



About this guide

- CDKN aims to help decision-makers in developing countries design and deliver climate compatible development.
- Managing climate-related disaster risk is a high priority for CDKN's core audience: national planners and policy-makers in developing countries.
- This CDKN guide aims to support national planners and policy-makers and to strengthen their disaster risk management efforts, particularly in the context of the new international disasters agreement, to be finalised in 2015.

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Risk-informed decision-making: An agenda for improving risk assessments under HFA2

Summary

More frequent and intense climate extremes are expected as the climate changes; this, combined with changing patterns of exposure and vulnerability, is creating new geographic distributions of risk that need to be addressed explicitly through public policy. Disaster risk assessments are produced and promoted on the basis that they provide the information, analysis and knowledge needed to make sound choices and investments that reduce the human impact of environmental hazards. The analysis in this paper derives from research conducted in Latin America and the Caribbean (LAC), with additional material from CDKN's experience in Ghana, India and Pakistan. Based on a CDKN research project carried out in Latin America and the Caribbean in 2013 by the Latin American Faculty of Social Sciences (FLACSO) and three mini case studies conducted by CDKN regional offices in Africa and Asia, the results presented here provide useful insights into the use of risk-related information in public investment decisions to manage risk, adapt to climate change and promote development. This paper is therefore of relevance to the global disasters agreement, which is currently in preparation to succeed the Hyogo Framework for Action (HFA) 2005–2015 – referred to in this paper as 'HFA2'. These findings will be particularly relevant to national and local government officials who are responsible for risk management decisions; their international development partners who commission and finance the research; and the scientists and consultants hired to conduct the assessments.

Results from these studies suggest that there are technical, operational and institutional obstacles to the uptake of recommendations. These need to be recognised and understood when designing and implementing risk assessment projects. Technical capacities and alignment with other development priorities and political cycles all need to be taken into account, if risk assessment data are to have a positive influence on development, adaptation, and risk management policies and practices.

This paper discusses the technical, operational and institutional influences on the use and application of risk information related to climate extremes and other hazards, embedding its analysis in a broader set of challenges around implementing disaster risk management and adaptation policies. It presents a number of recommendations on how to conceive and conduct risk assessments that can clearly convey the main messages – and thus be more easily translated into effective risk management decisions.

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1. Introduction

The risk of major disasters is increasing rapidly in many parts of the world. In some places this is due to higher levels of vulnerability, but an even more important factor is exposure.^{1,2,3} The number of humans who are exposed to cyclones and earthquakes in large cities is expected to rise to 1.5 billion by 2050 – from just 680 million in 2000.⁴ Climate change is expected to bring about increases in the magnitude and/or frequency of climate-related hazards, exerting a significant impact on overall levels of disaster risk.⁵ It also introduces greater uncertainty into planning and investment decisions, as projections can differ on how future extreme events and more frequent lower-scale events may evolve. For example, in West Africa some models project an increase in drought frequency, while others predict the opposite.⁶ Therefore, disaster risk management and adaptation policies need to take into account this uncertainty, demonstrating enough flexibility to adapt to shifting climate hazard characteristics.⁷

Risk assessment is a key component of the HFA 2005–2015, composing Priority Area 2 along with the monitoring and early warning systems it helps to inform. Adopted by 168 governments at the World Conference on Disaster Reduction in January 2005, the HFA provides a comprehensive framework for governments and other stakeholders to better understand disasters and take measures to reduce their impacts. It not only encourages the development of risk assessment methods and capacities, but also urges countries to “incorporate these methods into decision-making processes at regional, national and local levels”,⁸ as well as in “the urban planning and management of disaster-prone human settlements, in particular highly populated areas and quickly urbanising settlements”.⁹

Under the HFA, there has been a proliferation of risk assessment activities at different scales, often funded by donors and multilateral institutions. However, the HFA mid-term review noted a lack of systematic risk assessments that factored in social and economic vulnerabilities. By 2009, several countries had reported progress on Priority Area 2. But they highlighted challenges in conducting these assessments in a comprehensive, multi-hazard way that could inform disaster risk management policies, link early warning with preparedness and response, and use the information to plan action at the local level.¹⁰

2. Measuring disaster risk

Within the disasters and climate change research communities, ‘risk’ is understood to be the outcome of “hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects”.¹¹ ‘Exposure’ refers to the degree of contact of the hazard with a person, group or system, while ‘vulnerability’ refers to the degree to which they are susceptible to harm or damage. Vulnerabilities can increase risk either by influencing the likelihood of a disaster occurring or the severity of the consequences if it does occur.¹² The complex interplay among environmental hazards, exposure

and the vulnerability of people, assets and livelihoods is often referred to as 'disaster risk', and the contribution of these elements to risk is typically presented as the equation:

$$\text{Risk} = \text{Hazard} \times \text{Vulnerability} \times \text{Exposure}$$

More recent studies of disaster risk also include 'capacity' in the equation, emphasising the social, political, environmental and economic factors that contribute to the capacity to reduce risk.^{13,14}

In addition to these basic components, disaster risk has a number of important characteristics that should be taken into account when attempting to measure it. First, it is dynamic and constantly changing – and climate change will add to this dynamism. Second, risk is geographically as well as socially defined, and therefore is more accurately measured at the local level.¹⁵ Third, it is often created in multi-hazard contexts. Finally, because vulnerability is an important component of risk, other chronic social problems such as low incomes and high employment levels, lack of personal and social safety, and poor health will have an important bearing on a society's level of risk. In fact, high vulnerability and exposure are considered an outcome of skewed development processes, including those associated with environmental mismanagement, demographic changes, rapid and unplanned urbanisation, and the scarcity of livelihood options for the poor.¹⁶ Understanding these relationships is therefore critical to the design and use of disaster risk assessments.

3. What is a risk assessment?

A disaster risk assessment comprises one of the principle options society has to advance our understanding of the existing and potential consequences of extreme events. It is one starting point within the broader risk governance framework for initiating climate change adaptation and disaster risk reduction and transfer measures.¹⁷ For many international organisations, any risk-reduction process should begin with an identification of what the actual risks are.¹⁸

Broadly, a risk assessment is used to identify and explore the types, intensities and likelihood of the (undesired) consequences of a particular activity or event for individuals and groups.¹⁹ It is therefore a tool that can be used for gaining knowledge about risk. A disaster risk assessment is concerned with environmental hazards and their potential impact on human life, livelihoods and assets. According to the Organisation for Economic Co-operation and Development (OECD), a disaster risk assessment identifies and assesses the likelihood and consequences of potentially disastrous events, and hence "provides governments with the basis for the prioritisation of investments in disaster risk reduction, the improvement of emergency management capabilities and the design of financial protection strategies in a manner tailored to local conditions, needs and preferences".²⁰ The terms 'risk assessment' and 'risk analysis' are often used interchangeably, although for some, risk assessment is a more comprehensive process that involves a risk analysis (i.e. the identification and analysis of hazards and vulnerability)

as one of its components. Risk assessment processes and components vary widely between the agencies performing them (see Table 1), and this often depends on the hazard in question as well as organisational culture. However, to focus on the processes themselves and avoid normative judgments about what they should do irrespective of the context, we use the concept of risk assessment here to refer to three key steps:²³

1. Identification and estimation of hazard(s)
2. Assessment of exposure (and, ideally, vulnerability)
3. Estimation of risk, combining the likelihood and severity of the consequences based on hazard characteristics and exposure/vulnerability.

Risk assessment processes can employ a variety of tools that are selected according to management context, access to data and technology, and the number and types of stakeholders involved. These tools will vary from formalised probabilistic risk assessments to local-level, participatory risk and context analysis methodologies. Probabilistic risk assessment techniques incorporate and quantify uncertainty, allowing for informed decision-making within hypothetical scenarios, as well as comparisons between sources of risk using coherent metrics.²⁴ Developed by the insurance sector, probabilistic risk assessments are increasingly being used to guide urban planning and in conjunction with climate change models.²⁵

However, risk assessment does not have to be complex or particularly time-consuming. There are many examples where action has been taken to reduce risk based on available or easy-to-access knowledge, including solid waste management and maintenance of drainage infrastructure to mitigate flood risk, and stricter building codes to reduce earthquake losses.²⁶

Risk assessments are usually commissioned and conducted as part of a risk management and adaptation plan. Assessments usually start with the hazard to identify potential damage scenarios and probabilities and model potential consequences over time and space.²⁷ Risk management, on the other hand, encompasses a larger domain and is based on many considerations that are not part of the assessment results.²⁸ These considerations are explored in detail through a case study analysis in this paper. It is, however, important to recognise that, in the design and application of risk assessments, they do not automatically translate into a set of recommendations or plan of action to be taken up by decision-makers. This 'uptake' needs to be carefully considered within the disaster risk management or climate change adaptation plan.

4. Using risk assessments in decision-making

Risk assessments are important as both products and processes. They can provide valuable inputs to decisions that need to be taken about where to invest or what to insure, and they can also raise awareness among stakeholders about different components of risk. Conducting a risk assessment can increase transparency and it can even be used as a consensus-building tool.²⁹



Table 1. Risk assessment components according to different agencies and frameworks

Hyogo Framework for Action (2005) ²¹	World Resources Institute components of adaptive capacity	OECD Disaster Risk Assessment and Risk Financing (2012) ²²	Inter-American Development Bank Risk Management Index
<p>'Risk identification and assessment':</p> <ul style="list-style-type: none"> • Risk assessments and maps, multi-risk: elaboration and dissemination • Indicators on disaster risk reduction and vulnerability • Data and statistical loss information • Scientific and technological development; data sharing, space-based earth observation, climate modelling and forecasting • Regional and emerging risks. 	<p>'Assessment':</p> <ul style="list-style-type: none"> • National vulnerability and impacts assessment • Adaptation inventories • Risk assessment in national planning documents • A system in place for regularly updating the above assessments in the future. 	<p>'Risk analysis':</p> <ul style="list-style-type: none"> • Hazard identification and analysis • Vulnerability and impact analysis • Risk evaluation • Risk monitoring and re-evaluation. 	<p>'Risk identification':</p> <ul style="list-style-type: none"> • Systematic inventory of disasters and losses • Hazard monitoring and forecasting • Hazard evaluation and mapping • Vulnerability and risk assessment • Public information and community participation • Risk management training and education.

The role of disaster risk assessments may be analysed from a number of different, but complementary, decision-making perspectives:^{30,31}

1. Increase awareness and understanding of disaster risk, thus laying the ground for more attention to be paid to disaster risk management and climate change adaptation.
2. Develop financial applications to spread and transfer risk to the private sector (such as insurance).
3. Guide and inform risk management and adaptation policies and investments at different levels based on decisions about acceptable levels of risk (e.g. for engineers to design construction projects).
4. Inform early warning systems and contingency planning in the development of preparedness and emergency response plans.
5. Inform land-use, urban and spatial planning decisions.

Previous studies suggest that risk assessments need to be targeted to specific needs and decisions, at different scales and sectors.³² For example, a risk assessment conducted with the purpose of engaging communities, communicating risk and promoting local action will have low data requirements and costs compared to an assessment needed to inform risk management policies in a city, or for catalysing growth in the catastrophe risk insurance market.³³

5. Under the microscope: Risk assessments in Latin America and the Caribbean³⁴

Most of the analysis in this paper derives from research conducted in Latin America and the Caribbean (LAC), with additional material from CDKN's experience in Ghana, India and Pakistan introduced in the next section to provide some global comparisons.³⁵ To analyse how risk assessments

have been undertaken and the information used to inform decision-making in LAC, FLACSO conducted research in six countries: Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador and Peru. These countries are considered representative of the region in terms of institutional developments relating to disaster risk management and climate change adaptation, geographical scales (and thus, types of subnational administration), levels of human development, and the various contexts of risk along with their relationship to climate change.

Data were collected through a series of interviews in each country with three types of actors: decision-makers with responsibilities for disaster risk management and climate change adaptation (as well as professionals from territorial and economic planning and environmental management); risk assessment consultants; and data providers. The interviewees were asked what they felt were the necessary requirements for risk assessment to positively inform policy decisions. These factors were then examined in more detail through the analysis of cases of individual risk assessments. The initial results were then presented and debated at a regional workshop in Costa Rica and at national-level workshops in each of the six project countries.

In each country, the disaster risk management and/or climate change adaptation initiatives selected for analysis either focus exclusively on assessing risk or they constitute part of a larger risk management project with risk assessment as a component. Each of the 20 risk assessment exercises that were examined fell into one of the intended use categories outlined in the previous section.

Colombia

A highly disaster-prone country that has experienced serious losses due to recent weather events, Colombia exhibits a high level of consciousness with regard to disaster risk and climate



Coastal flooding in Cartagena, Colombia. Photo: Mathieu Lacoste/CDKN

change. It is the most advanced country in the region in terms of risk management structures, with a history of progressive policy development on risk reduction and control since 1989. A diverse set of risk assessment types exists in Colombia, but this multiplicity also creates problems for instrumentation and use: the methods used are not always complementary and when applied in the same territory this has led to confusion and sometimes even conflict. Three cases were selected for analysis (see Table 2).

El Salvador

El Salvador is a highly disaster-prone country with multi-hazard conditions, subject to climate change pressures including sea

level rise. El Salvador was innovative in establishing a first real separation between civil defence and risk-reduction functions, with the creation in 2003 of the National System for Territorial Studies, which concentrated all hazard monitoring agencies under one roof and promoted risk analysis at different levels. Three case studies were selected to examine the uptake of risk assessments in decision-making (see Table 3).

Dominican Republic

The Dominican Republic is highly exposed to hydro-meteorological hazards and will likely be affected by sea level rise in the future. Despite international investment to strengthen risk management measures, risk remains

Table 2. Colombia case studies

Initiative involving a risk assessment	Intended use
1. A voluntary collective insurance product against disaster damage to public and private buildings in the city of Manizales, including through a subsidy to low-income households. The municipal government, academic institutions and private sector together designed and implemented the insurance scheme.	Develop financial applications to transfer risk (such as insurance)
2. Seismic risk reduction in schools in the capital, Bogotá. This project focuses on improving school buildings and providing education on risk. The programme began in the 1990s with an inventory of schools, followed by an assessment of the state of these buildings using indicators. In 2000, the Education Secretariat in the Federal District developed some basic standards for new construction.	Guide and inform risk management and adaptation policies
3. Inclusion of risk assessments in spatial plans in Colombia: the case of Manizales. At the start of the century, the first territorial planning instruments were developed for 12-year periods in four municipalities. To complement this, a set of risk management guidelines was produced to help municipalities identify and assess risks with the spatial plan.	Inform spatial planning decisions



Table 3. El Salvador case studies

Initiative involving a risk assessment	Intended use
1. Reduction of risk associated with hydro-meteorological hazards in the lower part of the Lempa River Basin. This programme includes risk assessments using a climate vulnerability approach and methodology, although the initiatives proposed as a result focus very much on reducing current risks.	Increase awareness and understanding, thus laying the ground for more attention to be paid to disaster risk management and climate change adaptation
2. The European Commission's Humanitarian Aid Department's disaster preparedness programme (DIPECHO). The programme is not focused on climate change adaptation although it makes reference to implementation through a number of climate-related agencies including the Ministry of Environment and Natural Resources.	Increase awareness and understanding, thus laying the ground for more attention to be paid to disaster risk management and climate change adaptation
3. Municipal risk management plans. These plans are focused on strengthening the capacity of civil protection in risk-reduction activities.	Inform spatial planning decisions

high. This is especially the case in the western part of the country and in urban areas where there are high levels of poverty and extreme poverty, a situation exacerbated by poor Haitian migrants and refugees arriving after the 2011 earthquake. Three case studies were selected (see Table 4).

Costa Rica

Costa Rica has a well-established disaster risk management system and long-term experience with risk assessment and legislative reform in this area. Nonetheless, disaster risk remains high in poorer provinces. Four case studies were reviewed in the country (see Table 5).

Ecuador

Ecuador is a country facing multiple hazards, including macro-climatic phenomena like El Niño. Changes in risk management system over last five years have resulted

in greater emphasis on risk assessment and reduction, supported by a decentralisation process and the creation of municipal risk management offices. Four case studies were selected for further analysis of risk assessment development and use (see Table 6).

Peru

Peru's mountainous and coastal landscape exposes it to multiple hazards, including earthquakes and El Niño impacts, as well as climate change pressure from glacier melt and sea level rise. Peru has a well-developed and financed national risk management system, strengthened by the decentralisation of public resources to municipal governments. Disaster risk assessments are used in public investment projects and have led to improvements in planning and reporting processes. Three case studies were assessed (see Table 7).

Table 4. Dominican Republic case studies

Initiative involving a risk assessment	Intended use
1. Flood risk map for the Yuna River Basin (Yunarisk), undertaken as part of the Disaster Prevention and Preparation Programme between 2006 and 2010. The programme, funded by the EU and the United Nations Development Programme (UNDP), was initiated after tropical storm Jeanne, which caused widespread damage. The risk mapping was carried out by consultants.	Guide and inform risk management and adaptation policies
2. Climate change risk management for hydraulic resources and agriculture in the Yaque del Sur River Basin between 2011 and 2012, implemented by UNDP Bureau for Crisis Prevention and Recovery and the International Institute for Sustainable Development, with local organisations including the National Institute for Hydraulics Resources. The risk assessment used climate models and participatory methods, and looked at climatic risks and existing methods and capacities to manage these risks in agricultural and water sectors.	Guide and inform risk management and adaptation policies
3. Hazard and risk assessments produced by the Department of Territorial and Land-use Planning, Ministry of Economy, Planning and Development, with funding from the Inter-American Development Bank. The results included the production of risk maps for different hazards in Santo Domingo and Santiago, the capital and a province of the Dominican Republic, respectively. The methods used for these assessments were developed into the probabilistic risk assessment programme known as the Central American Probabilistic Risk Assessment (CAPRA), which can be used across sectors and by different agencies.	Inform spatial planning decisions

Table 5. Costa Rica case studies

Initiative involving a risk assessment	Intended use
1. Inclusion of risk assessments by the Costa Rican Institute of Aqueducts and Drainage and Sewers (AyA). The AyA has a risk management programme, funded and implemented by WB/GFDRR (CAPRA Technical Assistance Project). It has been expanding this through different offices and regional projects.	Guide and inform risk management and adaptation policies
2. Standardisation of impact assessments by the National Risk Prevention and Emergency Response Commission. Discrepancies in measuring loss and damage after disasters led the Commission to develop a standardised method by building consensus with other agencies, in collaboration with universities in Costa Rica.	Guide and inform risk management and adaptation policies
3. Tools for implementing the National Climate Change Strategy at the municipal level. This Climate Change Division programme promotes the use of analysis tools for adaptation and mitigation planning at the municipal level.	Guide and inform risk management and adaptation policies
4. Climate change applications in the agriculture sector. This programme developed by the Ministry of Agriculture and Farming and the National Meteorological Institute with support from the National Autonomous University, is generating probabilistic rainfall maps and protocols for action at the regional level within Costa Rica through ongoing dialogue between stakeholders at national, regional and community levels.	Guide and inform risk management and adaptation policies

Table 6. Ecuador case studies

Initiative involving a risk assessment	Intended use
1. Provincial Climate Change Strategy in the coastal province of Guayas. In the first phase of implementation in 2012, a sectoral vulnerability study was carried out by the International Centre for Research into El Niño (Centro Internacional para la Investigación del Fenómeno de El Niño, or CIIFEN), looking at climate change and climate variability.	Inform spatial planning decisions
2. The climate change adaptation through effective water governance project (PACC) included a study undertaken in 2009 by the Ministry of Environment and UNDP into the vulnerability of water resources to climate change in the river basins of Babahoyo, Catamayo, Chone, Jubones, Paute and Portoviejo.	Guide and inform risk management and adaptation policies
3. A study of risk assessment in urban and rural schools undertaken by UNICEF, the Ministry of Education and DIPECHO in 2012. This case study focused on one school in Chimborazo province.	Guide and inform risk management and adaptation policies
4. A methodology developed and implemented by UNDP, the National Risk Management Secretariat and several local universities for measuring the physical, socioeconomic, political, institutional and legal aspects of vulnerability to natural hazards, applied in 21 municipalities in Ecuador. The case study focused on the application of this methodology and use of the results in Ibarra and Latacunga in 2013.	Inform spatial planning decisions

These case studies represent a mix of contexts and scales in which risk assessments have taken place in recent years. Some show good practice, while others exemplify some of the many problems associated with carrying out a risk assessment in isolation from broader policy processes.

6. Barriers to the uptake of risk assessments

The case study analysis revealed a number of obstacles to the proper consideration, use and impact of risk assessments in different decision-making processes. These can be divided into three types of barriers:

1. Technical: data and technological issues at relevant scales
2. Operational: the challenge of translating the assessment first into recommendations and then into a plan of action, as well as cost issues
3. Institutional: issues of policy, political cycles and incentives.

These obstacles are examined in detail below, using examples from particular countries and case studies across the LAC region and from the mini case studies in Africa and Asia, where relevant. The issues raised in this analysis are not intended to be exhaustive, but they do collectively point to key enabling factors. These enabling factors, which are



Table 7. Peru case studies

Initiative involving a risk assessment	Intended use
1. Methodology for measuring risk, designed by the National Institute of Civil Defense and used for strengthening housing structures and reducing risk in human settlements in Lima. This is linked to work by the Land Titling Agency (COFOPRI): to get formal titles for property, a risk assessment needs to be carried out.	Guide and inform risk management and adaptation policies
2. Risk analysis methodology, an instrument used by the National Public Investment System since 2006 as a tool to identify and recommend actions that need to be taken to reduce risk in public investments. The method has been used progressively at national, regional and local levels.	Develop financial applications to transfer risk (such as insurance)
3. Climate change studies in the Huacrachuco micro river basin started in 2008, through the Climate Change Adaptation Programme financed by the Swiss Agency for Development and Cooperation. PACC began with a two-year interdisciplinary study of risk, using historical data and modelling future scenarios in order to design adaptation measures and establish a regional agenda on climate change adaptation.	Inform spatial planning decisions

outlined in section 7, can be built upon by international and national funding agencies and research institutions carrying out risk assessments.

Technical obstacles

Lack of conceptual clarity

Risk assessment tools are designed using different – and sometimes even conflicting – conceptual frameworks across different countries and contexts. In particular, it is notable that disaster risk management and climate change adaptation are focused on similar problems and use analogous methods, yet have different conceptual, theoretical and institutional origins. The understanding of central concepts such as hazard, exposure, risk, vulnerability, resilience and capacity varies substantially between these policy domains. The study showed that in Costa Rica the disaster risk management, climate change (adaptation and mitigation) and environmental management themes have separate practitioner communities that understand key concepts such as hazard and risk very differently. This has made it difficult to articulate these issues as mutually interdependent; in turn, this presents a significant obstacle to the widespread quantification of risk assessment, which should be an integral input to all types of planning processes in Costa Rica.

In Costa Rica, El Salvador and Peru, the variety of methodologies used to measure risk and the lack of consensus over their validity and appropriateness has meant that risk assessments are subject to constant changes. As a result, the findings are often contested or rejected, and studies end up being incompatible with regulatory requirements. In the absence of one official methodology to define, for example, risk-prone areas near a river, different technical proposals are produced by agencies for establishing or restricting certain type of land use. This creates confusion for decision-makers.

Lack of data

Lack of quality data, including spatial data on vulnerability and exposure, is a major constraint across the LAC region, especially at local level. Methods promoted by donors and

international agencies for gathering exposure data can be complex, time-consuming and capacity-intensive, and in these countries risk assessments have sometime failed to generate robust and reliable results.

In Pakistan, lack of data is a major constraint to producing robust risk assessments, and also results in poor coordination between different disaster management authorities (see Box 1).

Low technical capacity

Public sector agencies at the local level across LAC often lack staff who could generate or even interpret risk assessment results. Local governments are at a distinct disadvantage, with few possibilities to contract staff with the capacity and knowledge to articulate technical studies with normative and regulatory processes.

Donors and national governments are aware of the likelihood that municipalities will not be able to generate necessary inputs or interpret outputs, and this is creating a structural exclusion of different territories from risk-reduction activities. In El Salvador, for example, a local government strengthening programme has made recommendations for municipal disaster risk management plans that are excessively costly and complex. This includes proposals for resettlement, solid waste management and construction of dykes. In the case of the European Union-financed Project for the Implementation of the Integrated Geographic and Hydro-Meteorological Platform of the Central American Region and its Practical Applications, recommendations have been made on technology transfer, irrigation systems, soil and water conservation techniques that are technically and economically beyond the capacity of local governments in La Palma and San Ignacio to implement.

Operational obstacles

Difficulties in interpreting results

The case studies highlighted obstacles to the dissemination of information between scientists and decision-makers. One clear such obstacle relates to the lack of procedures for explaining technical results ‘in simple Spanish (or English)’ to

Box 1. Pakistan case study: Information, capacity and coordination gaps across scales

In Pakistan there is no national database with disaster risk information, but the National Disaster Management Authority (NDMA) is in the process of developing one. District Disaster Management Authorities (DDMAs) and Provincial Disaster Management Authorities (PDMAs) do not have the technical capacity to carry out risk assessments, and even the NDMA needs to contract external agencies to undertake national risk assessments. However, damage and needs assessments have been conducted by government authorities at different scales after disasters, although lack of capacity has led to these being less thorough than they should be.

Another problem is the lack of coordination across scales, from donors to implementers to decision-makers. Community-based organisations work independently of the district and provincial disaster management authorities and rely on their own assessments to carry out their emergency relief activities. At provincial and national levels, the respective DMAs do not communicate which information is available and whom it is directed towards. In the case of the Punjab, where one CDKN project has been working with the PDMA to incorporate 'climate resilience' into post-disaster planning and reconstruction efforts, this could be due to the fact that the PDMA formulates its own Disaster Management Plans, while in the case of other provinces the NDMA is responsible for preparing them.

Overall, there is an over-reliance on historical records of disasters and disaster impacts in identifying high-risk areas.

relevant decision-makers. The decision-makers' lack of ability to understand the results may actually be discouraging the use of technical tools in some places due to their perceived limited applicability. Decision-makers were found to regularly dismiss scientific evidence, not because it is considered irrelevant or unimportant, but because it is presented in a manner that cannot easily be integrated into the processes that these decision-makers have to manage. In Costa Rica, the Dominican Republic and Ecuador, case study research found that the results of vulnerability and risk assessments were often presented in a technical language or in formats that were difficult for both national and local decision-makers to interpret and use. In Ecuador, the study of the climate change vulnerability of water resources in a number of river basins revealed a limited technical understanding of climate change concepts and data by government officials.

High levels of bureaucracy in these countries also present a constraint. In Peru, lengthy bureaucratic processes and red tape made it difficult to turn technical results into political action. This was particularly the case when direct action was needed, as well as when recommendations sought to inform new processes and administrative tools such as laws, regulations, protocols or procedures.

Mismatch between scales

The use of risk information depends heavily on the geographical scale(s) at which it is generated. Often the results are translated from the national level to subnational or community contexts and do not correspond with reality at this level. The data therefore lack credibility and usefulness for local-level decision-makers. This has occurred in Costa Rica, the Dominican Republic and Ecuador. These case studies highlight the importance of considering the scale at which action is needed to deal with risk, when deciding the scales at which information should be sought or generated. In other cases, assessment results cannot be taken up due to lack of coherence between the geographical scale to which the proposal refers (a micro basin) and the scale at which the legal framework refers (regional scale).

Institutional obstacles

The use of assessment and analysis tools is particularly sensitive to institutional environments, which have a number of characteristics in common across the LAC region and beyond. These institutional obstacles not only prevent risk assessments from being used more effectively in planning, but also inhibit progress on implementing the disaster risk management and climate change adaptation policies themselves. Therefore these obstacles represent a broader set of challenges to managing disaster and climate risks more effectively.

Low salience

A key challenge to influencing disaster risk management and climate change adaptation-related decision-making is the relatively low priority given to these topics in the agendas of sectoral and line ministries across all the LAC countries studied. Despite the mobilisation that occurs in times of disaster and the level of public awareness that climate change has achieved, addressing the underlying causes of these risks is still overlooked and poorly understood by many government agencies. This problem may be rooted in the fact that these are policy areas associated with extreme events rather than the mechanisms by which risk is constructed over time. This is the case in Costa Rica and El Salvador, where disaster risk management and climate change adaptation policies are well developed – but are perceived by most government authorities to have little relationship to sectoral concerns. In these contexts it is difficult to convert the technical results of the different assessments into priorities and actions that directly relate to development agendas.

In most of the case studies examined, disaster risk management and climate change adaptation had particularly low salience at the municipal level. Faced with the immediate needs of communities for employment, housing, security and basic health and education, plus the low levels of capacity and resources in local governments to interpret risk information, planners and policy-makers tend to disregard these studies prior to making investment decisions.

Short political timescales

Climate change is framed in long time periods, as are geological hazards which, combined with high levels of uncertainty, make it difficult for decision-makers to translate

information into action. This is particularly true as scales go beyond the periods of elected government. This makes a call for immediate action very difficult, especially with the ever-present myriad of other problems that require immediate attention. Four-to-six-year government cycles often preclude the possibility of implementing changes based on messages that relate to decadal scales. This disconnect is one of the main challenges facing disaster risk management and climate change adaptation agendas.

Other types of hazards, like high temperatures, may simply be invisible to policy-makers because death or injury is not attributed to the extreme event in question (see Box 2).

7. A political impact agenda

The LAC project opened up space for concerns over assessment tools and processes to be discussed openly by academics and practitioners. A general anxiety expressed by regional stakeholders regards the huge disconnect between what has been invested in these tools and their actual impact, which is limited. Nonetheless, a discussion of the problem allowed stakeholders to identify common obstacles and explore ways to improve the utility of risk assessments in the future. Although in many cases risk assessment methodologies are still in very early stages of development, it is likely that these tools will increase in relevance over time, as risk management approaches and instruments gain traction.³⁷ Hence, serious attention needs to be paid now to the way in which scientific knowledge is generated, to ensure that it is cognizant of fast-moving political agendas and national priorities. The enabling factors discussed below were identified in some of the case studies and also through dialogue between different stakeholder groups at the national and regional workshops. They comprise a set of principles that governments, international agencies, universities, non-governmental organisations and a successor arrangement to the HFA can follow when planning and undertaking risk assessments.

Enabling factors for successful use of risk assessments

Process not projects

The trend in recent years has been to use risk assessment tools in specific projects. However, project programming often focuses on only one sector, and does not lead to long-term ownership or everyday use of the tools and methodologies. Progress on incorporating risk information in development practice requires negotiations between different agencies and levels of government across geographical areas, in order to reach consensus over a longer timescale. This can be seen in El Salvador, where municipal plans are produced with a medium-term vision and include measures to avoid disaster risk in infrastructure investments. Risk assessments are needed to access funds to implement the plans, so they are usually taken seriously by municipal authorities and are part of permanent processes promoted by local governments. Donors and aid agencies are the main promoters of assessment tools and analysis in the LAC region and, consequently, they are important stakeholders

Box 2. India case study: Raising the visibility of heat hazards in Ahmedabad

In the city of Ahmedabad, India, extreme heat presents a significant threat to the health, lives and livelihoods of residents, especially of those living in slum communities and/or working outdoors. In May 2010, an extreme heat event that caused significant deaths, health impacts and suffering prompted the city's government to take action. A CDKN-funded project led by the Natural Resources Defense Council in partnership with the Indian Institute of Public Health Gandhinagar and the Public Health Foundation in India, helped to tackle this threat.³⁶ Working closely with the city government, the project assessed the potential risks from extreme heat over the coming decades in the context of climate change, especially for the most vulnerable groups, and developed a set of innovative strategies to tackle the problem.

However, one major obstacle remains. Compared to floods or earthquakes, extreme heat is a 'quiet hazard'. Prior to the 2010 heat wave, a lack of awareness about heat-related health risks among government officials and citizens alike led to little action to tackle the threat from extreme heat. To address this, the project partners held workshops following the 2010 heat wave to raise awareness of its impact on the city. With no temperature gauge in the city, and no system in place to monitor heat impacts on health and mortality, city officials were not fully aware of the extent of the heat wave's impact until presented with heat- and mortality-correlated data. This information then prompted action. Yet the need for a major event that identifies heat as a substantial health risk remains a key barrier to tackling extreme heat risks at scale. On a positive note, thanks to the project in Ahmedabad, extreme heat has been recognised in Indian national policy as a disaster risk, and this should improve awareness across the country.

that need to resolve many of the barriers to uptake. A more process-oriented approach to risk management should be encouraged, whereby donors consider risk assessment as part of an overall appraisal process. If risk assessments are separated out and become a precondition for the development of disaster risk management and climate change adaptation projects, this discourages building links with decision-makers as a first step.

Engage users in design

The involvement of all interested parties in the locations where the assessments are being conducted can help build awareness and trust. But it is also essential to the quality of the results, as well as the sustainability of their application. A common objection to externally driven projects in the LAC region is that they are designed without involving the scientific and technical institutions within a country and the government departments that might be able to use the results. This results in information being produced that does not fit with decision-makers' actual requirements (as discussed under Operational Obstacles). These obstacles can be partially reduced by



Monsoon rain and flash flood yet tea stall is still open for business on August 11, 2011 in Varanasi, Uttar Pradesh, India. Photo: Daniel J. Rao/Shutterstock.

engaging local producers and users of risk information in the design and implementation of these assessments. In all the LAC case studies, end-users were involved in some way in the design and/or implementation of the risk assessments, but those that were most successful engaged regularly with mid-level government officials, who were politically appointed but close to technical staff.

Build capacity

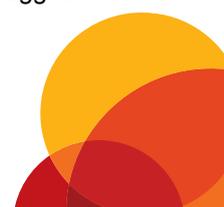
Government officials, particularly at subnational levels, often lack the technical capacities to assess proposals, request technical assistance and establish the standards required for the assessment to be carried out. In addition, as discussed above, externally driven processes tend to be one-offs, and so these risk assessments end up having a very short shelf life. These problems can be overcome by providing capacity building alongside financing for risk assessments. In Colombia, technical training by scientists, technicians and professionals from different specialisations supports risk analysis and decision-making at different scales. Investment in research and development, as well as a public policy that transcends disaster risk management and climate change adaptation agendas, have given Colombia a reputation for innovation, making it a strategic ally in south-south cooperation on development topics. This investment in capacity building means that risk assessments can continue to be conducted within Colombia without the need to wait for externally driven and financed initiatives.

Promote partnerships across scales

Reducing gaps between national and subnational scales is fundamental to improving the quality, use and replication of risk assessment results. This is particularly urgent at the local/community level, where the need for assessment and analysis is the greatest but where typically the least resources are allocated. Association between agencies at different scales can help reduce these asymmetries. Donors have provided governments with technical instruments and expertise, but this has been mainly at the national level. Investing in risk assessment capacity at the local level is expensive and is challenged by institutional and technical weakness. Hence, inter-governmental and multi-scale partnerships are needed to help create the assessment tools at the local level, where capacities are lower or non-existent, and to promote geographical replication. This has happened in Costa Rica through the standardisation of loss and damage data, where local actors provide information on disaster impacts, and the national government (along with universities) develops and updates the protocols for including the information in a national database, as well as providing training on how the system works.

Target sectors

Recent studies suggest that governance structures in most countries do not provide enabling environments for integrated approaches to tackling disaster risk and climate change impacts.³⁸ However, the case study analysis suggests that



one of the most effective ways to achieve correspondence between design and use of assessments is by targeting sectoral agendas. Sectors represent national development priorities; therefore, using these agendas as a starting point for better risk management makes more sense than imposing an 'integral' approach from outside. Risk assessment processes need to be better targeted at sectoral agencies to help them see the potential benefits of identifying and managing risks. In addition, the underlying causes of risk in each sector may turn out to be similar, providing a basis for more joined-up action.

Build inter-sectoral collaboration

Risk assessments can also be used to improve collaboration between agencies that have traditionally had difficulties working together, like the environmental, energy and agricultural sectors. A good starting point is to conduct risk assessments involving a small number of sectors that have common goals and a history of collaboration. Many countries have thematic advisory boards, for example, where ministries and government agencies come together to plan activities, and these can be used to facilitate coordination, synergies and technical cooperation. This is happening in Costa Rica through the Central American Climate Forum, where activities undertaken by the national university (the facilitator), a regional water board (provider of data and information) and the Ministry of Agriculture (user of information) have provided and interpreted information that is highly relevant to the disaster risk management and climate change adaptation needs of the sector. In this process, new actors are appearing as relations with other sectors and problems arise, and these relationships will continue to grow.

Similarly, in Ghana, the risk assessment methodology is building relationships across sectors and scales of governance (see Box 3).

Interpret outputs

To influence policy, assessments must engage with decision-makers and provide convincing results. Based on evidence from the LAC study, this can be achieved if technical inputs and priority issues for decision-makers are better articulated at the start of the initiative. Technical staff should also seek to present results within a broader context in order to engage wider audiences – i.e. by explaining the results in terms of their social, economic and development implications. The relationships between topics of general interest, political priorities and scientific evidence must be made clear by all those involved in understanding risk. The overall message is that analytical frameworks as well as data produced and key messages need to be clear and widely disseminated.

Link risk to development needs

Resource use, land ownership and productive activities can all generate risks, but these practices also present opportunities and benefits for some, if not all, social groups. Most risk assessments only look at the negative part of the risk equation, ignoring the positive aspects that decision-makers must also take into account.⁴⁰ Taking risks can be good for growth and economic development. However, these risks need to be balanced against the negative consequences of disaster and demonstrated through cost-benefit analysis, risk assessments and other decision-making

Box 3. Ghana case study: Using CRiSTAL to assess risk in coastal areas

In Ghana, heat hazards, coastal erosion and flooding are having an increasing impact on livelihoods in coastal areas. Responding to increasing public pressure to support coastal communities, the Regional Institute of Population Studies at the University of Ghana led a CDKN-funded research project with the aim of strengthening the resilience of urban communities in these areas.³⁹ The project used the CRiSTAL framework, a bottom-up approach to risk assessment and identification of possible interventions. Representatives from government were brought in to maximise the potential for policy impact and, ultimately, to ensure a comprehensive, risk-informed policy and development framework in coastal areas.

Livelihoods were used as an entry point for discussions of the hazards that communities and households are exposed to, the resources that they use, existing autonomous adaptations or coping mechanisms, and possible local government interventions. CRiSTAL's bottom-up and participatory approach involves communities at risk, local government, national government agencies and parliamentarians. This has helped ensure locally relevant policy recommendations that reflect the perspectives of those at risk, as well as maximising the uptake of the findings and recommendations both locally and nationally. However, managing the communities' expectations of the outcome of the risk assessments was a challenge.

The research, including risk assessment, has informed a discussion of Ghana's climate change policy framework and the establishment of a community-based climate change adaptation fund in Ghana. A local planning officer commented, "I am now using the knowledge gained in my planning activities in the district, as well as the policy briefs dubbed 'Climate Talks', which have provided guidelines for intervention and proper communication of climate change vulnerability". There is optimism from Ghana's National Development Planning Commission that policy recommendations produced by the project will continue to guide climate and development planning across the country's coastal zones.

Source: Based on interviews conducted in Ghana between January and March 2014 with local and national government authorities, project officials and community-based organisations involved in the risk assessments.

tools. Risk assessment frameworks should therefore balance the advantages and disadvantages of risk to help decision-makers relate the analysis to development needs. Tools like CRiSTAL go some way towards doing this by examining the different types of resources used by communities, thereby assessing the development needs alongside the potential risks.

Tie to political timescales

To increase the salience of climate change risk information, focus needs to be placed on the development processes that generate exposure and vulnerability to current and

future hazards, rather than predicting hazard averages and extremes into the distant future. This allows risk factors to be demonstrated quantitatively and localised spatially. The Provincial Strategy for Climate Change in Guayas, Ecuador is the result of an expressed need for the development of instruments that could generate knowledge on environment and climate change adaptation for regional planning and policy. These topics were therefore understood from the start in relation to more specific and delimited processes. The methodology developed was centred around promoting an understanding of the relationship between humans and nature, integrating climate and environmental data as well as social and economic variables that permitted a more integral understanding of the climate change problematic.

Overall, these studies demonstrate that a lot more can be done to ensure that precious funds invested in understanding risk are well spent. The LAC region has a long history of disaster risk management and climate change adaptation policy development, and in many countries research in these fields is more advanced and better funded than in other regions. However, risk assessments suffer from many of the same obstacles to uptake that disaster risk management and climate change adaptation agendas face in their implementation: lack of political salience and a separation from broader development concerns. Risk assessments need to become part of a more holistic consideration of development needs, taking into account the benefits of locating people, infrastructure and livelihoods in hazardous areas as well as calculations of potential losses.

If these technical studies are to be taken seriously, they need to be framed in such a way as to look beyond disaster and climate risks at sectoral and broader societal concerns. The climate change adaptation work being undertaken in Costa Rica by the national university and Ministry of Agriculture is a good example of this. Framed within an agricultural and farming development agenda, ongoing stakeholder consultations are helping to define climate-related problems and priorities for action at different scales. They are gradually bringing in other sectors, such as environment and water management, in such a way as to generate new priorities for action in other policy spheres.

Recommendations for improving the rationale and impact of risk assessments

To ensure that risk assessments are designed with political impact in mind, the rationale and expected impact must be made explicit. Table 8 outlines a set of issues and questions that can be asked of a risk assessment processes before, during and after the research has begun to improve its potential to inform decision-making. This typology of risk assessment decisions has four areas of scope:⁴¹

1. **Theoretical scope**, which is concerned with the theoretical concepts on which the risk assessment is based, e.g. methods (quantitative/qualitative, probabilistic/deterministic), data sources
2. **Design scope**, which refers to how the assessment was designed, e.g. the users and types of decisions the risk assessment is designed to inform

3. **Implementation scope**, which is concerned with how the assessment itself is done, e.g. the types of exposure that are included and the geographical scale at which it is implemented
4. **Scope of use and users**, which refers to the way that a risk assessment could potentially be used.

In summary, risk assessments can provide a useful input to decision-making, but will only do so if they are designed with impact in mind. A robust rationale is needed, whereby those involved in the commissioning, design and implementation of the assessment foresee an impact pathway. Although this will require taking time to consider factors that were not always included in risk assessment processes in the past, doing so will improve the likelihood that public investment decisions are informed by risk information and help to build climate resilience.

Conclusions

- A successor agreement to the Hyogo Framework for Action 2005–2015, referred to as HFA2, should promote risk assessments that help policy-makers to relate disaster risk to broader development decisions.
- Climate-related risk management should be at the heart of development planning, yet technical, operational and institutional obstacles stand in the way of risk-informed decision-making. Too often, risk assessments are ignored by decision-makers because the results are difficult to interpret.
- Risk assessment should be demand-led and designed with end-users to ensure uptake and sustainability in application.
- One-off risk assessments as pre-conditions to risk management projects should be avoided, as these end up having a very short shelf life.
- Donors should seek to develop local capacity for commissioning and interpreting risk studies.
- Future risk assessments should focus on sectoral needs as the basis for subsequent multi-sectoral work.

Table 8. Risk assessment decision typology

<p>Theoretical scope</p>	<p><i>Conceptual basis</i></p> <ul style="list-style-type: none"> • How is the risk assessment methodology constructed? • What is the underlying conceptual model of risk? • What type of evidence is there to support the approach? 	<p><i>Methodology</i></p> <ul style="list-style-type: none"> • How is the assessment constructed? e.g. quantitative/qualitative analysis, participatory/top-down, site-specific/generic-analytical 	<p><i>Data sources</i></p> <ul style="list-style-type: none"> • What information is deemed most important and how can it be collected? e.g. loss data, hazard data, exposure data, vulnerability data, survey data, expert opinion, interviews, community participation 	<p><i>Social context</i></p> <ul style="list-style-type: none"> • What are the cultural, business and government norms within which a risk assessment is to be used? Assessments can be socially agnostic or highly customised, based upon the specific context
<p>Design scope</p>	<p><i>Intended use</i></p> <ul style="list-style-type: none"> • The initial expected use for the assessment, including for informational, advocacy and research purposes or as a legal requisite • The initial policy driver for generating an assessment: disaster risk management, climate change adaptation, development or increased sustainability 	<p><i>Intended users</i></p> <ul style="list-style-type: none"> • Who will make use of the information? Identify those involved in interpretation of results, priority identification, policy formulation and implementation • Who should be made aware of the data collection and analysis process? 	<p><i>Assumptions</i></p> <ul style="list-style-type: none"> • What points of intervention are conceived of or assumed during development of the assessment? e.g. financial, macroeconomic, infrastructure, legal, social, humanitarian, local action 	<p><i>Risk management activity</i></p> <ul style="list-style-type: none"> • Type of risk management that the assessment's outputs promote. e.g. long-term risk-reduction and/or risk control measures
<p>Implementation scope</p>	<p><i>Scale</i></p> <ul style="list-style-type: none"> • What is the unit of analysis used in the assessment? e.g. global, regional, national, provincial, municipal, community or sector • Breadth of approach: e.g. from single sector, single hazard to multi-sector, multi-hazard • Vertical scale: is the assessment for a purely national or purely local level, or does it integrate multiple levels? 	<p><i>Temporality</i></p> <ul style="list-style-type: none"> • How long does the assessment take? • Does it produce a one-time report, or are results regularly updated with new data and input from users? • How do climate change scenarios relate to the lifespan of the intervention? 	<p><i>Quality</i></p> <ul style="list-style-type: none"> • Overall quality of the risk assessment including granularity, evidence base, uncertainty, quality assurance, heuristics, applicability, relevance 	
<p>Scope of uses</p>	<p><i>Intervention modalities</i></p> <ul style="list-style-type: none"> • From shorter-term, emergency preparedness projects to longer-term risk avoidance programmes 	<p><i>Decision-making process</i></p> <ul style="list-style-type: none"> • Which point of decision-making is it useful for? e.g. policy formulation, strategy formulation, project, infrastructure or individual investment decisions 	<p><i>Levels of governance</i></p> <ul style="list-style-type: none"> • e.g. international, national, regional, local (including cities and towns), community or even individual family scales 	

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