banks and bilateral aid. The Global Facility for Disaster Reduction and Recovery (GFDRR) is one of the largest sources for DRR funding. The total amount contributed to the GFDRR fund in 2012 was around US\$ 322 million (GFDRR 2012a). Given the relatively small amount of DRR funding available, and the availability of considerably larger amount of CCA funding, it is of little surprise that many organisations have been reframing their projects accordingly (Ireland 2010)—the question is to what extent these projects represent business as usual in DRR, rather than genuinely attempting to incorporate CCA considerations.

Development programmes represent another opportunity, where funding for DRR can be accessed through development assistance. To date, this source of funding has been relatively small—the GFDRR (2012b) reports that since the 1980s, only 2 % of total worldwide development assistance (US\$ 91.2 billion) has gone to disaster-related

activities. Of this, almost 70 % has gone to emergency response, 25 % to reconstruction and rehabilitation, and the rest to prevention and preparedness. Mainstreaming DRR into development programmes means that a higher proportion of development funding might be accessible for DRR in the future.

Another potential but more controversial source of financing for DRR is insurance. Although the use of insurance as a risk reduction mechanism remains contentious, Kunreuther (1974, 1996) has long advocated for insurance as an important tool for hazard mitigation. Kunreuther and Pauly (2006) suggest a comprehensive insurance scheme with four layers, from the international to the household level. For example, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) is a risk pooling facility financed by a multi-donor trust fund of regional financial institutions and 16 member countries (CCRIF 2012). Successful examples at the national level are the Turkish Catastrophe Insurance Pool and the Mexican government national catastrophe relief and reconstructions fund (Linnerooth-Bayer et al. 2005). These show collaboration in risk sharing, involving international, regional and national organisations, governments, private insurers and NGOs, and are able to create synergies and positive results, through pay outs after disasters. At the local scale, schemes include local government and private markets by insurance companies. At the individual level, Wamsler (2007) suggests index-based insurance, micro-insurance (Suarez and Linnerooth-Bayer 2010) or targeted transfers (such as workforce and employment guarantee schemes) offered by local governments or NGOs.

Linnerooth-Bayer et al. (2005) suggest that the donor community have enough understanding (through modelling and estimates) to be able to help low-income and at-risk nations and communities to cope with potential economic losses of disasters by providing assistance prior to disasters occurring. They add that insurance schemes should be coupled with preventive measures. This way, 'donor-supported risk-transfer' would give a mutual benefits to funder and recipients by leveraging limited disaster-aid budgets and freeing recipient countries from being highly dependent on post-disaster assistance.

4.7.1 Implications for Indonesia

Disaster risk reduction funding for Indonesia is generated from a multitude of sources such as national and local government development annual budgets (Gol 2004) and also from international organisations and NGOs (Gol 2008a). The net official development assistance and official aid received reached almost US\$ 1,393 million in 2010 (Indexmundi 2013). In 2005, Indonesia received the highest ever ODA of US\$ 2,534 million just after the 2004 Indian Ocean tsunami (Indexmundi 2013). Unfortunately, we could not find the percentage of this fund that is allocated for DRR. The donor providing the largest amount, Australian Aid, gave AU\$578.4 million (2012–2013) with 4 % allocated to humanitarian aid and disaster response (AusAID 2013b). Indonesia is one of GFDRR priority core countries (GFDRR 2013a). There have been more than US\$ 7 million made available since 2007, with 96 % for DRR mainstreaming and recovery (GFDRR 2013b). Losses from disasters have cost Indonesia \$US24 billion accumulatively, almost all from the result of earthquakes/seismic activities (EMDAT 2013). The country's post-disaster response budget reached approximately US\$ 76.4 billion between 2004 and 2010 (World Bank and GFDRR 2011). The annual economic impact of natural disasters is estimated at 0.3 % of GDP and the impact is even larger at sub-national and local levels (World Bank and GFDRR 2011). These increasing disaster losses suggest that countries and organisations need to find more optimal, achievable and affordable mechanisms for financing (Linnerooth-Bayer et al. 2007).

There is some progress in developing comprehensive disaster risk finance and insurance in Indonesia, at least in planning stages. The World Bank and GFDRR (2011) suggest six options for disaster risk financing strategies, for the short, medium and long term. In the short term, Indonesia needs to develop financial disaster risk assessment tools (option 1). Option 2 is to develop a national disaster risk finance strategy in the form of a three-tier insurance: parametric insurance and catastrophic bonds for high risks, contingent credit for medium risks and contingent budget for low risk. Option 3 is to establish a National Disaster Reserve Fund (NDRF) to ensure rapid disbursement of post-disaster financing. In the medium term, Indonesia could establish disaster risk insurance for public assets (option 4). The next option is to promote property catastrophes risk insurance of private dwellings. Finally in the long term, Indonesia needs a Joint Disaster Reserve Fund for Local Governments (option 6) (World Bank and GFDRR 2011).

In summary, improved stakeholder collaboration and public-private partnerships (Linnerooth-Bayer and Mechler 2007) are crucial strategies to reduce losses. DRR financing and insurance in Indonesia should take place across all levels of governance. Indonesia also needs to utilise multiple sources of funding, including international agencies, donor organisations, the reallocation of current national and local development budgets, and private entities and NGOs (Linnerooth-Bayer et al. 2005).

5 Conclusion

We have achieved the aims of the study by, first, proposing a new and innovative framework for AIDR; second, identifying seven pathways for implementing AIDR; and third, examining the implications for Indonesia. The causes and impacts of disasters are expected to become more complex and uncertain and understanding them requires comprehensive, systematic and multi-disciplinary analysis. Through a systematic analysis of the links between resilience, DRR, CCA and AG, we have developed the AIDR framework as an analytical tool to assist scholars, policymakers and practitioners to determine the important factors contributing to disaster resilience, identify ways to better integrate CCA in DRR and create strategies aimed at increasing system adaptiveness to uncertainties and complexities.

We have outlined seven pathways for AIDR and discussed worldwide progress as to how certain pathways, or elements of them, have been implemented in practice to date. Pertinent for each of these pathways is the need to put the community at risk at the centre of the DRR strategies and to concentrate resources and attention at the local level. Our first pathway advocated for the integration of DRR, CCA and development, by building on the acknowledgement and progress of DRR, CCA and development integration internationally. The second pathway focused on strengthening polycentric governance and pointed to the high level of polycentricity in international DRR approaches. The third pathway related to fostering collaborations. Our study showed that agencies in DRR, CCA and development and environment still work in silos and work is needed to close such sectoral fragmentation. Notably, collaboration seems to be taking place at the local level where networks of cities are working together to build resilience. Fourth was the pathway of improving knowledge and information, where we identified innovative trends in the provision of knowledge through free, accessible and more user-friendly mediums. For the fifth pathway on enabling institutional learning, we identified several learning techniques that will allow DRR to shift from its current primary practice of single-loop learning approaches. Sixth was the pathway relating to the self-organisation and networking. We identified networks

of DRR organisations at different governance levels and argued that self-organisation is a critical process during emergency periods to build community resilience. Seventh and finally was the pathway relating to the provision of disaster risk finance and insurance. We found that there was a large contrast between the amount of funding available for DRR and CCA/development and called for DRR activities to tap those resources. We also discussed how DRR funding and insurance could take place more comprehensively from the international, regional, national, sub-national, local, community and household level.

Having identified the pathways, we then examined the current progress and challenges in building disaster resilience in Indonesia and suggested strategies to align Indonesia's DRR strategies with the seven pathways for AIDR. In our view, it is now time to focus attention and resources at the local level—to actively involve local governments, NGOs and CBOs and to place communities at risk at the centre of integrated resilience building activities. In Indonesia, gaps in capacity have clearly hindered the integration of DRR, CCA and development locally. Preference for reducing poverty and boosting economic development continues to outweigh DRR considerations in local development agendas. Data provision is needed through agency collaboration and increased research capacity. DRR networks especially at the community level also need to be strengthened by connecting them with other strategic networks and providing more resources and assistance. We found that pathways on learning and financing were the least understood and implemented in the country. Community learning needs to happen through increasing awareness and education to increase skills and prioritise disaster preparedness. Research is needed to understand adaptive processes of learning and how it contributes to disaster resilience. Indonesia also needs to utilise multiple sources of funding, which in turn calls for public-private partnerships between international agencies, donor organisations, national and local governments and with private insurers and NGOs.

The pathways are laid out as specific mechanisms to implement the conceptual AIDR framework in practice and are intended to generate discussion on and further explorations of the processes and trajectories for advancing and transforming (Loorbach 2007; Pelling 2011) current DRR approach to achieve a resilience and sustainable world in general and Indonesia in particular.

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CHAPTER 11 CONCLUSION

As changes in hazard characteristics and socio-economic development are increasing the vulnerability of communities to a growing, uncertain and complex set of potential shocks, this research presented in this thesis aimed to help formulate strategic solutions for building resilience to disasters caused by natural hazards and climate change impacts. Based on the notion that people and community are inherently resilient, these strategies focus on integrated governance and institutional resilience-building mechanisms to support communities in the face of uncertainty.

This chapter describes how the thesis meets the research objectives defined in the introductory chapter (Section 1.1), and continues with a summary of key insights and policy recommendations for the planning and implementation of adaptive and integrated disaster resilience (AIDR). Finally, the limitations of the research and areas for further research are identified.

11.1 Meeting the Research Objectives/ Summary of Key Findings

This thesis endeavours to meet its research objectives of developing integrated governance strategies for building resilience to disasters and climate change in policy and practice, by proposing adaptive governance (AG) strategies that are embedded within larger resilience-building strategies, which integrate issues of disaster risk reduction (DRR), climate change adaptation (CCA), and which allow for an integral consideration of the complexities and uncertainties in addressing disaster risks within a social-ecological system. Chapter 3 explores the relationships between resilience and DRR, identifying three important components of disaster resilience, namely: sustainable development, DRR and community characteristics. Chapter 4 examines the concepts of DRR and CCA and examines the drivers, progress and challenges for their integrations, Chapter 5 investigates resilience and AG and proposes four key characteristics of AG (polycentric and multilayer governance, participation and collaboration, self-organisation and networks, knowledge and learning) that influence resilience.

While the specific insights made in each chapter are important in their own right, they have also made a broader collective contribution to the development of AIDR framework by which these components and characteristics form the skeleton of the AIDR framework. Part I of the thesis gives an overview and rationale for the study. The collection of papers, presented as chapters in this thesis (Parts II, III and Chapter 10 of Part IV), form a coherent body of research that conceptualised and investigated governance strategies for AIDR, and their implications for Indonesia.

In Part II of the thesis, I provide a systematic assessment of the relationships between the key concepts, namely between resilience and DRR, DRR and CCA, and resilience and AG, and use a robust and systematic procedure through which the AIDR framework is developed. I utilise the results from Part II to inform the analysis of the progress and challenges in building resilience and integrating DRR and CCA in Indonesia (Part III). Through this process, I develop the AIDR concept and utilise it as a framework to evaluate pathways for AIDR in the Indonesian context (Part IV).

In the following sub-sections, I describe the way in which the thesis is able to meet its specific objectives. Within each of these sections, I highlight how the results and discussion chapters responded to the research objectives set forth in the introduction, summarise the findings for each research question defined in Table 1-2, and provide an overview of how these results contribute to the concept of AIDR.

11.1.1 Objective 1: To develop an in-depth understanding of the inter-relationships of theoretical concepts related to building resilience to disasters and climate change.

Chapters 3, 4 and 5 within Part II (Theoretical Review) are dedicated to delivering the first objective of the thesis. There are four key concepts that are found to be relevant to this research, namely resilience, DRR, CCA, and AG. In Chapter 3, I show that resilience is increasingly used as an indispensable concept in DRR since it emphasises the ability of the system to cope, learn and adapt from changes or disturbances to a social-ecological system (SES) (Klein et al., 2003). Adopting the concept of AG concept of is crucial to dealing with the problems related to disasters and the complexities and uncertainties of impacts. Key findings on the inter-linkages between these four concepts build the foundation for the analysis throughout the thesis. I provide a summary of these issues below to illustrate the relationships between resilience and DRR (Chapter 3), DRR and CCA (Chapter 4), and resilience and AG (Chapter 5).

Resilience and Disaster Risk Reduction

In Chapter 3, I analyse the relationships between resilience and DRR. I conduct a meta-analysis of definitions and important factors for disaster resilience, as discussed in theories and implemented in practices. I propose an integrated disaster resilience model (Figure 3-1). The model is comprised of three key components, namely sustainable development (SD), DRR, and community. The research finds that SD component is important, since it provides the supporting environment for DRR activities to operate effectively, and it reduces the underlying risks that lead a nation or community to becoming vulnerable. The DRR component has four factors: (1) disaster prevention and mitigation, (2) preparedness, (3) response, and (4) recovery and reconstruction. Strengthening resilience in each phase is necessary for effective and comprehensive DRR. Finally, the community component is comprised of values/aspirations/goals, partnerships and collaboration, participation and networks, and community knowledge and capacity. Focussing on the community is important since community characteristics vary considerably and they need to drive decisions about what they want to be resilient to and how to achieve resilience.

Disaster Risk Reduction and Climate Change Adaptation

Building on the findings in chapter 3, I examine the integration of DRR and CCA in Chapter 4. The chapter reviews these progresses, and analyses and synthesises them into a coherent analytical framework for DRR and CCA integration (Figure 4-1). The need for integration across all components of the integrated disaster resilience model is demonstrated (Figure 3-1). My discussion also show that the discourse on the integration has moved from the question of 'why' to integrate, to 'how to integrate' to achieve further progression. My research further outlines the latest institutional progresses on integration of DRR and CCA, as well as documents tools and strategies for integration.

Adaptive Governance and Resilience

In Chapter 5, I examine the relationships between AG and resilience. My research finds that AG contributes to disaster resilience through four key characteristics: (1) polycentric and multi-layered institutions, (2) participation and collaboration, (3) information and knowledge, as well as (4) networks and self-organisation (Figure 5-1). It is shown that polycentric and multi-layered institutions have an extremely important role in influencing the capacity to manage resilience. These types of institution facilitate resilience-building by enabling scale-matching between environmental problems and institutional scale, improving knowledge and actions, and also by increasing the interplay between institutions.

My review finds that self-organisation is pertinent at the local level, and that network characteristics vary in different DRR activities. The review and application of the concepts of AG within this research is a novel contribution to disaster studies, through: the general identification of the benefits of each resilience-building characteristic; identification of the relevance of AG in building resilience to disasters; identification of lessons from disaster studies can contribute to the AG literature and vice versa and discussion on further studies needed to strengthen the connections. The potential contributions from AG for more effective DRR include how to overcome ineffectiveness and inefficiencies of polycentric DRR governance, how to increase quality of and lessen transaction costs of participation of DRR multi-stakeholders, how to strengthen the role of network and self-organisations in DRR, and how institutional learning can be systematically adopted and implemented for the planning and implementation of DRR.

In summary, the above discussion shows that this thesis has been able to meet its first objective by having achieved an understanding of the theoretical underpinnings and relationships between the key concepts of building resilience to disasters and climate change, through providing a coherent and comprehensive analysis of the relevance and the inter-relationships between the four key concepts of resilience, DRR, CCA and AG.

11.1.2 Objective 2: To review the successes and challenges in building resilience to natural hazards and climate change in Indonesia, one of the most vulnerable countries in the world.

I explore the progress and challenges of building resilience in Indonesia in Part III of the thesis. This part builds on the results obtained in Part II, which examines the relationships between four key concepts of resilience, DRR, CCA, and AG. To apply this analysis to practice, I chose Indonesia as the case study since it represents a complex and pertinent environment where the impacts of climate change are increasingly felt through accelerating impacts of disasters, where climate-related disasters dominate, but also where there have been extensive progress on the planning and practice of DRR. To achieve its second objective, the research presented in Part III focuses on the progress and challenges in building disaster resilience (Chapter 5), the integration of DRR and CCA (Chapters 6 and 7), and the role of AG in resilience (Chapter 8). A summary of these issues is provided below.

Progress in building resilience to disasters and climate change in Indonesia

In Chapter 6, I examine Indonesia's progress in building disaster resilience toward the five HFA Priorities for Action and the remaining challenges. The chapter describes the development of DRR governance at the national and local level and the research indicates that some of the most progressive changes the country's DRR planning have been driven by the existence of regulatory frameworks related to the Law 24/2007 on Disaster Management, and by the participation of multi-stakeholders, particularly at the local level. Law 24/2007 recognises the need to increase hazard awareness and to develop a more systematic and integrated approach to DRR. It introduces a fundamental paradigm shift in DRR from reactive to proactive approaches, formally acknowledges that DRR is an important part of the people's basic right to protection and their needs being mainstreamed within government administration and development. Other principles recognised include public participation, public-private partnership, international collaboration, and a multi-hazard approach. Public participation is important since it helps to increase the accountability of the implementing agencies (in this case the government), and serves to encourage public partnership engagement and with DRR programs. Private partnerships and international collaboration can help Indonesia gain more support in terms of knowledge and resources in building resilience. A multi-hazard approach is important in Indonesia because the country is affected simultaneously by a range of hydro-meteorological and geophysical hazards. In order to increase the effectiveness and efficiency of DRR activities, these hazards need to be addressed in an integrated way.

A key challenge is the lack of capacity for implementing DRR at the local government level. This includes; a minimal understanding of the importance of strategies to integrate DRR and CCA into development; insufficient financial resources to implement integrated approaches; competing agendas of poverty reduction and local economic development; and a heavy focus on post-disaster management. A consequence is that different localities have achieved very different levels of progress. As has been discussed in Chapter 6, interviews with stakeholders in the cities of Makassar and Kendari show that they were more concerned with poverty reduction than with DRR, and that if a disaster were to occur, they expected support to be provided from higher levels of government. On the other hand, some locations (such as Aceh, Padang and Yogyakarta), are much more advanced in conducting activities related to DRR due to the support of the various international organisations after the extensive impacts from the recent earthquake in 2009 in Padang, volcanic eruption in 2006 and 2010 in Yogyakarta, and the Indian Ocean tsunami in 2004 which hit Aceh.

Also in Chapter 6, I identify emerging issues that add another layer of complexity to DRR efforts in Indonesia: these are efficient integration of DRR and CCA, and urban risk governance. All of these findings are highly valuable for DRR policy and practice in Indonesia and the literature related to building disaster resilience. First, the finding in Chapter 6 shows that different places in Indonesia experience different types of hazards and also different socio-economic characteristics, and that disaster management and resilience building activities need to address these different characteristics in order to be effective. Hence, it is crucial to strengthen the capacity of local actors to deal with the hazards and risks. Second, the finding in Chapter 6 also shows that the role of external organisations (higher levels of government, national and international NGOs) in providing support and resources to local stakeholders is vital.

Progress and challenges in integrating DRR and CCA in Indonesia

In the next stage of the analysis, I examine the progress and challenges of DRR and CCA integration. Chapters 7 and 8 (of Part III) build on the result in Chapter 4 in Part II (Theoretical Review). Chapters 7 and 8 examine the drivers, progress and challenges to integrating DRR and CCA at the national and local levels, and also vertically and horizontally across institutional levels in Indonesia. The chapters also compare the development of CCA legislation and institutions, both of which are still mostly developed at the national level. The chapters show that DRR and CCA integration has to-date only occurred in normative terms; it is merely of recognition of the need for integration, with no actual implementation of integrated activities.

This paper contributes to literature on DRR in Indonesia since there has not been systematic study on DRR and CCA integration in Indonesia. After the papers in chapter 7 and 8 were published, UNDP produced a similar report on the integration in Indonesia (UNDP Indonesia, 2012a). This integration is important to ensure better coordination of activities, and avoid duplication of efforts by different agencies implementing DRR and CCA activities. The research presented in Chapters 7 and 8 shows that the key driver for the integration of DRR and CCA in Indonesia is the high-frequency of hydro-meteorological hazards. Disasters caused by such event comprise almost 60% of disasters, more than 60% of the number of total people affected, and almost 60% of the total damage incurred.

My research further indicates that challenges for the integration include sectoral segregation between national level government agencies, and a lack of understanding of local stakeholders of the need for integration. Both of which hinder the ability to plan and implement an integrated approach. This understanding of the challenges to integration is critical in order to help formulate strategies for more effective integration. The chapters hence recommend three strategies for enhanced integration. First, there needs to be a re-orientation of the institutional arrangements for DRR and CCA, to increase the efficiency of planning and implementation. Second, DRR and CCA activities require stronger support at the local level, with the specific aim of reducing the underlying causes of vulnerability of communities at risk. Third, non-government organisations play an important role in integrating DRR and CCA through community-based initiatives. The most important implication of these findings is that the need to support local stakeholders, namely local governments, local non-government organisations and community-based organisations, is even stronger since they are often the first-responders to disasters and tend to understand specific conditions that can hinder or accelerate resilience-building efforts.

Adaptive Governance and Resilience in Indonesia

Having identified strategies for addressing the challenges to the integration of DRR and CCA in Part II, I discuss multi-stakeholder platform (MSPs) for DRR as an innovative AG strategy for building disaster resilience in Indonesia in Chapter 9. In this thesis, MSP in DRR is understood as multiplicity of organisations at different scales of governance working towards more coordinated and integrated actions in DRR. MSPs role in building resilience is considered an important strategy in DRR since it enables implementation of adaptive governance that is considered new and innovative strategies. It is innovative since MSPs allow for pooling of knowledge and experiences, and provides space for participation and collaboration or multi-stakeholders to be involved actively in DRR rather than the previously heavy reliance on governments.

In Indonesia, MSPs consist of organisations beyond key government organisations, to include NGOs, business actors, local CBOs. My findings in this chapter indicate that MSPs is an innovative strategy since it can facilitate better coordination and pooling of resources and knowledge that can facilitate better integration of DRR and CCA. Furthermore, I find that higher-level MSPs tend to have more capacity, linkages and resources than their lower-level counterparts, despite the findings that local MSPs are the ones who contribute directly to building resilience and reducing vulnerability.

In summary, the above discussion demonstrates that this thesis has been able to met its second objective by providing a coherent and comprehensive understanding of the progress and challenges in building resilience to disasters and climate change in Indonesia.

11.1.3 Objective 3: To develop a set of adaptive governance strategies aimed at helping to achieve integrated DRR and CCA in both policy and practice

Building on Part II (Theoretical Review) and Part III (Case Study of Indonesia), my research in Chapter 10 Part IV proposes the concept of adaptive and integrated disaster resilience (AIDR) (Figure 10-1). In developing the AIDR framework, I am conceptually influenced by three significant areas of research on the implications of adaptive governance in managing complex social-ecological system, namely adaptive water governance (e.g. Pahl-Wostl, 2008; Pahl-Wostl et al., 2008), adaptive governance, risk and resilience (e.g. Lebel et al., 2006; Lebel et al., 2010b), and adaptive risk governance (e.g. Renn, 2008; Klinke and Renn, 2011). AIDR provides the scope and ability to face complexities and uncertainties by designing institutional processes that function across sectors and scales, engage multiple stakeholders, support self-organisation and enable social learning.

The identification of seven pathways to achieving AIDR is one of the main achievements of the research presented in this thesis. These pathways have considerable value for theory and policy in DRR and CCA. They offer much needed guidance to theorists and policy makers on how to better integrate existing DRR strategies with CCA and broader development aims. This guidance includes recommended institutional strategies that are likely to be better suited to complexities and uncertainties through the strengthening of polycentric governance; the fostering of multi-stakeholder collaboration; the improvement of knowledge and information ability and exchange; the enabling of institutional learning; the ability to self-organise and network; and the increasing role of risk finance and insurance. In addition, these pathways call for policy makers to direct more resources to the local level and to put the community at the centre of the integrated activities. The results from all chapters in Part III (Case Study of Indonesia) generally suggest that progress in DRR and CCA has occurred predominantly at the national level. The importance of investing DRR more strongly at the local level have also been one of the key findings in the global documents of progress towards the HFA Priorities for Action (UNISDR, 2011d). The discussion shows that this thesis has been able to meet its third objective by proposing AIDR framework and pathways as governance strategies to achieve an integrated DRR and CCA in policy and practice.

To sum up this section, the above discussion shows that this thesis has met the three objectives defined in the introduction through a robust and systematic analysis of the key concepts, the implications of findings to DRR and CCA policy and practice in Indonesia, and the formulation of governance strategies that allow for a more effective integration of DRR and CCA in policy and practice.

11.2 Study Limitation

The conclusions outlined above have made a number of important contributions to the literature related to resilience, DRR, CCA and governance, and to DRR policy and practice, generally or in Indonesia. The findings generally be applied especially to those countries in Asia with similar characteristics to Indonesia, such as the Philippines, Bangladesh, Viet Nam, to name but a few. These countries are similarly subject to the hazards of physical and climate-related disasters, and are also categorised as lower or lower-middle income countries. However, as with any study, there are some inherent limitations for generalising the findings from this case study to other contexts. Complexity in resilience building is shaped by nations and communities' differences in social, economical, political, technological and cultural differences that have been shaped through hundred and throughs of years of history. The approach to analyse the situation may be similar, but the way to arrive at the conclusion or findings will likely to be different and hence lead to different solutions. Moreover, using case studies of two local governments (i.e. Kendari and Makassar cities), limits generalisation to other places in Indonesia. However, other places that are very vulnerable such as Aceh, Padang, Jakarta, Semarang, Yogyakarta and Papua are included in the discussions. Hence this study has been able to consider between highly and less vulnerable, between large and smaller cities, and between western and eastern part of Indonesia (see discussion in Chapter 2, section 2.2 on the fieldwork).

Publishing the results through thesis-by-publications has its advantages, but also comes with certain limitations and challenges. Writing a thesis through publication is beneficial in terms of communicating research quickly, getting exposure to publication processes, and receiving feedback from others. It also somewhat reduces the heavy load of writing towards the later period of the PhD. However, it leaves me with little flexibility in changing or refining the direction of my study if needed at a later stage of my PhD. I need work around material that I have already written and published. Moreover, repetition on the discussions of the four key concepts in this thesis (resilience, DRR, CCA and AG) as well as the discussions on the occurrences of and impacts of disasters worldwide and in Indonesia is unavoidable in each of the published paper. I find it particularly challenging trying to put all the papers together in a coherent thesis. However, I had anticipated this challenge by developing a clear outline early in the project and by consistently reviewing my thesis outline should changes become necessary. The literature that I utilise is limited to that published in the years before my papers are written. However, I overcame these challenges through discussing and utilising the latest literature on specific concepts in section 1.4 of the thesis Introduction.

11.3 Contribution to Knowledge

In this section, I discuss the contribution of the research to knowledge, organised based on the contributions made to theory, policy and practice.

11.3.1 Contributions to theory

My research makes several theoretical contributions, in relation to the examinations of the inter-linkages between the four concepts (resilience, DRR, CCA and AG) adopted in the thesis. While there have been calls for an integrated analysis in building resilience (e.g. Paton and Johnston, 2006), most existing literatures focuses on the inter-linkages between only two concepts, such as resilience and DRR (e.g. Manyena, 2006), DRR and CCA (e.g. Schipper, 2009) or resilience and adaptive governance (AG) (e.g. Folke et al., 2005). This research makes the theoretical contribution of conducting analysis utilising the four concepts simultaneously. This simultaneous analysis of these four key concepts is based on the results of the fieldwork in Indonesia, which show that governance capacity and institutional arrangements hinder both the integration of DRR and CCA, and the ability of local stakeholders in planning and implementing resilience activities.

I comprehensively review the development of resilience concepts within the disaster management. This study contributes to the literature related to resilience studies through the comparison of how resilience is defined in theory to how it is understood and implemented in the practice of DRR. As a comprehensive study it adds value to existing literature through the examination of disaster resilience in different fields of study and through comparisons between the interpretation of theories and the actual practices of humanitarian and development organisations. While there have been vast amounts of research examining the etymology of resilience (e.g. Manyena, 2006; Birkmann et al., 2012), this research makes valuable contribution through analysing how the concept is understood in practice, by organisations such as the IFRC, UNISDR, US/IOTWS, DFID (see Chapter 3). This is of significant importance, since these organisations have been implementing and conducting activities on the ground to directly build resilience at the community level (e.g. Twigg, 2007; IFRC, 2008).

My research also contributes to the development of an analytical framework for DRR and CCA integration. While there have been many studies that examine the integration of DRR and CCA, as discussed in the academic literature, as well as studies on the progress of integration within the international spheres of DRR and CCA, they are analysed separately, either in journal papers (e.g. Schipper, 2009) or in organisational reports (e.g. Tearfund Organisational Report prepared by Venton and La-Trobe, 2008).

Furthermore, my research makes a vital contribution to the literature through a coherent analysis and documentation of the latest knowledge on the proposed tools, strategies and progress in integration, obtained from academic papers and organisational reports. The comprehensive framework for analysing disasters and adaptation is needed to provide perspective and to create a paradigm shift from the current, generally separate, discussions and application of these issues. An integrated approach in DRR and CCA is essential, are, since they both aim to reduce vulnerability, to increase resilience and both call for a no-regret approach, resources could be used more effectively when implemented in an integrated fashion. This framework contributes to both the literature and practices since it allows for different key concepts to be developed in a robust and systematic manner. This is important in expanding the credibility of research and also the applicability of the research into practice. Another contribution I make in this research is through utilising the results from Djalante and Thomalla (2011) on the integrated disaster resilience model (see Figure 3-1) to propose that CCA integration needs to be considered within all the factors that build disaster resilience. This is a similar concept to the coupling point for integration proposed by Prabakhar et al. (2009).

This research applies the theory of Earth System Governance (ESG) to the issue of DRR and CCA integration. The integration of DRR and CCA is imperative in Indonesia, considering that the frequency and the economic impacts of climate-related disasters dominate the characteristics of disasters in general, and are expected to escalate in the future. The integration of DRR and CCA is also necessary to make sure that resources are utilised effectively in tackling both problems integrally rather than separately. The ESG is a novel approach proposed by Biermann et al (2010), which has been applied extensively to other complex environmental problems such as ocean governance, coastal management, and global environmental governance (Gupta and Lebel, 2010), but has not yet been similarly utilised in the field of DRR. By utilising the ESG framework, this study has been able to contribute to existing knowledge through the systematic examinations of the drivers, challenges, key institutions and their roles and relationships, all of which lend to the identification of policy-relevant strategies for better integration of DRR and CCA in Indonesia.

I also explore the implications of the adaptive governance (AG) concept, where developed within other disciplines and applied to disaster studies. The AG concept has been extensively applied in the field of complex environmental governance such as water, coastal areas and natural resources conservation, but not in DRR studies. Yet, AG is vital in strengthening the processes in building resilience since it allows for a flexible, collaborative and learning-by-doing governance approach. All of these studies contribute to the development or utilisation of multi-disciplinary methods in understanding complex environmental problems such as disasters.

Moreover, my research develops a systematic analytic structure in devising the AIDR framework, where the conceptual development and theoretical linkages between each of the key concepts of DRR, CCA, resilience and AG are examined and are utilised to analyse the more complex relationships between all key concepts.

Finally, my research contributes to the advancement of science and policy interface. Closer science and policy interface, as well as policy-relevant academic studies, are needed and strongly encouraged to ensure that science fulfils its responsibility to aid the advancement towards a better and more sustainable society (Hjerpe and Linnér, 2009; Weichselgartner and Kasperson, 2010). I critically examine and make reference to various international activities, alongside organisations' reports related to DRR and CCA planning and implementation. I then analyse these progresses using frameworks that have been conceptually developed in various disciplines related to disaster studies. I combine these analyses with the results of fieldwork in Indonesia, to develop a framework of and pathways for AIDR, which are strongly policy-relevant.

11.3.2 Contributions to policy and practice

This research further makes several contributions towards introducing the relevance of the resilience concept into policy and practice. My research examines the various frameworks and practical guidelines on disaster resilience proposed by organisations, which have been working on building community and nation's resilience to disasters. By focussing on Indonesia as the case country, the research contributes to literature with the studies on a country that is highly vulnerable to disasters and climate change (UNDP Indonesia, 2012b).

I identify key governance actors and issues for DRR and CCA in Indonesia. It is a unique perspective, in that I utilises information obtained from my semi-structured interviews with key stakeholders in DRR and CCA, together with my personal knowledge and perspective working in the development sector in Indonesia. I conducted the fieldwork with various stakeholders at the national level and also with two local governments' stakeholders in Makassar and Kendari. Moreover, the research, through the analysis of existing literature, makes references to other highly vulnerable areas such as Padang, Yogyakarta, and Jakarta.

I also develop the recommendations to be useful for policy makers and development actors on DRR and CCA in Indonesia. With the papers published through this study, I make a contribution through critical analyses on knowledge, policy and practice in DRR in Indonesia. There have been similar studies conducted previously, but they focus mostly on DRR in Indonesia, and also discuss local areas of Aceh, Padang, Bali and Yogyakarta (Chang-Seng, 2010; Lassa, 2010; Kusumasari, 2012). Moreover, much of the existing literature is based on reports by organisations implementing projects related to DRR in Indonesia, such as the World Bank (World Bank and GFDRR, 2011), UNDP (UNDP Indonesia, 2007, 2008b, a, 2012a), BNPB (BNPB, 2009, 2010a, 2013b) to name but a few. My research harnesses information from those organisations' reports and combines it with information gained through empirical studies in two different locations in Indonesian, Kendari and Makassar. This critical analysis is vitally essential in gaining closer, better and more objective analysis of the progress and challenges in building resilience in Indonesia.

I utilise the integrated resilience model (Chapter 3), the integrated DRR and CCA model (Chapter 4) and the framework for adaptive governance and resilience (Chapter 5), to analyse the progress for building disaster resilience in Indonesia. I provide a systematic analysis of the progress in Indonesia, various tools of analysis, either existing frameworks such as the HFA, or synthesised frameworks developed in this study. While there have been reports submitted by the government of Indonesia on the progress in implementing the HFA, these have not been theoretical studies which critically and objectively examine the progress, which this study attempts to do. Through the analyses done in Part III of the thesis, on the case study of Indonesia, this study valuably suggests several policy-relevant recommendations for more effective governance strategies in building resilience and integrating DRR and CCA in Indonesia. Policy-relevant recommendations are extremely useful, since the responsibility of developing DRR and CCA strategies lies mostly with the governments, from the national to local level.

Another practical significance of the research includes identification of the role of multi-stakeholder platforms (MSPs) as an innovative or new practice in DRR. One of the four important characteristics in adaptive governance (AG) that is necessary to building resilience is the formation of MSPs in DRR. The roles of MSPs have been proposed in different studies, which involve complex and interlinked problems of social and ecological systems. Based on my interviews in Indonesia, I am able to examine the role of MSPs as a novel and innovative strategy in building resilience, since MSPs can help to connect various organisations informally and to pool knowledge and resources from various organisations. In this thesis, I argue that the role of MSPs in DRR, from the global to local level, is an innovative strategy to building resilience. This study contributes to a theoretical analysis on the roles of MSPs, something that has not been done previously. All of these individual studies contribute to and expand the development of resilience studies, and are applicable to DRR practices and policies.

Through combining the results of the theoretical analyses and empirical explorations of Indonesia, my other key contribution of this research is the proposed framework for adaptive and integrated disaster resilience (AIDR), and accordingly pathways for more efficient and accelerated resilience building in Indonesia. Pathways for AIDR are imperative as they propose governance strategies, which consider the three most relevant issues for building resilience, namely DRR, CCA and development. The pathways would significantly fill the gap in current governance strategies by accommodating and utilising multi-stakeholders, as has been shown to increase resilience effectively.

The pathways for AIDR are especially consequential for Indonesia, considering that it is one of the most vulnerable countries to disasters and climate change. Indonesia is currently a developing country where much of the impact of ineffective development, such as non-compliance with land-use regulation or infrastructure provision without consideration of risks, puts the community at-risk in the first place. Through utilising the pathways, Indonesia can aim to build resilience more comprehensively, since the pathways call for integration of DRR, CCA and development, involvement of multi-stakeholders, as well as for the utilisation of disaster risk insurance and finance.

The pathways of AIDR are policy-relevant and can be utilised by policy makers in Indonesia in trying to build resilience to disasters and climate change. A targeted and efficient strategy for building resilience is needed within the context of Indonesia, where resources are limited, capacities are generally low and the frequency and impacts of disasters are worsening. Through the pathways generated from the AIDR framework, this study manages to suggest a comprehensive and systematic assessment of resilience-building progress and hence suggests more targeted and efficient strategies for the integration of DRR, CCA and development in policy and practice.

11.4 Recommendations

11.4.1 Recommendations for improving DRR policy in Indonesia

I choose Indonesia as the case study since it is one of the most vulnerable countries to disasters and climate change. The combinations of geographical and socio-economical factors put Indonesia in a vulnerable position to hazards and disaster risks. It is located in the geological 'ring-of-fire', circled by a ring of volcanic mountain forms. It is a low-lying coastal area with the majority of its people living along the coast. Moreover, since the 2004 Indian Ocean tsunami, there have been substantial transformations in DRR, mainly through the development of DRR institutions and through increased awareness of building resilience at the community level. This situation provides immense opportunities for researching DRR, as is reported in Part III of the thesis. In addition to focusing on the individual elements of disaster resilience, there is merit in stepping back from the detail in order to draw together key recommendations for improving disaster resilience in Indonesia. This section does so by identifying three key groupings of recommendations that are central to improving disaster resilience. These recommendations make a twofold contribution. First, they provide valuable policy recommendations for a country that is extremely vulnerable but also is increasingly transforming its DRR planning and activities. Second, the groupings provide a broad and interrelated set of recommendations that warrant attention from policy makers and scholars in future normative theorising about disaster resilience in other countries and contexts.

To achieve an integrated disaster resilience

In Chapter 6, I examine Indonesia's progress in building resilience and outline four recommendations to accelerate the progresses. The underlying points within these recommendations are the need to concentrate efforts at the local level, through expanding the capacity of local governments and other stakeholders as well as through increasing community participation in DRR.

- First, there is a need to strengthen the participation and coordination of multiple stakeholders at the national level, and to formulate a coordinated funding mechanism to improve DRR (as well as CCA) coordination between different national ministries. Not only Bappenas need to play more active role in horizontal coordination between key sectoral agencies (for mainstreaming DRR and CCA in development) but also BNPB should be more actively involved.
- Second, there needs to be improvement in the capacity and capability of local governments, especially with regard to program implementation. One key issue arising with this regard is on qualification of the status of disasters (national, provincial, local) which is currently has not been legislated. The current principle adopted is that higher-level government (national and provincial)

must provide supports for emergency reliefs and recovery process when a disaster's impact exceeds a local government's capacity.

- Third, participation of a wide range of stakeholders at the sub-national and local levels to support community-based DRR is to be encouraged.
- Fourth, there is a need to develop methods and tools for mainstreaming DRR into local development planning which are suitable to local conditions and acceptable to local governments.

There are three recommendations made to accelerate the progress of DRR.

- First is to provide more support to local MSPs in order to increase the capacity and capability of local actors. Involvement of various stakeholders can lead to and facilitate information and knowledge sharing. Chapter 9 discusses the roles of MSPs in building resilience to disasters. MSPs role in building resilience is considered important strategy in DRR since it enables implementation of adaptive governance that is considered new and innovative strategies. It is innovative since MSPs allow for pooling of knowledge and experiences, and provides space for participation and collaboration or multi-stakeholders to be involved actively in DRR rather than the previously heavy reliance on governments.
- Furthermore, the availability of combined resources can improve local preparedness and response. As shown in Chapter 9, this level of support needs to be extended, specifically to enhance the participation of communities and groups at the grassroots level, and, in particular, the support needs to improve capacity in local governments and local NGOs, as well as to facilitate the identification of focal point and champions for DRR locally.
- Another recommendation is that the local networks in Indonesia create more links with established networks, especially those based thematically on the HFA priorities.
- The last recommendation made here for Indonesia is to broaden and strengthen engagement with 'non-traditional' stakeholders, which, in the Indonesian context, include sectoral organisations, parliamentary members, scientific and academic communities and the private sector. Parliamentarians in Indonesia should play a stronger role in setting policies and legislation and in the creation of enabling environments for DRR. As shown in Chapter 6, parliament plays an important role in the government's development budget allocation for DRR activities (Djalante et al., 2012), however there is still no involvement of members of the national parliament within the Indonesian National Platform's organisational structure. Another important stakeholder is the private sector, which is the provider and leader in the construction of resilient infrastructure, sustainable development of urban areas, energy safety and the protection of critical resources (GPDRR, 2011a), which is pertinent to Indonesia.

To enhance the integration of DRR and CCA

Based on Chapter 7, I outline three recommendations for more effective integration of DRR and CCA in Indonesia.

- First, there needs to be reorientation in the institutional arrangement, especially among the roles of key agencies such as BNPB, DNPI, MoE and Bappenas, as well as those of UNDP and the World Bank. It should be noted that while these key agencies have and will remain key stakeholders, it is recommended that other national governmental agencies should also be involved more active in the processes of DRR and CCA integration. Moreover, international donors and funding agencies may facilitate this through their funding schemes, but the sustainability needs to be built in these schemes, through enabling national and local agencies and other stakeholders to take greater and more active responsibility in the future.
- Second, the study finds that the strong and cogent involvement of NGOs in implementing the integration warranted the recommendation for more support and resources to be allocated at the local level to the local NGOs stakeholders.

As is outlined in Chapter 8, strategies to facilitate a better integration of these issues should include the training of local stakeholders in development planning (that integrates DRR and climate change), the implementation of more resilience-building projects through local governments and NGOs (funded from higher-level agencies) which are also embedded within development, and the provision of incentives for locally integrated approaches to DRR. More specifically at the local level, the role of Bappeda in facilitating the integration between DRR and CCA should be strengthened through the support of the Ministry of Home Affairs (MOHA) as the key coordinators for sub-national and local governments in Indonesia. Hence, it is important the MOHA is to be involved in the integration processes.

To increase the adaptiveness of DRR and CCA strategies

My recommendations to increase adaptiveness within the DRR and CCA strategies are outlined in the seven pathways for AIDR in Indonesia, discussed in Chapter 10, Part IV.

- The first pathway is to integrate DRR, CCA and development strategies.
- The second pathway is to strengthen polycentric DRR arrangements by improving the capacity of local stakeholders. Institutional capacity varies widely between national and local governments, and also varies within the local government. Studies on DRR in some local government levels reveal a lack of capacity to implement DRR; a low understanding of the importance of strategies to integrate DRR and CCA into development; a lack of financial resources to implement integrated approaches;

competing agendas of poverty reduction and local economic development; and a heavy focus on post-disaster management.

- The third pathway is to improve coordination between agencies involved in DRR, CCA, environmental protection and development in Indonesia, in order to avoid an overlap of mandates or a shifting of blame. Improved coordination is also essential to make sure that all resources (financial and in-kind) are available and ready when needed (such as during emergency situations). Strategies to increase collaboration include giving incentives (for example – financial), showcasing the benefits (e.g. innovation in practice that has arisen through the pooling of knowledge and resources) and developing umbrella organisations that are responsible for coordinating the activities of different stakeholders.
- The fourth pathway is to develop research agendas in DRR, which systematically and comprehensively identify existing research on hazards, and better integrate material on a range of other changes and risks, including climate change. This can be strengthened through provision of data platforms, collaboration and networking between agencies, nationally and internationally.
- The fifth pathway should focus on the provision of systematic learning mechanisms within DRR processes in Indonesia. Chapter 10 recommends for the provision of more activities to experiment with moving from single- to double-loop or transformative learning, and for developing complex, but locally contextualised, disaster scenarios (e.g. a high magnitude earthquake, coinciding with an extreme flood, a high tide and/or a terrorist attack) for a major city like Jakarta, as well as for the strengthening of community learning through increasing awareness, training, community disaster preparedness and search-and-rescue.
- Sixth, community self-organisation is an imperative strategy especially during disaster emergencies. Hence, more support needs to be given to community networks, including identifying and strengthening existing community networks, connecting them with other local, regional and international networks and with the HFA thematic networks, and supporting their continuity and sustainability through providing resources and in-kind assistance.
- Seventh, DRR insurance in Indonesia should be implemented comprehensively from the regional to local and community level.

11.4.2 Recommendations for improving international institutions, policies and guidelines for

DRR and CCA

I appraise the role of the UNISDR in coordinating, campaigning, advocating, and informing various aspects of DRR internationally. Through its five regional offices (Africa, America, Arab States, Asia and Pacific, and Europe), the UNISDR has demonstrated effective conduct in its mandates. My findings on DRR progress in Indonesia show that nationally, there has been excellent coordinated action, mainly between UN organisations, UNDP, World Bank, OCHA, and BNPB. As is outlined in Chapter 9 on MSPs in DRR, my recommendations for UNISDR would be to initiate and strengthen engagement between established and new emerging networks internationally, to those nationally, and most importantly, to local networks. Established relationships between stakeholders involved in the Global Platform for DRR, determined by the UNISDR, should be extended to network with NGOs and CBOs locally, which would otherwise not have access to the pooling of wealth and knowledge inherent within the Global Platform.

One finding in Chapter 3 is that the HFA was one of the most comprehensive DRR frameworks, which precipitates its use in Chapter 6 to examine the progress in implementing the HFA in Indonesia. I would like to use this opportunity to recommend a more systematic approach to assessing a nations' progress in implementing the HFA. Even though there are 22 indicators of the five HFA priorities for actions, the current practice is that nations voluntarily measure their own progress, which self-assessment is likely to lead to inconsistencies in the assessment of comparative countries. A parallel process conducted by the Global Network for DRR (GNDRR), a networks of NGOs in DRR worldwide, shows that the HFA progress differs globally (GNDR, 2009; Oxley, 2009; GNDR, 2011), and in Indonesia (YEU and GNDRR, 2009). For example, using the results from the Global Assessment Report 2011, Indonesia's achievement of 2.8 in priority 3 has a different outcome when viewed from the perspective of a similar progress in Viet Nam. An example is set by the United Kingdom, the first nation to measure its HFA progress through a peer-review process (UNISDR, 2013f).

As has been noted in various reports on the HFA evaluations (UNISDR, 2011d, 2013d, b, e, a), now is the time to concentrate efforts towards the local stakeholders in the reporting processes, specifically, towards those that are more likely to reflect the progress of implementing DRR. The UNISDR's 'Resilient Cities campaign and 'Safe School and Hospital campaign' are two strategies that need to be strengthened locally through better and more systematic methods for reporting the progress of implementation.

My findings in Indonesia show that seven local governments (Makassar, Jakarta, Bantul, Padang Pariaman, Sleman, Yogyakarta and West Sumatra Province) are currently involved in the 'Resilient Cities' campaign and have submitted their local progress reports on the implementation of the HFA and 10 Essentials for Making Cities Resilient (2011-2013) (UNISDR, 2013b). A closer examination of the reports submitted shows no consistency in the ways progresses are measured. Moreover, despite Indonesia's pledges to increase the safety of more than 3,000 schools and 100 hospitals (UNISDR, 2010, 2011a), there are no systematic efforts to report on the campaign's progress.

11.4.3 Recommendations for future research

In the course of developing more effective and integrated strategies to build resilience to disasters and climate change in policy and practice, various features related to resilience, DRR, CCA and AG have been examined. Taken as a whole, this analysis raises several critical issues that warrant further research by scholars of disaster resilience, environmental governance or social science. The identified future research recommendations include:

Methods to measure the processes and outcome of community resilience

As is identified in the findings, on integrated disaster resilience (Chapter 3) and on implementing the HFA in Indonesia (Chapter 6), there are significant challenges to identifying important component for resilience, as well as how to measure whether resilience to disasters has been improved after any particular activities. There has been a proliferation of tools and strategies proposed, such as the social vulnerability index or community resilience indicators (Cutter et al., 2008a, b), and measuring vulnerability to increase resilience (Birkmann, 2005), to name but a few. I recommend further studies to identify resilience-building innovations and activities occurring at the local level. Documenting these activities would enable the development of meta-analysis or typology of local resilience-building activities, as well as documenting lessons learnt and challenges encountered for global application.

Legal framework for better coordination in DRR and CCA activities

A finding from Chapter 6, on the progress of implementing the HFA in Indonesia, states that one key difficulty in building resilience to disasters and climate change in Indonesia is the difficulty in horizontal coordination and collaboration between sectoral agencies at the national level as well as those vertically between the national, sub/national and local level. It is recommended that a multi-level comprehensive legal framework as well as tools for coordination between different stakeholders is needed. This hence needs to be multi-disciplinary between disaster, law, as well as policy studies.

Research on institutional and legal arrangement for implementing DRR at the local government level

Another finding from Chapter 6 is the need to increase local government understanding on the importance of mainstreaming DRR and CCA locally. While this finding has been understood by many, the main issue lies on how to bring more financial and technical support to local governments while their capacity to absorb this additional funding and technical support is not yet there due to inadequate institutional and legal arrangement. Hence, development of tools and methods for dealing with this issue should be the focus of future research.

The integration between disasters, adaptation and other related issues

My research examines the integration of DRR and CCA (Chapter 4) as well as the progress and challenges of the integration in Indonesia (Chapters 7 and 8). These studies indeed has identified the need for greater development in literature in considering not only DRR and CCA, but also other issues arising from that, such as, how to integrate climate change mitigation activities within the current DRR activities, the role of migration, gender and conflicts and how they play out within activities for building resilience.

Operationalisation of each AIDR pathway

The AIDR proposal includes discussions of the seven pathways for AIDR (integrated DRR, CCA and development; polycentric DRR governance; sectoral integration; risk knowledge; institutional learning; self-organisation and networks; risk finances and insurance). While these are important in their own right, there is also an increasing range of emerging issues concerning the operationalisation of each pathway that need to be further tested and examined by scholars in the future. A similar example is given in a recent publication which outlines strategies to operationalising the Climate Smart Disaster Risk Management (CSDRM) approach (CSDRM, 2013).

A need for greater focus on the political economy of disasters, particularly why some pathways are taken and not others

While the seven pathways for AIDR have substantially advanced our knowledge of governance strategies for integrated DRR and CCA, further issues arising from this are the question of how and why some pathways are taken and not others, and the need to examine the methods for prioritising these pathways.

Implementation of AIDR pathways at different scales of governance

The AIDR framework developed in this thesis is intended to strengthen institutional ability to face complexities and uncertainties, by designing institutional processes that function across sectors and scales, to engage multiple stakeholders, and to promote social learning. Further to this, it is an important base for scholars to build on and extend the AIDR framework at different levels, scales, and contexts. I recommend prioritising research to examine how each AIDR characteristic and pathways could be implemented at the local level.

AIDR contribution to the international agendas of post-2015 DRR framework (HFA2), Millennium Development Goals and Sustainable Development Goals

Finally the UNISDR synthesis report of the consultation for post-2015 HFA (or termed HFA2) summarises three themes (UNISDR, 2013e). First, HFA2 needs to focus more at the local level by increasing the capacity of local stakeholders, creating stronger linkages between national and local governments, as well as strengthening partnerships between local stakeholders. The second theme is the need for an integrated approach within DRR, where issues of CCA, poverty reduction, development planning and sustainable development require attention. The third theme is the importance of devising an enabling environment for DRR implementation. This would include enabling risk data and information, public awareness, capacity development, and accountability. These themes are strongly aligned with the AIDR framework proposed in this study. Hence I recommend that further study is undertaken to evaluate how the AIDR framework is placed and aligned with the United Nations' (2010, 2011, 2012a, d) frameworks of the Millennium Development Goals and Sustainable Development Goals as well as how the AIDR framework can support the development and implementation of the future international DRR framework.

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**These reference lists are for those cited in Parts I and IV only (Chapters 1, 2, 11).
References for chapters in Parts II, III and Part IV Chapter 10 are placed within the respective
chapters since they have been submitted or published as journal articles.**

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APPENDICES

Appendix 1: Ethics Approval from Macquarie University

MACQUARIE
UNIVERSITY



Research Office
Research Hub, Building C5C East
MACQUARIE UNIVERSITY NSW 2109

Phone +61 (0)2 9850 8812
Fax +61 (0)2 9850 4465
Email ro@vc.mq.edu.au

Ethics
Phone +61 (0)2 9850 6848
Email ethics.secretariat@ro.mq.edu.au

23 October 2009

Ms Riyanti Djalante
Macquarie Herring Road Apt
3/142 Herring Road
North Ryde
NSW 2133

Reference: HE30OCT2009-D00158 ✓

Dear Ms Djalante,

FINAL APPROVAL

Title of project: **Creating Resilience to Disasters and Climate Change in Coastal Cities in Indonesia**

Thank you for your recent correspondence. Your response has addressed the issues raised by the Ethics Review Committee (Human Research) and you may now commence your research.

Please note the following standard requirements of approval:

1. The approval of this project is **conditional** upon your continuing compliance with the *National Statement on Ethical Conduct in Human Research (2007)*.
2. Approval will be for a period of five (5) years) subject to the provision of annual reports. **Your first progress report is due on 23 October 2010.**

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report on the project.

Progress Reports and Final Reports are available at the following website:
http://www.research.mq.edu.au/researchers/ethics/human_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).
4. Please notify the Committee of any amendment to the project.
5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability of the project.
6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University. This information is available at: <http://www.research.mq.edu.au/policy>

ETHICS REVIEW COMMITTEE (HUMAN RESEARCH)
MACQUARIE UNIVERSITY

http://www.research.mq.edu.au/researchers/ethics/human_ethics

www.mq.edu.au

ABN 90 952 801 237 (ICRCs Provider No 00002)

Appendix 2: Consent Form (in English)



Information and Consent Form

You are invited to participate in a study of “Creating Resilience to Disasters and Climate Change in Coastal Cities in Indonesia”. The purpose of the study is to examine how resilience can be achieved to promoting better synergies of governance in Indonesia in dealing with climate change and disaster risk related issues.

The study is being conducted by Riyanti Djalante, PhD student from the Department of Environment and Human Geography, Faculty of Science, Macquarie University, Australia, phone number +61 (0)2 9850 4285, email riyanti.djalante@mq.edu.au. The researcher’s contact number of while in Indonesia +62 858 814 38708. The research is being conducted to meet the requirements of Doctor of Philosophy in Human Geography under the supervision of Dr Frank Thomalla, phone number +61 (0)2 98509670, email frank.thomalla@mq.edu.au of the Department of Environment and Geography, Macquarie University, Australia. If you decide to participate, you will be asked to provide information in the form of initial stakeholder consultations. This consultation should take about 20 minutes and intended to obtain your general view of how disaster risk reduction (DRR) or climate change adaptation (CCA) activities are conducted in Indonesia. Specific information sought are your insight of how do you think CCA and DRR are governed from your organisations roles point of view.

Any information or personal details gathered in the course of the study are confidential (except as required by law). No individual will be identified in any publication of the results. All information will be accessed solely by the researcher and the supervisor. Information obtained is only used to further develop the research questions and designs of the empirical data collections for my PhD project. The information will be kept confidential. Permission will be sought from the participants if the researcher intends to publish any information obtained in this scoping visit at a later stage of my PhD. A summary of the information can be made available to you (sent as email attachment) on request and you may choose to elaborate further on the summary.

APPENDICES

You are also advised that the researcher is a government official for the South East Sulawesi Province in Indonesia and is currently on study leave from January 2008 to June 2013. Participation in this study is entirely voluntary: you are not obliged to participate and if you decide to participate, you are free to withdraw at any time without having to give a reason and without consequence.

I, (participant's name) have read (or, where appropriate, have had read to me) and understand the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this research, knowing that I can withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep.

Participant's Name:

Participant's Signature: _____ Date:

Investigator's Name:

Investigator's Signature: _____ Date:

The ethical aspects of this study have been approved by the Macquarie University Ethics Review Committee (Human Research). If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Ethics Review Committee through the Director, Research Ethics (telephone +61 (0)2 9850 7854; email ethics@mq.edu.au) or alternatively you can contact (Mr) Sabaruddin Sinapoy, phone number +62 852 4189 5814, email sabaruddinsinapoy@yahoo.com, a lecturer at the University of Haluoleo, Sulawesi Tenggara, Indonesia, who will pass any concerns raised to the Macquarie University Ethics Review Committee (Human Research). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

(PARTICIPANT COPY)

Appendix 3: Consent Form (in Bahasa Indonesia)



Lembar Informasi dan Persetujuan

Anda diundang untuk berpartisipasi dalam kegiatan penelitian “Mencapai System yang Resilient terhadap Bencana dan Perubahan Iklim di Kota-Kota Pesisir di Indonesia”. Penelitian ini bertujuan untuk menganalisa bagaimana resilient dapat dicapai melalui kerjasama yang lebih baik antara berbagai unsur pemerintahan di Indonesia dalam menghadapi masalah yang terkait dengan bencana dan perubahan iklim.

Penelitian ini dilaksanakan oleh Riyanti Djalante, mahasiswa tingkat doctoral (S3) dari Jurusan Lingkungan dan Geografi, Fakultas Sains, nomor telepon +61 (0)2 9850 4285, email riyanti.djalante@mq.edu.au. Nomor telpon peneliti selama berada di Indonesia adalah +62 858 814 38708. Penelitian ini dilaksanakan untuk memenuhi persyaratan Doctor of Philosophy di bidang Human Geography, dengan dosen pembimbing oleh Dr Frank Thomalla, nomor telepon +61 (0)2 9850 9670, email frank.thomalla@mq.edu.au dari Jurusan Lingkungan dan Geografi. Jika anda setuju untuk berpartisipasi, anda akan diminta untuk memberikan informasi dalam bentuk konsultasi pemegang kepentingan. Konsultasi ini berlangsung kira-kira selama 20 menit and bertujuan untuk mendapatkan pandangan umum anda tentang bagaimana kegiatan-kegiatan Pengurangan Resiko Bencana (PRB) atau Adaptasi Perubahan Iklim (API) dilaksanakan di Indonesia. Informasi detail yang ingin kami dapatkan khususnya berupa bagaimana PRR dan API ini terkoordinasikan dengan berbagai pihak, dilihat dari sudut pandang organisasi anda.

Semua informasi dan data personal yang diperoleh dalam kegiatan ini terjaga kerahasiaannya (kecuali ada hukum yang membatalkannya). Data individu tidak akan terpublikasi. Semua informasi hanya disimpan dan digunakan oleh peneliti dan dosen pembimbing. Data yang didapat hanya akan digunakan untuk lebih memperdalam pertanyaan-pertanyaan penelitian serta untuk desain metode pengumpulan data peneliti. Informasi akan terjaga kerahasiaannya. Persetujuan dari anda akan kami mintakan nanti jika peneliti bermaksud untuk mempublikasi informasi dari kegiatan ini dikemudian hari. Ringkasan dari

APPENDICES

informasi yang anda berikan dapat kami kirimkan kepada anda kembali melalui email jika anda menghendaki dan anda dapat memperlengkap informasi tersebut. Anda juga diinformasikan bahwa peneliti adalah seorang PNS yang bekerja pada Pemerintah Sulawesi Tenggara di Indonesia dan sekarang sedang tugas belajar mulai dari bulan Januari 2008 sampai bulan Juni 2013. Keikutsertaan anda dalam penelitian ini adalah sukarela: ada tidak dapat dipaksa untuk terlibat, anda dapat mengundurkan diri sewaktu-waktu tanpa harus memberikan alasan dan tidak memiliki konsekwensi apapun.

Saya, (*nama peserta*) telah membaca (*atau, jika dibutuhkan, telah dibacakan*) dan mengerti informasi diatas dan pertanyaan yang saya berikan telah dijawab dengan memuaskan. Saya setuju berpartisipasi dalam penelitian ini, juga mengetahui bahwa saya dapat mengundurkan diri dari penelitian ini sewaktu-waktu tanpa ada konsekwensi apapun. Saya telah diberikan lembaran yang sama untuk saya simpan.

Nama peserta:

Tanda-tangan Peserta: _____ Tanggal:

Nama Peneliti:

Tanda-tangan Peneliti: _____ Tanggal:

Aspek etik dari penelitian ini telah disetujui oleh Komite Review Etik Universitas Macquarie (Penelitian terhadap Manusia). Jika anda mempunyai ketidaksuakaan terhadap aspek etik atas partisipasi anda dalam penelitian ini, anda dapat menghubungi Komite Review Etik melalui Direktur, Etik Penelitian (telepon +61 (0) 2 9850 7854; email ethics@mq.edu.au), atau anda juga dapat menghubungi (Sdra) Sabaruddin Sinapoy, telepon +62 852 4189 5814 email sabaruddinsinapoy@yahoo.com, dosen pada Universitas Haluoleo, Sulawesi Tenggara, Indonesia, yang akan menyampaikan keluhan anda kepada Komite Review Etik Universitas Macquarie (Penelitian terhadap Manusia). Semua komplain yang anda masukkan akan dijaga kerahasiaannya dan ditindaklanjuti, dan anda akan diberitahukan kelanjutannya.

(LEMBAR UNTUK PESERTA)

Appendix 4: Semi-structured interview on DRR and CCA for the Ministry of Planning



**CODE: SSI-1 NAT (DRR and CCA)
SEMI-STRUCTURED INTERVIEW
FOR MINISTRY OF PLANNING AT THE NATIONAL LEVEL IN JAKARTA**

INTRODUCTION

This PhD study is titled “Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia”.

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations’ planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies to help increasing resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

DRR AND CCA POLICIES AND PLANS

- Is there any national climate change adaptation (CCA) OR disaster risk reduction (DRR) policy, act or related legislations? Specify?
- How does the Development Planning Ministry involved in DRR and CCA policy? And is there any implicit/explicit mention of the two issues?
- Have the national or local governments integrate DRR and CCA concerns in its planning or implementation? If yes, please describe any case
- Do you think DRR and CCA concerns if fully integrated into other regular governance activities or development assistance initiatives?
- If yes, what kind of intervention is the most effective?
- If no? How do you think it can be done?
- How are various sectors such as (agriculture, health, and infrastructure, education, and water resources, interior) engaged in environmental risk management issues?
- Are there any published documents/procedures to ensure a common understanding of the precise roles of and inter-relationships between different bodies/ministries?
- How does DRR and CCA policies get translated from the national to provincial or local governments?

FUNDING FOR DRR AND CCA

- What is the average national government budget per year allocated for DRR, and its percentage compared to the whole national budget?
- What is the average national government budget per year allocated for CCA, and its percentage compared to the whole national budget?
- Are there any specific national DRR or CCA office fully funded by the government? What is its budget?
- How is the DRR or CCA budget changes overtime? (What are the explanations for these changes?
- Lists the past or current projects in CCA or DRR, specifying the owner, and the executor of the projects:
- What role do international financial (lending) institutions play?

ORGANISATIONAL ARRANGEMENTS FOR DRR AND CCA

- Are DRR or CCA managed together or separately?
- If together, please explain further?
- If separate, why and will they be managed together in the future?
- Are there any specific national DRR or CCA office?
- What is the structure/organigram for DRR AND CCA nationally?
- List all governmental organisations related to DRR AND CCA at the national level?
- What are the functions of these offices/ministries?
- Does this coordination bring a positive or negative outcome?
- How do you think these organisational relationships between DRR and CCA can be improved?

INTERNATIONAL OR NON-GOVERNMENT ORGANISATIONS (INCLUDING RESEARCH ENTITIES, UNIVERSITIES, COMMUNITY BASED ORGANISATIONS)

- Are there any international or non-government organisations working in any aspect of for DRR AND CCA at the national level?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- What are the natures of their involvements?
- Does this involvement bring a positive or negative outcome?
- How do you think the relationships can be improved?

THANK YOU FOR YOUR COOPERATION

Riyanti Djalante

PhD Candidate, Macquarie University, Australia

Riyanti.djalante@mq.edu.au

Appendix 5: Semi-structured interview for government organisations in DRR at the national level



CODE: SSI -2 NAT (DRR)
SEMI-STRUCTURED INTERVIEW
FOR GOVERNMENT ORGANISATION INVOLVED IN DRR AT THE NATIONAL LEVEL IN JAKARTA

INTRODUCTION

This PhD study is titled “Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia”.

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations’ planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies increase resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

POLICIES AND PLANS

- How does your organisation develop or formulate its yearly plan?
- (If interview is at the national level) How do DRR policies developed by your organisation get translated from the national to provincial or local governments?
- (If interview is at the local level) How do DRR policies developed by your organisation aligned or synchronised with the national to provincial policies?
- What are the past or current projects in DRR by your organisation?

FUNDING

- What your yearly budget?
- What is the source of that funding?
- Does your organisation receive non-government or international funding?

ORGANISATIONAL ARRANGEMENTS FOR DRR

- List all governmental organisations related to DRR at the national or local level?
- What are the functions of these offices/ministries?
- Does involvement of other ministries bring a positive or negative outcome?
- How do you think these organisational relationships on DRR can be improved?
- How do you think DRR coordination between national and local level government can be improved?

INTERNATIONAL OR NON-GOVERNMENT ORGANISATIONS (INCLUDING RESEARCH ENTITIES, UNIVERSITIES, COMMUNITY BASED ORGANISATIONS)

- Are there any international or non-government organisations working in any aspect of for DRR at the national or local level?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- What is the nature of their involvement?
- Does this involvement bring a positive or negative outcome?
- How do you think the relationships can be improved?

ON LINKAGE OF DRR AND CCA

- Do you see any linkage between DRR and CCA?
- Have your organisation been involved in planning for CCA nationally?
- If yes, please explain further
- If yes, please also give your view on what are the positive or negative experiences from the collaboration and how that can be improved?
- If no, why not?
- If no, will you be willing to work or collaborate further in any CCA planning in the future?

THANK YOU FOR YOUR COOPERATION

Riyanti Djalante

PhD Candidate, Macquarie University, Australia

Riyanti.djalante@mq.edu.au

Appendix 6: Semi-structured interview for government organisations in CCA at the national level



CODE: SSI-3 NAT (CCA)
SEMI-STRUCTURED INTERVIEW
FOR GOVERNMENT ORGANISATION INVOLVED IN CCA AT THE NATIONAL LEVEL IN JAKARTA

INTRODUCTION

This PhD study is titled “Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia”.

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations’ planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies increase resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

POLICIES AND PLANS

- How does your organisation develop or formulate its yearly plan on CCA?
- (If interview is at the national level) How do CCA policies developed by your organisation get translated from the national to provincial or local governments? (If interview is at the local level) How do CCA policies developed by your organisation aligned or synchronised with the national to provincial policies?
- What are the past or current projects in CCA by your organisation?

FUNDING

- What your yearly budget on CCA?
- What is the source of that funding?
- Does your organisation receive non-government or international funding?

ORGANISATIONAL ARRANGEMENTS

- List all governmental organisations related to CCA at the national level?
- What are the functions of these organisations?
- Does involvement of other organisations bring a positive or negative outcome?
- How do you think these organisational relationships on CCA can be improved?
- How do you think CCA coordination between national and local level government can be improved?

INTERNATIONAL OR NON-GOVERNMENT ORGANISATIONS (INCLUDING RESEARCH ENTITIES, UNIVERSITIES, COMMUNITY BASED ORGANISATIONS)

- Are there any international or non-government organisations working in any aspect of for CCA at the national level?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- What is the nature of their involvement?
- Does this involvement bring a positive or negative outcome?
- How do you think the relationships can be improved?

ON LINKAGE OF DRR AND CCA

- Do you see any linkage between DRR and CCA?
- Have your organisation been involved in planning for DRR nationally?
- If yes, please explain further
- If yes, please also give your view on what are the positive or negative experiences from the collaboration and how that can be improved?
- If no, why not?
- If no, will you be willing to work or collaborate further in any DRR planning in the future?

THANK YOU FOR YOUR COOPERATION

Riyanti Djalante

PhD Candidate, Macquarie University, Australia

Riyanti.djalante@mq.edu.au

Appendix 7: Semi-structured interview on DRR and CCA for department of planning at the local level



CODE: SSI-1 LOCAL (DRR and CCA) SEMI-STRUCTURED INTERVIEW FOR PLANNING DEPARTMENT IN LOCAL LEVEL

INTRODUCTION

This PhD study is titled “Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia”.

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations’ planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies to help increasing resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

DRR AND CCA POLICIES AND PLANS

- Is there any local climate change adaptation (CCA) OR disaster risk reduction (DRR) policy, act or related legislations? Specify?
- How does the local planning department involved in DRR and CCA policy? And is there any implicit/explicit mention of the two issues?
- Have the local governments integrate DRR and CCA concerns in its planning or implementation? If yes, please describe any case
- Do you think DRR and CCA concerns if fully integrated into other regular governance activities or development assistance initiatives?
- If yes, what kind of intervention is the most effective? , If no? How do you think it can be done?
- How are various sectors such as (agriculture, health, and infrastructure, education, and water resources, interior) engaged in environmental risk management issues?
- Are there any published documents/procedures to ensure a common understanding of the precise roles of and inter-relationships between different bodies/ministries?
- How does DRR and CCA policies get translated from the national to provincial or local governments?

FUNDING FOR DRR AND CCA

- What is the average local government budget per year allocated for DRR, and its percentage compared to the whole local budget?
- What is the average local government budget per year allocated for CCA, and its percentage compared to the whole local budget?
- Are there any specific local DRR or CCA office fully funded by the government? What is its budget?
- How is the DRR or CCA budget changes overtime? (What are the explanations for these changes?
- Lists the past or current projects in CCA or DRR, specifying the owner, and the executor of the projects:
- What role do international financial (lending) institutions play?

ORGANISATIONAL ARRANGEMENTS FOR DRR AND CCA

- Are DRR or CCA managed together or separately?, If together, please explain further?
- If separate, why and will they be managed together in the future?
- Are there any specific local DRR or CCA office?
- What is the structure/organigram for DRR AND CCA in Makassar?
- List all governmental organisations related to DRR AND CCA at the local level?
- What are the functions of these offices/ministries?
- Does this coordination bring a positive or negative outcome?
- How do you think these organisational relationships between DRR and CCA can be improved?

INTERNATIONAL OR NON-GOVERNMENT ORGANISATIONS (INCLUDING RESEARCH ENTITIES, UNIVERSITIES, COMMUNITY BASED ORGANISATIONS)

- Are there any international or non-government organisations working in any aspect of for DRR AND CCA at the local level?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- What are the natures of their involvements?
- Does this involvement bring a positive or negative outcome?
- How do you think the relationships can be improved?

THANK YOU FOR YOUR COOPERATION

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Appendix 8: Semi-structured interview for government organisations in DRR at the local level



CODE: SSI-2 LOCAL (DRR) SEMI-STRUCTURED INTERVIEW FOR GOVERNMENT ORGANISATION INVOLVED IN DRR AT THE LOCAL LEVEL

INTRODUCTION

This PhD study is titled “Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia”.

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations’ planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies to help increasing resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

POLICIES AND PLANS

- How does your organisation develop or formulate its yearly plan on DRR?
- (If interview is at the national level) How do RRR policies developed by your organisation get translated from the national to provincial or local governments? (If interview is at the local level) How do RRR policies developed by your organisation aligned or synchronised with the national to provincial policies?
- What are the past or current projects in RRR by your organisation?

FUNDING

- What your yearly budget on RRR?
- What is the source of that funding?
- Does your organisation receive non-government or international funding?

ORGANISATIONAL ARRANGEMENTS

- List all governmental organisations related to RRR at the local level?
- What are the functions of these organisations?
- Does involvement of other organisations bring a positive or negative outcome?
- How do you think these organisational relationships on RRR can be improved?
- How do you think RRR coordination between national and local level government can be improved?

INTERNATIONAL OR NON-GOVERNMENT ORGANISATIONS (INCLUDING RESEARCH ENTITIES, UNIVERSITIES, COMMUNITY BASED ORGANISATIONS)

- Are there any international or non-government organisations working in any aspect of for RRR at the local level?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- What is the nature of their involvement?
- Does this involvement bring a positive or negative outcome?
- How do you think the relationships can be improved?

ON LINKAGE OF DRR AND CCA

- Do you see any linkage between DRR and CCA?
- Have your organisation been involved in planning for CCA locally?
- If yes, please explain further
- If yes, please also give your view on what are the positive or negative experiences from the collaboration and how that can be improved?
- If no, why not?
- If no, will you be willing to work or collaborate further in any CCA planning in the future?

THANK YOU FOR YOUR COOPERATION

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Appendix 9: Semi-structured interview for government organisations in CCA at the local level



CODE: SSI-3 LOCAL (CCA) SEMI-STRUCTURED INTERVIEW FOR GOVERNMENT ORGANISATION INVOLVED IN CCA AT THE LOCAL LEVEL

INTRODUCTION

This PhD study is titled “Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia”.

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations’ planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies increase resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

POLICIES AND PLANS

- How does your organisation develop or formulate its yearly plan on CCA?
- (If interview is at the national level) How do CCA policies developed by your organisation get translated from the national to provincial or local governments? (If interview is at the local level) How do CCA policies developed by your organisation aligned or synchronised with the national to provincial policies?
- What are the past or current projects in CCA by your organisation?

FUNDING

- What your yearly budget on CCA?
- What is the source of that funding?
- Does your organisation receive non-government or international funding?

ORGANISATIONAL ARRANGEMENTS

- List all governmental organisations related to CCA at the local level?
- What are the functions of these organisations?
- Does involvement of other organisations bring a positive or negative outcome?
- How do you think these organisational relationships on CCA can be improved?
- How do you think CCA coordination between national and local level government can be improved?

INTERNATIONAL OR NON-GOVERNMENT ORGANISATIONS (INCLUDING RESEARCH ENTITIES, UNIVERSITIES, COMMUNITY BASED ORGANISATIONS)

- Are there any international or non-government organisations working in any aspect of for CCA at the local level?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- What is the nature of their involvement?
- Does this involvement bring a positive or negative outcome?
- How do you think the relationships can be improved?

ON LINKAGE OF DRR AND CCA

- Do you see any linkage between DRR and CCA?
- Have your organisation been involved in planning for DRR locally?
- If yes, please explain further
- If yes, please also give your view on what are the positive or negative experiences from the collaboration and how that can be improved?
- If no, why not?
- If no, will you be willing to work or collaborate further in any DRR planning in the future?

THANK YOU FOR YOUR COOPERATION
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Appendix 10: Semi-structured interview for local government and NGOs roles on specific resilience programmes



CODE: SSI -5 (RESILIENCE)
SEMI-STRUCTURED INTERVIEW
FOR LOCAL GOVERNMENT AND NGOs ROLE
ON ONE SPECIFIC RESILIENCE BUILDING PROGRAMMES

INTRODUCTION

This PhD study is titled "Promoting Resilience to Disasters and Climate Change in Coastal Cities: Case study of Indonesia".

AIMS OF THIS QUESTIONNAIRE

The specific aims of this questionnaire is to gather specific information on national government organisations' planning and implementation of disaster risk reduction (DRR) and climate change adaptation (CCA) policies increase resilience to natural hazards and impacts of climate change in Indonesia.

INTRODUCTION

Please fill the name of the contact person for this questionnaire (these details will be kept confidential and no direct attributions will be made in reporting insights obtained from this questionnaire):

Name	
Gender	
Organisation name	
Role within organisation	
Contact (in the event of clarification needed)	
Date & Place of Interview	

SPECIFIC RESILIENCE BUILDING PROJECT

(This questions is intended to examine what elements are important for this resilience project)

- What is the name of this project?
- What are the goals of this project?
- Who decide the project goals?

FUNDING FOR THE RESILIENCE PROJECT

- How much is the project costs?
- Where is the funding from?

ORGANISATIONAL ARRANGEMENTS FOR THE RESILIENCE PROJECT

- Who are involved in this project?
- Are there any government organisations involved in this project?
- Are there any NGOs involved in this project?
- What are the functions of each organisation involved?
- Are there any established guidelines on relationships between governmental entities with these organisations?
- Who decide/establish the guideline?
- Does this coordination bring a positive or negative outcome?
- How do you think these resilience project can be improved?

PROJECT BENEFITS TO COMMUNITY

- Who are the main beneficiaries of this project?
- How do you make sure that they receive maximum benefits out of this resilience project?
- Does this project involve the community at any stage of the project?
- What is the nature of their involvement?
- Does this involvement bring a positive or negative outcome?
- How do you think the community involvement can be improved?

RESILIENCE FRAMEWORK

(Interviewer explain the synthesised resilience framework)

- How does resilience defined in this project?
- What are the main driver for this project/ what is it that the community to be resilient for?
- Does this project based on any specific community resilience framework? (if yes, go to Q.23 if no, go to Q.24)
- If yes, please mention the framework name
- What resilience element(s) that is/are important for this project? (in Sustainable development category)
- What resilience element(s) that is/are important for this project? (in DRR category)
- What resilience element(s) that is/are important for this project? (in Community Engagement category)
- Why are some elements more important than others?
- What are the positive or less positive things about the framework?
- How do you think the framework can be better or more applicable?
- What are the challenges from implementing this framework?
- How does resilience measure, monitored, and evaluated?

THANK YOU FOR YOUR COOPERATION

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