RISK INFORMED DEVELOPMENT

using Disaster Risk Information for Resilience

Conference Report,
27-29 August 2018, Bangkok

ADB adpc Canada german cooperation DEUTSCHE ZUSAMMENARBEIT Regional Integrated Multi-Hazard Early Warning System RIMES UNDP UNITED NATIONS ESCAP Economic and Social Commission for Asia and the Pacific UNISDR The United Nations Office for Disaster Risk Reduction

RISKINFORMEDDEVELOPMENT

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1 \ Introduction

1 / The recent disasters in Southeast Asia, such as the two the earthquakes in Indonesia, floods in Myanmar, and typhoon in the Philippines, serve as a reminder of the high levels of disaster risk in the region. Between 1988-2017 natural hazards have caused the death of 400,000 people, affected 397 million people, and caused 133 billion direct physical losses in the Southeast Asian developing member countries of the Asian Development Bank (ADB). [1] These losses are set to increase with the expected rise in intensity and frequency of climate-related hazards due to climate change, and due to increase in exposure and vulnerability of infrastructure and assets as development takes place with insufficient regard to disaster risk. The potentially unsustainable levels of disaster-related damages and losses in the future could undermine or even reverse development progress. Considering the destructive impact of natural hazards on people, infrastructure, livelihoods in a changing climate, the 2030 Agenda for Sustainable Development has integrated climate and disaster resilience into its global development targets. The Sustainable Development Goals have been informed by the Sendai Framework for Disaster Risk Reduction 2015-2030, an intergovernmental agreement that elevated "investing in disaster risk reduction for resilience" as one of its four priorities alongside a better understanding of disaster risks, strengthening disaster risk governance to manage disaster risk, and enhancing preparedness and risk-informed recovery, rehabilitation, and reconstruction. So too, the Paris Agreement on Climate Change also highlights the importance of managing risks from extreme weather events.

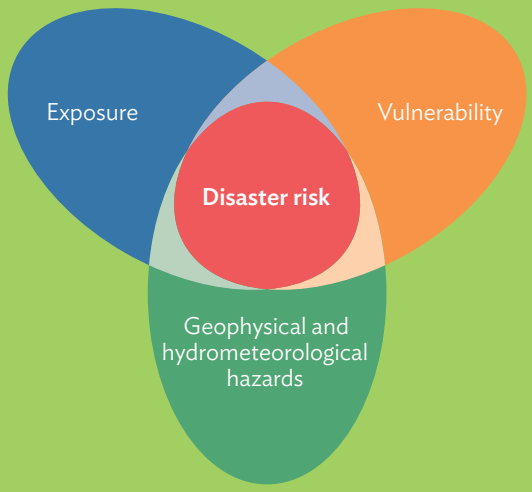
2 / Addressing the threats from natural hazards, many countries in Southeast Asia have already raised the profile of disaster risk reduction in their national development plans and strategies. The next step—the systematic integration of disaster risk (current and future) information into development programming and design, implementation, and maintenance of individual projects across all relevant sectors—has presented several challenges (See box 1 on definition of disaster risk). The reasons are complex and often rooted in difficulties to formulate and coordinate risk-informed policies, set well-defined and measurable sector-specific disaster risk reduction targets, and nurture a supportive risk governance environment for the implementation of these targets. These institutional and managerial challenges often coincide with a lack of overall knowledge of the direct and indirect socioeconomic impact of disasters as well as a limited understanding of contextual factors that feed into the exposure and vulnerability to natural hazards. Furthermore, limited capacity in assessing disaster risk, identifying risk reduction opportunities and solutions, and estimating costs and benefits of integrating risk reduction measures into development, lags behind overall policy intentions.

[1] EM-DAT: The CRED/OFDA International Disaster Database. https://www.emdat.be/. Universit Catholique de Louvain, Brussels, Belgium.

Box 1 \

Disaster Risk

Disaster risk is a function of the probability of occurrence of a hazard of varying intensity (i.e., physical strength) in a particular location, the people and physical assets situated in that location and therefore exposed to the hazard; and the level of vulnerability of those exposed people and physical assets to that hazard.



Hazards describe potentially occurring natural events, comprising geophysical hazards, such as earthquakes, and hydrometeorological hazards, such as floods. Exposure of an element at risk is the degree of possible physical contact between a community, livelihood, or asset and a potentially damaging hazard event (for instance, structures or settlements located in floodplains). Vulnerability relates to the physical, social, economic, and environmental conditions of a community, livelihood, or a particular asset and its propensity to be adversely affected by a hazard event. Vulnerabilities can increase risks from even relatively moderate hazards. The conditions that generate vulnerability often relate to the various facets of poverty, such as low incomes and lack of access to services and information.

Source: Asian Development Bank

3 / In this context, a regional conference was organized with the objectives to (i) discuss the importance of risk-informed development in the context of Southeast Asia's rapid development, (ii) demonstrate how to apply disaster risk information to development processes and decision-making, and (iii) identify the enabling environment required to implement risk-informed development. The conference provided a space for senior technical staff from government agencies in Southeast Asia, private sector companies involved in undertaking disaster risk assessments, and partner organizations to explore the application of disaster risk information in development.

4 / The conference was organized from August 27 to 28 2018 in Bangkok, Thailand by ADB in partnership with the Asian Disaster Preparedness Center (ADPC), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES), United Nations Development Programme (UNDP), United Nations Economic and Social Council for Asia and the Pacific (UNESCAP), and United Nations Office for Disaster Risk Reduction (UNISDR). Funding was provided by the Government of Canada. Conference participants included delegations from Bangladesh, Cambodia, Indonesia, Lao PDR, Maldives, Myanmar, Nepal, the Philippines, Thailand, and Viet Nam.[2] Furthermore, experts and officials from India, Mexico, the Netherlands, New Zealand, and Nicaragua shared their experience.

5 / The conference focused on the application of disaster risk information in national development planning, urban development, agricultural development, and disaster risk financing. Session formats included panel discussions, short presentations and breakout groups on risk-informed national development planning, risk-informed agricultural and urban development, and disaster risk financing (See box 2 on brief description of the key sessions).

6 / The report provides an overall summary of conference presentations and discussions and is organized around 3 main sections: (i) key lessons in generating actionable risk information, (ii) key lessons in applying risk information to development processes and programs, and (iii) basic steps in creating an enabling environment for risk-informed development. To illustrate some central points, the summary report refers to a selected number of country-specific examples from conference presentations.

[2] (i) ADB-Canada sponsored the participants from Cambodia, Indonesia, Lao PDR, Myanmar, the Philippines, Thailand, and Viet Nam; and (ii) UNESCAP funded participants from Bangladesh, Cambodia, Maldives, Myanmar, and Nepal.

Box 2 \

Workshop Sessions

Session: Risk-informed national development planning process
The session focused on integrating disaster risk information in long- and medium-term national development plans, and public investment planning process. The session included brief presentations on use of disaster risk information in national development planning process in Indonesia and in the appraisal of public investment projects in Mexico, followed by a panel discussion involving experts in national development planning, hazard assessment and disaster risk management.

Session: Risk-informed agriculture
The session focused on both top-down (innovation and knowledge-based policy interventions) and bottom-up approaches (multi-stakeholders' risk communication platforms, decision support tools and efficient agriculture extension mechanisms) to reduce disaster risk and manage residual disaster risk in the context of agriculture sector. The session included sharing of experiences from Greater Mekong Subregion and Myanmar, followed by a panel discussions involving experts in climate science, early warning systems, and earth-observation technology.

Session: Risk-informed urban development
The session had a focus on use of disaster risk information to guide longer-term planning, land use management, development control regulations, design of urban infrastructure projects and management of urban services. The session includes case studies from Thailand and Wellington, New Zealand and was followed by a panel discussion involving experts in exposure mapping, urban infrastructure and emergency response.

Session: Disaster risk financing
The session discussed ex-ante financial instruments that can support government in timely relief, early recovery and reconstruction interventions. The session included an introductory presentation on disaster risk financing, followed by presentations on the Philippines' disaster risk financing and insurance strategy and its application, and an overview of the Philippines City Disaster Insurance Pool. A panel discussion involving experts from the governments of Indonesia and the Philippines, Willis Towers Watson Public Ltd., and ADBI focused on the use of disaster risk knowledge and understanding of disaster risk financing tools, financial preparedness for disasters, and country experiences of disaster insurance pools, including development and potential use.

Market place of innovative solutions
The conference showcased innovative solutions and approaches for pursuing risk informed development including forecast based financing to improve disaster preparedness, geospatial online tools for risk-informed decision making, use of community risk mapping in recovery and reconstruction, and co-management of green solutions for riverbank erosion.

2 \ Key Lessons in Generating Actionable Risk Information

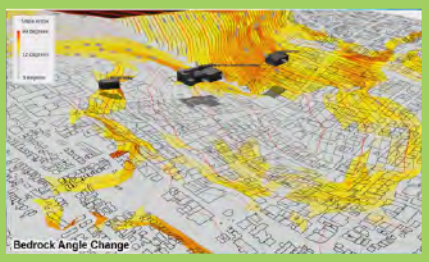
7 / **Adopt risk information to the needs of end users.** Risk information pertaining to natural hazards and climate change has long been the exclusive realm of science. However, applying risk information to decision-making in development requires adapting both content and presentation of risk information to the needs of end users. For instance, the information needs of officials in national planning ministries differ substantively from the needs of urban planners working in municipalities, insurance companies, or from farming communities. These differences in user needs refer to the type and presentation of risk information, including both spatial (location, size, and resolution) and temporal (timing, duration, and time frames) characteristics. To establish compatibility between different relevant data-bases (e.g., land-use data, exposure data, etc.), it is important to agree on a common scope and format in which data and information is captured. For instance, it is important to agree on the geographic boundaries (e.g., administrative units such as provinces and districts), the appropriate resolution in which hazard data is represented and shared, and the use of compatible tabular and/or mapping software.

8 / **End users need to be involved in risk assessment processes from their initial design to the finalization of outputs.** Specific risk communication strategies and methods need to take account of differences between groups of end users in terms of information needs, risk perception, and educational background. The example from New Zealand in Box 3 illustrates a risk communication process that helped to channel scientific risk information into urban land use planning, a revision of building codes, and emergency management.

Box 3 \

'It's Our Fault' - Risk Information Transfer through a Multi-stakeholder Process in Wellington, New Zealand

The 'It's Our Fault' research program involves a comprehensive study of the likelihood of large earthquakes in Wellington, the effects of these earthquakes, and their impacts on humans and the built environment. It aims to provide risk information needed for Wellington to become a more resilient city. This includes better understanding of the location and extent of faults, more detailed information on soil types and liquefaction vulnerability, and the adequacy of current planning provisions. It has demonstrated a reduced likelihood of movement in the Wellington Fault than previously estimated, modelled the ground motions that would result from a more dangerous subduction zone earthquake, and enabled the insurance industry to have a better understanding of risk.



The research program uses a multi-stakeholder process where risk information end users (the Wellington City Council Chief Planner and Chief Engineer, the Greater Wellington Regional Council Hazards Manager, and the Regional Manager, Wellington Region Civil Defence and Emergency Management Group) form part of the program team with the project lead and risk information providers (GNS Science) and principal research funders (the Earthquake Commission). This allows for effective transfer of science into local land use planning, into emergency management practice, and into seismic design requirements for buildings. However, having end users in the project team with scientists can cause issues for regulators around the stage at which new risk information is 'known' as Councils have duties to publicly disclose and act on risk information under their governing legislation. Early stage briefings from the science providers may need to exclude council officials.

Involving end-users as part of the program team allows them to shape research objectives and specify the content and format of risk information that they require. The program has involved a research project on landslide risk that specifically focuses on turning science into regulation. The research on landslide risk will be coupled with a review of existing planning provisions to determine what provisions require change. The volume of new risk information produced through the program, particularly in relation to earthquake and landslide risk, has generated the need for a full review of the Wellington City District Plan. In this review a specific natural hazards chapter will be formulated to give weight to the importance of risk issues in informing future urban development in the city.

Source: Pam Johnston, Principal Advisor, Disaster Risk Reduction, Earthquake Commission, New Zealand

9 / **Start with available risk information.** Risk information will only be as good as the quality of underlying data and of methods used in analyzing data and modeling risks. Data can be poor for instance, data on the condition of sector-specific assets and on damages and losses, especially at subnational levels. Building up databases is as important as it is time-consuming (especially from scratch), but this does not need to delay preliminary analysis. For instance, even in the absence of vulnerability data, an analysis of hazard and exposure data can provide base layers for the identification of disaster risk hotspots (e.g., for the appraisal of investment projects or preliminary land use planning). In the absence of data on exposed assets, modern technology such as earth-observation and tools such as google maps can be drawn in to fill in the gaps. These gaps can then be addressed in an incremental fashion as better and more data becomes available and can be used to improve risk analysis and assessments.

10 / **Recognize uncertainties.** Even if it is based on excellent data sets and methods, risk information still involves varying degrees of uncertainty that are, for instance, associated with a lack of credible data but also the fact that our understanding of natural hazards and climate change is still evolving. The extent of uncertainty needs to be communicated clearly, so that end users can make fully informed, strategic decisions. This requires the disclosure of scientific evidence, but also that any judgments about the quality and relevance of the evidence to the risk assessment is thoroughly described.

11 / **Tap community knowledge.** Communities have specific knowledge that needs to be tapped into in order to establish rounded and relevant risk information but also to generate interest in and support for risk reduction. Even the best scientific models are unlikely to fully grasp local conditions and specific factors influencing risk. Therefore qualitative, community-based assessment methods and quantitative, scientific risk assessments can exist side by side, enrich, and even validate each other.

12 / **Standardize risk assessment methods.** To ensure quality and coherence in risk information that is used to inform design codes and regulations, be they building codes or zoning laws, countries need to standardize risk assessment and mapping methods. Standardization is also important to produce risk information that is compatible in terms of territorial coverage (e.g., district risk assessments that can feed into a provincial analysis). Standardization is needed to agree on credible sources of (hazard, exposure and vulnerability) data, sound methodology/ies for risk assessment, and requirements for representing and communicating risks.

13 / In a nutshell, conference discussions and presentations established the following seven common characteristics of actionable risk information:

- User orientation and participation. Participation of users throughout risk assessment processes is needed to agree on useful end products in appropriate form and formats and to facilitate the sharing of relevant information.
- Ownership of risk information. Participation and user orientation are expected to generate ownership, ensuring that relevant databases and information products are maintained, updated, and budgeted for.
- Credibility. Risk information needs to be technically credible but also account for risk perceptions of end users.
- Transparency. Different user groups have different levels of tolerance for uncertainty and require a full disclosure of the limitations of risk information.

- Build confidence. Risk information should inspire some confidence that risks can be addressed and that addressing more common and moderate levels of risk can incrementally build resilience against higher risk scenarios.

- (Public) Accessibility. Risk information should be accessible in terms of both the means or technologies of communication (e.g., online and offline) and to communication methods (e.g., maps, graphs, etc.).

- Visually appealing. Risk information needs to be communicated in a visually appealing way to attract the attention of different target groups, (e.g., communities, officials, and politicians).

3 \ Key Lessons in Applying Risk Information to Development Planning Processes and Programs

Box 4 \

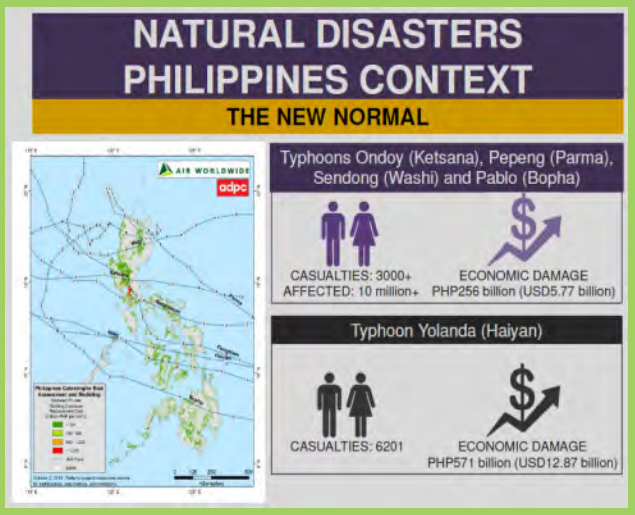
Philippine City Disaster Insurance Pool

The Government of the Philippines is developing the world's first city disaster insurance pool, with support from ADB. The pool will offer parametric insurance for earthquake and typhoon cover, with payouts expected to be made within 15 business days of qualifying disaster events. The pooled structure will reduce the cost of disaster insurance for participating cities, thereby encouraging uptake, by (i) diversifying risk, enabling a reduction in the volatility of total losses experienced by the group relative to each insuring in isolation and so reducing funding requirements, (ii) absorbing the first layer of loss from pool reserves, so reducing the amount of reinsurance required to protect the pool, (iii) sharing administrative costs associated with the creation and management of the pool and, (iv) collective bargaining in negotiating reinsurance.

The acquisition of data and application of data has played a critical role in shaping the design of the pool. Several key factors supporting the successful acquisition of data have been identified in the process:

- Understand formal city procedures (e.g., agreements and memoranda of understanding) for sharing data and information and follow them closely.
- Establish trust and develop of close working relationships with data providers.
- Provide careful clarification of the purpose and benefits of data sharing, including indirect benefits.
- Adopt a proactive, "door-to-door" data acquisition approach, involving all relevant city administration departments.
- Recognize that data collection can take some time.

Certain challenges have also been encountered, in particular relating to data incompatibility and decentralized database. Most cities generate, collect, store, and retrieve tabular as well as spatial information to inform their day-to-day operations and decision-making process. However, these datasets are manipulated, updated, and stored in individual and often incompatible databases by various city departments. This creates issues in terms of duplication of data as well as data disparities. Similarly, geographic data, particularly local community data and maps produced by national government agencies, often cannot be easily overlaid due to format and software incompatibilities. A collective effort is required to overcome these efforts.



14 / **Risk evaluation process forms the basis for risk-informed development**. The application of risk information requires evaluating and distinguishing risks that are unacceptable from risks of acceptable levels. The latter need to be addressed through structural and non-structural disaster risk reduction (DRR) measures, whereas residual disaster risk management (disaster preparedness, response, and recovery) focuses on acceptable levels of remaining risk. These risk-layering or risk evaluation processes form the basis of risk-informed development planning, both generic (at national and sub-national levels) and sector-specific.

15 / **Need for collaborative governance framework.** Risk-informed development planning requires a collaborative governance framework in which public policy makers, technical and scientific experts, and private sector and civil society organizations work together and an informed public that demands investments in disaster risk reduction/disaster risk management (DRR/DRM). Attitudes and underlying incentive systems need to change to reward resilient policy making and action, even if they do not generate clearly visible, short-term benefits. This is a long-term process and cannot be achieved through a one-off risk assessment or planning exercise.

16 / **Incentives to encourage risk reduction.** Changing **incentive systems** to reward forward-looking investments in risk reduction needs to be based on a solid understanding of how and when investment decisions are currently made. An essential question is how development progress is currently measured, by whom, and how associated indicators influence investment decision making. For instance, the transport sector may be evaluated against the length of built and rehabilitated roads and bridges. Such a focus bears the potential of perverse incentives in terms of not prioritizing the building of better and more resilient roads (since these could reduce the need for rehabilitation, and hence reduce access to funding).

17 / **Baseline for current disaster risk reduction investments.** Risk-informed development also requires a **baseline of current DRM/DRR investments** and necessary capacities and resources to address DRM/DRR gaps. Such an analysis can help to draw in individual sectors to better appreciate the relationship between their scope of work and risk reduction and to draw them into a collaborative risk-informed development planning framework that clarifies their current and future roles and capacity in DRR/DRM. It can also help to further prioritize and steer investments towards resilience strengthening.

18 / **No blueprint to institute risk-informed development.** There is no blueprint or strictly defined sequence to design and institute a risk-informed development planning system or capacity. Depending on country contexts, it may, for instance, be more practical to prioritize highly exposed and vulnerable geographic regions or sectors, develop sector-specific risk information assessment tools and risk reduction and risk management solutions. Demonstrated evidence of the benefits of risk-informed planning/budgeting in one sector may then motivate other sectors to follow suit. Similarly, such experience can provide generic development planning apex bodies, such as ministries of planning and finance, with guidance to develop risk-informed planning mechanisms and tools. Conversely, in other countries with centralized planning and stronger regulatory capacity, it may make more sense to start the process at the level of national development planning apex bodies (See box 5 for examples from Latin America and the Caribbean). In more decentralized contexts with strong urbanization trends, risk-informed development planning may focus initially on urban areas and then spread to peri-urban and rural areas that share similar hazard exposure and vulnerabilities before defining intra-territorial and national planning arrangements and institutions.

Box 5 \

Network of Public Investment Planning Systems in Latin America and the Caribbean

The network of Public Investment Planning Systems was set up in 2009 as a voluntary network of offices in charge of public investment processes (that is, either ministries of planning or finance) in seventeen member countries of the Economic Commission for Latin America and the Caribbean (ECLAC). Mainstreaming disaster risk reduction and adaptation to climate change in public investment processes is currently the main focus of the network. Some member countries such as Chile, Nicaragua, and Peru already have methodologies to mainstream DRR and climate change adaptation (CCA) in public investment projects. In the case of Nicaragua, this includes specific guidelines for sector projects (road infrastructure, energy, water and sanitation, and housing). Other countries, such as Mexico, have developed tools to analyze disaster risk within specific projects to determine cost benefit. There are also advances in creating budget classifiers for DRR and CCA spending, including in Nicaragua and Peru.

Source: Roger Vega Rodriguez, Director of Public Investment, Ministry of Finance & Public Credits, Nicaragua

Box 6 \

Planning in Conditions of Uncertainty: Adaptive Pathways

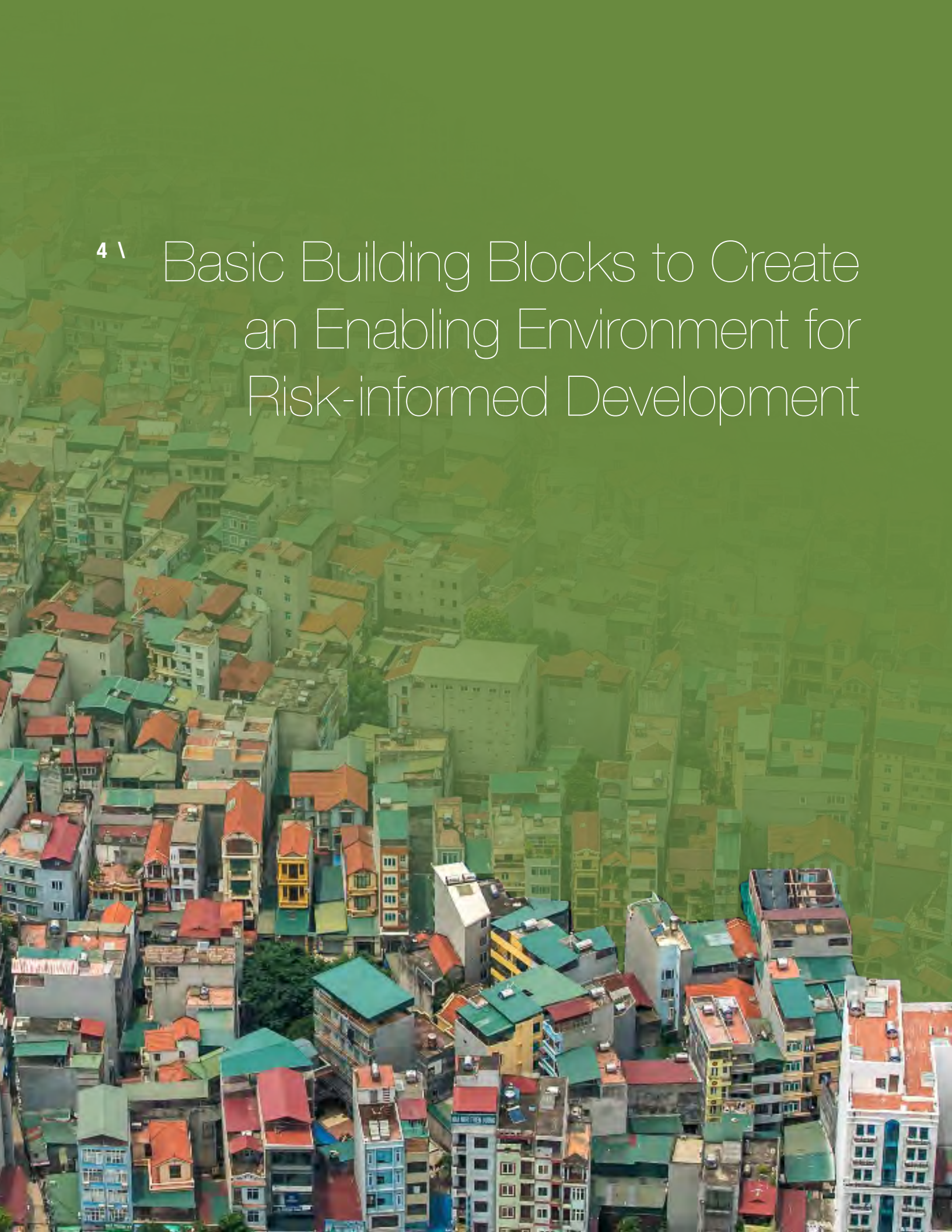
Uncertainty about a range of dynamic factors including the impact of climate change, population growth, new technologies, and economic development have undermined conventional planning assumptions that the future can be reasonably predicted based on one "most likely" scenario. Uncertainty about the future has given birth to a new approach to planning called "Adaptive Pathways" that promotes the creation of a longer-term framework to guide future actions taking into account multiple scenarios, but only commits to relatively short-term actions. Planning under this approach emphasizes flexibility, monitoring and learning, and the ability to correct decisions in light of new insights and circumstances. This type of adaptive planning has garnered particular attention in the domains of environmental management and climate change. For instance, the UK Thames 2110 initiative used decision trees to analyze sequenced actions to prepare the Thames estuary for conditions of sea level rise. Similar decision-making tools have been used to study how flexibility can be built into flood risk insurance in the Netherlands.

See: Haasnoot, M. et al. Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. In: Global Environmental Change. 23. 2013. pp.485-498. Amsterdam, the Netherlands.

19 / **Communities need to drive risk-informed development.** Regardless of the administrative systems of countries, **communities are at the frontline of resilience** and risk information and risk-informed development planning needs to address the needs of vulnerable communities. This requires bottom up and top down communication and coordination mechanisms to (i) facilitate the flow of actionable risk information and resources including targeted DRM investments, and (ii) ensure that risk reduction solutions that work are identified, tracked, and replicated.

20 / **Adopt adaptive pathways to deal with uncertainties.** In the face of both uncertainty of risk scenarios and constrained resources, an **incremental approach** to climate and disaster risk reduction and management has been found to be more practical and easier to justify. The climate change community has termed the concept of "**adaptive pathways**" (see Box 6 on Adaptive Pathways) to address an uncertain future, meaning that they prioritize most likely scenarios (e.g., seasonal flooding or drought hazards) but identify alternative "pathways" and leave room for extra measures and investments if other scenarios transpire. Such an incremental approach that accommodates **uncertainty, limited resources and learning** may also work in the context of other hazards.

4 \ Basic Building Blocks to Create an Enabling Environment for Risk-informed Development



While there are several paths towards strengthening an enabling environment for risk-informed development, the following are key components in identifying disaster risks and incorporating disaster risks into development plans and action.

21 / **Build up or strengthen the understanding of disaster risks**. The understanding of disaster risks requires information on hazards, exposure, and vulnerability. Such information builds upon various base data layers including data on hazards; climate; hydrological, meteorological, geological/geo-physical, and topographic data; population, assets, and other infrastructure, livelihoods, and other relevant socio-economic characteristics; and historical disaster losses and damages. These base layers of data inform the identification of hazard-prone areas and scenarios[3] and the establishment of geo-referenced datasets on population, residential buildings, land and water resources, assets (e.g., industrial assets, crops, livestock etc.), and networked infrastructure (e.g., roads and transport, energy and electricity, drainage channels, and irrigation etc.), which are critical to establishing exposure patterns, including disaster hotspots. Together with an analysis of the vulnerability of these geo-referenced elements and their replacement values, a fuller picture of the characteristics and distribution of disaster risks and the extent and likelihood of damages and losses can be established.

22 / **Strengthen institutional arrangements for the ongoing collection, collation, analysis, and coordination of disaster risk data**. Disaster risk correlates with a range of dynamic factors including migration, industrial development, urbanization, environmental degradation, climate change, and globalization. It is therefore important to strengthen (i) data collection in relevant sectors (i.e., to make sure that there are comprehensive, systematic, and updated asset inventories and that damages and losses are continuously tracked), and (ii) that risk analysis is undertaken at regular intervals to monitor and reflect critical changes in disaster risk scenarios. Institutional arrangements include inter-organizational memoranda and technical protocols about the collection, format, and transmission of data (including roles and responsibilities). Furthermore, it is necessary to clearly allocate coordination and lead roles for risk assessments as well as provisions and procedures for the official adoption of risk assessment results. Regulations may be necessary to clarify or standardize responsibilities, objectives, basic methodologies (including credible sources of base data), and intervals in which disaster risk assessments need to be conducted.

23 / **Ensure that relevant disaster risk information is effectively shared**. Different users require different applications, scope, and resolution of disaster risk information. At the same time, it is important to build compatible databases and information hubs that can be easily accessed by potential end users.

24 / **Ensure disaster risk information is effectively communicated**. Different communication strategies and methods need to be designed to reach various user groups ranging from politicians, administrators, and technicians to private households. Methods need to address current risk perceptions, communication preferences, educational background, economic status as well as possible social or gender barriers to accessing information. Grassroots organizations, media, educational establishments, and local governments can act as key disseminators and multipliers of disaster risk information. Furthermore, partnerships can be established with private sector agencies, such as internet providers, mobile phone companies, and insurance companies to further disseminate disaster risk information.

[3] Climate change makes it mandatory to monitor trends and changes in hydro-meteorological hazard patterns.

25 / **Strengthen incentive systems for a collaborative risk governance framework**. Risk-informed development requires the willingness of multiple actors (government, private, civil society) and sectors to share information and resources, adjust their own plans and programs to achieve overarching resilience objectives, and adhere to agreed standards and codes. Competition, for instance for limited resources or for visibility can inhibit such cooperation. Therefore, incentives that reward cooperation and participation in risk-informed development need to be designed and complemented by effective sanctions for the breech of agreed standards and regulations. Incentives that work are very context-specific but good practices for incentive-driven, cooperative risk governance include:

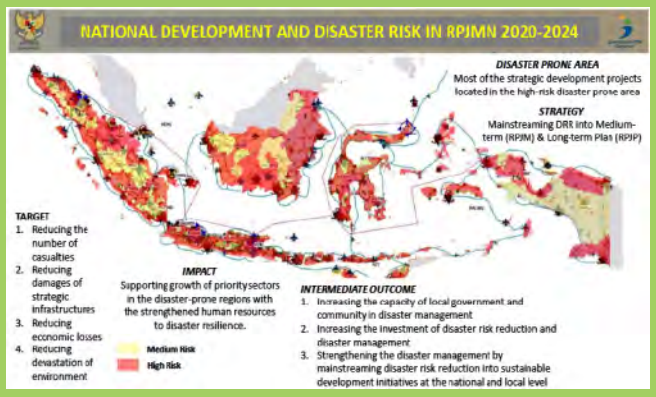
- Risk-informed development processes are coordinated by a neutral agency/broker that is not seen as an operator or competitor for finite resources.
- The credit for resilience outputs and outcomes is shared amongst relevant agencies and the roles and contributions of key actors are visible.
- Sectors, subnational governments, and communities that reach defined resilience targets are rewarded.
- Development projects are screened against disaster risk and approval of projects is contingent upon meeting a set of resilience requirements.
- Specific cross-sectoral resourcing or funding mechanisms for risk-informed development projects and initiatives are established.
- Partnerships are established with private sector agencies to promote resilience initiatives and help bridge funding gaps (e.g., insurance schemes, safer housing development, etc.)
- Relevant industry representatives and professional and community organizations are consulted and should participate in the development, dissemination, and monitoring of safety and building codes and zoning regulations.

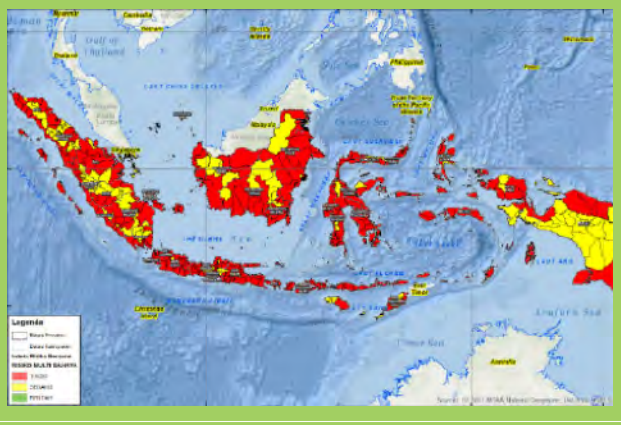
26 / **Define roles and strengthen capacities of development planning apex bodies**. Development planning apex bodies, namely ministries of planning and finance, have a key role in facilitating the design, appraisal, and implementation of risk-informed development plans, programs, and investment projects. While the individual roles of these entities differentiate from country to country, these ministries can play crucial roles in translating resilience ambitions into longer midterm and annual development plans and budgets to coordinate risk-informed planning within and across sectors and track and monitor the achievement of risk reduction objectives (See box 7 and box 8 on role being played by national planning and finance ministries in Indonesia and Mexico respective to advance risk-informed development).

Box 7 \

Indonesia's BAPPENAS and InaRISK

Since the 2005 Indian Ocean tsunami, Indonesia has been progressively strengthening its disaster risk management capacity. An important outcome of this process is the disaster risk information portal InaRISK that was launched in 2015. It uses an ArcGIS server to reflect the spatial distribution of risk assessment results for the entire Indonesian archipelago, i.e., potential hazards, population affected, predicted physical and economic losses (in Rupiah), and environmental damages (in hectares). Scales of resolution range from 1:250,000, 50,000 to 25,000 and allow zooming from national and provincial levels to districts and municipalities. InaRISK acts as a portal to disseminate risk information to provincial and local planners. The National Development Planning Agency (Bappenas) has used projections from InaRISK for formulating the national Medium-Term National Development Plan (RPJMN) 2020-2024 and long-term disaster management plans (RIPB) 2015-2045. InaRISK has been instrumental in the establishment of a disaster risk index (See map) covering 497 districts and identification of 136 high risk district/municipalities for priority support. This index also reflects existing DRM capacity. InaRISK helps both central and local government and other interested parties to design strategic programs, policies, and activities to reduce disaster risk at national and subnational levels. It also is a major indicator against which to track the progress of disaster risk reduction (structural and non-structural measures). Finally, InaRISK has been used for the formulation and possible revision of spatial planning documents.





Source: Dr. Suprayoga Hadi, Primary Planner for the Deputy Minister for Regional Development, BAPPENAS, Indonesia, Presentation, 27.08.2018.

Box 8 \

Mexico's Ministry of Finance and the R-FONDEN Risk Index

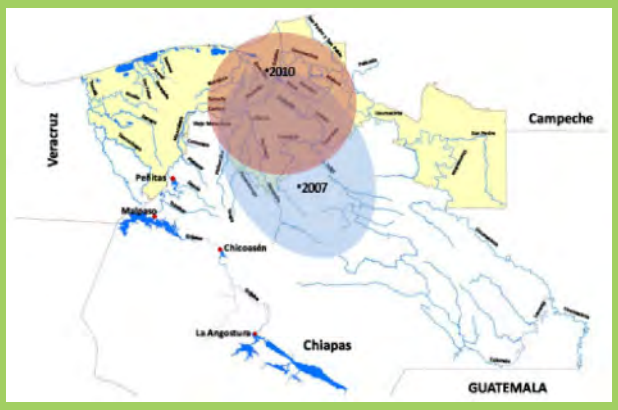
In Mexico, new public investment projects have to submit a risk assessment and a cost benefit analysis to the Ministry of Finance. The risk index determines whether it is necessary to incorporate disaster risk reduction actions or components and is calculated as follows:

$$I\,R = \frac{\text{Risk estimation}}{\text{Value of Project}}$$

(O < I risk < 1; with value to 1 indicating a higher level of risks)

The risk estimation is based on the risk information system R-FONDEN, a probabilistic disaster risk model based on three main components:

1. Databases of public assets which includes variables such as location, construction characteristics and reconstruction values to evaluate its vulnerability and also hazard variables.
2. Modeling of hazards, such as earthquake, tropical cyclone, and flood, to assess the impact of those disasters hazards on the assets and get vulnerability functions for each type of infrastructure.
3. Probabilistic and actuarial risk models which analyze historical losses to develop a disaster risk financing strategy (retention and transfer) for public infrastructure.



R-FONDEN estimates the potential economic losses based on hazard, exposure, and vulnerability analysis and provides risk metrics such as annual average loss (AAL) and probable maximum loss (PML). Besides its application in public investment planning, the risk information and modeling tool has been used to estimate impact of disasters on government finances, design of risk transfer instruments such as catastrophe bonds and disaster insurance, and provide technical advisories to local governments on the design of financial strategies.

Source: Salvador Perez Maldonado, Mexico, Presentation 27.08.2018


RISK-INFORMED DEVELOPMENT
USING DISASTER INFORMATION FOR RESILIENCE
WE MUST FRAME THE PROBLEM DIFFERENTLY: TOWARDS THE AGENDA NOT EVENTS
ENABLING ENVIRON
RISK-INFORMED DEV'T
1 ROBUST UNDERST
OF DISASTER
2 SYSTEMATIC COL
DISASTER DAMAGE
3 CLEAR UNDERSTAN
D.R. MGT. EXPEND
4 INSTITUTIONAL S
FOR DISASTER-RISK
5 CAPACITY ACROS
AND SECTORS
THE LONGER THE PLAN
THE MARGIN FOR ERROR
ADAPTIVE PATH
PREPARE FOR
BUT LEAVE ROOM

27 / **Communities as actors of their own resilience**. Risk-informed decision making for development ultimately needs to benefit and strengthen the resilience of vulnerable communities. Communities, women in particular, need to be empowered to become more effective agents and leaders of their own resilience. Strengthening disaster risk awareness and information helps communities to identify risk reduction priorities, act upon these priorities and ask for relevant support. Informed communities can also play a pivotal role in monitoring and enforcing risk reduction norms, codes, and regulations. The integration of community DRR/DRM concerns into government policy and plans requires stronger risk governance and administrative capacity at district levels (especially in disaster risk hotspots). However, such bottom up planning processes also need to ensure that communities have access to adequate technical support to design, implement, and monitor risk reduction measures.

28 / **Towards risk-informed decision-making in development**. Risk-informed decision-making in development has attracted increasing attention in the last decade in Southeast Asia, initially spurred on by the Indian Ocean tsunami and an emphasis on a "build back better" recovery path. Since then progress has been made in a number of sectors including education, transport, agriculture, and urban development. This experience can inform the establishment of more institutionalized systems for the generation, management, and application of actionable disaster risk information for development planning.

Resilience

Collaborative risk governance

Adaptive pathways to deal with uncertainties

Communities as actors of their own resilience


ADB

adpc

Canada

german
cooperation
DEUTSCHE ZUSAMMENARBEIT

Regional Integrated Multi-Hazard Early Warning System
RIMES

UN
DP

UNITED NATIONS
ESCAP

UNISDR