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ADB Working Paper Series

**Disaster Risk Management at the
Regional Level: The Case of Asia
and the Pacific**

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Abstract

Hazards have no respect for the political boundaries of countries so it is essential for disaster risk management (DRM) to be developed with a strong regional perspective. This paper describes a wide range of regional initiatives in Asia and the Pacific that rely on innovative solutions being adopted within a holistic approach, linking national governments, regional organizations, diverse sectors, and public and private bodies. The study also illustrates how crucial the regional scale of engagement is for concentrating the common interests of individual government policy commitments to DRM while supplementing countries' own resources with expanded institutional relationships to energize a more sustained impetus to reduce disaster risks throughout the region. Regional attributes include the beneficial attention of distributed specialist technical, scientific, and academic institutions that are motivated by interests beyond disaster concerns.

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1. INTRODUCTION

Since hazards have no respect for the political boundaries of countries, it is essential for disaster risk management (DRM) to be developed with a strong regional perspective, leading to close patterns of regional cooperation. This relates to the theme of governance as one of the threads of this study. This paper describes a wide range of regional initiatives that rely on innovative solutions being adopted within a holistic approach that link national governments, regional organizations, diverse sectors, and public and private bodies.

Frequently, it is the occurrence of a disaster that propels the essential roles of governance into wider public awareness, often with unflattering results. If a disaster is large in scope and causes great loss, then its effects will be felt beyond the country where it occurred, with economic consequences extending throughout a region or even further internationally. Yet ironically, the most critical governance structures having any effect on a crisis situation or hazardous threat are determined and realized long before any existing disaster risks materialize into a crisis or disaster.

In anticipating and responding to catastrophic disasters, the key figures of national government ministries need to define and coordinate responsibilities among themselves. There is much work that needs to be done in DRM in what should become established routines and responsibilities across ministries, agencies, and institutions. Typically, a primary focus is given to known or familiar hazards, but much less attention is devoted to identifying and minimizing prevailing conditions of vulnerability and the changing nature of public exposure. The avoidance of underlying socioeconomic dimensions of vulnerability and physical exposure, or an official willingness to tolerate the creation of new risks in government-sanctioned growth and development strategies, remain major impediments to sound DRM commitments by governments.

Despite often theoretical acknowledgement of DRM principles, this is in stark contrast to the crucial role governments should be fulfilling in designing effective DRM strategies and implementing programs. This is routinely interpreted widely to include responsibility for all aspects of exercising authority and providing coordination to insure public safety. Government capacity to manage disaster risks is critical in terms of prevention, preparation, response, recovery, and reconstruction, yet in practice emphasis is concentrated on efforts to reduce the impacts of hazards when disasters occur. The leadership and political decisions needed to reduce vulnerability and exposure prove to be much harder and have few short-term political payoffs. Without grasping this challenge, as societies become more complex and human habitats become more concentrated with greater demands on infrastructure and the environment, existing risks will worsen and new threats will emerge. A changing climate and more competitive global economic practices will only increase disaster consequences beyond individual national capabilities.

In these conditions, despite governments' primary roles in managing disasters when they occur, the wider abilities needed to accomplish definitive reduction of disaster risk factors associated with vulnerability and exposure are often determined by wider enabling environments. These include other elements of a society such as education systems, technical institutions, regulatory procedures, professional skills, and even local community activities. It is these combined elements which provide the potential for a holistic approach to addressing DRM within a society. These often less visible, but decidedly more sustaining features of DRM, are composed of various policies, enforcement of standards, capable institutions, qualified staff, and dedicated associates.

As disaster risks expand or new threats emerge, these resources need to be distributed across an area wider than only individual countries. Populations and their livelihoods become more exposed because of complex infrastructure systems and economic interdependencies, so better information and more specialized abilities are necessary. With able direction and a common sense of purpose to engage actors with a regional perspective, creative relationships can produce the innovative solutions that are increasingly required to implement effective DRM strategies.

Under these conditions expanded DRM capabilities are crucial attributes wherever they can be established. They are necessarily supported by many functions and involve actors who are engaged in their daily professional and personal pursuits. As one considers the routine functioning, growth, and well-being of a society these many additional technical and human resources need to be more explicitly associated with each other as part of the wider development agendas of all countries.

Governance needs to be informed and competent at all levels of official responsibility and in the relationships that exist between jurisdictions and among countries. Information networks and reliable data need to be commonly available to foster productive associations. Moreover, public involvement is essential in all aspects of DRM planning, through local communities as well as civil society institutions.

The modern world has shrunk in time through advances in information and transportation, so no country is immune to the wider social, economic, and political influences which condition the changing circumstances of DRM. As environments change, climate becomes more variable. Cities grow, and as more people move to them, they alter the very nature of risk. People are threatened by new and more uncertain hazards. Storms and climate do not respect political boundaries, while pandemics or wildfires can spread within a tight, closely-knit community. As risks expand, disaster risk management expectations extend beyond the capacities and geography of individual countries.

Under these conditions, it is imperative for the governments of countries and the inhabitants of local communities to both depend on and profit from wider regional influences which have a bearing on managing their prevailing risks. This requires more professional involvement and additional institutions are essential. Geographically, these wider supporting functions and resources exist regionally, often in enterprises which have not always been associated specifically with disasters.

The globalized economy links all countries in many respects, so disasters no longer occur only in one country, and can have serious consequences around the world. The experience of Toronto, Canada, facing a combined public health and economic crisis from exposure to Severe Acute Respiratory Syndrome (SARS) that originated in Asia in March 2003 is one such example. It demonstrated that effective communication of risk requires an understanding of how “global cultural flows have reshaped public events within far-reaching and complex chains of causality” (Drache and Feldman 2003). Global trade, which enriches economies and has been a driver of growth for many Asian countries, also imposes wider risks which can increase the needs of many other countries.

The multi-stakeholder dialogue conducted by the United Nations International Strategy for Disaster Reduction (UNISDR) leading up to the post-2015 arrangements for DRM has highlighted the importance of trans-boundary issues (UNISDR 2013c). This implies more attention to regional and subregional policy commitments and joint activities. A specific recommendation was made to create subregional platforms as an integral part of successor Hyogo Framework for Action (HFA) arrangements (HFA2). They are needed to establish regional coordination mechanisms, to strengthen information

sharing, and to promote risk reduction measures and collaborative response for trans-boundary hazards. Additional suggestions were made to increase joint studies and to consider these expanding risks to lives, property, economies, and the environment in broader political and development contexts. These actions will encourage improved coordination among intergovernmental organizations which combine collected views and interests of neighboring and geographically associated countries.

These combined influences can empower effective efforts to manage disaster risks across Asia and the Pacific, even though there is no single political sovereignty or any collective government jurisdictions which prevail across the entire area. As disasters do not acknowledge political boundaries, this paper illustrates some of the influencing factors and institutions working across Asia and the Pacific which contribute to disaster risk governance through their policies and practice. They all need to be more widely acknowledged and supported in the crucial roles they play for making individual societies safer.

2. ATTRIBUTES OF REGIONAL DISASTER RISK MANAGEMENT

Innovative means and sustained regional structures are necessary for implementing DRM and managing regional disaster risks. Cultural affinities and shared geophysical conditions of Asia and the Pacific are positive attributes for advancing applied DRM activities which transcend individual country policies. These shared interests are particularly relevant in subregional geographical areas exposed to common hazards or which support similar types of livelihoods and associated vulnerabilities.

Weather forecasting and early warning systems are by their very nature subregional in focus as is routinely demonstrated in the Bay of Bengal when cyclones threaten Bangladesh, India, Myanmar and Sri Lanka. Geophysical conditions and potential hazards are common throughout the Himalayan region regardless of political boundaries. This was dramatically demonstrated by the similar socioeconomic conditions and vulnerabilities of people living in the mountain villages affected by the destructive Himalayan earthquake of October 2005. In another shocking case, it was only after 350,000 deaths from the 2004 Indian Ocean Tsunami that the value of a regional Indian Ocean tsunami warning system was understood and installed by international organizations and beneficiary countries.

Southeast Asian countries share an exposure to the annual tropical cyclones which sweep across their territories and the routine monsoon floods. Yet, the extent and consequences of the 2011 floods in Thailand were as surprising as the challenges caused by political uncertainties in early decision making. The consequences of a flood may be similar in neighboring countries when a river forms a boundary between them, such as the Mekong River, but the resulting needs can also be very different. Physical flood barriers do not work well if they are constructed on only one side of a river. In other cases where a river traverses neighboring countries, as in the Ganges and Brahmaputra river basins, there are numerous disaster risk conditions which exceed the interests and concerns of individual countries. Despite the small and often isolated local populations in Pacific island countries and territories, strong social and cultural ties have enabled collective DRM commitments regardless of national policies.

2.1 Regional Institutions as a Foundation for Disaster Risk Management

Individual regional institutions provided a foundation for DRM in Asia and the Pacific even before some countries extended their national strategies beyond emergency relief and civil protection roles. When they are well conceived they can be instrumental in bringing together the technical knowledge of specialists, opportunities for applied or “action” research, analytical abilities to understand human and geophysical interactions, and the occasion for interaction among various stakeholders involved with disaster risks in different dimensions of a society. In providing such a professional, policy-defining, and public basis for DRM in various subject areas, institutions can be key to cementing the multiple interests of governments, communities, and professional structures around matters of public risk awareness and DRM.

Once established with professional regard and sustained by country ownership and support, regional institutions are important for maintaining momentum in DRM accomplishments. They also should serve as a repository for documented experience, data acquisition and analysis, and learning experience that provides essential recall and advance for future generations. Additionally, they serve as an intersection for the wider dissemination of international thinking and advancement of combined development agendas. They provide opportunities for policy makers and technical practitioners from countries to meet, share experiences, and to be exposed to new approaches for applying DRM. For these numerous reasons, institutional facilities are more deserving of sustained cultivation and support than they often receive.

These opportunities transcend individual national interests, and over time have facilitated the building of strong professional relationships and distinctive subregional associations. They offer a tangible role for scientific study, but more importantly a means by which scientific knowledge and practical experience can be combined through wider public interest and local involvement. In some instances, and particularly as practiced in the Pacific, with a strong commitment to consensus, subregional or localized views are consolidated. This provides a stronger voice to the subject in global forums and in addressing contentious future global issues such as climate change and green development strategies.

These institutions have seeded the region with professional DRM expertise over the years with their consistent motivation, progressive advocacy of DRM policies, and abilities to conduct joint activities, practical training, and extensive sharing of Asian and Pacific DRM experiences. The extent to which countries have sought to benefit from this existing expertise through consolidation of the availability of trained personnel and development of strategic DRM programs and national political commitments to the subject varies. The attributes for DRM are easily overlooked as they seldom have “disaster” attached to their names. However, regardless of an individual country’s current level of engagement, the recognized standing of these institutions with their inclusive orientation serves to provide a collective platform for DRM subjects. This remains the case even as countries inevitably encounter some limiting circumstances in their official policies or vacillating interests of successive governments.

There are several types of regional institutions which have contributed to the growth in DRM capabilities. Historically, there were few institutions specifically identified with disaster and risk management interests; other associations focused on improved emergency or humanitarian response cooperation. As the concepts of DRM became more widely expressed through international frameworks such as the HFA, they became more closely associated with the shared interests of climate change

adaptation, green development, environmental awareness, business or enterprise continuity management, and community resilience. As international discussion intensifies over the underlying principles for global development after 2015, there is considerable scope for fostering more strategic institutional networks to advance DRM. Beyond the official responsibilities of national governance, the institutional capabilities of regional organizations are likely to become more influential in advancing DRM practice across Asia and the Pacific.

However, this can result in drawing more of a distinction with other international initiatives which feature more specific humanitarian intervention activities, joint combined military-emergency preparedness exercises, or more narrowly-conceived hazard-specific contingency scenarios. While such emergency preparedness responsibilities certainly are a justifiable aspect of DRM, and explicitly considered in the context of the fifth HFA priority for action, it is important that the distinctions of emergency management and risk management not become blurred, or worse, understood to be one and the same.

The following organizations provide a sample of DRM expertise and regional institutions which exist within Asia and the Pacific. They suggest regional resources which combine holistic approaches and innovative solutions that can be welded into a more commanding Asian and Pacific network for DRM to meet expanding risk management requirements.

2.1.1 Disaster Preparedness and Risk Management Institutions

The Asian Disaster Preparedness Center (ADPC) was established in 1986, originally at the Asian Institute of Technology near Bangkok, Thailand, to provide professional training for all aspects of disaster and risk management specifically focused on Asian and Pacific needs and requirements. While still providing a wide range of more specialized and increasingly sophisticated training in its current role as an independent organization, ADPC has greatly expanded its activities to include research, advisory, and policy promotion roles to advance DRM in pursuit of its mission to be “a leading regional resource center for the realization of disaster reduction for safer communities and sustainable development in Asia and the Pacific.” In this respect, it is particularly committed to “promoting disaster awareness and the development of local capabilities to foster institutionalized disaster management and mitigation policies” (ADPC 2012).

Although created later in 1998 in Kobe, Japan, with the support of the Government of Japan, the Asian Disaster Reduction Center (ADRC) has played an important role in enhancing disaster resilience for its 29 member countries. It works “to build safe communities, and to create societies where sustainable development is possible” (ADRC 2013). It also supports practical disaster reduction activities to build resilient communities and seeks to foster networks among countries through programs including personnel exchanges, training, and technical assistance cooperation.

Created as a consequence of the regional needs for better early warning collaboration among countries following the 2004 Indian Ocean Tsunami, the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) reflects the maturing of technical institutions devoted to DRM. As an international intergovernmental organization focused on regional needs, RIMES was established in 2009 to be owned and managed by its Member States. It currently has 13 members of which 12 are Asian or Pacific countries, and has 18 more collaborating countries with 11 in Asia or the Pacific (RIMES 2013). It works to integrate risk information at various scales to meet the early warning needs of diverse users. It provides a technical interface between specialized organizations and national or local institutions which allows new and

emerging technologies to be evaluated or extended in their use. In these respects RIMES marks the emergence of a new form of mutually supporting partnership, grounded in regional needs to invest in building collective capacities which can address common concerns. It also advances the shaping and sharing of technical abilities and advanced communications resources with collective benefits in their application.

2.1.2 Geographically Focused Technical Development Organizations

A different type of regional organization is easily overlooked because “disaster” is not specifically included in its name. These organizations are technically or geographically defined and engage in wider development objectives which necessarily involve human exposure and vulnerability to disaster risks. As they are concerned with improving human conditions in local habitats they are interested in the environmental conditions on which people depend. Two examples are cited, although there are others associated with these environment, development and community-based subject areas which relate to public exposure to disaster risks.

Several multidisciplinary institutions in Asia and the Pacific combine their interests in human development needs with geophysical and natural environmental risks. They are grounded in scientific research, influence national policies and are governed through intergovernmental arrangements. These attributes are extended through resourceful information management which makes the institutions effective examples for applied DRM and sustainable development practice. In this respect they display a beneficial blend of government interests, diverse staffing in functional structures, and pursuit of policies for extended community use and relevance.

The Mekong River Commission for Sustainable Development (MRC) provides integrated management of water and related resources through its basin-wide cooperation, regional planning, and shared technical abilities. As an intergovernmental organization it has contributed to the development and progressive implementation of DRM strategies in Cambodia, the Lao People’s Democratic Republic, Thailand, and Viet Nam since 1995 (MRC 2013).

The International Centre for Integrated Mountain Development (ICIMOD) is an intergovernmental education institution with interests in fragile mountain environments and the livelihoods of mountain people. It is concerned with the impacts of globalization and climate change affecting its eight members.¹ The work of the institute addresses development opportunities in the Himalayan region with a full consideration of the physical, social, and economic vulnerability of its inhabitants (ICIMOD 2013).

Another type of key technical institution crucial for DRM practice on a regional basis is often organized around subregional needs. One example is the World Meteorological Organization’s Regional Climate Centers. Their work shapes the policy elements of international DRM frameworks to have a more specific regional or national emphasis. They also provide technical training opportunities, support institutional capacity development, and are a source of specialized technical services, information, and data. Two specialized regional climate centers were established in Beijing and Tokyo in 2009 to provide long range forecasts and to produce products in support of regional and national climate activities. In 2013, a third North Eurasian regional climate center was established in the Russian Federation, and a fourth was begun in an initial demonstration phase in India (WMO-RCC 2013).

¹ Afghanistan, Bangladesh, Bhutan, People’s Republic of China (PRC), India, Myanmar, Nepal, and Pakistan.

These are examples of important technical resources which are situated throughout the region, often with a geographical or developmental focus which are not limited to the circumstances of specific disasters as they address the wider development interests of multiple countries. United Nations agencies and international organizations like the International Federation of Red Cross and Red Crescent Organizations (IFRC), UNDP, UNICEF, or WHO routinely have regional offices based in Asian cities such as Bangkok, Kuala Lumpur, Manila New Delhi, or Tokyo. They all provide a broad policy familiarity while supplying additional technical resources suited to DRM, even though they are not always so readily identified with on-going DRM roles because their routine work is associated with national development activities.

2.2 Regional Organizational Linkages to Advance Disaster Risk Management

The absence of any sovereign political authority in the Asia and Pacific region, or within subregions, provides latitude for targeted investment in principal institutions that can advance applied DRM practices across risk-defined areas or zones and collectively benefit participating countries. Multiple benefits can be gained by developing associated or linked education, research, or applied technical institutional networks dedicated to DRM. These combined professional linkages would be well placed to provide complementary DRM services benefitting from established international organizations or framework support while focusing on the disaster risks of particular relevance to Asian and Pacific country interests.

2.2.1 Engaging Higher Education Institutions in the Region

The composite academic and technical requirements for effective DRM implementation provide a compelling reason for regional and international organizations to establish more consciously devised and better supported higher education capacities to advance DRM in the region. The continuing need for technical and human resources is a common theme in many countries' reporting on their challenges to implement HFA priorities (UNISDR 2013b). Despite a longer period of return on education investments there are few better alternatives to achieve sustainable DRM. Yet it remains surprising how few joint initiatives or regional education facilities pursue DRM subject contexts. By drawing on the individual institutional and technical abilities which exist within individual countries and linking them more explicitly through DRM-affiliated regional networks, more effective use could be made of scarce professional resources. The Chair's Summary of the Fourth Session of the Global Platform for Disaster Risk Reduction cites that globally there is "an unmet demand for data, tools, methods and guidance on implementing risk reduction and a shortage of specialists educated and trained for the task", and "... integrating disaster risk management into education at all levels including higher education should be a priority" (UNISDR 2013d).

Bilateral and multilateral support have contributed to cost-effective academic research, multidisciplinary technical education, and information management activities with regional emphasis. There are notable individual research and teaching facilities throughout Asia and the Pacific, but there are frequent expressions of need for more researchers, better shared documentation, and greater networked access among

institutions. These institutions provide opportunities for DRM study and have archived experience to serve students from throughout the region.²

Despite individual courses of study, there is not yet an established Asian consortium for joint higher education teaching, research, and applied community outreach specific to DRM, such as the exemplary consortium Periperi U. in Africa.³ The Network for Social Sciences in Disaster Prevention in Latin America (LA RED) is another network of academic researchers and practitioners created in 1992 to provide concerted research and training on disaster risk management realized particularly within and by local communities across the countries of Latin America (LA RED 2013). While there are various communities of practice which share DRM information and experience across Asia, or otherwise are motivated by leading academicians, there can be value for investing in a structured Asia and Pacific network of linked higher education academic and research institutions dedicated to the different facets of DRM learning and applications. A model can be found in the initial joint academic research and learning commitments made to address world hunger through the Consultative Group for International Agricultural Research (CGIAR) since the early 1970s, so the concepts and demonstrated benefits are well-known (CGIAR 2013).

2.2.2 A Proposed Regional Complex Risk Management Institution

It may be timely to consider a common structure working within an Asia and Pacific environment to advance communication and collaboration related specifically to the complexity of large and compound disasters. The creation of an Asia and Pacific “complex risk management institute” or network of distributed institutions could promote and support the identification of combined hazards and their extended impacts. It could further address means for managing the risks by drawing on collective technical and operational abilities spread across the region. Many elements of disaster risk and consequence management need to be unified either in a single location or networked through institutions sharing a common purpose. Data need to be collected, archived and disseminated about evaluating combined risks, mapping, and individual risk assessment findings. Regional benefits would result from compiling existing work, projects, best practices, guidance, and expertise. There is a further need to advocate standardized methodologies and management structures to promote collaboration, shared information, and professional networking. The provision of technical resources and assistance brought together under a regional institutional facility or through structured relationships would create a primary source for supporting common standards.

The initiative could bring together experts in specific types of disasters and aspects of complex response strategies to assist national governments, commercial enterprises,

² They include the Asian Institute of Technology in Bangkok, Bandung Institute of Technology and Gaja Mada University in Indonesia, National University of Singapore, Kyoto University in Japan, Beijing Normal University in China, Tata Institute for Social Science in Mumbai, BRAC University and Bangladesh University for Environment and Technology in Bangladesh, Roorkee (and other) Institutes of Technology in India, University of the South Pacific in Fiji, among others.

³ Periperi U. or “Partners Enhancing Resilience for People Exposed to Risks” is a consortium of 10 African universities which links multiple programs dedicated to trans-disciplinary DRM learning and practice located in 12 different faculties. Other than initial supporting grants from the United States Agency for International Development (USAID), the individual academic and research programs have received strong local support from the hosting institutions. (Periperi U. 2013). A Periperi U. seminar addressing the methods of explicitly mobilizing higher education for DRM capacity development was conducted at the Fourth Session of the Global Platform for Disaster Reduction in Geneva, 24 May 2013. <http://www.unisdr.org/we/inform/events/32982>

and local authorities in their joint efforts to manage the unforeseen consequences of compound disaster events. Its responsibilities would include using methods and consolidated data for identifying and then assessing organizational capabilities and professional skills of existing risk management organizations in various countries. Regional collaboration to provide training would increase individual competence and foster agency networks for professional mutual aid. A goal of such an Asia and Pacific facility would be to motivate and support individual national emergency management systems working to certified standards applicable to compound disaster events. This effort could also assist in lessening a significant gap which currently exists between government policies and corporate business continuity practices which often operate in parallel contingency planning contexts. The emphasis should focus on complex events that are likely to impact more than single countries, and particularly those with wide regional commercial implications.

Such a regional facility or structure would also provide an overarching set of relationships for various government and international agencies to promote, advocate, and support risk management. An Asia and Pacific complex risk management institute would bring together the activities of the United Nations system, international financial institutions, and other bilateral or multilateral agency initiatives addressing portions of the subject across the region. While there are many technical, research, and development institutions, presently there are none which singly or in combination address these multiple factors essential for advancing strategic risk management requirements on a regional scale.

3. REGIONAL COOPERATION

Regional cooperation assumes distinctive forms which contribute to improving certain aspects of disaster risk management. However, the different political, economic, institutional, and crisis management characteristics of subregional cooperation exert various influences on policy and governance in countries. Even though there are partial and sometimes episodic occasions for joint associations in Asia that extend beyond bilateral technical assistance programs into joint DRM activities, they often remain focused primarily on emergency response for major disaster events. There have been examples of shared subregional experience and the formulation of agreements which express solidarity for DRM principles and policies.

However, beyond these expressions of common intent and some joint exercises, more tangible activities for advancing DRM policy and joint practice in managing risks are yet to be fully realized. The UNISDR Progress Review of the HFA in Asia and the Pacific from 2011–2013 provides information about both accomplishments reported, and challenges which continue to be faced by the intergovernmental organizations: the South Asian Association for Regional Cooperation (SAARC), the Association of Southeast Asian Nations (ASEAN), and the Secretariat of the Pacific Community Applied Geoscience and Technology Division (SPC-SOPAC) in the Pacific (UNISDR 2013b).

Of the examples cited, it is in the Pacific where these various influences are most closely aligned in a common subregional expression of commitment to a shared understanding of DRM needs and priorities. The additional international attention focused on climate change consequences and especially on rising sea levels has provided impetus for Pacific island countries and economies to pursue joint benefits of regional solidarity. The growing political influence of the Small Island Developing States bloc in both political and international development forums has further encouraged a

collective approach to addressing the particular needs of disaster risks in small island human and ecological habitats. This characteristic of a strongly shared common commitment to DRM purpose in the Pacific has not yet been fully realized in other Asian subregions.

3.1 Regional Humanitarian and Emergency Response Cooperation

Historically, in terms of humanitarian and emergency response cooperation there have been examples of regional cooperation in disaster management policy development, joint operational abilities, and specialized emergency training. At times of crisis, regional organizations can represent wider collective interests when bilateral country engagement or physical access may be difficult. In this respect, ASEAN was instrumental in channeling humanitarian assistance into Myanmar following Cyclone Nargis in 2008. The ASEAN Regional Forum (ARF) was established between the 10 ASEAN countries and 17 other regional and partner industrialized countries in 1994 as a forum for security dialogue in Asia and the Pacific. It has later begun to address practical cooperation measures in disaster relief activities. The Philippines and the United States of America (USA) organized the first ARF disaster relief exercise in the Philippines in 2009; Indonesia and Japan jointly organized the second exercise in Indonesia in March 2011 after the Great East Japan Earthquake (ASEAN ARF 2011).

In specific operational terms, ASEAN started conducting annual regional disaster emergency response simulation exercises in 2005. Consequently, the ASEAN Coordinating Centre for Humanitarian Assistance (AHA Center) was established in 2011 to facilitate cooperation among countries' emergency services with the United Nations and other relevant international organizations. Standard Operating Procedures for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations have been devised and provide a common basis among responding organizations in joint disaster relief and emergency response operations. Similar procedures have been agreed regarding the use of military and civilian assets at the time of disasters. ASEAN has demonstrated some of these joint abilities in conducting operations on the ground. The AHA center provided emergency relief goods from a regional emergency stockpile established in Malaysia in 2012 after Typhoon Bopha affected Mindanao, Philippines. ASEAN also dispatched emergency assessment and response teams for that event.

There have been other preparedness activities which reflect a growing collaboration among individual countries with growing awareness and collaboration in addressing trans-boundary risks (UNISDR 2013b). These are driven by increased sharing of information to overcome existing data scarcity. These efforts also draw on a wider selection of technical institutions and seek to combine relevant country information for improved risk assessments.

The Program for Enhancement of Emergency Response (PEER) is an example of beneficial collaboration in training for disaster preparedness and response capabilities. Established in 1998 with programs in four countries, PEER has continued for 15 years with the support of USAID and the American Red Cross (ARC), and now conducts activities in nine Asian countries. The program is a good example of the shared use of regional training resources for a common purpose, while it also applies its cumulative experience to specific country operational requirements. The program has been conducted at various times by both the National Society for Earthquake Technology (NSET) in Kathmandu, Nepal, and the Asian Disaster Preparedness Center (ADPC) in Bangkok, Thailand. Presently they both implement the program jointly with USAID and

ARC by drawing on each institution's particular strengths and abilities. Investment in more collaborative training programs such as PEER would be a definite asset for the region.

In South Asia, there has been less evidence of formal intergovernmental cooperation in joint humanitarian and emergency relief assistance. The foreign ministers of the SAARC countries signed an Agreement on Rapid Response to Natural Disasters in 2011. While the intention was to provide for a coordinated subregional response mechanism and prior planning for relief and humanitarian assistance, those expectations have not yet been realized. The agreement suggests future opportunities to enhance trans-boundary disaster preparedness and response cooperation, although it awaits ratification by the SAARC member states before they can be implemented.

In the Pacific, the available resources for joint humanitarian assistance are quite limited, although the Pacific island countries and territories share their disaster relief requirements and experiences with their wider working association with development and donor organizations through the annual Pacific Platform for Disaster Risk Management. Considering the population distribution across the Pacific and the many small communities, Pacific countries and territories have focused their attention and resources on building resilience and reducing risk in local communities.

3.2 Regional Cooperation and Exchange of Experience

Recurring Asian regional DRM conferences such as the Asian Ministerial Conferences on Disaster Risk Reduction are another form of cooperation for governments, regional organizations, and professionals engaged in implementing DRM. They serve to endorse countries' commitments, share experience, and consolidate future priorities. They also played a key role in multi-stakeholder dialogues conducted through UNISDR efforts leading up to the Fourth Session of the Global Platform for Disaster Risk Reduction on 21-23 May 2013. It is expected that they will motivate similar involvement leading to the successor arrangements of the HFA after 2015, which will be decided at the Third World Conference on Disaster Risk Reduction to be held in Sendai, Japan in March 2015 (UNISDR 2013c). The 6th Asian Ministerial Conference on Disaster Risk Reduction in June 2014 will present a strategic opportunity for building regional consensus on HFA2 as it will be the last intergovernmental meeting in the region before the Third World Conference.

At an operational level and with more of a concentration on implementation, similar benefits are obtained from the mostly annual Regional Consultative Council meetings sponsored by ADPC and corresponding annual meetings for the member countries of ADRC. These meetings provide a strong regional focus and demonstrate the value of maintaining DRM political commitments and solidarity, at least in principle. However, without increasing the corresponding national commitments and allocation of sustaining resources to applied DRM implementation, these meetings run the risk of becoming more rhetorical than substantial. Therefore there is a growing need to determine and apply specific targets, and to increase accountability for tangible outputs of accomplishment against the expression of frameworks, roadmaps, and blueprints for success. There are clear indications that such accountability mechanisms will be central to the negotiation and agreement of HFA2 to influence future DRM (UNISDR 2013c, UNISDR 2013d).

3.3 Regional Information Access, Exchange, and Data Requirements

There is much information available about DRM activities in Asia and the Pacific as well as all other countries concerned. The Preventionweb portal allows information searches by region, country, activity, organization or subject (Preventionweb 2013). Its Asia home page has direct links with 20 regional organizations engaged with disaster risk reduction (DRR) and has contacts for 1392 other organizations working throughout Asia; it lists 305 entries in Oceania for the Pacific subregion. The UNISDR website for Asia and Pacific provides even more focused material (UNISDR 2013e). The Asian Disaster Preparedness Center has initiated a website portal to record DRR projects across the region and to share their experience and reference materials (ADPC Gateway 2012). More extended discussions about the risk trends and current status of DRM practice in Asia and the Pacific are available in the biannual Disaster Reports for Asia and the Pacific, published in 2010 and 2012 (UNESCAP-UNISDR 2010, and 2012).

In the specific area of regional technical information development and dissemination, advanced technologies offer promise for future advances in DRM. One example is Sentinel Asia, a program initiated by the Asia-Pacific Regional Space Agency Forum (AFPRSA) in 2005. It involves regional technical and institutional partners to expand the use of information and communication technologies (ICT) and space capabilities to improve the speed and accuracy of disaster preparedness and early warning. It combines the interests of ASEAN, Asian and Pacific ICT and space agencies, the Asian Institute of Technology, The United Nations Office for Outer Space Affairs (UN-OOSA), UNESCAP, and the ADRC to apply advanced remote sensing and web-based GIS technologies to support disaster risk management requirements (AFPRSA 2013).

Yet with all this experiential information being shared across Asia and the Pacific, there is a need for more consolidated data and analysis to make the financial and corresponding political justification for investing in DRM. This requirement is referred to frequently in national reporting on the HFA Monitor and has emerged as a key issue and proposal in most of the multi-stakeholder dialogues proceeding towards 2015 (UNISDR 2013c). Many of the national reports from the region cited the need for improved data to ensure that decision-making is based on evidence. The absence of data is particularly acute at local levels and a widespread lack of guidelines, methods, and standards is noted especially for risk assessments. Countries also expressed limitations in obtaining or analyzing data, which have implications for better availability and development of analytical capacities through education.

When considered in strategic terms and relative to previously identified regional or subregional DRM agendas, a networked system of DRM professional institutions could contribute to providing the foundation for a regional DRM data development and management system. This would encourage improved data acquisition, common standards, cost efficiencies, and multinational engagement for shared regional benefits.

4. SUBREGIONAL INTERGOVERNMENTAL ORGANIZATIONS

Subregional intergovernmental organizations in Asia and the Pacific have been proponents of DRM for some time, although with the exception of long-standing engagements in the Pacific, tangible actions to further DRM beyond supportive

declarations date mostly from the past five years. The ten member states of ASEAN adopted the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) in July 2010 to confirm their commitment to the HFA. This was the first legally-binding agreement related to the HFA and serves as a common regional platform in responding to disasters. A Comprehensive Framework on Disaster Management was adopted by SAARC in 2007. As it was similarly aligned with the HFA, it has become the guiding framework for the South Asia subregion. In November 2011 the SAARC member states further adopted a National Disaster Rapid Response Mechanism agreement to address trans-boundary disasters through regional cooperation, although it must still be ratified by the member states before it can come into effect. The Applied Geoscience and Technology Division of the Secretariat of the Pacific Community has a long association with the development and management of Pacific commitments to DRM governance and policy development. It has worked closely with 21 Pacific island countries and territories since 1995 to develop and implement comprehensive regional policies for DRM.

4.1 The Southeast Asia Subregion

Beyond the framework documents cited above and the joint emergency response cooperation described previously, in Southeast Asia ASEAN has proceeded to develop other instruments to advance DRM. The ASEAN Committee on Disaster Management adopted a work program to run from 2010 to 2015 to implement activities under the subregion's foundation document, AADMER. The comprehensive activities cover such areas as improved risk assessment using satellite-based monitoring systems, GIS-based information platforms, and community-based DRM. As part of this program a Regional Roadmap for Disaster Risk Assessment has been adopted and a series of capacity development activities is being provided to member states in such areas as standardizing disaster loss databases. The GIS-based Disaster Monitoring and Response System is being implemented by the ASEAN Centre for Humanitarian Assistance and similarly aims to upgrade essential data quality and access for improved decision-making capabilities.

These initiatives represent programs grounded in multiple interests and various degrees of political or economic motivation. Conceptually they can be well considered, but the requirement for assured resource allocations, and sustained policy commitments are seldom guaranteed. In the absence of a regionally recognized authority or institution dedicated to advancing disaster risk management across the region and able to engage the various national officials, international organizations and regional bodies involved in such initiatives can become short-lived, narrowly focused, or marginalized.

4.2 The South Asia Subregion

In South Asia subregional initiatives to advance DRM beyond traditional emergency assistance were stimulated in SAARC primarily following the Indian Ocean Tsunami in 2004. The SAARC member countries approved a Comprehensive Framework on Disaster Management and Disaster Prevention in 2007. It refers to generic priority areas for attention such as improving early warning systems and increased sharing of information. A subregional SAARC Disaster Management Center became operational in 2007 to share knowledge, provide technical advice to governments, and conduct research and capacity development leading to improved coordination in terms of more comprehensive DRM policy development and practice. In addition, a South Asia Disaster Knowledge Network was created in 2009 to serve as a network for scientific,

technical, research, and practicing organizations.

While there have been advances within some of the individual countries in the subregion in these primary areas of interest, progress has not been uniform nor even smooth. A variety of complicated geopolitical relationships, national concerns about key natural resources, and a hesitancy to share what is considered in some quarters to be sensitive data have combined to frustrate earlier intentions of more harmonized regional DRM policies and practices. There have been limited commitments, competing priorities, and a more general failure to provide adequate resources, so while the instruments and institutions exist, their current relevance is modest (Ishiwatari 2012).

4.3 The Pacific Subregion

The Pacific countries and economies demonstrate a strong historical commitment to regional cooperation, consensus decision making, and environmental sensitivity. Regional political and technical institutions have provided solid foundations for DRM for nearly 20 years since the Pacific Forum Leaders adopted the Pacific Regional “Madang” DRM Framework in 1995. Exemplary and productive relationships have been developed beyond conferencing in the combined development, climate, environment and disaster risk activities pursued collectively in the Pacific. Common efforts are a hallmark among the regional development strategies which involve a respected regional political body, technical institutions, international organizations, and technical assistance agencies working through a common Pacific structure.

SPC-SOPAC continues to provide technical advice and policy support for the region through the Pacific Disaster Risk Reduction and Disaster Management Framework for 2005–2015 approved by Pacific leaders in 2005. It coordinates activities with other SOPAC technical programs and among regional or international development partners such as those related to the Pacific Islands Framework for Action on Climate Change, 2006–2015. Among the 16 Pacific countries which submitted HFA national progress reports in the 2011–2013 cycle, 13 of them have climate change policies which specifically include DRR issues. Twelve countries link disaster risk reduction policy commitments in their national development plans (UNISDR 2013b).

A recent development suggests the growing sophistication of joint Pacific commitments to apply DRM instruments in practice for subregional benefits. With the support of SPC-SOPAC, the World Bank and ADB launched an innovative Pacific Catastrophe Risk Assessment and Financing Initiative as a pilot risk transfer program with commercial insurance companies (SPC-SOPAC 2013). The combined initiative provides countries with disaster risk modeling and assessment tools to understand, model, and assess their exposure to natural disasters as essential pre-requisites to access risk financing.

4.4 The Asia Pacific Economic Area

The Asia-Pacific Economic Cooperation (APEC) intergovernmental body is primarily dedicated to fostering business and trade relationships and opportunities, but it has also demonstrated an awareness for the wider implications of disaster risks throughout Asia and the Pacific. APEC has had an Emergency Preparedness Working Group (EPWG) since 2005 when it began as a virtual task force to coordinate and facilitate emergency and disaster preparedness among member countries. The concept and focus was expanded in 2009 to include wider human security issues, and particularly efforts to reduce disruptions to business and trade in the area (APEC 2013). Recognizing the importance of the work, APEC upgraded it to a working group in 2010.

The association shapes its interests to address the primary needs of its members so it concentrates on supporting the region to prepare for and respond to disasters. As with other organizations focused primarily on crisis and contingency management, APEC also seeks to reduce the risk of disasters and encourages business and community resilience. By encompassing the multiple interests of its members, it can support countries in refining and giving voice to their common concerns, conveying a collective view to United Nations agencies, international organizations and financial institutions, or bilateral assistance organizations. Although it is not widely considered in international DRM contexts, it could become a more influential actor.

Unfortunately, without strong motivation such internally conceived intentions driven by trade policy and business interests can easily remain separate from national DRM policy formulation and practice. They tend to proceed in nearly parallel organizational environments, ministries, and professional networks with different audiences. As the 2011 Bangkok flood and the Great East Japan Earthquake, tsunami and Fukushima nuclear crisis demonstrated serious commercial consequences throughout Asia, they could stimulate more impact of APEC on DRM in the future. The breadth of APEC's membership also may encourage the organization to become a useful forum to address supply chain disruptions to production systems. If motivated to do so, APEC can address these issues with a scope that exceeds the capacities of its individual members.

APEC leaders issued an important declaration in this regard in December 2012, when they stated, "Recognizing the vulnerabilities of our economies to natural and anthropogenic disasters, we reaffirm the importance of enhancing preventative measures, emergency preparedness, disaster resiliency and fostering of scientific and technical cooperation among APEC economies, communities and businesses in this regard." (APEC 2012)

The organization's commitment to meeting future needs through partnership was expressed in comprehensive terms as the statement continued, "In view of high economic costs incurred by many APEC economies due to natural catastrophes in recent years, we note the timeliness and the importance of strengthening our resilience against disasters through the development of disaster risk management strategies. We recognize that integrated disaster risk financing policies are part of overall disaster response preparedness. In this regard we recognize the value of knowledge exchange within APEC and beyond and appreciate the joint efforts of the World Bank, the OECD, the ADB and other bodies' joint efforts to elaborate practically applicable guidelines for financial authorities' responses to natural disasters with due regard for the work undertaken by the G20. In developing these policies, attention should be given to advance planning and preparation measures by financial authorities." (APEC 2012)

This is a commitment which needs to be capitalized upon and not allowed to remain simply a political declaration. Governments, and international and regional organizations working in Asia and the Pacific need to embrace such explicit regional initiatives.

5. CRITICAL CONSIDERATION OF REGIONAL PRODUCTION NETWORKS AND SUPPLY CHAINS

The recent growth of an intricate web of supply chains and production networks in Asia has important implications for DRM. The successful functioning of East and Southeast Asia's finely constructed and balanced production networks and supply chains rests on

the premise of there being no major disruptions to the system, including from natural hazard events. In the past two decades, pressures for economic growth and greater productivity have led to the creation of large industrial zones located in areas highly exposed to natural hazards. The Bangladesh Export Processing Zone in Chittagong (CEPZ) was constructed directly on the coastline adjacent to the mouth of the Karnaphuli River on the Bay of Bengal. While its proximity to the port of Chittagong is expedient for production and transportation services, the location is highly exposed to the frequent cyclones which batter the country.⁴ Currently producing exports valued at US\$1.3 billion and with annual investment of US\$100 million in the facility (January 2012–February 2013), one must speculate on the corresponding value of any appreciable risk management or reduction measures in place at the facility (CEPZ 2009).

Modern production procedures demand minimal inventories with "just in time" supply chain systems linking parts manufacture, transportation, and use with very limited margins for contingencies. These production economies equally rely on complex logistics systems throughout Asia which extend to other continents. While based on cost-benefit efficiencies, these commercial procedures are dependent on telecommunications, information, and transportation systems which, if disrupted, can impact global markets. The world price of computer hard drives increased threefold following the 2011 floods in Bangkok where 90% of the world's production was located (UNESCAP-UNISDR 2012).

Many industrial estates were constructed near Bangkok on former rice fields adjacent to the country's largest river which has a history of flooding. While the location was conducive to agricultural production dependent on annual floods, in 2011 it proved less suited for multi-million dollar manufacturing plants protected by insufficient embankments and cement retaining walls. The commercial impact of the floods was greatest north of Bangkok where land use planning concentrated economic activities in risk-prone areas. The inadequate flood defenses around the industrial sites were breached at various times during the flooding, leaving seven industrial estates flooded by up to 3.4 meters of water. In October 2011 officials at one of the estates (Hi-Tech) reported that it would take 10 weeks to drain away 12 million cubic meters of water in their facility, while officials at another plant (Nakorn) estimated it would take 13 weeks to clean the plant after the water receded, and about another year to fully rebuild their infrastructure (Geneva Reports 2012).

Automobile manufacturing was one of the most seriously affected sectors. All nine Japanese car manufacturers with operations in Thailand had to suspend production, and about 450 Japanese manufacturers were affected overall. Thailand's oldest and largest industrial estates with a large concentration of Japanese manufacturers were among the most damaged, hurting Japanese companies already reeling under the earlier effects of the East Japan earthquake, tsunami, and nuclear disaster. Many of these companies had moved significant operations into Thailand to avoid the strong yen and power shortages affecting Japan after the East Japan earthquake. Consequently, the production impact was felt beyond Thailand, forcing companies such as Toyota and Honda to reduce benefits and delay the launch of new products. The consequences of the floods also impacted factories directly in India, Indonesia, Viet Nam and the Philippines (Carpenter 2011). Honda suffered especially, as some critical parts for models produced in Thailand and India were produced only in the Thailand

⁴ The exposed location of the CEPZ between the coastline and the Karnaphuli River less than a kilometer away is evident from the map available at <http://wikimapia.org/8320276/Chittagong-Export-Processing-Zone-CEPZ>.

factory, so the Bangkok floods shut down production facilities in New Delhi. The effects extended even more widely as the disruption in global supply chains for component parts disrupted Toyota car production in 22 countries extending as far as North and South America (UNESCAP-UNISDR 2012).

Electronics firms like Toshiba, Sony, Nikon and Nidec also suspended production at their Thai factories due to flood damage or supply shortages, leading to major annual losses. Sony reduced its full-year operating profit outlook by 90 per cent. It also reported an unexpected third quarter loss of US\$345 million. Sony predicted a US\$1.2 billion annual loss for the year 2011–12 (Carpenter 2011).

The 2011 Great East Japan Earthquake (and the tsunami and nuclear accident that it precipitated) also caused enormous disruption to production networks and supply chains in the region, and damaged the economies concerned. While direct physical losses resulting from the March earthquake and tsunami in Japan were estimated at US\$212 billion, compared to the direct physical losses resulting from the June–December floods in Thailand estimated at \$40 billion, the full economic impacts of both of these disasters are likely to have been much higher. Through production networks, the impacts of a major disaster in one part of the region can now be felt across the length and breadth of these networks.

Similarly, the disruptions caused by the Thailand floods not only caused significant declines in Thai exports of electronics (-47.4%) and electrical appliances (-21.9%), in 2011 they also had significant impacts on Japan, where the manufacturing production index fell by 2.4% (from October 2011 to January 2012), led by a contraction in electrical component production of 3.7% during the same period.

Disruptions in the supply of intermediary products following the Great East Japan Earthquake caused automotive and electrical components production in Japan to contract by 47.7% and 8.3%, respectively, in March 2011, year-on-year.⁵ But contractions were also evident for several other economies in the region. For the automotive sector, reduced production soon spread to the Philippines (-24%), Thailand (-19.1%), and Indonesia (-6.1%) during April to June 2011. For the production of electrical components, the highest contraction was likewise recorded by the Philippines (-17.5%), followed by Malaysia (-8.4%), during April to May 2011 (all percentages are year-on-year).

This brief indication of the impacts of two major disasters in 2011 on regional economies through disrupted production networks is only a fraction of the full indirect costs involved. For industries in the private sector, ignoring the lessons of risk management multiplied their economic vulnerability. The stringent economics of global manufacturing supply chains ignores the reality that economies of scale are closely associated with increased risks. The smaller the number of plants and the greater the concentration in areas of likely hazards, the higher the risk of business interruptions will be. The greater the distances between component suppliers, the fewer their numbers for critical parts, and the smaller inventories are, the higher the risk of avoidable interruptions of supply chains. In view of the frequency of natural hazard events in Asia and the Pacific and the region's increased economic vulnerability through supply chains and production networks, it is important that such impacts are closely studied on a regional basis.

⁵ Loss figures and the following percentages in reduced production are from METI 2011, as quoted in Disaster Risk Management in Asia and the Pacific: An unpublished issues paper on the joint ADB and ADBI study on Disaster Risk Management in Asia and the Pacific, April 2013.

The propagation of these economic impacts of disasters within and beyond the region could be reduced through greater recognition of the consequences of clustering production facilities or transportation services in locations particularly exposed to hazards, diversifying industrial locations for assembly and component suppliers, and ensuring the resilience of logistical support systems. In terms of making better use of recognized policies, there is considerable scope for the wider adoption of accepted business continuation practices by individual firms. At the very least, due consideration should be required either by regulatory means or more directly by corporate self-interest to ensure the use of proven risk mitigation practices. These should include accepted international risk management standards and established business continuity practices.⁶

As cities become agglomerations of large scale industries, the growth of commerce can create its own ecosystem where land is available, prices are lower, and regulations are few or more relaxed. As these hubs grow and become linked through intricate supply chains spreading across and beyond countries, risks and contingent requirements can easily be overlooked. Eventually, a localized disaster can have a macroeconomic impact on a regional scale.

It is therefore critical to identify systemic risks of all types for all populations. This implies the importance of industrial policies considering such elements as settlement patterns, land use, and their combined influences on increasing or creating new risks. It is equally important to analyze the extended impacts of disaster event scenarios which include proper social and economic impact assessments. This foresight is needed to understand what types of social and recovery programs are required for the affected area and population beyond the immediate concerns of commercial production values.

These improvements can be furthered by the mutual recognition of governments and business interests that there are shared benefits to be gained from combining their efforts to adopt effective remedial measures. It is recommended that this objective be pursued through both government policies and business practices, working jointly to incorporate explicit and established risk management practices and standards already embodied in business continuity practice into national strategic DRM policies, planning, and programs. At present, there are few countries which recognize, much less require that mutually reinforcing disaster risk management standards are coherently employed in national DRM strategies. With greater attention given to “making the business case for DRM” there should be more political encouragement for bridging the current divide between the economic rationale for disaster reduction and the implementation of official policies to identifying, assessing, and proceeding to reduce disaster risks (UNISDR, 2013a).

6. CONCLUSION

This study illustrates how crucial the regional scale of engagement is for concentrating the common interests of individual government policy commitments to DRM, while also supplementing countries’ own resources with expanded institutional relationships to energize a more sustained impetus to reduce disaster risks throughout the region. Regional attributes include the beneficial attention of distributed specialist technical, scientific, and academic institutions that are motivated by interests beyond disaster

⁶ Refer for example to such established standards as ISO 31000 for risk management and ISO 23220 for societal security. ISO publications are available from national standards institutes in member countries or at http://www.iso.org/iso/home/store/publications_and_e-products.htm

concerns. They can be driven by capitalizing on collaborative relationships that incorporate combined political, economic, environmental, and regional development interests. The high social value of education in the region can contribute to a more explicit involvement of civil society in reducing public risk through all levels of learning. These are all dynamic features in Asia that have also demonstrated how to bind distant localities for common purpose across the Pacific.

The region has abundant material and technical resources, with a growing body of human capacities to direct abilities and techniques toward more sustained risk awareness. The subjects elaborated in this study encourage the further identification of innovative means to build public risk consciousness through on-going professional and academic linkages. Broader perspectives such as those developed through APEC's growing engagement in risk reduction are one example of how the subject can become more integral to established commercial activities. Rather than being driven by multiple or independent national policy initiatives alone, or only promoted as an international framework, a more explicit regional vision of collaborative DRM remains an unrealized opportunity. As disaster hazards are pervasive across the region, the risks will grow as development prospers unless social vulnerability and public exposure can be reduced. Visionary relationships, joint government–institution–public collaboration, improved data and shared information, collective analysis, joint resource commitments, and multidisciplinary efforts that transcend geographic and sector boundaries will define the future effectiveness of regional DRM.

REFERENCES

- Asian Development Bank and Asian Development Bank Institute (ADB-ADBI). 2013. *Disaster Risk Management in Asia and the Pacific: An issues paper of the joint ADB and ADBI Study on Disaster Risk Management in Asia and the Pacific*. Tokyo: ADBI.
- Asian Disaster Preparedness Center (ADPC). 2012. Program for Enhancement of Emergency Response (PEER). <http://www.adpc.net/blog/>
- Asian Disaster Reduction Center (ADRC). 2013. <http://www.adrc.asia/aboutus/index.php>
- Asia Pacific Economic Cooperation (APEC). 2013. Working Group on Emergency Preparedness. <http://www.apec.org/Home/Groups/SOM-Steering-Committee-on-Economic-and-Technical-Cooperation/Working-Groups/Emergency-Preparedness>
- Asia Pacific Economic Cooperation (APEC). 2012. APEC Leaders' Declaration. Vladivostok, Russia, 8–9 September. http://apec.org/Meeting-Papers/Leaders-Declarations/2012/2012_aelm.aspx
- Asia-Pacific Regional Space Agency Forum (AFPRSA). 2013. http://www.aprsaf.org/initiatives/sentinel_asia/
- Association of South East Asian Nations Regional Forum (ASEAN ARF). 2011. <http://aseanregionalforum.asean.org/about.html>
- Carpenter, G. 2011. Cat-I Bulletin: Thai Floods, 3 November. Available: <http://www.guycarp.com/portalapp/publicsite/catdocument.pdf?instratreportid=2077>
- Chittagong Export Processing Zone (CEPZ). 2009. <http://www.epzbanladesh.org.bd/bepza.php?id=cepz>
- Consultative Group for International Agricultural Research (CGIAR). 2013. History of CGIAR. <http://www.cgiar.org/who-we-are/history-of-cgiar/>
- Drache, S. and Feldman, S. 2003. Media Coverage of the 2003 Toronto SARS Outbreak: A report on the role of the press in a public crisis. Toronto: Roberts Centre for Canadian Studies, York University.
- Government of Japan, Ministry of Economy, Trade and Industry (METI). 2011. *Japanese Industry-Lasting Change in Manufacturing Industry*. Tokyo.
- International Centre for Integrated Mountain Development (ICIMOD). 2013. <http://www.icimod.org/>
- Ishiwatari, M. 2012. Government Roles in Community-Based Disaster Risk Reduction, *Community-Based Disaster Risk Reduction: Community, Environment and Disaster Risk Management*. (10). Emerald Group Publishing Limited.
- Mekong River Commission for Sustainable Development (MRC). 2013. <http://www.mrcmekong.org/>
- Network for Social Sciences in Disaster Prevention in Latin America (LA RED). 2013. <http://www.la-red.org>
- Partners Enhancing Resilience for People Exposed to Risks (Periperi U.) 2013. <http://www.riskreductionafrica.org>

- Preventionweb. 2013. <http://www.preventionweb.net> (accessed 6 June 2013).
- Preventionweb. 2013. Asia. <http://www.preventionweb.net/english/countries/asia> (accessed 8 June 2013).
- Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES). 2013. <http://www.rimes.int>
- Secretariat of the Pacific Community Applied Geoscience and Technology Division (SPC-SOPAC). 2013. Disaster Reduction Programmes. <http://www.sopac.org/index.php/sopac-programmes/disaster-reduction-programme>
- United Nations Economic and Social Commission for Asia and the Pacific and the United Nations International Strategy for Disaster Reduction (UNESCAP-UNISDR). 2010. *The Asia Pacific Disaster Report 2010, Protecting Development Gains - Reducing Disaster Vulnerability and Building Resilience in Asia and the Pacific*. Bangkok: UNESCAP/UNISDR. <http://www.unescap.org/idd/pubs/Asia-Pacific-Disaster-Report-2010.pdf>
- United Nations Economic and Social Commission for Asia and the Pacific and the United Nations International Strategy for Disaster Reduction (UNESCAP-UNISDR). 2012. *The Asia Pacific Disaster Report 2012, Reducing Vulnerability and Exposure to Disasters*. Bangkok: UNESCAP/UNISDR.: <http://www.unisdr.org/we/inform/publications/29288>
- United Nations International Strategy for Disaster Reduction (UNISDR). 2005. *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. Geneva: UN. <http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf>
- United Nations International Strategy for Disaster Reduction (UNISDR). 2013a. *Global Assessment Report on Disaster Risk Reduction. From Shared Risk to Shared Value: The Business Case for Disaster Risk Reduction*. Geneva: UN. <http://www.unisdr.org/we/inform/publications/33013>
- United Nations International Strategy for Disaster Reduction (UNISDR). 2013b. *Progress Review of the Hyogo Framework for Action in Asia and the Pacific 2011–2013*. Bangkok: UN. <http://www.unisdr.org/we/inform/publications/32851>
- United Nations International Strategy for Disaster Reduction (UNISDR). 2013c. *Asia Pacific Synthesis Report: Consultations on the Post-2015 Framework for Disaster Risk Reduction (HFA2)*. Geneva: UN. http://www.preventionweb.net/files/33369_synthesisreportunisdrasiapacificcon.pdf
- United Nations International Strategy for Disaster Reduction (UNISDR). 2013d. Chair's Summary of the Fourth Session of the Global Platform for Disaster Reduction: Resilient People, Resilient Planet. Geneva, 21-23 May. http://www.preventionweb.net/files/33306_finalchairssummaryoffourthsessionof.pdf
- United Nations International Strategy for Disaster Reduction (UNISDR). 2013e. Asia/Pacific. <http://unisdr.org/asiapacific>
- World Meteorological Organization. Regional Climate Centers (WMO-RCC). 2013. <http://www.rccra2.org>