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# Fiscal Disaster Risk Assessment *Options for Consideration*



PAKISTAN



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The report is the result of an extensive stakeholder consultation, including high-level meetings with Chairman of the NDMA; the Additional Secretary, Ministry of Finance; the Commissioner of Insurance, SECP; the Special Secretary, Finance Department, Government of Punjab; and the Directors General of the respective PDMAs.

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## Abbreviations

AEL	annual expected loss
DFA	dynamic financial analysis
DRM	disaster risk management
FONDEN	Natural Disaster Fund (Mexico)
GDP	gross domestic product
GoP	Government of Pakistan
NDM Act	National Disaster Management Act
NDMA	National Disaster Management Authority
NDMF	National Disaster Management Fund
NICL	National Insurance Company Limited
PDMA	Provincial Disaster Management Authority
PDMFs	Provincial Disaster Management Funds
PML	probable maximum loss
SECP	Securities and Exchange Commission of Pakistan

# Executive Summary

The objective of the report is to raise awareness of the financial impacts that disasters have on the budget of the Government of Pakistan (GoP) and to form the basis for a continued dialogue between the GoP and the World Bank on the potential development of a strategy for financing disaster losses. The study presents a series of complementary options for development of a national disaster-risk financing strategy, based on a preliminary fiscal risk analysis and a preliminary review of the current budget management related to disasters in Pakistan. The recommendations provided in this document are therefore a starting point for a collaborative discussion with the GoP on the potential development of a broad Disaster Risk Financing and Insurance (DRFI) program that would equip the Ministry of Finance with additional instruments to manage the contingent liability posed by disasters. This report follows a request from the government for advisory services from the World Bank in the areas of disaster risk identification and the resulting fiscal impacts on the state.

This study benefits from the international experience of the World Bank, which has assisted several countries in the design and implementation of sovereign disaster risk financing strategies (for example, in the Caribbean island states, Colombia, Indonesia, Mexico, Peru, the Philippines, and Vietnam) and property catastrophe risk insurance programs (such as in Eastern Europe, Romania, and Turkey). This experience is necessarily tailored to the institutional, social, and economic characteristics of Pakistan as well as the availability of relevant data.

On average, approximately 3 million people are affected by natural catastrophes each year in Pakistan, which equates to approximately 1.6 percent of the total population. According to an analysis of historical disaster data since 1973, collected for this report from UNdata,<sup>1</sup> approximately 77 percent of the population affected by disaster has been impacted by floods.

Pakistan faces a major financing challenge from natural catastrophes, with flooding causing an estimated annual economic impact of 3–4 percent of the federal budget.<sup>2</sup> Preliminary analysis in this report estimates the annual economic impact of flooding in Pakistan at US\$1.2 billion to US\$1.8 billion, equivalent to 0.5–0.8 percent of national gross domestic product (GDP).<sup>3</sup> However, the simulations we present in chapter 3 show that a major flood event (occurring, on average, once every 100 years) could cause losses in excess of US\$15.5 billion,<sup>4</sup> which equates to around 7 percent of national GDP<sup>5</sup> or almost 40 percent of the federal budget. In terms of annual probability, there is a 1 percent chance in any year that a major event of this size will occur. Although the government tries to meet the recovery and reconstruction needs to rebuild damaged infrastructure

<sup>1</sup> UNdata, which provides statistical resources of the United Nations (UN) system, is accessible at <http://data.un.org/>.

<sup>2</sup> Budget estimate taken from Government of Pakistan, Finance Division, "Federal Budget 2014–15: Budget in Brief," June 3, 2014, [http://finance.gov.pk/budget/Budget\\_in\\_Brief\\_2014\\_15.pdf](http://finance.gov.pk/budget/Budget_in_Brief_2014_15.pdf). Exchange rate fixed at PRe 102 per US\$1.

<sup>3</sup> 2013 GDP figure used, numbers rounded.

<sup>4</sup> Upper-bound estimate taken from two methodologies, further discussed in chapter 3.

<sup>5</sup> 2013 GDP numbers.

in the aftermath of disasters, insufficient financing to rebuild has led to the deterioration of the infrastructure's protective capacity against future adverse natural events, resulting in additional losses in succeeding disaster events.

Progress has been made on the establishment of financing mechanisms for dealing with disaster losses, but significant work still remains to operationalize structures and to ensure that financing mechanisms are appropriately provisioned. A structure for dedicated federal and provincial funds for disaster risk management has been established under the National Disaster Management Act 2010. However, challenges still remain with respect to operationalization of the funds and standardization of procedures across provinces. It remains difficult for the GoP to analyze the financing needs and gaps for meeting relief, recovery, and rehabilitation support to the affected portion of the population. The heavily decentralized approach to disaster risk financing in the provinces is a key contributor to these challenges. The mechanisms through which disasters are financed vary from province to province, depending on the administrative systems in place and the ready availability of funds. There is a need for a sustainable plan to ensure that the National Disaster Management Fund (NDMF) and provincial funds are adequately provisioned in the context of likely needs.

Although the federal and provincial governments recognize the need to allocate resources in their budgets for disaster response prior to a disaster, they lack the technical basis to determine such allocations. At present, post-disaster expenditures are financed from contingent and supplementary budgets during the relief and recovery phases and from the annual Public Sector Development Program during the reconstruction phase. The inaccessibility of data on the underlying hazards and their past and possible future financial implications is one barrier to the informed ex ante provisioning of funds. A development of technical capacity and necessary tools to quantify likely needs for disaster-related expenditure would help the government to both (a) determine appropriate allocations through the budget, and (b) explore and make informed proposals for possible sources of financing outside of the budget.

This study presents the GoP with a series of options for consideration that could help the government increase its immediate financial response capacity against disasters and better protect its fiscal balance. Specifically, there are seven options for consideration spread across the short, medium and long term (table ES.1). These options follow the operational framework of (a) assessing risk, (b) arranging financial solutions, and (c) delivering funds to beneficiaries.

The implementation of a national disaster risk financing strategy would require significant institutional capacity building and further work to quantify likely needs for disaster-related expenditure. Disaster risk financing is just one component of a comprehensive fiscal risk management strategy, which requires specific financial and actuarial expertise. Major capacity building related to disaster risk assessment and incorporating international best practice in financial management of disasters would be required for the development and use of financial tools to guide the GoP in its national disaster risk financing strategy.

**Table ES.1 Options for a National Disaster-Risk Financing Strategy in Pakistan**

Time frame	Options for disaster risk financing
Short term	Develop a central database of disaster losses and expenditures to better predict future financial costs of disasters
Short term	Operationalize the National and Provincial Disaster Management Authorities (NDMA and PDMAs)
Short term	Clarify contingent liability associated with post-disaster cash transfer programs, and restructure their financing sources to ensure efficient access to funds in the event of a disaster
Short to medium term	Develop financial disaster risk assessment tools, including development of financial catastrophe risk models for the Ministry of Finance
Short to medium term	Develop a national disaster risk financing strategy that proposes models for improving financial response capacity to disasters
Medium term	Establish a robust catastrophe risk insurance program for public assets
Medium to long term	Promote property catastrophe risk insurance for private dwellings



Hunza Valley, Pakistan. Credit: pulpitis/Thinkstock.com



## CHAPTER 1 Introduction

Pakistan is exposed to many types of adverse natural events and has experienced a wide range of disasters over the past 40 years, including floods, earthquakes, droughts, cyclones, and tsunamis. These hazards are further exacerbated by growing urbanization, increased vulnerability, and shifting climatic patterns, which have led to increasingly severe disasters. Over the past decade, the damages and losses from disasters in Pakistan have exceeded US\$18 billion. As Pakistan's population and asset base increase, so does its economic exposure to disasters.

The World Bank is supporting the Government of Pakistan (GoP) in building capacity regarding disaster risk management (DRM) to build resilience to both humanitarian and fiscal shocks associated with disasters. The financial losses alone since 2005 have totaled more than US\$18 billion (table 1.1). The recurring floods of 2010 and 2011 highlighted the need and importance of developing financial mechanisms to help the government mobilize resources in the immediate aftermath of a disaster while buffering the long-term fiscal impact of such events. There is a need to develop an overarching policy document in the form of a national disaster risk financing strategy, which could enable the government to make an informed choice on accessing various sources of funding to respond to disasters, including ex ante and ex post financing instruments.

**Table 1.1 Estimated Economic Impact of Major Disasters in Pakistan since 2005**

Event	Provinces affected	Estimated losses (US\$M)	Estimated losses as % of national GDP
Earthquake (2005)	Azad Jammu and Kashmir and Khyber Pakhtunkhwa	2,857	2.6%
Cyclone Yemyin (2007)	Balochistan and Sindh	322	0.2%
Floods (2010)	All	10,500	6.0%
Floods (2011)	Balochistan and Sindh	3,730	1.8%

Sources: Asian Development Bank and World Bank, “Pakistan 2005 Earthquake: Preliminary Damage and Needs Assessment” (Policy Note 34407); “Pakistan Cyclone and Floods 2007: Preliminary Damage and Needs Assessment, Balochistan and Sindh” (Urban Study 70329); “Pakistan Floods 2010: Preliminary Damage and Needs Assessment” (Board Report 58290); “2011 Pakistan Floods: Preliminary Damage and Needs Assessment” (Working Paper 84606), all published by World Bank, Washington, DC.

Note: Estimated losses are as of the time of event.

Historically, a reactive emergency-response approach has been the predominant way of dealing with disasters in Pakistan. To that end, the West Pakistan National Calamities (Prevention and Relief) Act of 1958,<sup>6</sup> which governed disaster risk management activities, was mainly concerned with organizing the emergency response. Following the 2005 earthquake that affected Azad Jammu and Kashmir (AJK) and the Khyber Pakhtunkhwa Province (then called the North-West Frontier Province), it became clear that appropriate policy and institutional arrangements needed to be put in place to mitigate potential losses of life and property from future disasters while protecting federal and provincial budgets.

The National Disaster Management Ordinance of 2006 established the National Disaster Management Authority (NDMA) as an executive arm of the National Disaster Management Commission. The NDMA has been made operational to coordinate and monitor implementation of national DRM policies and strategies. Among other things, this new system is designed to devolve and decentralize the DRM mechanisms: Provincial Disaster Management Commissions (PDMCs) and Authorities (PDMAs) have been established while similar arrangements have been made in AJK and the Federally Administered Tribal Areas (FATA)—eventually establishing the Sindh Disaster Management Authority, the Gilgit-Baltistan Disaster Management Authority, and the FATA Disaster Management Authority. In addition, District Disaster Management Authorities have been set up across the country and are viewed as the linchpins of the whole system, serving as the first line of defense in the event of a disaster.

A National Disaster Risk Management Framework has been formulated to guide the work of the entire DRM system. It identifies national DRM strategies and policies, highlighting nine priority areas to establish and strengthen policies, institutions, and capacities:<sup>7</sup>

<sup>6</sup> Hereafter referred to as the National Calamities Act of 1958.

<sup>7</sup> NDMA, “National Disaster Risk Management Framework Pakistan,” framework document, March 2007, [http://www.preventionweb.net/files/2952\\_NationalDisasterRiskManagement.pdf](http://www.preventionweb.net/files/2952_NationalDisasterRiskManagement.pdf).

1. Institutional and legal arrangements
2. National hazard and vulnerability assessment
3. Training, education, and awareness
4. Promoting DRM planning
5. Community and local-level risk reduction programming
6. Multihazard early warning system
7. Mainstreaming disaster risk reduction into development
8. Emergency response system
9. Capacity development for post-disaster recovery

Although the GoP has taken the necessary legal, institutional, and policy measures for DRM, several entities in addition to NDMA are working on DRM with overlapping mandates at the federal level. These include the Earthquake Reconstruction and Rehabilitation Authority, the Emergency Relief Cell, and the Federal Flood Commission, among others. This multiplicity of institutions at the provincial level includes the PDMAs, the Provincial Irrigation Departments, and the Civil Defence and Rescue Services. Similarly, in addition to the National Disaster Management Ordinance of 2006, multiple legal parameters cover disasters and emergency situations that overlap between government agencies and tiers.

The World Bank is providing technical assistance to the GoP for the development of a national disaster risk financing strategy. This nonlending technical assistance aims to (a) assess the GoP's fiscal exposure to disasters; (b) propose options for the development of a national strategy to improve financial response capacity for disasters; and (c) promote property catastrophe risk insurance for both public and private dwellings. The World Bank has been promoting a proactive, strategic DRM framework based on five pillars: risk identification, risk reduction, preparedness, financial protection, and resilient recovery.

Despite prevention and mitigation efforts, no country can fully protect itself from the impacts of major natural catastrophes. Disaster risk financing and insurance allows governments to increase their financial response capacity in the aftermath of a disaster and to improve access for affected populations to financial tools to aid recovery. These financial mechanisms can also reduce the impact of disasters on social and economic development by smoothing financial shocks and preventing governments and populations from resorting to adverse coping mechanisms that disrupt development initiatives and productivity. Table 1.2 describes the types of mechanisms that this practice area encompasses, along with mechanism beneficiaries.

**Table 1.2 Disaster Risk Financing and Insurance Policy Areas and Benefits**

Policy area	Beneficiaries	Benefits
Sovereign Disaster Risk Financing	Governments	<ul style="list-style-type: none"> <li>Increases financial response and reconstruction capacity by improving               <ul style="list-style-type: none"> <li>Resource mobilization, allocation, and execution;</li> <li>Insurance of public assets; and</li> <li>Social safety net financing.</li> </ul> </li> <li>Protects the stability of public finances by reducing the financial volatility in public expenditure generated by disasters</li> <li>Clarifies the government's contingent liability following disasters in terms of public assets, the private sector and state-owned enterprises, and the poor</li> <li>Provides incentives for public investment in risk reduction measures</li> </ul>
Property Catastrophe Risk Insurance	Homeowners and SMEs	<ul style="list-style-type: none"> <li>Provides access to compensation for physical property damage and indirect losses arising from that damage</li> <li>Increases awareness and understanding of financial vulnerability to disasters</li> <li>Helps distribute risk and burden of recovery between public and private sectors</li> <li>Can incentivize investment in risk reduction by business and households</li> </ul>
Agricultural Insurance	Farmers	<ul style="list-style-type: none"> <li>Provides access to compensation for production losses and damage to productive assets</li> <li>Helps distribute risk and burden of recovery between public and private sectors</li> <li>Increases awareness and understanding of financial vulnerability to agricultural risks</li> <li>Encourages farmers to invest more in risk reduction measures</li> <li>Allows for the adoption of higher-yielding, but riskier, farming methods</li> <li>Increases access to financial services and markets for low-income households (insurance, banking, savings)</li> </ul>
Disaster-Linked Social Protection	The poorest <sup>a</sup>	<ul style="list-style-type: none"> <li>Mitigates financial shocks by providing compensation for livelihood or asset losses through flexible social safety nets</li> <li>Increases awareness and understanding of vulnerability to disasters</li> <li>Can incentivize investment in risk reduction by the government or the at-risk affected population</li> <li>Safeguards vulnerable people from falling into poverty</li> </ul>

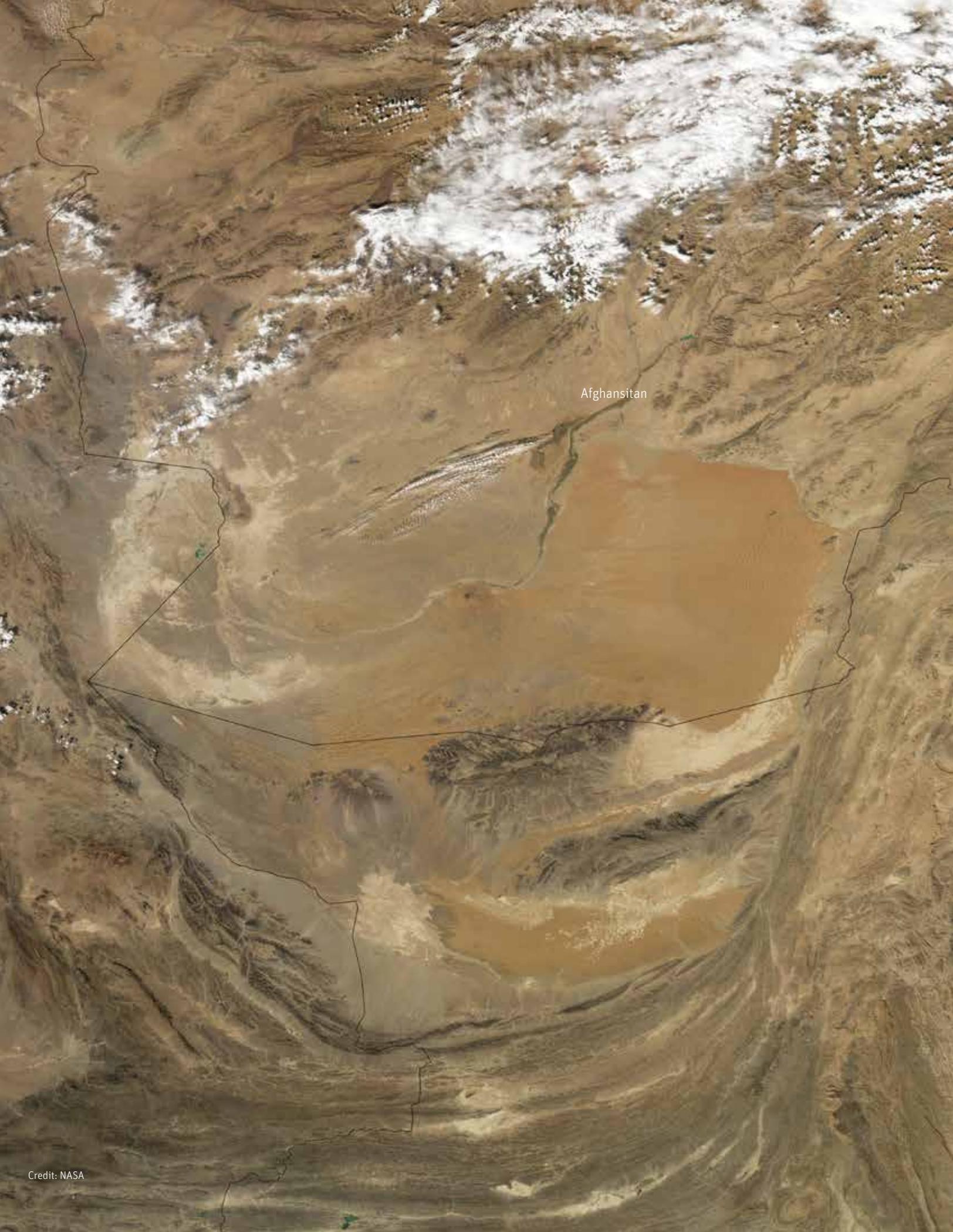
Source: World Bank, *Financial Protection against Natural Disasters: An Operational Framework for Financial Risk Financing and Insurance*, Working Paper 94988 (Washington, DC: World Bank, 2014).

Note: SMEs = small and medium enterprises.

a. Market-based instruments are not viable for certain population segments, and this is where disaster-linked social protection becomes a vital tool. Microinsurance can be used to target some lower-income households but may not be suitable for the poorest households.

This report contains the main findings and recommendations of this initial technical assistance. There are five chapters including this introduction. Chapter 2 presents an overview of the budget processes for the financing of disaster losses during each of the three post-disaster phases: immediate emergency response, recovery, and reconstruction. Chapter 3 provides a preliminary financial disaster risk assessment for Pakistan, focusing particularly on the fiscal impact of disasters. Chapter 4 presents an overview of the private catastrophe insurance market. Chapter 5 reviews the options for future financing of disaster recovery and reconstruction expenditures; this final chapter includes options for sovereign risk financing and for the promotion of commercial catastrophe insurance for the private property sector. Complementing the report are seven technical appendixes that provide information on further analyses and results.

This report also includes input from major donors that assist Pakistan in disaster risk management. From the inception of the report, the authors have engaged in proactive consultation with donors who have shown interest in the report's findings and recommendations. Initial findings of the report have also been shared with the donors bilaterally as well as through the Partnership for Disaster Resilience in Pakistan, which serves as the DRM donor coordination platform.



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An aerial satellite photograph showing a large river delta system, likely the Indus River, flowing into a body of water. The terrain is a mix of brownish, arid land and green, vegetated areas. The river channels are clearly visible, branching out from the top left towards the bottom right. The water in the delta is a muddy brown color, while the ocean water to the right is a darker blue. The overall scene depicts a complex hydrological system in a semi-arid region.

## CHAPTER 2

# Fiscal Management of Disasters

From an administrative perspective, disaster management entails well-defined procedures. A structure for dedicated federal and provincial funding of disaster risk management (DRM) has been established under the National Disaster Management (NDM) Act, 2010. However, challenges still remain regarding operationalization of the funds and standardization of procedures across provinces. It remains difficult for the Government of Pakistan (GoP) to analyze the financing needs and gaps for meeting relief, recovery, and rehabilitation support to the affected portion of the population. The heavily decentralized approach to disaster risk financing in the provinces is a key contributor to these challenges.

CHAPTER 2

Pakistan

Indus River

The GoP established the current regulatory framework for post-disaster management under the NDM Act, 2010. The Parliament of Pakistan approved “An Act to provide for (the) establishment of a National Disaster Management System for Pakistan” on December 8, 2010, which came into force retroactively on August, 17, 2007.<sup>8</sup> It defines a disaster as “a catastrophe or a calamity in an affected area arising from natural or a man-made cause or by accident, which results in a substantial loss of life or human suffering or damage to and destruction of property.”<sup>9</sup>

Before the implementation of the NDM Act of 2010, the GoP dealt with disasters guided by the National Calamities Act of 1958, which focused mainly on emergency response. Following the 2005 earthquake, the GoP recognized the importance of disaster risk reduction for sustaining long-term social, economic, and environment development. As such, it embarked on a program to establish appropriate policy, legal, and institutional arrangements and implemented strategies and programs to minimize national risks and vulnerabilities. Most notably, the National Disaster Management Authority (NDMA) Ordinance of 2006 was passed, specifically to be implemented by the National Disaster Management Commission. The ordinance was later superseded by the NDM Act of 2010.

The Act (2010) established a National Disaster Management Fund (NDMF) administered by the federal government and separate provincial DRM funds administered by each of the provincial governments.<sup>10</sup> Specifically, the Act (2010) stipulates that the NDMA shall administer the NDMF toward meeting emergency, preparedness, response, mitigation, relief, and reconstruction expenses. The Act (2010) also specifies rules on emergency procurement and accounting to facilitate the post-disaster use of the funds—for example, empowering district authorities to authorize respective departments to undertake procurements for rescue and relief as deemed necessary.<sup>11</sup> The NDMF shall be kept in one or more accounts maintained by the NDMA in either local or foreign currency in any scheduled bank in Pakistan and shall be operated in accordance with NDMA directions.<sup>12</sup>

The NDM Act of 2010 also provides guidance on the types of expenditures incurred by the federal government following disasters.<sup>13</sup> These expenditures include shelter, food, drinking water, medical cover and sanitation, special provisions for vulnerable groups, discretionary assistance on account of loss of life, and assistance for damage to housing and restoration of livelihoods. In addition, other relief activities and expenditures may be incurred as deemed necessary.

The NDM Act of 2010 explicitly references various sources of NDMF financing, but there is a need for a sustainable plan to ensure that the NDMF and provincial funds are adequately provisioned in the context of likely needs. The Act (2010) describes the following source of NDMF financing: (a) grants made by the federal government; (b) loans, aid, and donations from national or international agencies; (c) donations received from any other source; (d) the Prime Minister’s Disaster Relief Fund; and (e) any other fund related to natural calamities established at the federal level as the federal government may determine appropriate.<sup>14</sup> The Act (2010) also describes the following sources of financing for the Provincial Disaster Management Funds (PDMFs): (a) grants made by the federal government or provincial governments; and (b) loans, aid, and donations from national or international agencies provided in the prescribed procedures.<sup>15</sup>

<sup>8</sup> The NDM Act of 2010 (Act No. XXIV of 2010) was approved by the Chief Executive in 2007, while it was passed by the Parliament of Pakistan as a law in 2010. It came into force from the date of the promulgation of the ordinance.

<sup>9</sup> Clause 1, sub-clause b, NDM Act of 2010.

<sup>10</sup> Clauses 29 and 30, NDM Act of 2010.

<sup>11</sup> Clause 32, NDM Act of 2010.

<sup>12</sup> Clause 29, sub-clause 4, NDM Act of 2010.

<sup>13</sup> Clause 11, NDM Act of 2010, titled “Guidelines for minimum standards of relief.”

<sup>14</sup> Clause 29, sub-clause 2, NDM Act of 2010.

<sup>15</sup> Clause 30, sub-clause 2, NDM Act of 2010, titled “Establishment of Funds by Provincial Governments.”

At the time of writing, the federal government has made grants to the NDMF, but the limited allocations as well as legacy issues regarding the preexisting system have prevented the NDMF from being fully operationalized. The NDMF is not currently being used for disaster response. Instead, the Prime Minister’s Disaster Relief Fund remains the main vehicle to channel government funds to those affected by disasters. A sustainable plan is required to ensure that sufficient funds are available in the NDMF and PDMFs to address disaster losses, examining financing possibilities across a range of sources. Currently, if allocations to the NDMF were to become exhausted, the Ministry of Finance would likely be approached for extra funds. This demand would likely be met from reallocation of the existing allocations, such as slow-moving development projects or unused or surplus funds. However, in other cases, supplementary grants could be required to meet exceptional additional demand.

The NDM Act of 2010 outlines the NDMA’s authorities and functions.<sup>16</sup> In turn, the NDMA defines three levels of emergencies (table 2.1).

**Table 2.1 NDMA Definitions of Emergency Levels in Pakistan**

Emergency level	Description
<b>Level 1 (small events)</b>	Localized emergency events to be dealt with by the DDMA at the district level, such as small-scale fires, landslides, floods, canal or subcanal breaches, and low-level epidemics
<b>Level 2 (medium events)</b>	Emergencies that overwhelm DDMA capacity, at which point the DDMA can request PDMC assistance through the PDMA
<b>Level 3 (large events)</b>	Disasters beyond the capacity of provincial or regional governments, in which case a national emergency is declared

Source: Part IV, *National Disaster Response Plan* (Islamabad: National Disaster Management Authority, March 2010), <http://www.ndma.gov.pk/documents/ndrp/ndrp.pdf>.

Note: NDMA = National Disaster Management Authority. DDMA = District Disaster Management Authority. PDMC = Provincial Disaster Management Commission. PDMA = Provincial Disaster Management Authority.

Small (level 1) events are limited to a single district, and thus the district administration, headed by the deputy commissioner (DC) or district coordination officer (DCO), is responsible for relief efforts and leads coordination of all departments. The DC’s or DCO’s staff undertakes the initial situation and needs assessment, which is conveyed to the Provincial Disaster Management Authority (PDMA). In parallel, the provincial finance department is also informed of the financial requirements that could arise from the disaster.

For medium-size (level 2) events that are limited to an individual province, upon receiving information of a disaster covering more than one district, the PDMA coordinates with the DCs or DCOs of the affected districts. In addition, the PDMA coordinates with the relevant line departments of the province to assess the situation and to oversee the provision of relief to the affected population. The PDMA also notifies the chief executive of the province to allocate the resources required. The NDMA is also alerted on the nature of the disaster, and regular situation reports are shared.

For large (level 3) events that extend across provincial boundaries, the NDMA coordinates the efforts of the various PDMAs and provincial ministries and departments. Although the respective PDMAs lead relief assistance, the NDMA stands by to meet any gaps or raise resources through the office

<sup>16</sup> Clause 9, sub-clauses b, c, and d, NDM Act of 2010, titled “Powers and Functions of the National Disaster Management Authority.”

of the prime minister and the federal Ministry of Finance. The NDMA also coordinates the donor community by sharing situation reports and needs assessments while supporting preparation of relief and response plans to raise donor resources.

DRM procedures lack standardization across provinces despite specifications in the NDM Act of 2010. In general, the DRM system defined in the NDM Act of 2010 and national disaster response plans are not fully followed at the provincial level, and DRM approaches vary across the provinces. In Punjab, for example, disasters are typically managed following instructions given in war books such as the financial war book, and other provinces still follow instructions in the Natural Calamities Act of 1958. No institutional mechanisms currently exist to calculate the financial impacts of disasters within the federal or provincial treasuries. After a disaster, with the support of the World Bank and Asian Development Bank, the GoP undertakes a damage and needs assessment, which estimates the direct losses as well as the reconstruction costs by sector and province across both the public and private sectors.<sup>17</sup>

The post-disaster financial responsibilities of provincial governments are not well defined, but they generally include the types of expenditures listed in table 2.2. In addition to these expenditures, other relief mechanisms may be provided. In Punjab, for instance, short-term waivers on water and land taxes are common following a disaster. In certain cases, waivers of interest on agriculture loans are allowed as well as delays in the repayment of these loans.

**Table 2.2 Provincial Post-disaster Expenditures, by Operation Type**

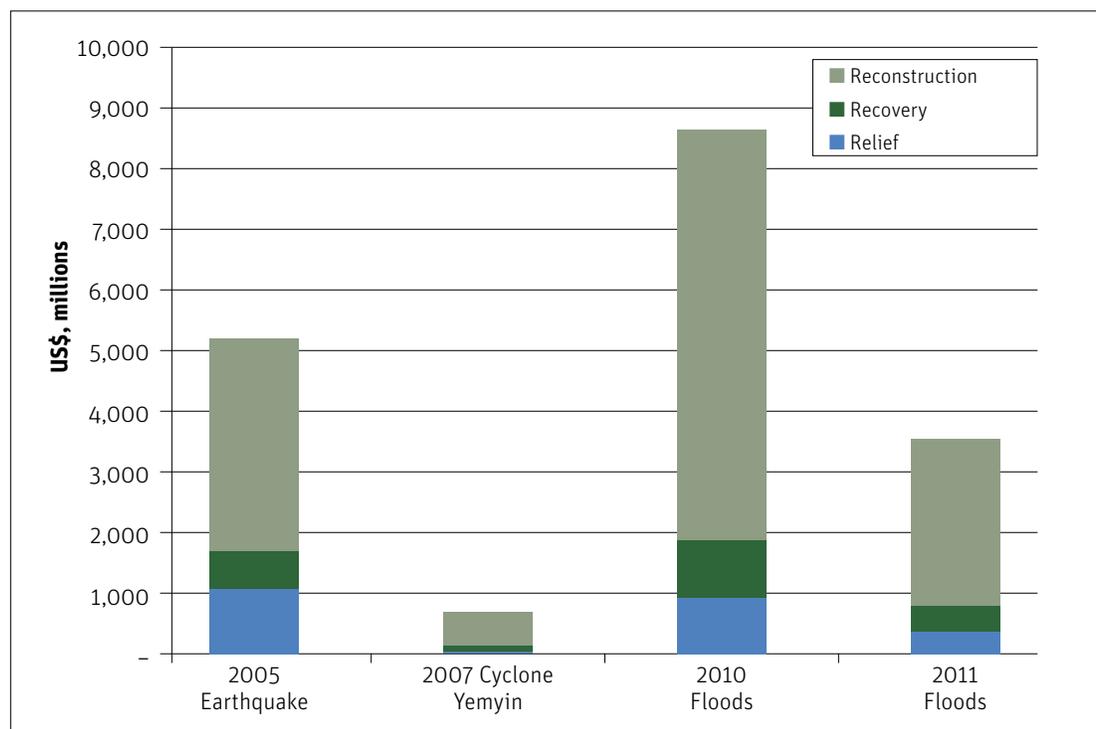
Operation type	Expenditures
Emergency relief	Food supply, medical care (including medicines), drinking water, and shelter
Recovery and reconstruction of public infrastructure and buildings	Reconstruction and repair of roads and bridges, health units, hospitals, schools, and other public buildings
Other assistance to populations	Seeds and fertilizer, money (cash) for reconstruction and repair of houses, and money (cash) to compensate families of the injured or dead

*Sources:* Provincial disaster management and contingency plans.

Since 2005, estimates of the total costs through the three post-disaster phases have twice exceeded US\$5 billion. Post-disaster cost estimates related to the 2005 earthquake and the 2010 floods totaled approximately \$US5.2 billion and US\$8.7 billion, respectively. Estimates made during the respective preliminary damage and needs assessments for four selected events since 2005 are shown in figure 2.1.

<sup>17</sup> These include the following (published by the World Bank, Washington, DC): “Pakistan 2005 Earthquake: Preliminary Damage and Needs Assessment” (Policy Note 34407); “Pakistan Cyclone and Floods 2007: Preliminary Damage and Needs Assessment, Balochistan and Sindh” (Urban Study 70329); “Pakistan Floods 2010: Preliminary Damage and Needs Assessment” (Board Report 58290); and “2011 Pakistan Floods: Preliminary Damage and Needs Assessment” (Working Paper 84606).

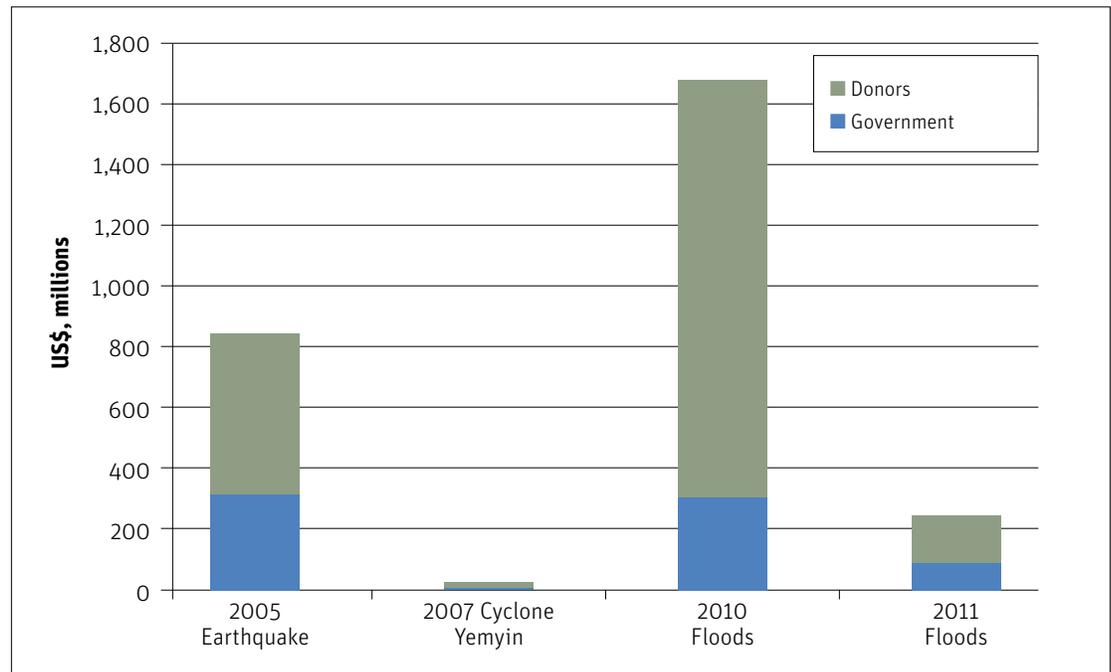
**Figure 2.1 Estimated Post-disaster Costs of Selected Major Disasters in Pakistan, by Phase, 2005–11**



Sources: United Nations (UN) Central Emergency Response Fund (CERF) Flash Appeals; UN Flash Appeal Humanitarian Response Plans; and the following damage and needs assessments by the Asian Development Bank and World Bank: “Pakistan 2005 Earthquake: Preliminary Damage and Needs Assessment” (Policy Note 34407); “Pakistan Cyclone and Floods 2007: Preliminary Damage and Needs Assessment, Balochistan and Sindh” (Urban Study 70329); “Pakistan Floods 2010: Preliminary Damage and Needs Assessment” (Board Report 58290); “2011 Pakistan Floods: Preliminary Damage and Needs Assessment” (Working Paper 84606).

Donor assistance can represent a significant, although uncertain, part of financing disasters. Indeed, since 2005, donor assistance has accounted for approximately 60–80 percent of total post-disaster expenditures during the relief and recovery phases (figure 2.2). After the 2005 earthquake, for example, international donors contributed approximately US\$520 million (62 percent) of a total estimated expenditure of US\$845 million for relief and recovery. In response to Cyclone Yemyin in 2007, international donor assistance accounted for approximately US\$21 million (59 percent) of the total \$US36.2 million expenditure for relief and recovery. In 2010 and 2011, following the devastating flood events, donors contributed 81 percent (US\$1.37 billion) and 65 percent (US\$157 million), respectively, of the relief and recovery spending. However, it should be noted that the total costs of the events summarized in figure 2.1 are four to seven times greater than the expenditures contributed to relief, recovery, and reconstruction. Thus, while donor financing plays an important role in financing the relief and recovery phases, it accounts for only 5–16 percent of all financing needs.

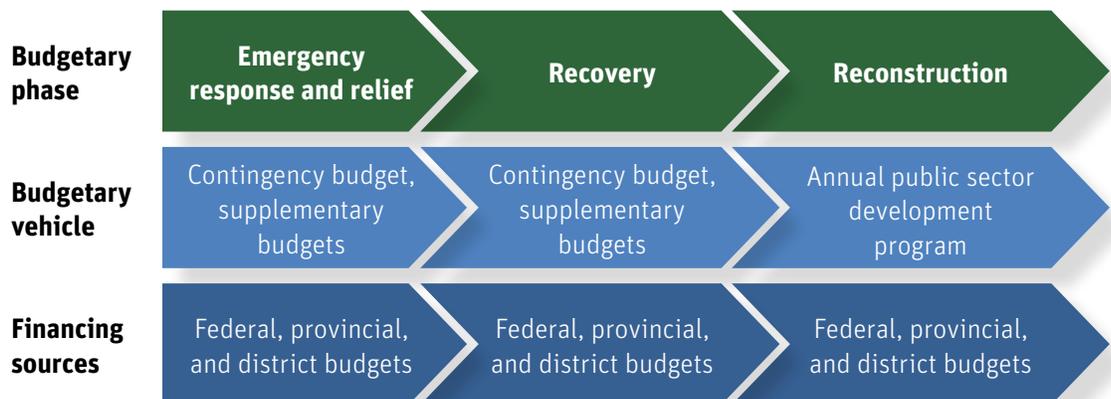
**Figure 2.2 Government and Donor Expenditures for Relief and Recovery from Selected Disasters in Pakistan, 2005–11**



Sources: United Nations (UN) Central Emergency Response Fund (CERF) Flash Appeals; UN Flash Appeal Humanitarian Response Plans; and the following damage and needs assessments by the Asian Development Bank and World Bank: “Pakistan 2005 Earthquake: Preliminary Damage and Needs Assessment” (Policy Note 34407); “Pakistan Cyclone and Floods 2007: Preliminary Damage and Needs Assessment, Balochistan and Sindh” (Urban Study 70329); “Pakistan Floods 2010: Preliminary Damage and Needs Assessment” (Board Report 58290); “2011 Pakistan Floods: Preliminary Damage and Needs Assessment” (Working Paper 84606).

The remaining part of this chapter is dedicated to describing the roles and responsibilities of the various public entities for each of the three post-disaster phases. Figure 2.3 summarizes the main sources of post-disaster funding.

**Figure 2.3 Financing of Post-disaster Operations in Pakistan**





## Emergency Response and Relief Phase

Funds for emergency response activities are immediately available from a variety of sources, depending on the size of the disaster. For small (level 1) events, district governments use their own financial resources for emergency response through their contingency budget lines. If these funds are not sufficient (for example, in the case of a medium-size [level 2] event), the provincial governments may provide funds from their contingency budget lines (where available). This process continues for level 3 events crossing provincial boundaries, where, should the respective district and provincial budgets be exhausted, additional funding come from the federal budget. Any additional expenditures are adjusted in the following year's budget through the demand for supplementary grant.<sup>18</sup>

Baluchistan, Khyber Pakhtunkhwa (KPK), and Sindh have allocated provincial contingency budget lines to meet disaster relief and response requirements as they occur to ensure prompt availability of funds. However in the case of the federal government and Punjab province, supplementary grants are typically used to provision post-disaster funds, and the required contingent funds are initially met by reappropriation from the surplus heads such as unused salary budgets. Once these funds are exhausted and additional grants are required, they are approved by the respective assembly within the following fiscal year's budget. This procedure is also followed in Baluchistan, KPK, and Sindh if the existing funds are not enough to cover post-disaster expenditures.

<sup>18</sup> "Supplementary" demands for grants and appropriations represent expenditures that could not be met from within the budget allocations under various normal annual demands and appropriation.

## Recovery Phase

The recovery phase (also called the rehabilitation phase) starts after the emergency response phase and typically lasts three to six months. During this specific post-disaster phase, lifeline infrastructure (water, electricity, sanitation, and so on) and key public buildings and infrastructure (such as hospitals and bridges) are repaired. Housing rehabilitation assistance is also provided to the affected households.

The NDM Act of 2010 provides some insights into the types of expenditures incurred by the federal and provincial governments, which include compensation for loss of life and also assistance on account of damage to houses and to restore means of livelihood.<sup>19</sup> The Act (2010) gives the NDMA the national authority to direct that, for severe disasters, relief may be granted in the repayment of loans or that fresh loans may be granted to the affected population with appropriate concessions.<sup>20</sup>

The Act (2010) does not stipulate the method of making post-disaster payments to the affected population. However, in practice, the affected region is first identified as a “calamity-hit area,” and then the data of expected beneficiaries is sent to the National Database and Registration Authority (NADRA) for verification. Once the beneficiary details are verified, the affected people are issued ATM cards through which they may obtain the cash compensation in one or more tranches.<sup>21</sup>

The funding mechanisms during the recovery phase are currently exactly the same as during the emergency response phase. Funds for financing the post-disaster recovery phase come from contingency budgets and supplementary budgets at the district, provincial, and federal levels. Initially funds come from the district budgets, and as these become exhausted, additional funding from provincial budgets becomes available. In the case of significant (level 3) natural catastrophes, district and provincial budgets are supplemented by funding from the federal budget.

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<sup>19</sup> Clause 20, NDM Act of 2010, titled “Guidelines for minimum standards of relief.”

<sup>20</sup> Clause 12, NDM Act of 2010, titled “Relief in loan repayment, etc.”

<sup>21</sup> There are no standard defined procedures for cash transfers to those affected by disasters, and the mechanism could range from providing cross-checks to ATM cards, depending on the situation and the needs.

## Reconstruction Phase

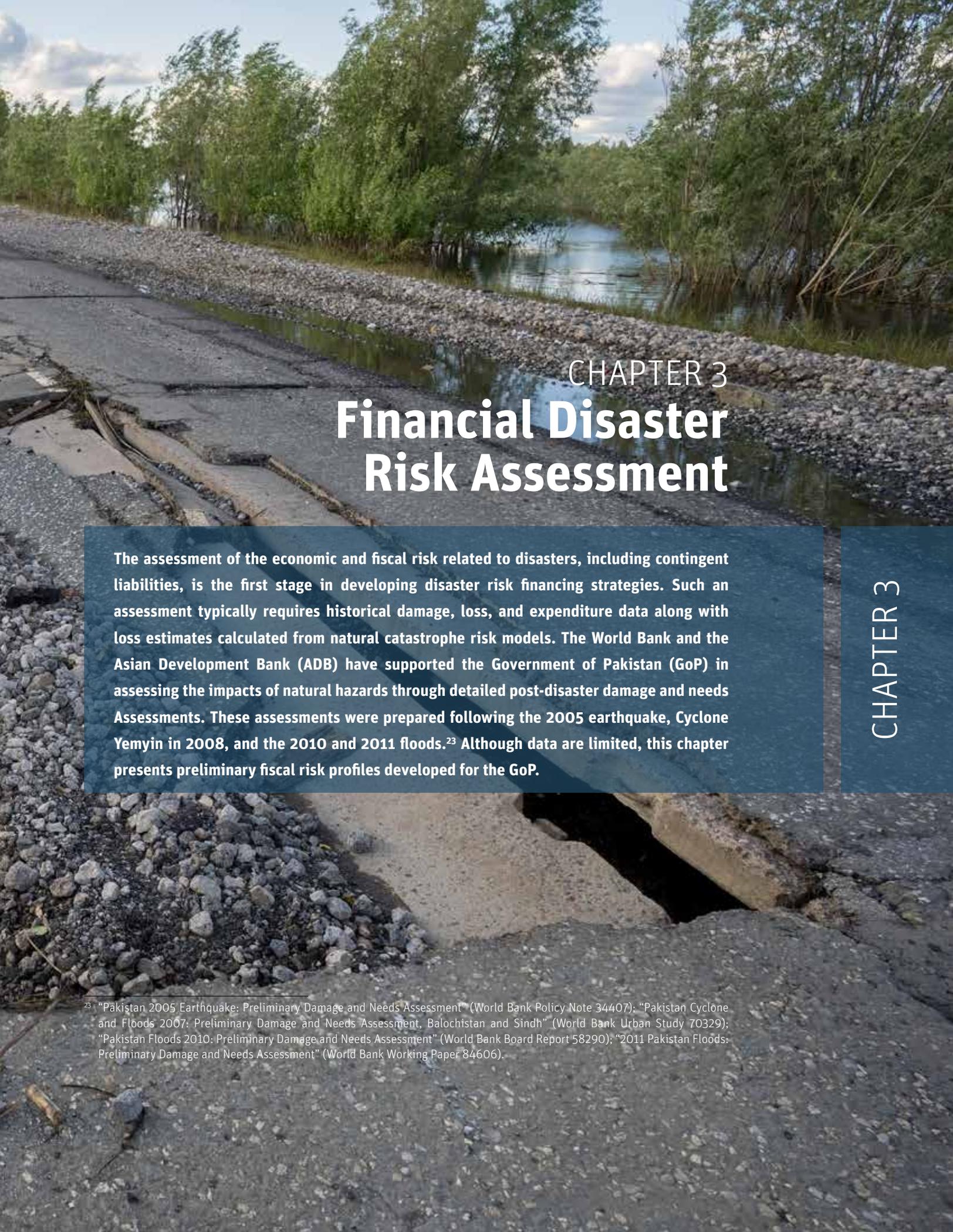
The reconstruction of public assets (at the federal and provincial levels) is mainly financed through the annual Public Sector Development Program (PSDP). The PSDP of the federal and provincial governments consists of a series of projects and programs that are developed according to Pakistan's long-term development needs. The PSDP expenditures are funded from revenue and capital accounts of the federal and provincial governments.

Line ministries are responsible for the reconstruction of their assets. Each affected ministry at either the federal or provincial level obtains estimates of the extent of disaster damages and prepares an appropriate program for the reconstruction of the affected public assets and infrastructure. Typically the relevant line ministries prepare these programs in consultation with the finance ministries of either the federal or provincial governments. The proposed programs are put before the national or provincial assemblies, as part of the PSDP of the federal or provincial government, for their approval. As soon as the programs are approved, they are implemented by the respective line ministries, as described in the GoP's Accounting Policies and Procedures Manual for federal and provincial governments.<sup>22</sup>

No central mechanism currently tracks the expenditures on relief, recovery, and reconstruction. Instead, funds are disbursed across different tiers of governance as well as across the various federal and provincial ministries and departments. The difficulty in tracking expenditures on relief, recovery, and reconstruction following disasters makes it challenging for the GoP to assess the needs and shortfalls for funds for disaster-related expenditure. A system to better track disaster-related expenditures across all the various implementing agencies would improve future needs assessments as well as the transparency and accountability of funds spent postdisaster.

<sup>22</sup> Government of Pakistan, *Accounting Policies and Procedures Manual* (Islamabad: Government of Pakistan, 1999).





## CHAPTER 3

# Financial Disaster Risk Assessment

The assessment of the economic and fiscal risk related to disasters, including contingent liabilities, is the first stage in developing disaster risk financing strategies. Such an assessment typically requires historical damage, loss, and expenditure data along with loss estimates calculated from natural catastrophe risk models. The World Bank and the Asian Development Bank (ADB) have supported the Government of Pakistan (GoP) in assessing the impacts of natural hazards through detailed post-disaster damage and needs Assessments. These assessments were prepared following the 2005 earthquake, Cyclone Yemyin in 2008, and the 2010 and 2011 floods.<sup>23</sup> Although data are limited, this chapter presents preliminary fiscal risk profiles developed for the GoP.

CHAPTER 3

<sup>23</sup> "Pakistan 2005 Earthquake: Preliminary Damage and Needs Assessment" (World Bank Policy Note 34407); "Pakistan Cyclone and Floods 2007: Preliminary Damage and Needs Assessment, Balochistan and Sindh" (World Bank Urban Study 70329); "Pakistan Floods 2010: Preliminary Damage and Needs Assessment" (World Bank Board Report 58290); "2011 Pakistan Floods: Preliminary Damage and Needs Assessment" (World Bank Working Paper 84606).

## Contingent Liability and Post-disaster Spending Needs

Our preliminary assessment of the government's contingent liability from disasters indicates that the government faces a major financing challenge arising from natural catastrophes. Flooding is a major driver of risk, causing an estimated annual economic impact of 3–4 percent of the federal budget (between US\$1.2 billion and US\$1.8 billion).<sup>24</sup> This range is equivalent to 0.5–0.8 percent of national gross domestic product (GDP).<sup>25</sup> However, our simulations show that a major flood event (occurring, on average, once every 100 years) could cause losses in excess of US\$15.5 billion,<sup>26</sup> which equates to around 7 percent of national GDP<sup>27</sup> or almost 40 percent of the federal budget.

The GoP's contingent liability due to disasters can create significant fiscal risk, but that liability is not clearly defined in law, making a fiscal risk assessment difficult to perform. Beyond its explicit contingent liability and associated spending needs (such as the reconstruction of public assets and infrastructure), the government may have a moral and social responsibility (implicit contingent liability) to assist the population in the aftermath of an extreme disaster. For example, the government not only provides not only emergency assistance (for example, food, shelters, and medical supplies) but also can finance recovery and reconstruction activities such as assistance to rebuild low-income housing. Contingent liabilities arising through the establishment of disaster-linked social protection schemes also need to be considered in such an analysis.

The GoP's post-disaster contingent liability can be categorized into short-term, medium-term, and long-term spending needs. All financial resources do not need to be mobilized immediately after a disaster, but adequate resources must be mobilized quickly to fund post-disaster emergency and recovery activities. Once the recovery phase is complete, the GoP must mobilize longer-term resources to meet its reconstruction needs. In general, governments assume contingent liabilities for three broad categories of post-disaster spending needs:

- *Repair of nationally owned public assets* such as national roads, major water infrastructure, and national government buildings (typically in the medium-term)
- *Repair of subnationally owned public assets* such as provincial and district roads, health facilities, schools, or local markets (typically in the short- to medium term)
- *Compensation for deaths and injuries, increased safety net payments, and stimulus grants* for livelihood recovery and housing reconstruction (typically in the short term)

A major challenge for the government in the aftermath of a disaster is to access immediate liquidity to finance its short-term spending needs. Although various financial instruments can be mobilized for the post-disaster reconstruction phase (including additional credit and tax increases), financial instruments that provide immediate liquidity after a disaster are more challenging to access. See appendix F, which describes the potential financial instruments available.

Assessing the short-term post-disaster spending needs is essential. To devise a cost-effective disaster risk financing strategy, especially for the funding of short-term post-disaster public spending needs, it is critical to assess those possible public spending needs that create additional fiscal risk for the government.

<sup>24</sup> Budget estimate from “Federal Budget 2014–2015: Budget in Brief” (Islamabad: Government of Pakistan, Finance Division, June 3, 2014), [http://finance.gov.pk/budget/Budget\\_in\\_Brief\\_2014\\_15.pdf](http://finance.gov.pk/budget/Budget_in_Brief_2014_15.pdf). Exchange rate fixed at PRe 102 = US\$1.

<sup>25</sup> 2013 GDP figure used, numbers rounded.

<sup>26</sup> Upper-bound estimate taken from the two methodologies detailed later in this chapter.

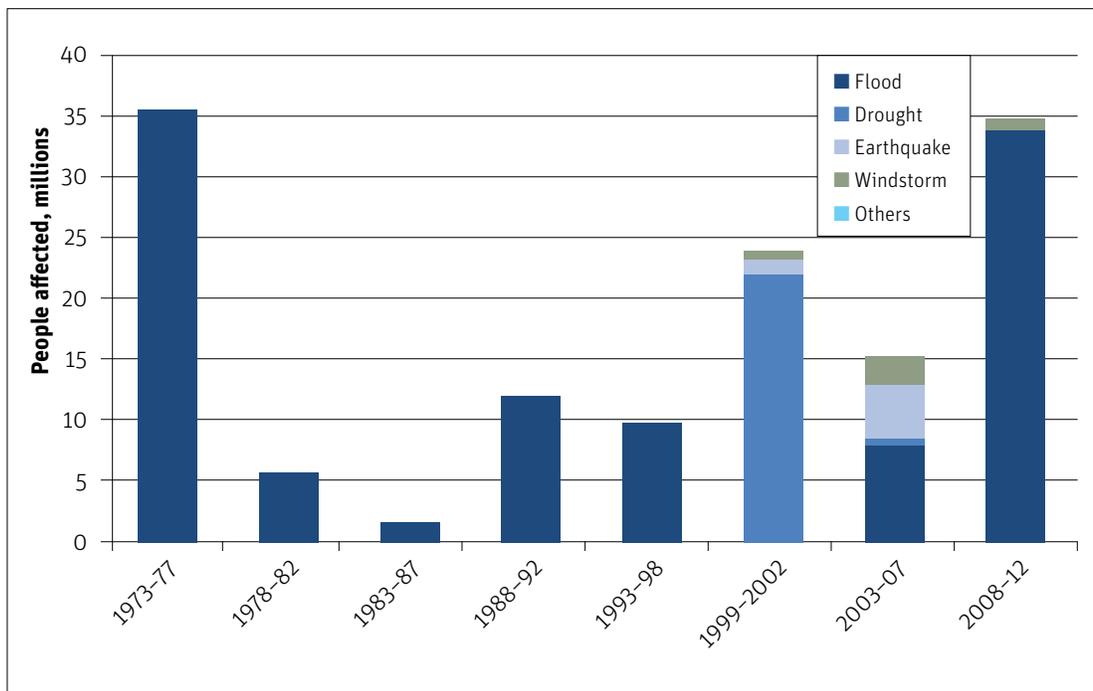
<sup>27</sup> 2013 numbers.

## Analysis of Historical Disasters in Pakistan

This report has estimated the number of people affected by historical disaster events across Pakistan between 1973 and 2012, which can serve as a proxy for the severity of each event.<sup>28</sup> During this 40-year period, 102 individual disaster events have been catalogued and analyzed for their impacts on the affected populations (as listed in appendix A).

On average, approximately 3 million people are affected by natural catastrophes in Pakistan each year, which equates to about 1.6 percent of the total population. Figure 3.1 shows the number of people estimated to have been affected by disasters since 1973, by peril type.

**Figure 3.1 Number of People Affected by Disasters in Pakistan, by Disaster Type, 1973–2012**



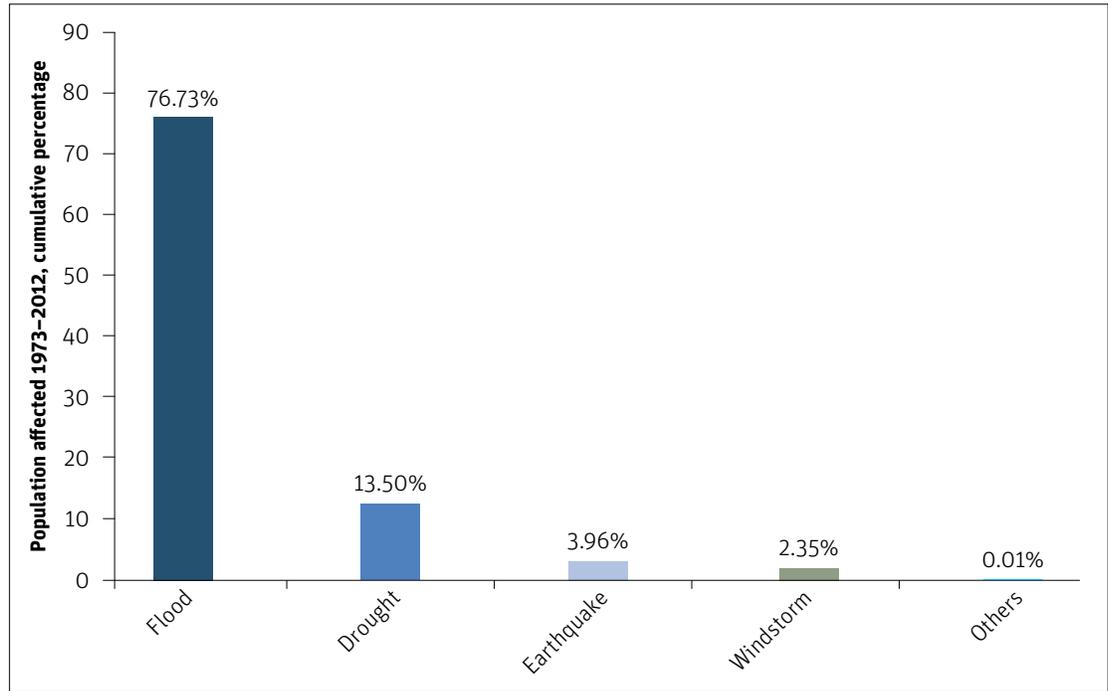
Source: National and Provincial Disaster Management Authority data.

Note: "Others" includes avalanche and landslides. Impacts include death, injury, property damage, and loss of livelihood.

From 1973 through 2012, floods affected approximately 77 percent of all the people affected by disasters in Pakistan (figure 3.2). Drought was the next most damaging peril, followed by earthquake, windstorms, and others (such as avalanches and landslides).

<sup>28</sup> For this report, a database of the impacts of natural disasters across Pakistan between 1973 and 2012 was developed, primarily from National Disaster Management Authority (NDMA) and Provincial Disaster Management Authority (PDMA) data sources. For more details on this catalog, see appendix A.

**Figure 3.2 Relative Impact of Disasters on Population in Pakistan, by Disaster Type, 1973–2012**

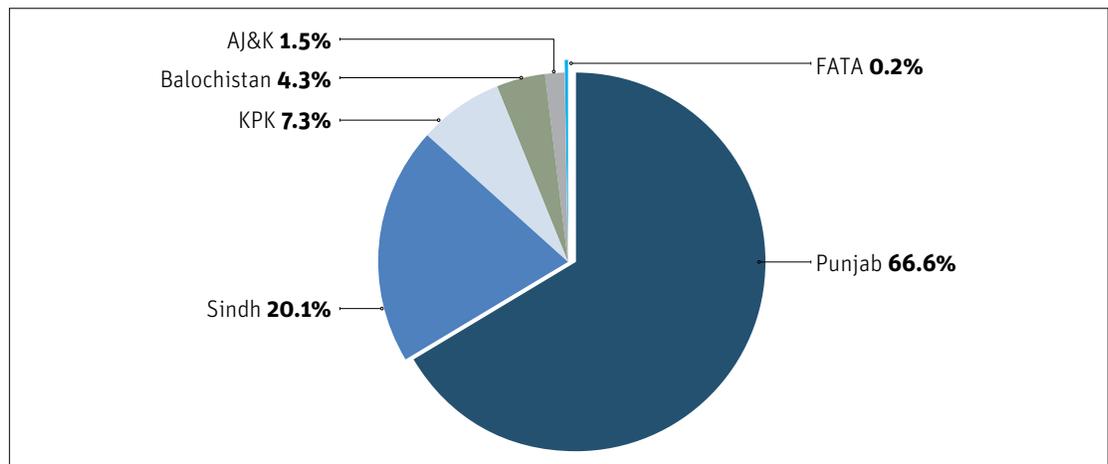


Source: National and Provincial Disaster Management Authority data.

Note: “Others” includes avalanche and landslides. Impacts include death, injury, property damage, and loss of livelihood.

Of all the people affected by natural catastrophes in Pakistan from 1973 through 2012, 87 percent were residents of either Punjab or Sindh provinces, which included 66.6 percent and 20.1 percent of people affected, respectively. The high number of affected people in these areas is due to a number of factors including high population density, poor infrastructure, the geomorphology of the regions, and the location of high numbers of residential properties on floodplains. A further 12 percent were residents of Baluchistan or Khyber Pakhtunkhwa provinces, with the remaining (less than 2 percent) living in Azad Jammu and Kashmir State, the Federally Administered Tribal Areas, and the Gilgit-Balistan administrative territory. Figure 3.3 summarizes the geographical distribution of affected people.

**Figure 3.3 Geographic Distribution of People Affected by Disasters in Pakistan, 1973–2012**

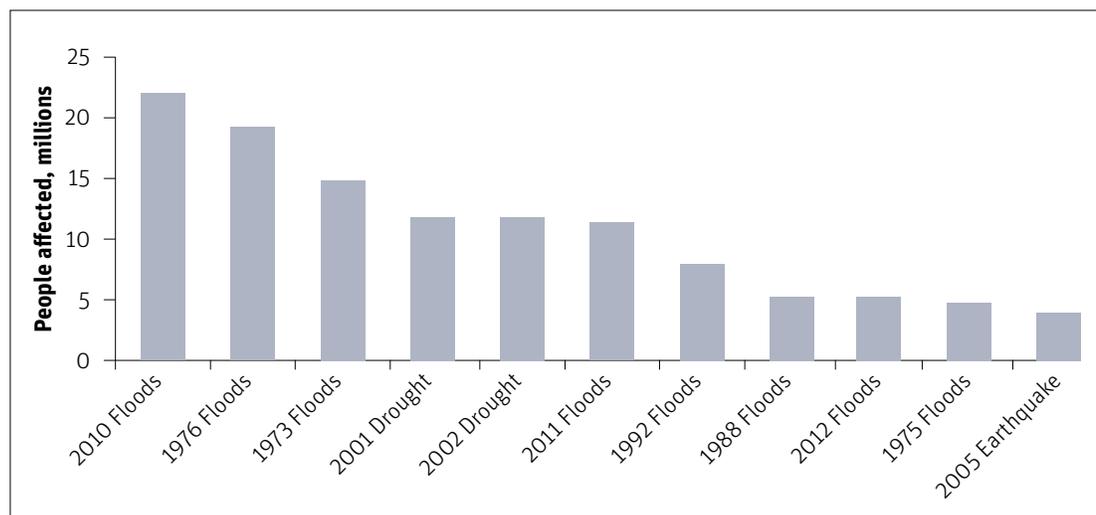


Source: National and Provincial Disaster Management Authority data.

Note: KPK = Khyber Pakhtunkhwa. AJ&K = Azad Jammu and Kashmir. FATA = Federally Administered Tribal Areas.

Since 1973, 11 natural catastrophes have hit Pakistan that, were they to occur in the present day, could affect over 4 million people. Of the 11 disasters estimated to have impacted over 4 million people, eight have been floods. Furthermore, the top three most impactful events (the floods of 2010, 1976, and 1973) affected well over 10 million people each (figure 3.4).

**Figure 3.4 Disasters in Pakistan Affecting over 4 Million People, 1973–2012**



Source: National and Provincial Disaster Management Authority data.

## Statistical Fiscal Disaster Risk Analysis

The fiscal disaster risk profile of Pakistan that reflects the government's contingent liabilities to disasters is built on actuarial analyses of historical disaster impact data collected for this report. Because of data availability, preliminary fiscal disaster risk profiles are developed for the whole country and one province (Punjab) regarding the peril of flood only.<sup>29</sup> In particular, risk metrics such as the annual expected loss (AEL) and probable maximum losses (PMLs) have been estimated. The AEL is an estimate of the long-term annual average loss, while the PMLs estimate possible large losses. The PML is defined as an estimate of the aggregate annual maximum loss that is likely to arise on the occurrence of an event or series of events with a certain probability. For example, a PML with a 100-year return period is the estimated loss caused by an event occurring once every 100 years on average (that is, with a 1 percent probability of occurrence per year on average).

### *Preliminary fiscal flood risk profiles of Pakistan and Punjab*

The fiscal disaster risk profiles of Pakistan and Punjab are related to the public spending needs for post-disaster operations. Post-disaster expenditures financed by the government in the first few months after a catastrophe are estimated using an indirect approach based upon the number of people identified as being affected by an event (appendix A).

After the analysis of the historical impact data, it was concluded that a meaningful, robust disaster risk profile could be generated only for flood risk—the most significant peril in Pakistan's recent

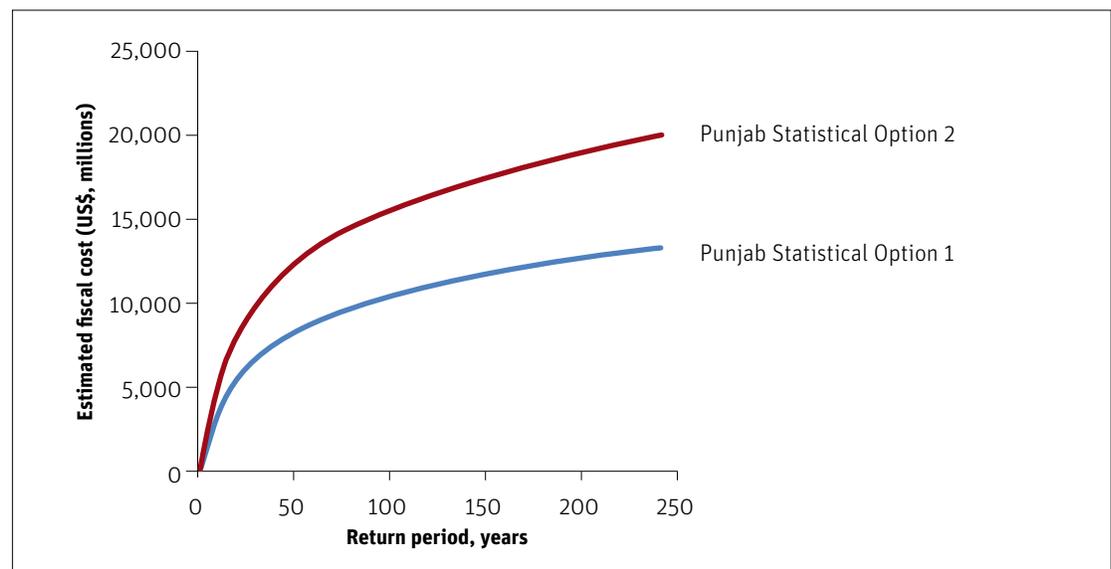
<sup>29</sup> The data lacked sufficient historical records for drought and earthquake events to perform actuarial analyses of those perils in a suitably robust manner.

history. As such, 40 years of flood events (from 1973 through 2012) have been examined to generate risk profiles for both the entire country and the province of Punjab. From an analysis of statistically significant distributions through the actual impact data from 40 years of flood events, we can extrapolate calculations of the possible severity of events with a low probability of occurrence (for example, with a 1-in-100-year or 1-in-250-year probability).

The government post-disaster budget expenditure per person affected by a flood disaster is estimated at between US\$400 and US\$600, on average. A portion of this cost is the direct financial compensation to the affected households for reconstruction of damaged housing and livelihoods support, and the remainder is for the reconstruction of critical public assets. Combining these estimates of fiscal cost per affected person, preliminary fiscal flood risk profiles have been calculated for the country of Pakistan (figure 3.5) and the province of Punjab (figure 3.6). In the figures, two options represent the lower and upper ends of the average estimated fiscal cost per person affected by a flooding event. These figures are based on different analytical techniques to arrive at the results.

This preliminary analysis indicates that the annual national fiscal disaster losses from flood are in the range of US\$1.2 billion to US\$1.8 billion, equivalent to 3–4 percent of the federal budget or 0.5–0.8 percent of GDP.<sup>30</sup> Once every 100 years these losses are expected to exceed either US\$10.3 billion or US\$15.5 billion (depending on the option assumed), which amounts to 25–37 percent of the federal budget or around 4–7 percent of GDP. In terms of annual probability, there is a 1 percent probability in any year that an event exceeding either US\$10.3 billion or US\$15.5 billion will occur. Figure 3.5 shows the indicative fiscal loss exceedance curve, and table 3.1 shows the indicative AEL and selected PML values. In an average year, the fiscal losses are estimated in the range of US\$1.2 billion to US\$1.8 billion. Every 10 years, they could exceed US\$3.4 billion to US\$5.2 billion, and every 100 years they could exceed, depending on the fiscal cost option, US\$10.3 billion or US\$15.5 billion.

**Figure 3.5 Estimated Fiscal Flood Risk Profile for Pakistan**



*Note:* The indicative exceedance probability curves represent two options equivalent to the lower and upper ends of the average estimated fiscal cost per person affected by a flooding event. These figures are based on different analytical techniques to arrive at the results. The “return period” refers to the time period defining the probability of a flood’s severity and associated loss, such as a 1-in-50-year loss or a 1-in-200-year loss.

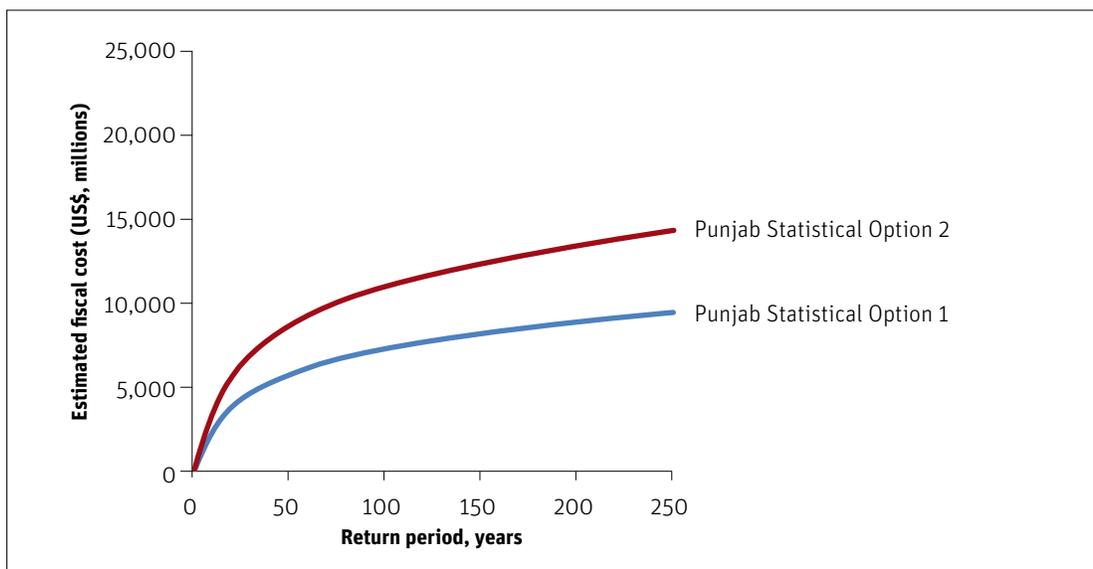
<sup>30</sup> 2013 GDP figures and 2014–15 budget estimate from “Federal Budget 2014–2015: Budget in Brief” (Islamabad: Government of Pakistan, June 3, 2014), [http://finance.gov.pk/budget/Budget\\_in\\_Brief\\_2014\\_15.pdf](http://finance.gov.pk/budget/Budget_in_Brief_2014_15.pdf). Exchange rate fixed at PRe 102 = US\$1.

**Table 3.1 Fiscal Flood Risk Metrics for Pakistan**

Indicative risk metric	National statistical flood option 1 (US\$, millions)	National statistical flood option 1 (% GDP) (% federal budget)	National statistical flood option 2 (US\$, millions)	National statistical flood option 2 (% GDP) (% federal budget)
Annual expected loss	1,179	0.5 (3)	1,769	0.8 (4)
Probable maximum losses				
10-yr. return period	3,476	1.5 (8)	5,214	2.2 (12)
25-yr. return period	6,037	2.6 (14)	9,055	3.9 (22)
50-yr. return period	8,142	3.5 (19)	12,213	5.3 (29)
100-yr. return period	10,344	4.5 (25)	15,517	6.7 (37)
200-yr. return period	12,621	5.4 (30)	18,932	8.2 (45)
500-yr. return period	15,719	6.8 (37)	23,579	10.2 (56)
1,000-yr. return period	18,094	7.8 (43)	27,140	11.7 (65)

Note: “National statistical flood options” 1 and 2 correspond to the lower and upper ends of the average estimated fiscal cost per person affected by a flooding event. These figures are based on different analytical techniques to arrive at the results. The “return period” refers to the time period defining the probability of a flood’s severity and associated loss, such as a 1-in-50-year loss or a 1-in-200-year loss.

In the case of Punjab province alone, this analysis indicates that the annual provincial disaster losses from flood are in the range of US\$0.8 billion to US\$1.2 billion; once every 100 years, losses are expected to exceed US\$7.4 billion to US\$11.1 billion (depending on the option assumed). Figure 3.6 and table 3.2 present the actuarial results of the analysis for flood events in the Punjab province.

**Figure 3.6 Estimated Fiscal Flood Risk Profile for Punjab Province**

Note: The indicative exceedance probability curves represent two options equivalent to the lower and upper ends of the average estimated fiscal cost per person affected by a flooding event. These figures are based on different analytical techniques to arrive at the results. The “return period” refers to the time period defining the probability of a flood’s severity and associated loss, such as a 1-in-50-year loss or a 1-in-200-year loss.

**Table 3.2 Fiscal Flood Risk Metrics for Punjab Province**

Indicative risk metric	Punjab statistical flood option 1 (US\$, millions)	Punjab statistical flood option 2 (US\$, millions)
Annual expected loss	831	1,247
Probable maximum losses		
10-yr. return period	2,456	3,685
25-yr. return period	4,289	6,433
50-yr. return period	5,799	8,698
100-yr. return period	7,379	11,069
200-yr. return period	9,016	13,523
500-yr. return period	11,237	16,855
1,000-yr. return period	12,946	19,419

*Note:* “Punjab statistical flood options” 1 and 2 correspond to the lower and upper ends of the average estimated fiscal cost per person affected by a flooding event. These figures are based on different analytical techniques to arrive at the results. The “return period” refers to the time period defining the probability of a flood’s severity and associated loss, such as a 1-in-50-year loss or a 1-in-200-year loss.

### **Preliminary Earthquake Risk Profile of Pakistan**

The historical disaster impact data set collated for this study did not contain enough drought, tropical cyclone, or earthquake events to support a reliable actuarial analysis of the possible fiscal impacts of these types of natural catastrophes. However, a prototype probabilistic earthquake model was used to demonstrate the value of such a modeling approach if appropriate input data sets were to become available. The results from this model are presented to illustrate the approach, but further development and refinement are necessary.

Probabilistic catastrophe risk models offer the government innovative tools to assess the country’s financial exposure to disasters. Governments in both developed and developing countries are increasingly using such modeling techniques to guide their disaster risk management and financing decisions. Such tools allow for the probabilistic assessment of low-frequency, high-severity disasters (such as major earthquakes) and their potential losses, as further discussed in box 3.1.

This preliminary probabilistic earthquake risk modeling approach complements the actuarial historical impact analysis. It presents a preliminary analysis of the damages caused by earthquake (shake only) to residential properties only. This earthquake risk assessment produced a seismic probabilistic loss exceedance profile for housing damage at the national level.

A significant amount of research and expertise went into the earthquake loss estimation. The probabilistic earthquake risk modeling was conducted using key input data sets from local experts in Pakistan that detail the most up-to-date seismic hazard analysis and housing inventory analyses (at a spatial resolution of 1 square kilometer) for the whole country. The modeling also evaluated the impact as if the 2005 earthquake were to occur at the present time.

The probabilistic seismic hazard analysis was derived from results of over 30,000 simulated earthquakes affecting Pakistan. Information about the number of dwellings, construction type (katcha, brick, concrete, and the like) and height were obtained from detailed studies and census information.<sup>31</sup> The damage and loss functions were based on nine vulnerability functions developed

<sup>31</sup> Katcha refers to cheap, natural construction materials such as mud, grass, bamboo, thatch, or sticks.

## BOX 3.1 Probabilistic Catastrophe Risk Modeling

Fiscal disaster risk assessments for governments can be developed using inputs from probabilistic catastrophe risk models. Catastrophe modeling techniques were originally developed by the international (re)insurance industry to assess the risk on portfolios of underwritten assets (for example, buildings), and governments are increasingly using them to analyze their exposure to adverse natural events. Catastrophe risk models typically comprise a hazard module, an exposure module, a vulnerability module, and a loss module.

**Hazard module.** This module contains a catalog of thousands of potential natural catastrophe events that could occur in a region, each one defined by a specific frequency and severity of occurrence. Analyses are performed on the historical occurrence of catastrophic events to capture the extent of possible events, based on expert opinions.

**Exposure module.** This is a georeferenced database of assets at risk, capturing important attributes such as geographical location; type of occupancy (such as residential, commercial, industrial, or agricultural); type of construction (for example, wood, steel, or masonry); age; and number of stories.

**Vulnerability module.** This module defines a series of relationships that relate the damage to an asset to the level of intensity of a peril (for

example, ground shaking for earthquakes or wind speed for tropical cyclones). The relationships will vary by peril and by the characteristics of each asset; for example, a small wooden house and a tall concrete building will respond differently to the ground shaking caused by an earthquake and, as such, they will be damaged in different ways and to different extents. On a larger scale—for instance, when analyzing an entire neighborhood or city—proxies may be used to capture an area’s overall vulnerability.

**Loss module.** This module combines the information in the other three components to calculate the overall losses expected for selected perils affecting a portfolio of assets of interest. Typically two kinds of risk metrics are produced: average annual losses (AALs) and probable maximum losses (PMLs). The AAL is the expected loss every year, on average, for the risks being analyzed; the PMLs describe the largest losses that might be expected to occur for a given return period (that is, within a given time period), such as a 1-in-50-year loss or a 1-in-200-year loss.

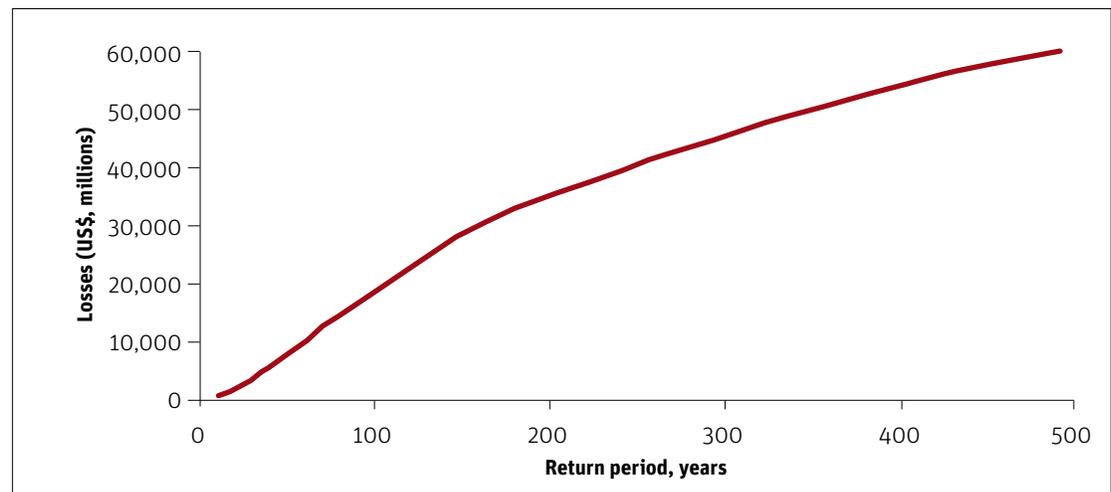
Risk metrics produced by probabilistic catastrophe risk models can be used to complement historical analyses and are particularly useful to policy makers in assessing the probability of losses and the maximum losses that could be generated by major events (such as an earthquake affecting a major city or a cyclone affecting a major port).

for Pakistan using a mix of building heights and construction types. The replacement values (or monetary value of the properties, updated to current values) were obtained after consultations with local engineers and collection of Pakistan-specific information on unit costs of construction from the World Housing Encyclopedia.<sup>32</sup> The total modeled replacement value of Pakistan’s building stock was estimated at US\$561 billion in current prices.

This preliminary analysis indicates that the annual expected earthquake loss to residential properties, or the housing sector, is approximately US\$1 billion and that these losses are expected to exceed US\$18.7 billion once every 100 years. The loss exceedance curve shows the potential earthquake losses for key return periods (figure 3.7). The results show that earthquake risk in Pakistan is very significant and should be considered to have a significant fiscal impact. It also shows that, over the long term, an annual average of 0.2 percent of the total value of the building stock in Pakistan is affected by earthquake loss (table 3.3).

One output of the probabilistic earthquake approach is a deterministic (“as-if” scenario) analysis of the 2005 earthquake. If this event were to occur in the present day, the total economic loss to residential properties is estimated at approximately US\$2.8 billion (about twice the 2005 losses), which corresponds to a return period of around 26 years. Given the increase in number of buildings in Pakistan since 2005, this analysis indicates that the number of properties damaged would be greater, but the actual number of properties destroyed would be lower (having been built better after the 2005 earthquake).

**Figure 3.7 Estimated National Earthquake Risk Profile for Residential Properties in Pakistan**



*Note:* The “return period” refers to the time period defining the probability of a flood’s severity and associated loss, such as a 1-in-50-year loss or a 1-in-200-year loss.

<sup>32</sup> For more information about the World Housing Encyclopedia (WHE), a collection of resources related to housing construction practices in seismically active areas of the world, see the WHE website: <http://www.world-housing.net>.

**Table 3.3 Fiscal Earthquake Risk Metrics for Pakistan**

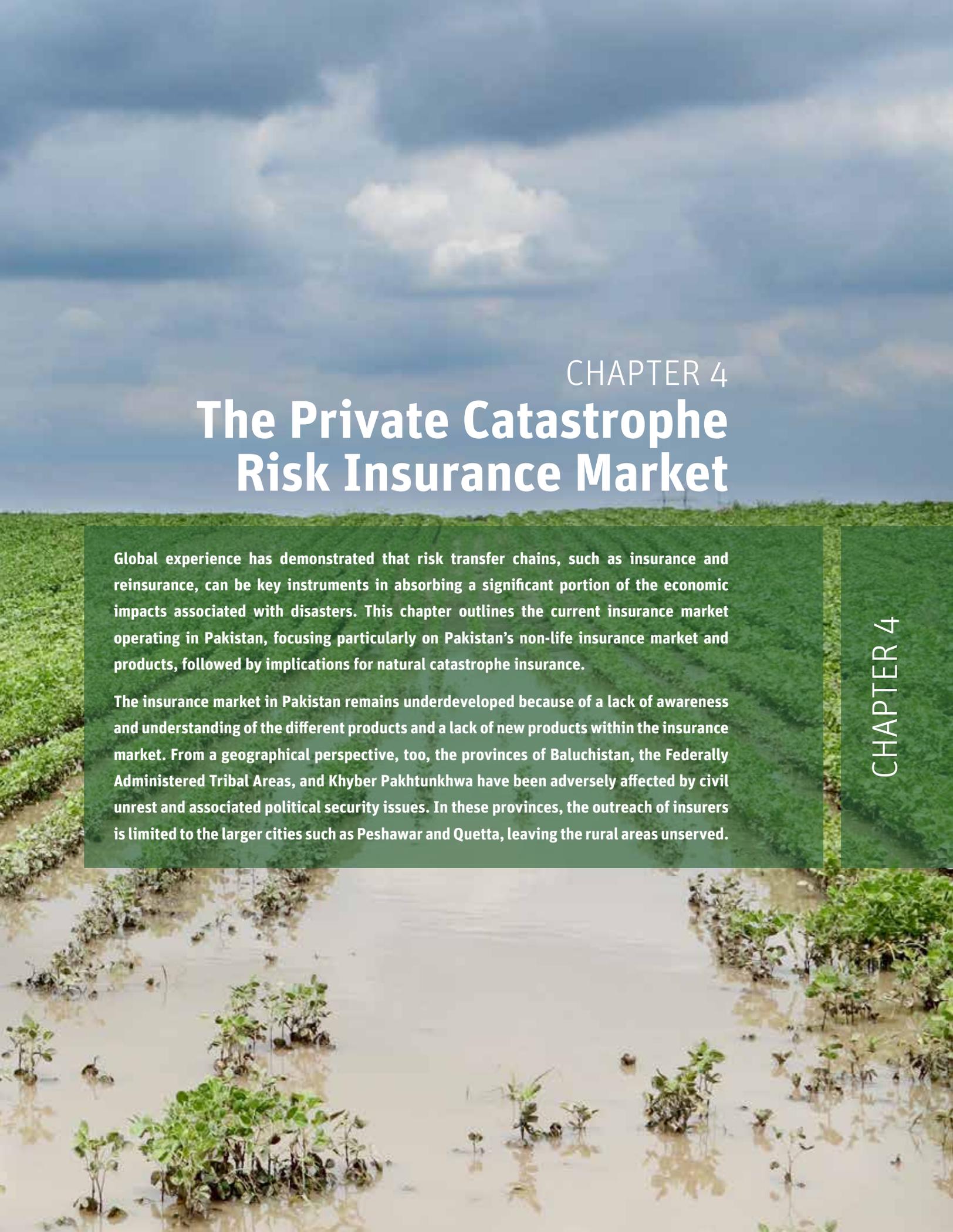
Indicative risk metric	Residential earthquake loss risk (US\$, millions)	Residential earthquake loss risk (% of exposed value)
Annual expected loss	956	0.2
Probable maximum losses		
10-yr. return period	949	0.2
25-yr. return period	2,750	0.5
50-yr. return period	7,660	1.4
100-yr. return period	18,700	3.3
200-yr. return period	35,000	6.2
500-yr. return period	60,700	10.8
1,000-yr. return period	80,600	14.4

*Note:* The “return period” refers to the time period defining the probability of a flood’s severity and associated loss, such as a 1-in-50-year loss or a 1-in-200-year loss.

In summary, although the flood fiscal disaster risk analysis should be seen as preliminary, it gives the GoP an order-of-magnitude estimate of its possible public spending needs for post-disaster operations. Because of the lack of historical earthquake and tropical cyclone event data, it was not possible to perform an actuarial analysis of the possible fiscal costs of these types of natural catastrophes. This actuarial analysis should be complemented by more-rigorous catastrophe modeling techniques, particularly for the assessment of possible losses from future major disasters. To illustrate the value of probabilistic and deterministic catastrophe models, a prototype earthquake model has been developed that estimates the possible losses to private residential properties from this peril, although this model would require additional developments and refinements before the outputs could be used in developing a disaster financing strategy. In lieu of more-robust modeling estimates, the results of the flood risk profiles for Pakistan and Punjab are used as an input to a series of options that the GoP may wish to consider toward the development of a preliminary national disaster risk financing strategy (as chapter 5 discusses in detail).

This report also highlights two different approaches to disaster risk analysis to estimate fiscal impacts: (a) the actuarial approach, and (b) the scientific and engineering-based approach. However, it is also important to recognize that the financial impacts estimated are for direct losses from independent hazard events. For example, the losses do not consider the impact of landslides after an earthquake in northern Pakistan. This impact could be further exacerbated if an earthquake occurred during the rainy season, further increasing the likelihood of landslides. Therefore, the preliminary loss estimates generated using these methods may not necessarily represent the maximum losses possible.





## CHAPTER 4

# The Private Catastrophe Risk Insurance Market

Global experience has demonstrated that risk transfer chains, such as insurance and reinsurance, can be key instruments in absorbing a significant portion of the economic impacts associated with disasters. This chapter outlines the current insurance market operating in Pakistan, focusing particularly on Pakistan's non-life insurance market and products, followed by implications for natural catastrophe insurance.

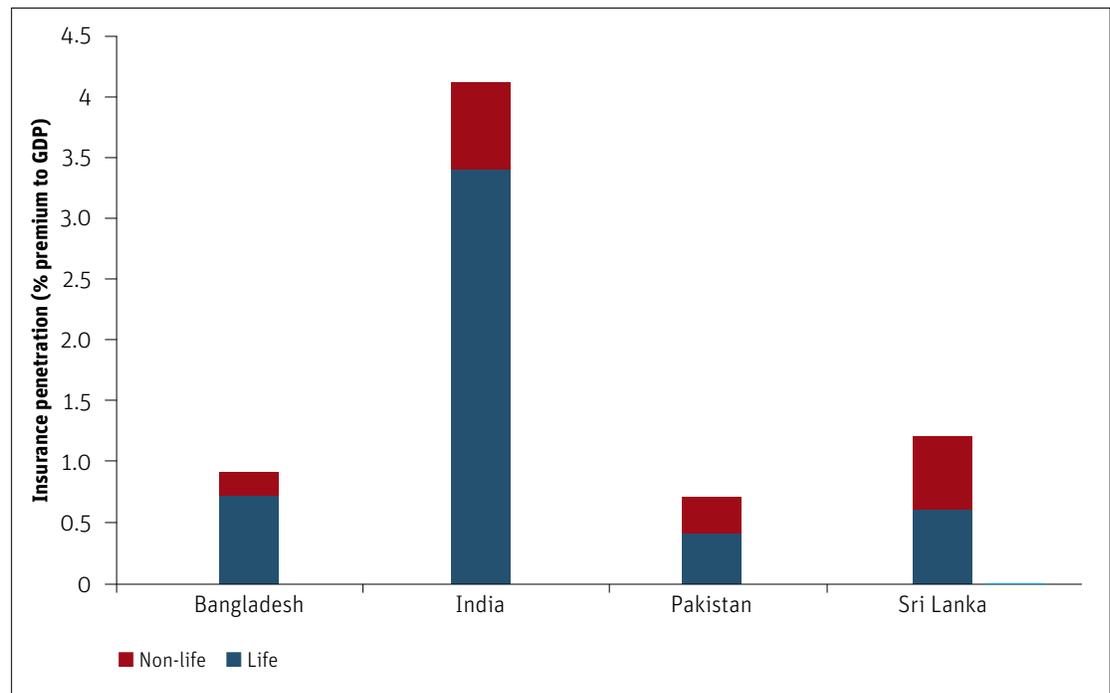
The insurance market in Pakistan remains underdeveloped because of a lack of awareness and understanding of the different products and a lack of new products within the insurance market. From a geographical perspective, too, the provinces of Baluchistan, the Federally Administered Tribal Areas, and Khyber Pakhtunkhwa have been adversely affected by civil unrest and associated political security issues. In these provinces, the outreach of insurers is limited to the larger cities such as Peshawar and Quetta, leaving the rural areas unserved.

## Overview of the Market

Forty-nine insurers, one national reinsurer, and some international reinsurers currently operate in Pakistan. All of these participants are regulated by the Securities and Exchange Commission of Pakistan (SECP), which also licenses and regulates insurance brokers, loss surveyors, and adjusters. However, under the current regulatory framework, insurance agents are not required to be licensed by the regulator, though all their activities are monitored and controlled through the insurance companies, which are required to maintain a register of their agents and are held responsible for all acts and omissions of the agents. The government-owned non-life insurer, the National Insurance Company Limited (NICL), though fully regulated by SECP, is under the administrative control of the Ministry of Commerce.

The insurance industry in Pakistan is small compared with its geographic peers. The country's overall insurance penetration (life and non-life premiums as percentage of gross domestic product [GDP]) has remained less than 1 percent over the past few years, one of the lowest in the SAARC region.<sup>33</sup> In 2011 the total insurance penetration (life and non-life) was approximately 0.7 percent in Pakistan, lower than in Bangladesh (0.9 percent), India (4.1 percent), and Sri Lanka (1.2 percent), as shown in figure 4.1. Traditionally, the agent selling network is the dominant channel for the delivery of insurance products in Pakistan. A small number of insurance brokers also operate in the market.

**Figure 4.1 Insurance Penetration in South Asia, Selected Countries, 2011**



Source: Swiss Re, "World Insurance in 2010: Premiums Back to Growth—Capital Increases," Sigma No. 2/2011 (New York: Swiss Reinsurance Company Ltd, 2011).

<sup>33</sup> The South Asian Association for Regional Cooperation (SAARC) is an organization of South Asian nations established in 1985 when the governments of Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka formally adopted its charter providing for the promotion of economic and social progress and cultural development within the South Asia region. It is headquartered in Kathmandu, Nepal. For details, visit the SAARC website: <http://www.saarc-sec.org/>.

Total annual gross premium revenue of Pakistan's non-life insurance sector was approximately US\$0.57 billion at the end of 2013, up from approximately US\$0.33 billion in 2006. Over the same time period, gross premium revenue in Pakistan's life insurance sector grew from approximately US\$0.23 billion to approximately US\$0.88 billion.<sup>34</sup>

In terms of annual growth rates, non-life insurance sector contracted by 11 percent from 2007 to 2009.<sup>35</sup> Since 2009, however, the sector's annual growth rates have increased by 6 percent. In contrast, the life insurance sector sustained an average annual growth rate of approximately 25 percent from 2007 to 2012. Fluctuating growth rates in the non-life sector are primarily due to the economic downturn that commenced in 2007, coupled with a decline in consumer and industrial financing by banks. (Such financing is the main driving force for non-life insurance growth, as non-life insurance is mostly centered on commercial lines.) However, the insurers have made no visible efforts to expand the outreach to personal lines of business; therefore growth has remained relatively stagnant.

In addition, the number of non-life insurers in Pakistan is not increasing; in fact, nearly 24 non-life insurers have exited the market since 2009. Typically those companies that have left the market have done so either voluntarily or in reaction to regulatory actions owing to compliance irregularities.<sup>36</sup> According to the Herfindahl–Hirschman Index, given the small size of the market, the existence of 40 non-life insurers as of 2012 indicates increased competition and decreased market power.<sup>37</sup> This could have an impact on technically sound catastrophe insurance premium rates. Based on gross written premiums, four insurance companies—EFU General Insurance, Adamjee Insurance, Jubilee Insurance, and NICL—enjoyed approximately 63 percent of the total non-life market in 2012. Of the remaining 37 percent of the non-life market, 22 percent was shared by 10 mid-size insurers, with the final 15 percent being split across 25 small insurance companies. As a consequence, the lower end of the non-life insurance sector is considered to be overcompetitive, characterized by aggressive pricing techniques and pressures on profitability due to the intense commercial competition.

### ***Insurance of public assets***

The state-owned NICL has a 12 percent non-life market share, with the remaining 88 percent being covered by private insurers. The NICL non-life market share has been relatively stable over the past five years, because its core business is to insure public assets of government and semigovernmental organizations.<sup>38</sup> Among the private companies covering the 88 percent of public assets, three large insurers had a combined market share of 50 percent in 2012 (that is, 44 percent of the total market share).

<sup>34</sup> Insurance premium figures from the SECP.

<sup>35</sup> Insurance sector growth information from the SECP.

<sup>36</sup> Securities and Exchange Commission of Pakistan (SECP), pers. comm., 2013.

<sup>37</sup> The Herfindahl index (also known as Herfindahl–Hirschman Index, or HHI) is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. Named after economists Orris C. Herfindahl and Albert O. Hirschman, it is an economic concept widely applied in competition law, antitrust law, and also technology management. It is defined as the sum of the squares of the market shares of the 50 largest firms (or if fewer than 50, summed over all the firms) within the industry, where the market shares are expressed as fractions. The result is proportional to the average market share, weighted by market share. As such, it can range from 0 to 1.0, moving from a huge number of very small firms to a single monopolistic producer. Increases in the Herfindahl index generally indicate a decrease in competition and an increase of market power, whereas decreases indicate the opposite.

<sup>38</sup> Securities and Exchange Commission of Pakistan (SECP), pers. comm., 2013.



### **Regulation**

The Insurance Ordinance of 2000 entrusted the supervision of insurance businesses to the SECP. In addition, the SECP's mandate has grown to include supervision and regulation of the insurance sector, nonbanking finance companies, and private pensions. The SECP also provides oversight of various external service providers to the corporate and financial sectors, including chartered accountants, credit rating agencies, corporate secretaries, brokers, and insurance surveyors.

### **Reinsurance**

The majority (51 percent) state-owned Pakistan Reinsurance Company Limited (PRCL) accounts for approximately 20 percent of all non-life reinsurance premiums written in 2012.<sup>39</sup> The only reinsurer in Pakistan, PRCL is listed on the Karachi Stock Exchange. However, the domestic insurers also reinsure with international reinsurers directly or through reinsurance brokers. During 2012, premiums of more than US\$0.28 billion, both in treaty and facultative contracts, were remitted abroad to foreign reinsurers, constituting approximately 49.5 percent of the total gross written premiums of non-life insurers, up from 37 percent in 2008.<sup>40</sup> For example, from 2008 to 2012, Swiss Re alone retained approximately 20 percent of the overall non-life business, and no risk was retroceded. The reinsurance treaties of Swiss Re in Pakistan normally cover business interruption from fire and allied perils as well as from natural catastrophe perils. To address undercapitalization of the market, the SECP and its stakeholders are currently deliberating a risk-based capital (RBC) model whereby the minimum capital requirement would need to be increased. By 2017, such requirements for non-life insurers would likely increase from the current PRe 300 million to PRe 500 million. The solvency ratio of an insurer is the size of its written premiums relative to the capital.

<sup>39</sup> Non-life reinsurance premium data from SECP 2013.

<sup>40</sup> Data on premiums remitted abroad from SECP 2013.

In Pakistan, the solvency regime for the insurance industry prescribed under the SEC (Insurance Rules), 2002, was revised in 2012. It is a dynamic solvency regime whereby the assets admissible for calculating the solvency of an insurance company and the assets' respective percentages have also been prescribed. The SECP also licenses and regulates the loss adjusters.

Large international reinsurance brokers encourage clients operating in Pakistan to have appropriate catastrophe insurance covers. This is based on actuarial catastrophe models, especially for small clients; the large and medium-size clients usually buy extended earthquake and flood coverage along with their fire policies. A small number of direct insurance brokers exist in the market, but few have expanded from the commercial and corporate market to serve the retail consumers.

### **Alternative insurance distribution channels**

Pakistan's microfinance industry has matured and diversified over the past 10 years. Although, there has been virtually no development of specific stand-alone microinsurance products in the past few years in Pakistan, major financing banks (MFBs), microfinance institutions (MFIs), multidimensional nongovernmental organizations (NGOs), and more recently, the commercial banks and telecom companies through the branchless banking platform have matured. The MFI product range has also broadened to include products beyond the typical enterprise loan such as insurance and alternative credit products (emergency loans, housing microfinance, and remittance services). Bancassurance and mobile banking, too, are rapidly becoming the modes of choice to deliver financial products. Although bancassurance is a growing and significant distribution channel, some constraint on its use exists because of high commission costs charged by the banks to provide this service.<sup>41</sup>

Pakistan's microfinance sector is vulnerable to fiscal shocks due to disasters. Discussions with the MFBs, MFIs, and Pakistan Microfinance Network revealed that the microfinance sector suffered heavily from the floods of 2010 and the catastrophic rains of 2011. Consequently, many of the MFIs become reluctant to lend or work in disaster-prone areas despite the need to create access to finance in these regions.

### **Private Property Catastrophe Insurance**

An analysis of insured losses from natural catastrophes indicates severe underinsurance in Pakistan. According to a survey of participants in the Pakistan insurance market conducted as part of this report, the largest insured loss events were the 2010 floods, followed by the 2011 floods (table 4.1). Anecdotal evidence strongly suggests that private property owners were significantly underinsured for losses from many of the recent natural catastrophes. Most properties and assets damaged by recent disasters were either uninsured or not covered for these particular perils.

<sup>41</sup> Bancassurance, also known as the bank insurance model, refers to an arrangement in which a bank and an insurance company form a partnership so that the insurance company can sell its products to the bank's client base.

**Table 4.1 Natural Catastrophe Losses of the Private Property Insurance Industry in Pakistan, 2005–12 (Pakistan rupees, millions)**

Hazard type	Year	Location	Sum insured	Gross premium	Net premium	Gross claims	Net claims	Retention ratio	Loss ratio
Earthquake	2005	Kashmir	107,066	470	377	16	16	80%	4%
Floods	2009	South	53,292	1,233	845	166	126	69%	15%
Floods	2010	South	775,761	2,118	1,071	3,342	303	51%	28%
Floods	2011	South	316,440	708	299	85	17	42%	6%
Floods	2012	South	20,458	46	23	12	5	49%	21%
Floods	2012	North	75,864	38	8	1	0	22%	3%

*Note:* For the policies affected, “sum insured” is the total sum insured by the insurance companies; “gross premium” is the premium earned for the sum insured on a gross basis; “net premium” is the premium earned for the sum insured on a net basis; “gross claims” is the total value of claims before insurance limitations such as deductibles and limits were applied; and “net claims” is the net value of claims after insurance limitations such as deductibles and limits were applied. The “retention ratio” is the net premium as a percentage of the gross premium. The “loss ratio” represents net claims as a percentage of net premiums.

In Pakistan, catastrophe insurance coverage is, by default, not included in a fire policy but available as an extension to a fire policy. However, it is subject to additional premium rates that cover the risks of earthquake (fire and shock) and atmospheric disturbances including floods and other extraneous or additional perils. Catastrophe insurance coverage usually includes buildings, machinery, business interruption, household contents, stocks, stock-in-process, and other contents covered under the fire insurance policy.

The earthquake and atmospheric disturbance are the most prominent catastrophic products available in the market, as a bundled product, and the annual premium rates range from between 0.60 per mille to 1.20 per mille for both perils with various terms, conditions, and deductibles being applied. These rates are usually applied on the sum insured of the risk; however, in some cases, it is written on the first-loss basis as well. Because commercially available catastrophe risk models for Pakistan are limited,<sup>42</sup> the pricing of leading domestic insurance companies tends to be conservative. Moreover, because the premium for natural perils is charged as part of the total premium for fire and allied peril policies, it is not possible to assess the premium for the catastrophe cover itself.

NICL, the government-owned insurer, has the exclusive mandate under law to provide insurance for public assets. Hence, all insurance business relating to any public property, or to any risk or liability pertaining to any public property, shall be placed with NICL only and not with any other insurer.<sup>43</sup> The classes being underwritten by NICL include fire, marine, engineering, aviation, motor, travel, and crop. Despite being given this mandate, NICL has not initiated any specific catastrophe insurance program for public assets (buildings, their contents, and national infrastructure). Because NICL has been entrusted with this specific mandate to insure the public sector property and risks, it is imperative to review its retention capacity versus reinsurance figures. NICL’s average retention during past three years has remained around 50 percent, which shows a reasonable risk appetite coupled with strong backing by reinsurers.

Discussions with the leading insurers as well as the SECP revealed limited understanding of the catastrophe exposure in the domestic insurance market, mainly owing to the inadequate availability of risk mapping data, and therefore the rates charged might be below the level required

<sup>42</sup> As of 2012, there is only a windstorm and earthquake model available from EQECAT Inc.

<sup>43</sup> Section 166, Insurance Ordinance of 2000.

considering the earthquake, flood, and tsunami exposures. The lack of discipline and competition in the market further restricts the required increases in premium rates. Further, in Pakistan, no specific or standardized underwriting guidelines are available to the industry for the underwriting of catastrophe risks.

Because of the non-availability of precise data, local insurers have shown strong reservations about the implications of the Insurance Ordinance's 72 hours' disaster definition clause, which, as a practical matter, is difficult to enforce.<sup>44</sup> Applications of event limits also remain a major concern for the insurers. Some insurers report that they conduct portfolio analyses to determine the expected distribution of losses from possible events such as atmospheric disturbances or earthquakes based on "Catastrophe Risk Evaluation and Standardizing Target Accumulations" (CRESTA) zone statistics.<sup>45</sup> However, CRESTA doesn't have a consistent risk zoning approach to classify risks.

Moreover, the development of catastrophe insurance and reinsurance in Pakistan is currently limited. There is no technical awareness and visible appetite for new products because inadequate data and conservative thinking regarding catastrophe insurance products is limiting the development of this important line of business.

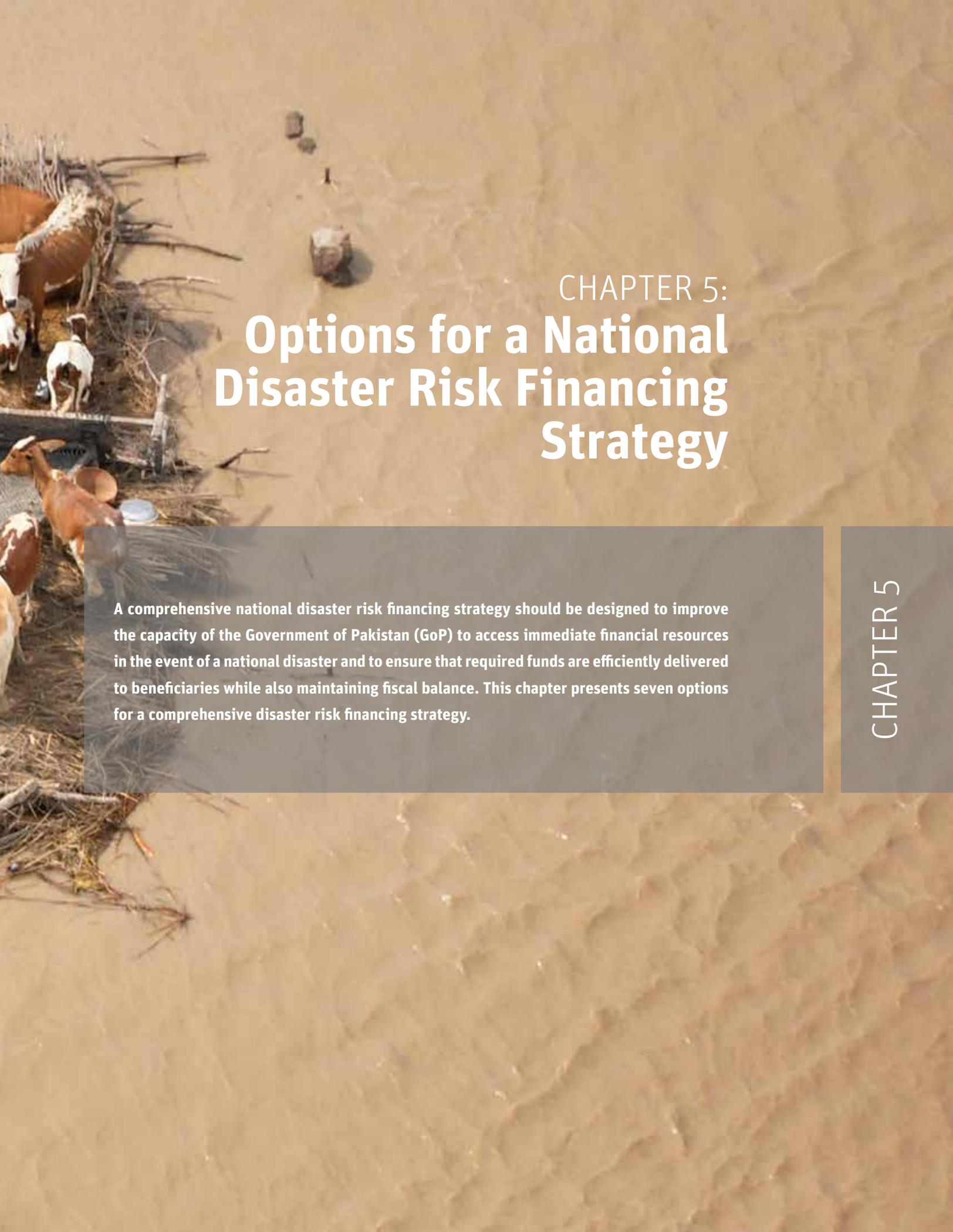
With the exception of a few larger insurers, insurance companies in Pakistan generally do not fully understand natural catastrophe insurance products, which in turn translates into lower awareness among the consumers or potential policyholders. One consequence of this situation is underinsurance, which is often unintentional because the policyholders are not aware of the possible coverage (or lack thereof) and need for catastrophe insurance. One of the most critical, but prevalent, issues is the lower insurance density (premium per capita) and penetration (premium per GDP) in the country, due mainly to lower disposable incomes, education, and awareness than in more-developed as well as religious factors and inadequate insurer outreach.

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<sup>44</sup> In the insurance and reinsurance industry, an "hours clause" refers to a time period (usually measured in consecutive hours) during which claims resulting from a given occurrence (such as a natural catastrophe) may be included in the loss under cover. It aggregates all losses occurred in the specified time frame (usually 72 hours) as a single event. This has implications for deductibles, limits, and per occurrence liability of policies.

<sup>45</sup> CRESTA was founded in 1977 by the insurance and reinsurance industry as an independent body for the technical management of natural hazard coverage (CRESTA Secretariat website, Munich, <https://www.cresta.org>). CRESTA risk zone information—widely used by insurers internationally for assessing the insurance rates they will charge—is based on observed and expected seismic activity as well as on other natural disasters such as droughts, floods, and storms.





## CHAPTER 5: **Options for a National Disaster Risk Financing Strategy**

A comprehensive national disaster risk financing strategy should be designed to improve the capacity of the Government of Pakistan (GoP) to access immediate financial resources in the event of a national disaster and to ensure that required funds are efficiently delivered to beneficiaries while also maintaining fiscal balance. This chapter presents seven options for a comprehensive disaster risk financing strategy.

## Seven Strategic Options Following the Operational Framework

Options for a national disaster risk financing strategy in Pakistan follow the operational framework of (a) assessing risk, (b) arranging financial solutions, and (c) delivering funds to beneficiaries.

### Option 1: Develop a Central Database of Disaster Losses and Expenditures

A centralized database of historical budget expenditures and losses relating to disasters would support a better understanding of the country's fiscal exposure to disasters. Pakistan's decentralized, reactive approach to financing disasters—which differs province to province—makes it extremely difficult to perform a national analysis of the fiscal impact of natural catastrophes.

This report has compiled a database of disasters in Pakistan since 1973, including a measure of their impacts in terms of the number of people affected (see appendix A). However, scant data are available on (a) the actual economic costs of these events; (b) the public expenditures spent financing these losses; and (c) the mechanisms through which these funds were allocated and directed toward post-disaster relief, recovery, and reconstruction activities.

A central database that compiles historical disaster budget expenditures and losses would allow the GoP to analyze its past fiscal exposure to natural catastrophes, and this information would be invaluable in helping to understand and predict the future financial costs of disasters to the state. A development of technical capacity and necessary tools to quantify likely needs for disaster-related expenditure would help the government not only to determine appropriate allocations through the budget but also to explore and make informed proposals for possible sources of financing outside of the budget. This information can also help the government identify areas where policy clarification is needed on the types and extent of post-disaster spending.

The key agencies for the establishment and maintenance of such a database would be the National Disaster Management Authority, the Provincial Disaster Management Agencies, and the Ministry of Finance. The development of any such database would look to draw from existing budgetary and disaster risk management structures and systems rather than to create a new isolated structure.

**Table 5.1 Options for a National Disaster Risk Financing Strategy in Pakistan**

Time frame	Options for disaster risk financing
Short term	1. Develop a central database of disaster losses and expenditures to better predict future financial costs of disasters
Short term	2. Operationalize the National and Provincial Disaster Management Funds
Short term	3. Clarify contingent liability associated with post-disaster cash transfer programs and enhance the programs' financing sources to ensure efficient access to funds after a disaster
Short to medium term	4. Develop financial disaster risk assessment tools, including financial catastrophe risk models for the Ministry of Finance
Short to medium term	5. Develop models for improving financial response capacity to disasters
Medium term	6. Establish a robust catastrophe risk insurance program for public assets
Medium to long term	7. Promote property catastrophe risk insurance for private dwellings

## Option 2: Operationalize the National and Provincial Disaster Management Funds

The National Disaster Management (NDM) Act of 2010 established a National Disaster Management Fund (NDMF) at the federal level and Provincial Disaster Management Funds (PDMFs) in each province, but none of these funds is yet officially operationalized. Currently the main sources of post-disaster funding are contingency and supplementary budget lines (for relief and recovery) and the annual public sector development program (for reconstruction).

The NDMF and PDMFs could be used to consolidate some of the currently disparate sources of financing for disaster-related expenditures. Using dedicated funding structures could assist with tracking and reporting of post-disaster spending and could also help clarify the division of post-disaster responsibilities in advance of events through a rules-based approach to access. Dedicated structures with emergency protocols and clear rules for release of funds can also help to speed up access to post-disaster financing for implementing agencies.

The legislative basis and administrative structure for the NDMF and PDMFs already exist. The next steps to operationalize these funds would involve developing a sustainable plan for financing the funds and working with the relevant authorizing and implementing agencies to integrate the funds into post-disaster processes. These actions also could determine any additional procedural or policy specifications required to make the funds as efficient as possible.

Regarding a plan for financing, these funds could finance some portion of the low-risk layer of a national disaster risk financing strategy (such as localized floods and landslides; see option 5). Guided by the preliminary flood risk profiles developed for this report, we estimate that financing for disaster losses of US\$1.2 to US\$1.8 billion is required annually. In the case of Punjab specifically, the preliminary flood risk analysis has identified annual financing needs of US\$0.8 to US\$1.2 billion. Additional analyses would be required for other perils and other provinces, but these figures give a ballpark estimate of the size of disaster risk management funds required in Pakistan.

One model for disaster risk financing may be found in Mexico which set up its Natural Disaster Fund (FONDEN) in 1996 to provide quick funds following natural catastrophes (as further discussed in box 5.1 and appendix C). Some of the main benefits from the establishment of the fund include clarification of the division between federal and state post-disaster responsibilities; encouragement of insurance purchases by public asset managers; commitment of entities to an audited, rules-based approach in the use of post-disaster disbursements; and development of a linked financing structure that leverages both public and private capital.

## Option 3: Clarify Contingent Liability Associated with Post-disaster Cash Transfer Programs and Enhance the Programs' Financing Sources

The GoP manages cash transfer programs that provide rapid financial relief to vulnerable populations in the aftermath of disasters. Cash transfer programs were designed in response to the 2005 earthquake, and the 2010 floods (at a national level) and to the large floods in 2011 and 2012 (at a provincial level). In 2012, the GoP developed a National Disaster Response Plan for future cash transfer-based responses.<sup>46</sup> The plan, approved by the prime minister, gives responsibility for early recovery cash transfer support to the Cabinet Division, building on the 2010 flood response, which was a partnership between the federal and provincial governments and served as the blueprint for the 2011 and 2012 provincial programs.

The plan provides clear mechanisms for administering future early-recovery cash transfer programs,

<sup>46</sup> "National Disaster Response Plan" (Islamabad: Government of Pakistan, 2012).

### Box 5.1 Mexico's Natural Disaster Fund (FONDEN)

Despite developing an institutional approach to disasters, all levels of government in Mexico were still regularly required to reallocate planned capital expenditures toward financing post-disaster reconstruction efforts. Budget reallocations created delays and scaling back of investment programs, while also slowing deployment of funds for recovery efforts.

In response, the country passed legislation in 1994 to require federal, state, and municipal assets to be privately insured. In 1996, the government created the Natural Disaster Fund (FONDEN) in the Ministry of Finance.

FONDEN is an instrument for the coordination of intergovernmental and interinstitutional entities to quickly provide funds in response to disasters. FONDEN's main purpose is to provide immediate financial support to federal agencies and local governments recovering from a disaster, particularly for (a) provision of relief supplies, and (b) financing for reconstruction of public infrastructure and low-income homes. FONDEN is also responsible for carrying out studies on risk management and contributing to the design of risk transfer instruments. (See appendix C for additional details.)

**The federal government has also used the FONDEN program to promote financial discipline at all levels. A rules-based approach, making access to FONDEN funds conditional on the purchase of insurance for public assets,**

is one mechanism through which the program seeks to instill financial discipline. Under these rules, the FONDEN program will only fund up to 50 percent of the reconstruction cost for federal assets that are not insured and that have received support in the past. For uninsured state assets, the figure is 25 percent. No support is available if the asset is damaged a third time and remains uninsured. In contrast, insured assets are eligible for FONDEN funding to cover 100 percent of reconstruction costs for federal assets and 50 percent for local assets irrespective of past claims through the program.

FONDEN also uses its connection with the private insurance market to commit both the federal and state governments to an audited, rules-based approach to post-disaster disbursements. An insurance contract is in place between the program and the international markets, which is linked to loss reporting by state and federal entities covered under the FONDEN program. Thus the reconstruction requests and implementation are subject to the transparency standards of the international markets in addition to the formal process of post-disaster reconstruction reporting managed by the Ministry of the Interior.

*Source:* Secretaría de Gobernación (2011). New General Rules and Specific Operating Guidelines for FONDEN, published by Mexico's National Civil Protection. 31 January 2011. Information can be accessed online at [www.proteccioncivil.gob.mx](http://www.proteccioncivil.gob.mx)

including a combination of geographic and poverty targeting to identify beneficiaries and verify their eligibility through the National Database and Registration Authority (NADRA). However, to date this plan, although approved, is not being implemented as planned at the federal level. At the provincial level, some efforts have been made, such as in Punjab, where the government is trying to put systems in place for efficient cash transfer responses, building on its experience from previous provincial-level cash transfer responses to flooding disaster. These experiences could help with the setup for a systematic post-disaster safety net.

For the poverty-based targeting of these cash transfers, the plan recommends using the National Poverty Registry (NPR), which covers almost the entire population of the country (more than 27 million households) and facilitates different score cutoffs to represent percentiles of the poorest population. Although the country also has a nationwide social safety net—the Benazir Income Support Programme (BISP, further discussed in box 5.2), which uses the NPR to identify its beneficiaries—the cutoff for disaster recovery benefits can be set, depending on fiscal space and need, either above or below the cutoff used to identify BISP beneficiaries.

Given the frequency of disasters (particularly floods) affecting Pakistan and the aggregate value of the transfer payments, such cash-transfer recovery programs represent a material and uncertain fiscal liability for the GoP. Although the mechanics of the payment system function well, the government lacks a clear understanding of the annual expected payments required from the program or of the probable maximum payments. Furthermore, no financial strategy is in place to ensure that the requisite funds are available on a timely basis without requiring a reallocation of resources from ongoing, planned government expenditures.

### Box 5.2 The Benazir Income Support Program (BISP)

**BISP was established as an autonomous national safety net authority through an act of parliament in 2010. Keeping in view the available fiscal space and the benefit amount to be paid to the beneficiaries, the program currently targets around 20 percent of the poorest (more than 7 million families) through a proxy means test-based poverty census. Its objective is to protect the poor against sharp rises in inflation and other financial shocks while also giving them the opportunity to exit poverty through complementary graduation programs.**

**The cash support is PRe 1,200 per month per family but paid quarterly (for example, PRe 3,600 per quarter). More than 80 percent of the disbursements are made electronically (via mobile phone and debit cards), which gives beneficiaries access to the money through points of sale and automatic teller machines (ATMs). The program is also testing intermediate and long-term graduation options, ranging from a conditional cash transfer program linked to primary education**

**of the beneficiaries' children (to help break intergenerational poverty) to imparting skills and microcredit for livelihood support.**

**The GoP provides most (93 percent) of BISP's budget through its development budget, and the rest of the funds come from other sources such as the Asian Development Bank, the U.K. Department for International Development (DFID), and the World Bank. Although this budget includes no specific contingency allocation for cash transfers in response to disasters, the budget mechanism allows for immediate addition of cash support to BISP beneficiaries if required.**

**The completion of the proxy means test for BISP resulted in a National Poverty Registry, which other programs are also using to target the poorest. To that end, the GoP approved a plan for cash transfers in response to future disasters, using the poverty registry and geographic location for the initial identification of beneficiaries for emergency recovery cash transfers.**

At present, the extent of liability varies with both the severity of the disaster and the available fiscal space. Discussions could be held with the GoP to determine whether the extent and size of cash transfers could be explicitly defined, clarifying government responsibility in the case of a disaster. Once the contingent liability is defined, a risk financing strategy (including options such as reserves, contingent credit instruments, and insurance) could be developed to manage its volatility and thus address the issue of fiscal space.

To adequately plan for likely future demands from this program, the contingent liability must be clearly quantified. A process to perform such quantification would require inputs from (a) risk assessment tools (concerning the likely frequency and intensity of natural hazards in Pakistan); (b) retrospective disaster impact analyses (concerning the relationships between geography and disaster intensity and thus the resulting cash payments); and (c) explicit GoP policy concerning cash responses, responsibility for fiscal liability, and payment amounts (in tranches and so on).

Therefore, it could be valuable to explore whether the cash transfer mechanism could become more efficient through the following approaches:

- Quantification of the range of the annual liability that arises from the cash transfer program
- Explicit definition of the liability, as described above
- Development of a risk financing strategy to manage the financial cost of the liability

#### **Option 4: Develop Financial Disaster Risk Assessment Tools**

The design of a comprehensive national disaster risk financing strategy begins with a detailed disaster risk assessment. Neither the federal government nor the provincial governments currently perform assessments of the likely budgetary impacts of natural catastrophes. Catastrophe risk modeling techniques can complement the actuarial analysis of historical loss data to assess the financial and fiscal exposure to disasters. Such models combine information on the underlying natural perils (hazard), the assets at risk (exposure), and their potential damageability (vulnerability) to calculate estimates of economic and fiscal risk. (For a further discussion of catastrophe risk modeling, see chapter 3, box 3.1.)

Hazard modules for the major perils should be developed in Pakistan. Chapter 3 of this report presented an actuarial analysis of historical fiscal impacts to generate preliminary fiscal disaster risk profiles for the GoP and the province of Punjab for the peril of flood. These analyses alone were possible because of the data available for flood events across the country and in Punjab. The lack of historical data for other major perils (in particular, earthquakes and tropical cyclones) means that hazard models should be developed or acquired that will provide preliminary estimates of the frequency and severity of these additional perils at the federal and provincial levels. The technical expertise within national geoscience and academic entities can be leveraged to help develop specific hazard modules, with World Bank guidance if required. At the time of writing, efforts are under way to address this requirement for greater technical understanding of the natural hazards facing Pakistan. In 2012, the National Disaster Management Authority (NDMA) established a National Working Group on Vulnerability and Risk Assessment along with four subject-specific technical subgroups to lead and coordinate the efforts for earthquake hazard, flood hazard, exposure, and vulnerability and risk communication.<sup>47</sup>

In addition, a national georeferenced exposure database could be built. This data set would include

<sup>47</sup> "National Working Group," National Disaster Management Authority, accessed Aug. 12, 2015, <http://www.disasterinfo.gov.pk/nwg>.

the locations and attributes of public and private buildings as well as infrastructure exposed to natural perils. The public assets catalogued would include schools, hospitals, water and sanitation facilities, public buildings, and roads and bridges. Private dwellings could also be included, especially those identified as being an implicit contingent liability to the GoP (for example, the housing stock the lowest socioeconomic groups). Agricultural assets such as crops, and georeferenced socioeconomic data on households could also be included to assess population needs and impacts on farmers. This database could support immediate post-disaster needs assessments and would also be used as an input to one or more catastrophe risk models, allowing the economic and fiscal impacts of disasters to be better quantified. In addition, this information could help the insurance industry to offer more sustainable and affordable property catastrophe insurance products.

Finally, a catastrophe risk model combining analyses of flood, earthquake, and tropical cyclone hazards could be the basis of financial decision-making tools for the Ministry of Finance. It would include a financial model that would build on the modeled losses of the catastrophe risk model and the historical losses. This tool could help the ministry to design the national disaster risk financing strategy, including the size of the annual budget allocations to the National and Provincial Disaster Management Funds, the structuring of contingent social safety net programs, and any disaster risk transfer strategy (such as insurance). Mexico's finance ministry currently uses such a financial model, as described in box 5.3.

### **BOX 5.3 R-FONDEN: The Financial Catastrophe Risk Model of the Mexico Ministry of Finance and Public Credit**

To inform the design of a risk financing strategy for its Natural Disaster Fund (FONDEN), the Government of Mexico developed R-FONDEN, a probabilistic catastrophe risk model tool. R-FONDEN (for Riesgo-FONDEN, or FONDEN Risk) offers catastrophe risk analysis of four major perils (earthquake, floods, tropical cyclones, and storm surge) concerning infrastructure in key sectors (education, health, roads, and low-income housing) at the national, state, and substate levels. The analysis can be performed on a scenario basis or on a probabilistic basis.

R-FONDEN takes as input a detailed exposure database (including details of buildings, roads, and other public assets) to calculate risk metrics including annual expected loss (AEL) and probable maximum loss (PML). The Institute of Engineering of the National

Autonomous University of Mexico (UNAM) led the technical coordination of the R-FONDEN initiative.

This model is currently used by the Ministry of Finance and Public Credit, in combination with the actuarial analysis of historic loss data, to monitor the disaster risk exposure of the FONDEN portfolio. It has also helped the ministry to design disaster risk transfer strategies, such as the placement of indemnity-based reinsurance and the issuance of catastrophe bonds.

For further information on FONDEN, see appendix D.

*Sources:* GFDRR (Global Facility for Disaster Reduction and Recovery), "FONDEN: Mexico's National Disaster Fund: An Evolving Inter-Institutional Fund for Post-Disaster Expenditures," fact sheet (Washington, DC: GFDRR, 2013); GFDRR and World Bank, "FONDEN: Mexico's National Disaster Fund—A Review" (Washington, DC: World Bank, 2012).

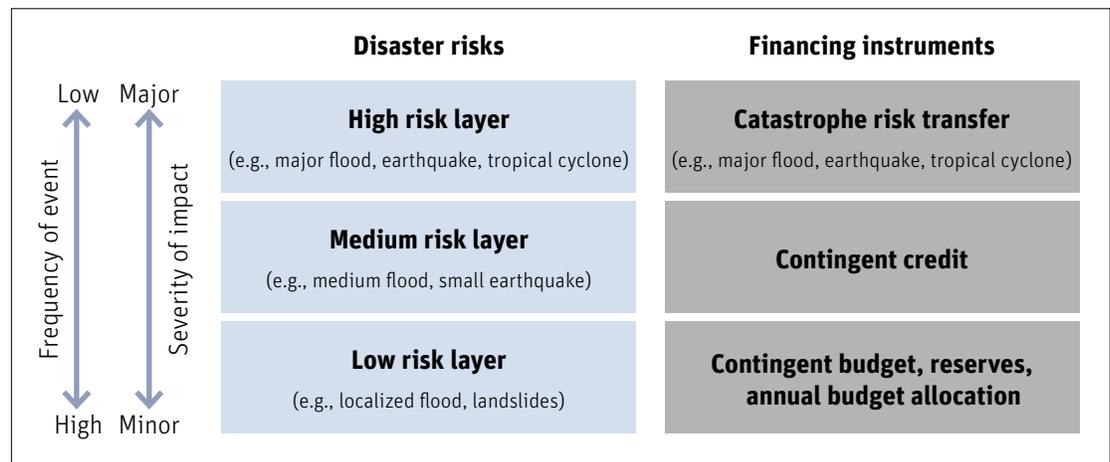
One of the key findings of chapter 4 of this report is the low level of technical understanding in Pakistan’s insurance and reinsurance sector. Detailed hazard and exposure models developed by the GoP could improve the knowledge base in the private sector, which in turn could help to improve (a) the quality of the insurance products offered by the market; (b) portfolio optimization of the primary insurance market; (c) negotiations on reinsurance pricing and rating agency submissions of insurance companies; and (d) the overall level of market penetration of non-life insurance across Pakistan. All of these improvements would help to reduce the GoP’s contingent liability in the event of a disaster.

**Option 5: Develop Models for Improving Financial Response Capacity**

The GoP could develop a national disaster risk financing strategy, with the technical support of the World Bank, that articulates how disaster losses will be financed at the national, provincial, business, and household levels. The strategy would articulate policy on post-disaster interventions for different beneficiary groups and would also present a plan for financing expected costs.

A mix of financing mechanisms would be determined based on expected losses, applied in a risk-layering approach, illustrated in figure 5.1. This approach offers an optimal mix of risk retention (through reserves or contingency budget and contingent credit lines) and risk transfer instruments (such as insurance). See appendix F for further details and a comparative analysis of risk financing and risk transfer products. Appendix G describes an operational framework for implementing disaster risk financing and insurance solutions.

**Figure 5.1 Three-Tiered Financial Strategy for Disaster Risk: A Bottom-Up Approach**



The preliminary flood risk profiles conducted as part of this report indicate that the government faces average costs of US\$1.2 to US\$1.8 billion every year.<sup>48</sup> Furthermore, a major flood event (occurring, on average, once every 100 years) could cost upward of US\$10 billion. Different financial instruments will be suitable for financing the smaller, recurrent losses and the large, infrequent losses to which Pakistan is exposed. The contingent liability arising from establishment of any disaster-linked social protection schemes should also be considered within the financing strategy.

For example, the National and Provincial Disaster Management Funds could be operationalized

<sup>48</sup> This estimate represents the annual expected national disaster loss from modeled perils only and is included only as a demonstration of the rough magnitude of losses.

and funded appropriately to deal with some part of the more-frequent, smaller losses using grants from the annual budget combined with external financing sources. For larger events that are not cost-efficient to prefund, contingent instruments such as insurance and contingent credit become effective tools. A number of countries in Central and South America have used the World Bank's contingent credit product—the Development Policy Loan with Catastrophe Drawdown Option—to access rapid liquidity in the event of a disaster (box 5.4). The Government of the Philippines also used one of these facilities to draw down US\$500 million to respond to Tropical Storm Sendong, which struck at the end of 2011.

### **Box 5.4 World Bank Development Policy Loan with Catastrophe Drawdown Option**

The Development Policy Loan with Catastrophe Drawdown Option (Cat-DDO) offers a source of immediate liquidity that can serve as bridge financing while other sources (such as concessional funding, bilateral aid, or reconstruction loans) are being mobilized after a disaster.

Borrowers have access to financing in amounts up to US\$500 million or 0.25 percent of gross domestic product (GDP), whichever is less. The Cat-DDO has a “soft” trigger, as opposed to a “parametric” trigger; funds can be drawn down upon the declaration of a state of emergency from a disaster. See appendix B for additional details.

Governments are also increasingly using risk transfer instruments such as insurance, catastrophe bonds, and catastrophe derivatives to deal with infrequent large events. In these cases, the higher “per-dollar payout” cost of risk transfer relative to retaining risk through reserves or credit is merited by the substantial financial capacity they offer. For example, the Government of Mexico has transferred catastrophic hurricane and earthquake risk to the international markets via catastrophe bonds and excess of loss insurance since 2006. The latest transaction in 2012 placed US\$315 million of risk via a catastrophe bond.

In summary, the GoP should consider a “bottom-up” disaster risk financing approach. It should secure financing for recurrent events through risk retention (operationalization of national and provincial reserves or contingent credit) and then deal with the higher-risk layers by increasing its level of financial resilience through the consideration of disaster risk transfer instruments.

### **Option 6: Establish a Robust Catastrophe Risk Insurance Program for Public Assets**

Disasters can severely affect public assets (such as schools and hospitals) and public infrastructure (such as roads and bridges). Countries' strategies for financing the reconstruction of public assets will vary depending on many factors including access to capital markets and the size of the event with respect to the fiscal budget. For example, developed economies with easy access to the capital markets may choose to self-insure because they can access additional financial capacity to bear the full cost of recovery and reconstruction after a disaster strikes. Other countries may require by law that public assets carry catastrophe insurance against disasters. Even where catastrophe risk insurance is compulsory, in practice, most public assets remain either uninsured or underinsured—

in part because public managers are reluctant to spend part of their limited budgets to pay insurance premiums, and in part because they lack adequate information to select cost-effective insurance coverage.

By law, public assets in Pakistan are required to be insured, and the state-owned National Insurance Company Limited (NICL) has the mandate to provide that insurance. However, it is not clear how comprehensive this coverage is and what the uptake rate of insurance is by managers of public assets. Our analysis suggests that public assets and infrastructure are not comprehensively insured against catastrophic risks in Pakistan, although some provinces and municipalities have recently insured specific, select public assets. Lack of consistent insurance of public assets highlights the need for a comprehensive database of public infrastructure. NICL could also use such a database to determine the insurability of these assets. Initiatives by the NDMA, the World Bank, and other agencies to collate, share, and synthesize geospatial information—including property and infrastructure that could potentially be affected by natural catastrophes—could be valuable for a public asset insurance program.

A catastrophe risk insurance program for public assets in Pakistan could be established in collaboration with the private insurance industry. Typically, through such a program, private insurers offer technical assistance to public entities in the design of their catastrophe insurance coverage of public assets. Standardized terms and conditions for the property insurance policies also would be developed in collaboration with the private insurance industry to help public managers identify their risk exposure and their insurance needs. The program could also structure a national insurance portfolio of public assets for placement in the private insurance and reinsurance market. A national approach to insuring public assets would allow for economies of scale and diversification benefits, and thus for lower reinsurance premiums as well.

In preparation of such a catastrophe risk program, a centralized database of public buildings, their contents, and nationwide infrastructure could be developed (as part of the activity to develop a national, georeferenced database of national assets) as well as a database of current insurance policies in force.<sup>49</sup> Analysis of both will help identify current blind spots and inefficiencies in the overall process of insuring public assets. In addition to better understanding the inclusions and exclusions of NICL natural catastrophe risk policies, a detailed dynamic financial analysis (DFA) of the portfolio of risks insured by NICL would provide key information and insight regarding portfolio optimization and evaluation of reinsurance structures.

### **Option 7: Promote Property Catastrophe Insurance for Private Dwellings**

In Pakistan, less than 1 percent of the residential property stock is currently insured against disasters. This low penetration is a direct result of the relatively poor development of the country's private non-life insurance market. However, other factors such as insurance affordability for families and general aversion to the concept of insurance also are key factors in Pakistan's low insurance penetration.

The GoP may therefore want to promote catastrophe insurance for private residential properties. A developed domestic property catastrophe insurance market would reduce the GoP's implicit contingent exposure to major disasters. To help stimulate market development, the GoP could finance and distribute exposure and loss models to private insurers. The government could also support information and awareness campaigns.

Turkey provides an international case study of the development of a national homeowners'

<sup>49</sup> Similar initiatives have recently been undertaken in Colombia and Peru.

catastrophe insurance program. The Turkish Catastrophe Insurance Pool (TCIP) was established in 2000 to help address issues of market failure in the country, specifically a lack of local-market earthquake insurance capacity and lack of demand for policies. The World Bank provided technical and financial assistance during the design stage of the TCIP to help model and rate the earthquake exposure. The Bank also made a contingent loan available during the start-up implementation stage to cover claims as part of the risk financing program. A key feature of the coverage is that it is a simple, earthquake-only property policy that is provided at affordable rates. Given the low voluntary demand for insurance by Turkish homeowners, earthquake insurance was made compulsory for registered houses in urban centers. Box 5.5 provides further description of the TCIP program.

### **BOX 5.5 The Turkish Catastrophe Insurance Pool (TCIP)**

The Turkish Catastrophe Insurance Pool (TCIP) is a public sector insurance company that is managed on sound technical and commercial insurance principles. The TCIP purchases commercial reinsurance, and the Government of Turkey acts as a catastrophe reinsurer of last resort for claims arising from an earthquake with a return-period loss of greater than 300 years.

The TCIP policy is a stand-alone property earthquake policy with a maximum sum insured per policy of US\$65,000; an average

premium rate of US\$46 per year; and a 2 percent of sum insured deductible. Premium rates are based on construction types (two types) and property location (differentiating between five different earthquake zones), and they vary from less than 0.05 percent for a reinforced-concrete house in a low-risk zone to 0.60 percent for a house in the highest-risk zone. Since its inception, the TCIP has achieved a penetration rate of approximately 20 percent, or 3 million domestic dwellings. See appendix D for additional details.

Should the GoP decide to establish a private residential catastrophe insurance program, it would have to make a number of key decisions, including the following:

- Whether to form a public sector catastrophe insurance fund (as in Turkey) or to promote some form of coinsurance pool through the involvement of the existing non-life commercial insurers.
- Whether to make homeowners' property insurance compulsory or to market the coverage on a voluntary basis. In Turkey, homeowner demand for property insurance was low because of the lack of an insurance culture; hence, it was deemed necessary to make coverage compulsory.
- Whether to bundle property catastrophe insurance with mortgages (at least as an initial step for homeowners) or to keep it as stand-alone coverage. Mortgage-linked catastrophe insurance could be made compulsory; alternatively, coverage could be bundled with property taxes. Because mortgage coverage usually extends over a longer time period, any shortfall later on could be covered by the sufficient capitalization of an insurance scheme.
- Whether to target the product only at urban property owners or to target all households. In Turkey, earthquake insurance is only compulsory in urban areas. In Pakistan, much of the rural building stock is unlikely to meet the minimum building standards required by local insurers and their respective reinsurance markets.

- Whether to involve the government in the program through a public-private partnership. This could include the provision of start-up funding (such as research and development costs) or early-phase risk-bearing capital.

Finally, improved coverage of insurance supervision would be required to effectively promote catastrophe risk coverage among private insurers. The quality of insurance supervision in Pakistan could be further improved through the use of a risk-based assessment of insurers' retention capacity and reinsurance strategies based on catastrophe risk modeling and actuarial tools. To that end, the World Bank, the Financial Sector Reform and Strengthening Initiative (FIRST), and the Securities and Exchange Commission of Pakistan have begun a project to harmonize the overall insurance legal and regulatory framework and to incorporate risk-based supervision.<sup>50</sup> The risk-based capital (RBC) method offers guidance to insurance companies to better manage risks. For example, RBC requires an insurance company with a higher risk to hold a larger amount of capital. There are also options for the market to adopt DFA tools that complement actuarial models to further refine the commercial earthquake premium rates and to assess the impact of disasters on the insurers' portfolio. A scoring tool to assess the quality and adequacy of the insurers' reinsurance strategies could also be developed.

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<sup>50</sup> FIRST, established in 2002, is a multidonor grant facility that provides short- to medium-term technical assistance to promote sounder, more efficient, and inclusive financial systems. Its current donors include the U.K. Department for International Development (DFID), Germany's Federal Ministry of Economic Cooperation and Development, the Ministry of Finance of Luxembourg, the Ministry of Foreign Affairs of the Netherlands, and the State Secretariat for Economic Affairs of Switzerland (SECO), in addition to the World Bank Group and the International Monetary Fund. For more information, see the FIRST website: <https://www.firstinitiative.org/>.

## Appendix A: Historical Disaster Database for Pakistan

A historical disaster database was compiled, specifically for this report, of the disasters that have affected Pakistan since 1973. The historical disaster data were gathered following a review of the available data at the National Disaster Management Authority (NDMA) and Provincial Disaster Management Authorities (PDMAs) across all the provinces and regions in Pakistan.

Although these data were readily available for the major recent disasters, the data for older events were extracted from the archives of the provincial relief commissioners housed in the provincial revenue departments.

The data collector met with the NDMA at the federal level and, at the provincial level, with the PDMAs, provincial finance departments, and provincial revenue departments. In some cases, records of the districts affected by various disasters were also analyzed to validate the numbers available at the provincial and national levels.

**Table A.1 Historical Disaster Impact Database**

Event	Year	Month	Peril	Region	Population affected (trended to 2012)
1	1973	—	Floods	Punjab	12,752,422
2	1975	—	Floods	Punjab	4,848,593
3	1976	—	Floods	Punjab	16,453,384
4	1977	—	Floods	Punjab	1,461,504
5	1978	—	Floods	Punjab	3,967,616
6	1979	—	Floods	Punjab	96,313
7	1980	—	Floods	Punjab	9,859
8	1981	Mar	Windstorm, tornado	Punjab	9,847
9	1981	—	Floods	Punjab	1,431,192
10	1982	—	Floods	Punjab	54,815
11	1983	—	Floods	Punjab	134,961
12	1984	—	Floods	Punjab	105,594
13	1985	—	Floods	Punjab	37,764
14	1986	—	Floods	Punjab	1,480,123
15	1988	—	Floods	Punjab	5,031,270
16	1989	—	Floods	Punjab	247,290
17	1990	—	Floods	Punjab	24,088
18	1991	Feb	Floods	Balochistan	1,087
19	1992	May	Earthquake	KPK	13,764
20	1992	Aug	Floods	AJK, Punjab, and Sindh	6,755,409
21	1993	Mar	Avalanche	KPK	619
22	1993	Jul	Floods	Punjab	400,677
23	1993	Nov	Windstorm	Sindh	6,285
24	1994	May	Windstorm	Punjab	302
25	1994	—	Floods	Punjab	373,103
26	1994	—	Floods and rains	Sindh	1,020,772
27	1995	—	Floods	Punjab and Sindh	3,088,514

Event	Year	Month	Peril	Region	Population affected (trended to 2012)
28	1996	Aug	Floods	Punjab	1,786,433
29	1997	Jun	Windstorm	KPK	204
30	1997	Oct	Windstorm	Sindh	177
31	1997	—	Floods	Punjab	2,850,899
32	1997	—	Cyclone Makran	Balochistan	136,695
33	1998	Mar	Floods	Balochistan	36,221
34	1998	Aug	Windstorm	Punjab	842
35	1998	—	Floods	Punjab	1,529
36	1999	May	Cyclone	Sindh	776,162
37	1999	—	Floods	Punjab	322
38	2000	—	Floods	Punjab	890
39	2000	—	Drought	Balochistan	1,523,624
40	2001	Jan	Earthquake	Sindh	1,119,180
41	2001	Mar	Windstorm, tornado	Punjab	34
42	2001	—	Drought	Punjab	10,293,468
43	2001	—	Floods	KPK	1,129
44	2002	May	Windstorm	Punjab	216
45	2002	Nov	Earthquake	GB	104,378
46	2002	—	Cyclone	Punjab	20,495
47	2002	—	Drought	Punjab	10,227,242
48	2003	Feb	Rains	Sindh	10,999
49	2003	Feb	Heavy rains	Balochistan	4,481
50	2003	Feb	Heavy rains	AJK	41
51	2003	Feb	Heavy rains	KPK	220
52	2003	Jul	Rains	Balochistan	283,721
53	2003	—	Floods	Punjab	9,681
54	2003	—	Drought	Punjab	89,142
55	2003	—	Rains	Sindh	1,030,318
56	2004	Feb	Earthquake	KPK	45,463
57	2004	—	Drought	Punjab	884,203
58	2005	Feb	Snowfall and rains	KPK	3,468,126
59	2005	Feb	Snowfall and rains	Balochistan	80,923
60	2005	Feb	Snowfall and rains	AJK	118
61	2005	Jul	Floods	KPK and Punjab	423,005
62	2005	Oct	Earthquake	AJK and KPK	4,046,147
63	2005	Dec	Avalanche	KPK	189
64	2006	Jul	Monsoon	AJK, KPK, and Sindh	2,133,403
65	2006	Sep	Floods	Punjab	342,119
66	2007	Mar	Landslide	AJK	235
67	2007	Apr	Avalanche	GB	220
68	2007	Sep	Cyclone Yemyin	Balochistan and Sindh	2,377,813
69	2007	Nov	Floods	Punjab	5,762
70	2007	—	Heavy rain	Sindh	318
71	2007	—	Cloudburst	KPK	379
72	2008	Sep	Floods	Punjab	120,621
73	2008	Oct	Earthquake	Balochistan	437,396
74	2008	Oct	Earthquake	KPK	74,576
75	2009	Feb	Earthquake	AJK	—

Event	Year	Month	Peril	Region	Population affected (trended to 2012)
76	2009	May	Avalanche	AJK	175
77	2009	Jul	Heavy rains	Balochistan	139
78	2009	Aug	Flash floods	KPK	3,285
79	2009	Oct	Floods	Punjab	223
80	2010	Jan	Landslides and floods	GB	316
81	2010	Feb	Breach of Zalzal Lake	AJK	14
82	2010	Feb	Avalanche	KPK	3,832
83	2010	May	Floods	GB	13,711
84	2010	–	Cyclone	Sindh	72
85	2010	–	Floods	AJK, Balochistan, FATA, GB, Punjab, and Sindh	19,094,527
86	2011	Mar	Tornado	Punjab	62
87	2011	Apr	Landslide	AJK	1,348
88	2011	Aug	Floods	Balochistan, Punjab, and Sindh	9,642,812
89	2012	Feb	Avalanche	AJK	97
90	2012	Mar	Avalanche	AJK	–
91	2012	Mar	Windstorm	AJK	1
92	2012	Mar	Windstorm	AJK	–
93	2012	Mar	Windstorm	AJK	–
94	2012	Mar	Avalanche	AJK	35
95	2012	Mar	Avalanche	AJK	1
96	2012	Apr	Avalanche	GB	936
97	2012	Sep	Lightning	AJK	2
98	2012	Sep	Flash flood	AJK	90
99	2012	Sep	Landslide	AJK	1
100	2012	Oct	Monsoon	AJK	451
101	2012	–	Floods	Balochistan, Punjab, and Sindh	4,964,154
102	2012	–	Torrential rain, flood	KPK	46,847

Note: – = not available. AJK = Azad Jammu and Kashmir. FATA = Federally Administered Tribal Areas. GB = Gilgit-Baltistan. KPK = Khyber Pakhtunkhwa.

# Appendix B: World Bank Development Policy Loan with Catastrophe Drawdown Option

The Development Policy Loan with Catastrophe Drawdown Option (Cat-DDO) is a contingent credit line that provides immediate liquidity to International Bank for Reconstruction and Development (IBRD) member countries in the aftermath of a disaster. It is part of a broad spectrum of World Bank Group disaster risk financing instruments available to assist borrowers in planning efficient responses to catastrophic events.

The Cat-DDO helps develop a country's capacity to manage the risk of disasters and should be part of a broader preventive disaster risk management (DRM) strategy. The Cat-DDO complements existing market-based disaster risk financing instruments such as insurance, catastrophe bonds, reserve funds, and others.

To gain access to financing, the borrower must implement a DRM program, which the Bank will monitor on a periodic basis.

## Key Features

The Cat-DDO offers a source of immediate liquidity that can serve as bridge financing while other sources (such as concessional funding, bilateral aid, or reconstruction loans) are being mobilized after a disaster. The Cat-DDO ensures that the government will have immediate access to bridge financing following a disaster, which is when a government's post-disaster liquidity constraints are highest.

Borrowers have access to financing in amounts up to US\$500 million or 0.25 percent of gross domestic product (GDP), whichever is less. The Cat-DDO has a "soft" trigger as opposed to "parametric" trigger, which means that funds become available for disbursement upon the occurrence of a disaster resulting in the declaration of a state of emergency.

The Cat-DDO has a revolving feature; amounts repaid during the drawdown period are available for subsequent withdrawal. The three-year drawdown period may be renewed up to four times, for a total maximum period of 15 years.

## Pricing Considerations

The Cat-DDO carries a London interbank offered rate (LIBOR)-based interest rate that is charged on disbursed and outstanding amounts. The interest rate will be the prevailing rate for IBRD loans at the time of drawdown. A front-end fee of 0.5 percent on the approved loan amount and a renewal fee of 0.25 percent also apply.

The Cat-DDO provides an affordable source of contingent credit for governments to finance recurrent losses caused by disasters. The expected net present value of the cost of the Cat-DDO is estimated to be at least 30 percent lower than the cost of insurance for medium-risk layers (that is, a disaster occurring once every three years). This cost saving can be even higher when the country's opportunity cost of capital is greater.

**Table B.1 Major Terms and Conditions of the Catastrophe Drawdown Option**

Purpose	To enhance and develop the capacity of borrowers to manage catastrophe risk To provide immediate liquidity to fill the budget gap after a natural disaster To safeguard ongoing development programs
Eligibility	All IBRD-eligible borrowers (upon meeting preapproval criteria)
Preapproval criteria	Appropriate macroeconomic policy framework The preparation or existence of a disaster risk management program
Loan currency	euro, yen, and U.S. dollar
Drawdown	Up to the full loan amount is available for disbursement at any time within three years from loan signing. Drawdown period may be renewed up to a maximum of four extensions
Repayment terms	Must be determined upon commitment and may be modified upon drawdown within prevailing maturity policy limits
Lending rate	Like regular IBRD loans, the lending rate consists of a variable base rate plus a spread. The lending rate is reset semiannually on each interest payment date, and applies to interests periods beginning on those dates. The base rate is the value of the six-month LIBOR at the start of an interest period for most currencies, or a recognized commercial bank floating rate reference for others
Lending rate spread	The prevailing spread, either fixed or variable, for regular IBRD loans at time of each drawdown.  1. Fixed for the life of the loan: consists of IBRD's projected funding cost margin relative to LIBOR, plus IBRD's contractual spread of 0.50%, a risk premium, a maturity premium for loans with average maturities greater than 12 years, and a basis swap adjustment for non US\$ loans.  2. Variable resets semiannually: consists of IBRD's average cost margin on related funding relative to LIBOR plus IBRD's contractual spread of 0.50% and a maturity premium for loans with average maturities greater than 12 years. The variable spread is recalculated on January 1 and July 1 of each year.  The calculation of the average maturity of DDOs begins at loan effectiveness for the determination of the applicable maturity premium, but at withdrawal for the remaining components of the spread.
Front-end fee	0.50% of the loan amount is due within 60 days of effectiveness date; may be financed out of loan proceeds.
Renewal fee	0.25% of the undisbursed balance
Currency conversions, interest rate conversions, caps, collars, payment dates, conversion fees, prepayments	Same as regular IBRD loans
Other features	Country limit: maximum size of 0.25% of GDP or the equivalent of US\$500 million, whichever is smaller. Limits for small states are considered on a case-by-case basis.  Revolving features: Amounts repaid by the borrower are available for drawdown, provided that the closing date has not expired.

Source: World Bank.

Note: IBRD = International Bank for Reconstruction and Development. LIBOR = London interbank offered rate. DDOs = drawdown options.

## Appendix C. Mexico's Natural Disaster Fund (FONDEN)

Mexico has a long history of, and broad exposure to, disasters. Located on the world's "fire belt"—where 80 percent of the world's seismic and volcanic activity takes place—Mexico is a seismically active country. The country is also highly exposed to tropical storms and is located in one of the few regions of the world that can be affected simultaneously by two independent cyclone regions: the North Atlantic and the North Pacific.

To address its vulnerability to adverse natural events, Mexico has developed a comprehensive institutional approach to disasters. The catalyst to comprehensive disaster risk management was the Mexico City earthquake of 1985, which killed 6,000 people, injured 30,000 others, and left a total of 150,000 victims. Total direct losses exceeded US\$4 billion.

Mexico established the National Civil Protection System (SINAPROC) in 1986 as the main mechanism for interagency coordination of disaster efforts. SINAPROC is responsible for mitigating societal loss and essential functions caused by disasters. Responsibility for SINAPROC lies with the Secretariat of the Interior, within which the National Center for Disaster Prevention (CENAPRED) was also established. CENAPRED is an institution that bridges the gap between academic researchers and government by channeling research applications developed by university researchers to the Secretariat of the Interior.

### The Natural Disaster Fund (FONDEN)

Despite developing an institutional approach to disasters, all levels of government in Mexico were still regularly required to reallocate planned capital expenditures toward financing post-disaster reconstruction efforts. Budget reallocations created delays and scaling back of investment programs, while also slowing deployment of funds for recovery efforts. In response, legislation was passed in 1994 to require federal, state, and municipal assets to be privately insured. In 1996, the government created the Natural Disaster Fund (FONDEN) in the Secretariat of Finance and Public Credit.

FONDEN is an instrument for the coordination of intergovernmental and interinstitutional entities to quickly provide funds in response to disasters. Its main purpose is to provide immediate financial support to federal agencies and local governments recovering from a disaster, particularly for (a) provision of relief supplies, and (b) financing for reconstruction of public infrastructure and low-income homes. FONDEN is also responsible for carrying out studies on risk management and contributing to the design of risk transfer instruments

### Main Features

FONDEN was originally established as a budgetary tool to allocate funds annually to pay for expected expenditures for disaster losses. In 1999, FONDEN was modified through the establishment the FONDEN Trust Fund, a catastrophe reserve fund that accumulates the unspent disaster budget of each year.

Financial support is directed toward public infrastructure as well as low-income households that, because of their poverty status, need government assistance. The adverse natural events covered by the FONDEN consist of geological perils (including earthquake, volcanic eruption, tsunami, and landslide) and hydrological perils (including drought, hurricane, excess rainfall, hail storm, flood, tornado, and wildfire).

FONDEN is based on three complementary instruments: the Revolving Fund, the FONDEN Program, and the FONDEN Trust Fund. The first provides monies for disaster relief efforts, the second supports reconstruction of infrastructure, and the third manages Mexico’s catastrophe risk financing strategy. They are further described as follows:

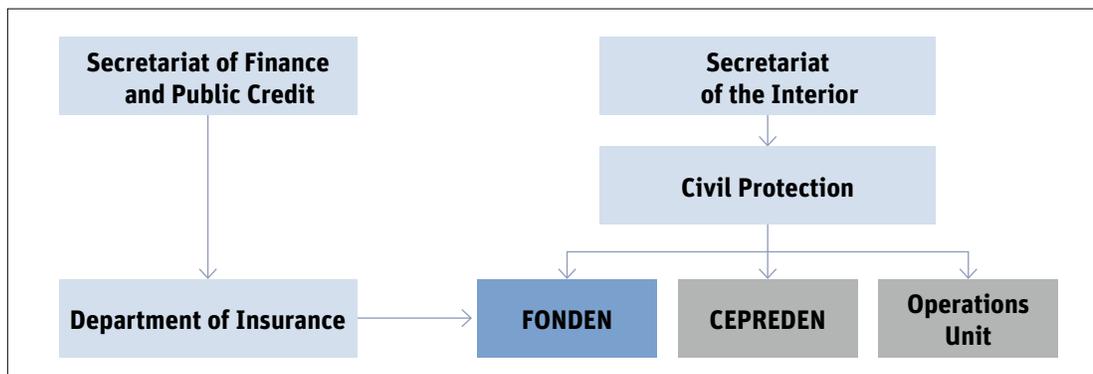
- *Revolving Fund*: This fund finances emergency supplies to be provided in the aftermath of a disaster, such as shelters, food, primary health care, and so on. In the case of high probability of a disaster, or imminent danger, the local governments can declare a situation of emergency and obtain resources from FONDEN immediately. Doing so allows local governments to take measures to prepare for immediate relief needs.
- *FONDEN Program*: This program finances rehabilitation and reconstruction projects for public infrastructure (owned by municipal, state, and federal governments) as well as the restoration of natural areas and private dwellings of low-income households following a disaster.
- *FONDEN Trust Fund*: This Trust Fund manages the assets of FONDEN, including its risk transfer strategy (reinsurance or alternative risk transfer instruments). The Federal FONDEN Trust manages the financial resources provided by the federal government, including the annual budget allocation. The State FONDEN Trusts, set up for each of the 32 states, manage the financial resources received from the federal FONDEN Trust after a disaster.

## FONDEN Institutional Structure

Located within the civil protection unit of the Secretariat of the Interior (figure C.1), FONDEN is a trust managed by one of Mexico’s main development banks (Banobras). The structure of FONDEN includes a counterparty in each of the 32 Mexican states, including Mexico City, to facilitate the assignment and management of federal transfers. The main advantage of this structure is the ability to provide resources to state governments immediately—on average, five days after the disaster.

The FONDEN Trust receives an annual allocation from the Secretariat of Finance and Public Credit to develop and manage its risk financing strategy. The risk is layered, with some tranches retained and others transferred through various instruments. To transfer risk to the reinsurance markets, or the capital markets for catastrophe bonds, the FONDEN Trust places excess risk first with the public insurer Agroasamex. This entity passes on the risk to the markets.

**Figure C.1 FONDEN Organizational Structure**



Source: World Bank (2012). FONDEN Mexico’s Natural Disaster Fund – a Review, published by the Global Facility for Disaster Reduction and Recovery, Washington DC, May 2012.

Note: FONDEN = Natural Disaster Fund. CEPREDEN = National Center for Disaster Prevention.

## FONDEN Program

The purpose of this program is to provide financing to state and local governments that are overwhelmed by the occurrence of a disaster. The assessment of losses to be cofinanced by FONDEN is based on a specific procedure involving the local and federal authorities. This procedure includes six main steps and should not exceed 23 days after occurrence of the disaster:

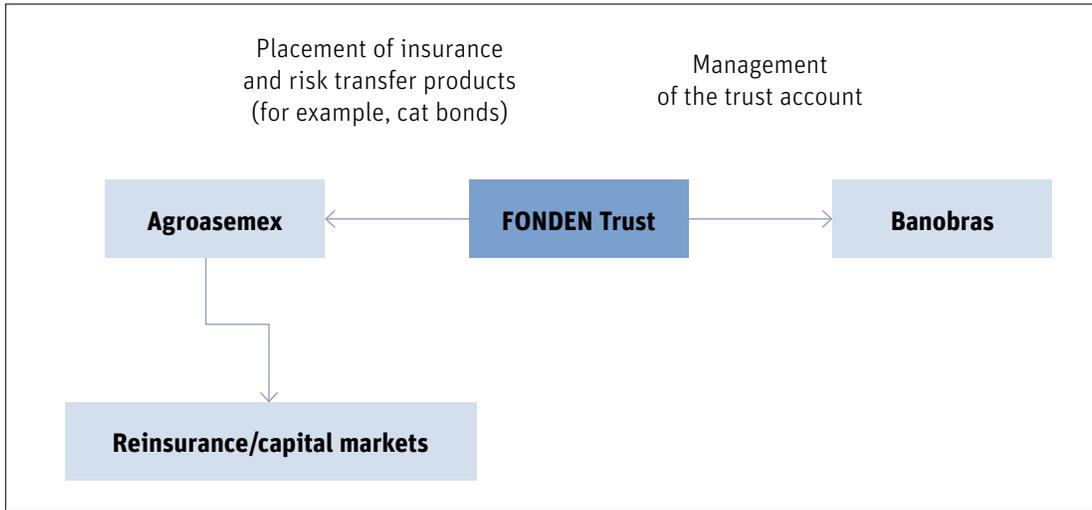
1. In the aftermath of a disaster, a specialized federal or state agency (for example, the meteorological department or geosciences department) certifies the occurrence of a disaster and informs the state government.
2. Within 4 days after the occurrence of a disaster, the state government sets up a technical committee to identify and assess the damage caused by the disaster.
3. Within 10 days, the technical committee provides the state government with a technical and financial evaluation of the disaster.
4. Within 15 days, the state government informs the federal government. The Secretariat of the Interior issues a declaration of state of disaster. Meanwhile, the Secretariat of Finance and Public Credit authorizes FONDEN to release early partial contribution to the state.
5. Within the following 2 days, the Secretariat of the Interior should (a) ensure that the requested assistance is related to the disaster; (b) verify that the damaged infrastructure has not benefited from FONDEN in the past (if this is the case, the proof of insurance of the damage infrastructure is requested); and (c) formally approve the cofinancing of the reconstruction of the damaged assets.
6. The claims are authorized to be financed by FONDEN. In the case of federal assets, the federal FONDEN Trust pays directly the contractor. In the case of state or municipal assets, the federal FONDEN Trust transfers the funds to the state FONDEN Trust once the state government has transferred its contribution.

## FONDEN Trust

The federal government aims to promote the private insurance of specific public assets owned by federal agencies and state governments, thus reducing its financing dependence on FONDEN in case of a disaster. The federal government has empowered FONDEN to develop a catastrophe risk financing strategy, relying on private risk transfer instruments such as reinsurance and catastrophe bonds. This helps FONDEN to increase its financial independence and overcome some political economy issues.

The financial structure of FONDEN is depicted in figure C.2. The public bank Banogras acts as the account manager of the FONDEN Trust. The public reinsurer Agroasemex intermediates any financial transactions with the international reinsurance and capital markets.

**Figure C.2 FONDEN Financial Structure**



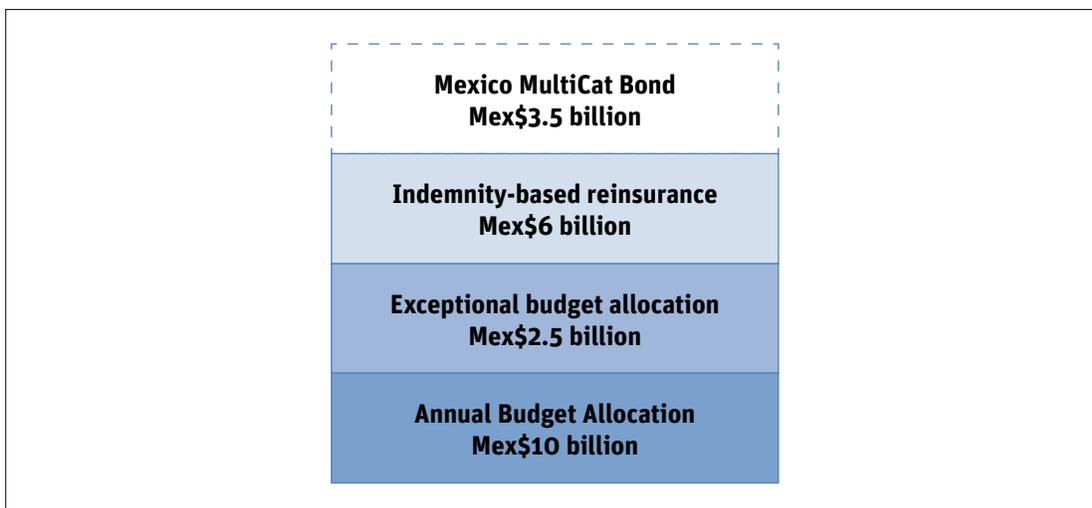
Source: World Bank (2012). FONDEN Mexico's Natural Disaster Fund – a Review, published by the Global Facility for Disaster Reduction and Recovery, Washington DC. May 2012.

Note: FONDEN = Natural Disaster Fund. cat bonds = catastrophe bonds.

## FONDEN 2011 Disaster Risk Financing Strategy

FONDEN's disaster risk financing strategy relies on a combination of risk retention and risk transfer. To execute this strategy, FONDEN receives an annual budget allocation from the federal budget, which is sometimes complemented by an exceptional budget allocation in the case of a major disaster. To purchase insurance coverage, the federal law was modified to allow FONDEN to transfer risk to the reinsurance and capital markets, with the insurance premium being defined as a service in the government budget law. The transferring of risk to the reinsurance and capital markets are intermediated by the public reinsurance company Agroasemex. Figure C.3 describes FONDEN's disaster risk financing strategy for 2011.

**Figure C.3 FONDEN Disaster Risk Financing Strategy, 2011**



Note: The Mexico MultiCat bond covers only earthquakes in three zones and hurricanes in three zones.

To implement the risk financing strategy, the federal budget includes a budget line of 0.4 percent of the government expenditures for the financing of public assets and FONDEN, which corresponded to Mex\$10 billion in 2011. If the annual budget allocation is insufficient, FONDEN can receive an exceptional budget allocation from the federal government reserve funds (such as the oil fund).

For the first time, in 2011, FONDEN placed an indemnity-based excess-of-loss (XL) reinsurance treaty on the international reinsurance market. Reinsurance payouts are based on the losses reported by FONDEN that are borne by the federal government (that is, 100 percent of the damage to federal assets and 50 percent of the damage to state or municipal assets and low-income housing). The losses reported to FONDEN include replacement costs (on average, 75 percent of the total losses) and improvement costs (on average, 25 percent of the total losses). Only replacement losses are covered under the reinsurance treaty. As of March 2011, the federal government was expecting to place a XL reinsurance treaty of Mex\$6 billion on excess of Mex\$12.5 billion.

FONDEN also secured the protection of a catastrophe bond. In 2006, it issued a US\$160 million catastrophe bond (CatMex) to transfer Mexico's earthquake risk to the international capital markets. It was the first parametric cat bond issued by a sovereign entity. After the CatMex matured in 2009, Mexico decided to further diversify its coverage by pooling multiple risks in multiple regions. In October 2009, with assistance from the World Bank, it issued a multiperil cat bond using the World Bank's newly established MultiCat Program. The federal government issued a four-tranche cat bond (totaling US\$290 million) with a three-year maturity, called MultiCat Mexico. It provided (binary) parametric insurance to FONDEN against earthquake risk in three regions around Mexico City and hurricanes on the Atlantic and Pacific coasts. The cat bond repaid the principal to investors unless an earthquake or hurricane triggers a transfer of the funds to the Mexican government. During the lifetime of the bond, no event triggered a payment.

## Appendix D: Turkish Catastrophe Insurance Pool

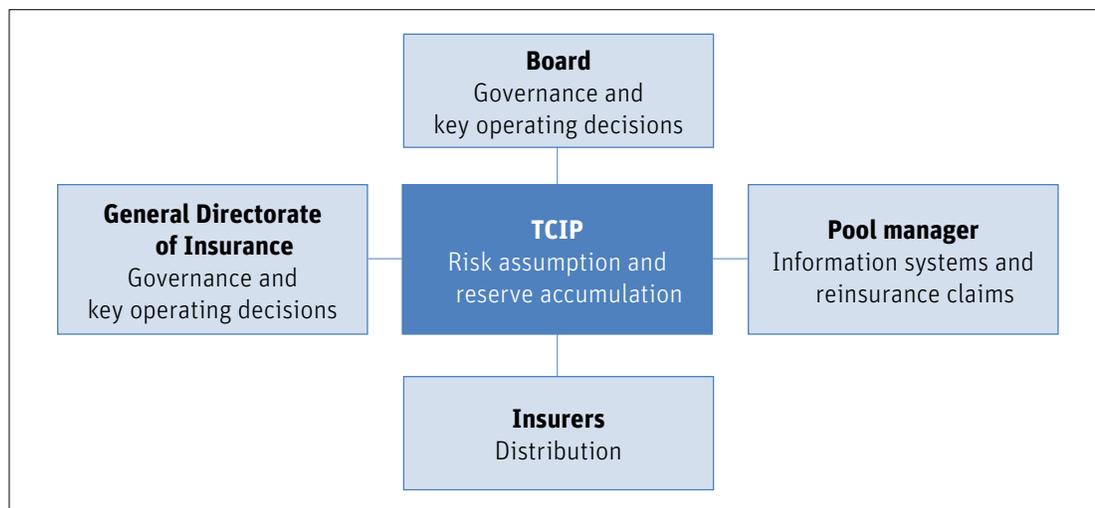
Bridging the contents of Europe and Asia, Turkey is highly exposed to severe earthquakes. Despite the common occurrence of earthquakes, Turkey's private insurance market was long unable to provide adequate capacity for catastrophe property insurance against earthquake risk. Without adequate commercial protection of residential buildings, the government faced a significant contingent financial exposure in post-disaster reconstruction of private property.

After the Marmara earthquake in 2000, in cooperation with the World Bank, the government worked to limit its financial exposure to the residential housing market through the establishment of the Turkish Catastrophe Insurance Pool (TCIP). The pool enables the Government of Turkey to ensure that owners who pay property taxes on domestic dwellings can purchase affordable and cost-effective coverage. As a result, the government's contingent fiscal exposure to earthquakes is decreased by the transferring of risk to the international reinsurance markets, which reduces pressure to provide post-disaster housing subsidies.

The TCIP is a public sector insurance company that is managed on sound technical and commercial insurance principles. It operates as a genuine public-private partnership with most, if not all, operational functions outsourced to the private sector. The TCIP purchases commercial reinsurance, and the Government of Turkey acts as a catastrophe reinsurer of last resort for claims arising out of an earthquake with a return period of greater than 300 years. The full capital risk requirements for the TCIP are funded by commercial reinsurance (currently in excess of US\$1 billion) and its own surplus capital (about US\$0.5 billion).

The TCIP policy is a stand-alone property earthquake policy with a maximum sum insured per policy of US\$65,000; an average premium rate of US\$46; and a 2 percent of sum-insured deductible. Premium rates are based on the construction type (two types) and property location (differentiating between five earthquake risk zones) and vary from less than 0.05 percent for a concrete-reinforced house in a low-risk zone to 0.60 percent for a house in the highest-risk zone.

**Figure D.1 Operational Structure of the Turkish Catastrophe Risk Pool (TCIP)**



Source: Gurenko, Eugene, Rodney Lester, Olivier Mahul, and Serap Oguz Gonulal, *Earthquake Insurance in Turkey: History of the Turkish Catastrophe Insurance Pool* (Washington, DC: World Bank, 2006).

The TCIP sold more than 3 million policies at market-based premium rates (23 percent penetration) in 2009, compared with 600,000 covered households when the pool was established. To achieve this level of penetration, the government invested heavily in insurance awareness campaigns and made earthquake insurance compulsory for homeowners on registered land in urban centers. The legal framework for the program envisages compulsory enforcement mechanisms in urban settings, while coverage is voluntary for homeowners in rural areas.

## Appendix E: Post-disaster Operational Phases

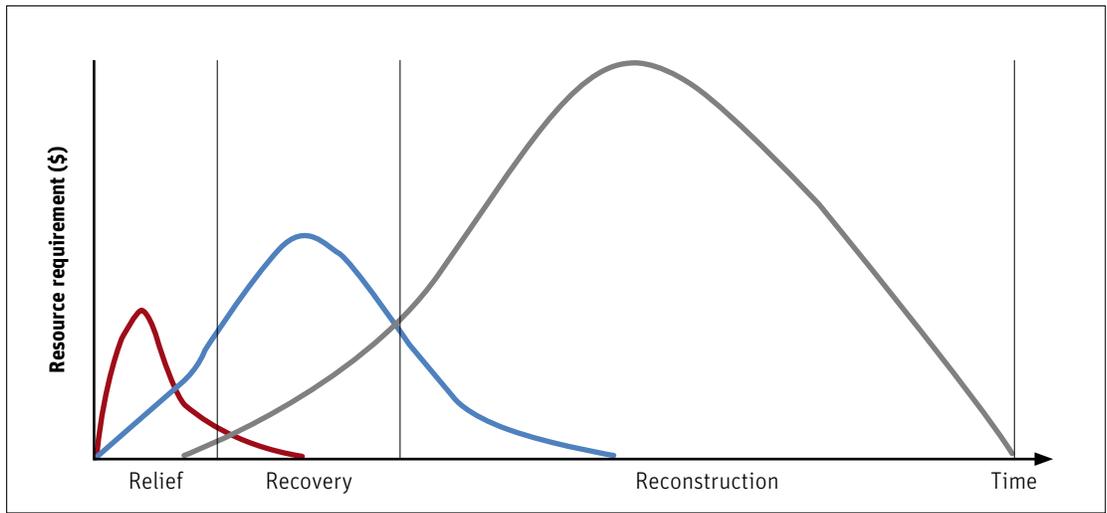
The role of disaster risk financing and insurance for the post-disaster operational phases is further detailed in “Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance” (Working Paper 94988, World Bank, Washington, DC, 2014). A summary is provided below of the three operational phases: emergency response and relief, recovery, and reconstruction.

**Emergency response and relief operations.** This phase includes emergency assistance to the affected population to ensure basic needs such as shelter, food, and medical attention. This assistance, provided during or immediately after a disaster, can save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected. This phase aims to stabilize the society and prevent or mitigate further loss. Such costs can be difficult to estimate *ex ante*, because they depend on the specific characteristics of the catastrophic event (location, intensity, time of the year [winter or summer], time of day [day or night], and so on). But they are relatively small compared with the subsequent recovery and reconstruction operations. Although relief costs are limited, they need to be financed within hours after a disaster. The capacity of governments to mobilize resources for relief operation on short notice should be a key component of their risk financing strategy.

**Recovery operations.** Following the initial relief efforts, recovery operations are crucial to limit secondary losses and ensure that reconstruction can start as soon as possible. They aim at the restoration and improvement, where appropriate, of facilities, livelihoods, and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors. In other words, recovery operations restore the society’s functions, such as reopening of schools, businesses, and so on, even if only in temporary shelters. They include, among other things, the emergency restoration of lifeline infrastructure (for example, water, electricity, and key transportation lines); the removal of debris; the financing of basic safety nets; and the provision of basic inputs (such as seeds and fertilizers) to restart agricultural activities. It is also during this phase that engineering firms can be mobilized to start the design of infrastructure work that will proceed during the reconstruction phase. The government may also have to subsidize the basic restoration of private dwellings, particularly for low-income families, before the reconstruction phase starts.

**Reconstruction operations.** This phase generally centers on the rehabilitation or replacement of assets damaged by a disaster. They include repair and rebuilding of housing, industry, infrastructure, and other physical and social structures that constitute that community or society. These include public buildings and infrastructure that are the direct responsibility of the state. National or local authorities generally have to face obligations that go beyond their own assets. In most cases, the government will have to subsidize the reconstruction of private assets, particularly housing for low-income families who could not otherwise afford to rebuild their homes.

**Figure E.1: The Three Post-disaster Phases**



Source: "Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance" (Working Paper 94988, World Bank, Washington, DC, 2014).

## Appendix F: Operational Framework for Implementing Disaster Risk Financing and Insurance Solutions

The Disaster Risk Financing and Insurance (DRFI) Operational Framework developed by the World Bank DRFI Program seeks to provide governments implementing financial protection strategies with a framework for the development and implementation of cost-effective, sustainable DRFI solutions. This framework is laid out in “Financial Protection against Disasters: From Products to Comprehensive Strategies—An Operational Framework for Disaster Risk Financing and Insurance” (Working Paper 94988, World Bank, Washington, DC, 2014). This text below summarizes this document.

The structure of the DRFI operational framework has emerged through a long, sustained dialogue and many years of working with governments and the private sector. It builds on more than 15 years of intensive partnerships with more than 60 countries worldwide in developing DRFI strategies and addressing challenges at both the policy and technical levels.

This framework aims to answer basic questions and challenges usually faced by governments when they initiate or further improve their DRFI strategies. Experience has shown that a DRFI engagement is usually triggered by two main entry points. First, governments often are looking to implement a specific product or financial instrument; here, the challenge is to help policy makers situate this instrument in the larger context of financial protection and disaster risk management. Second, governments may start from a particular development goal—such as protecting small farmers against drought or ensuring access to immediate post-disaster liquidity for central and local governments—in which case it is necessary to identify the appropriate solutions. In both cases, the Operational DRFI Framework provides governments with an initial orientation to start the relevant discussions with all stakeholders and gain an understanding of how the work might evolve over time. As a second step, it helps governments to identify and prioritize policy options and the needed actions to implement these choices.

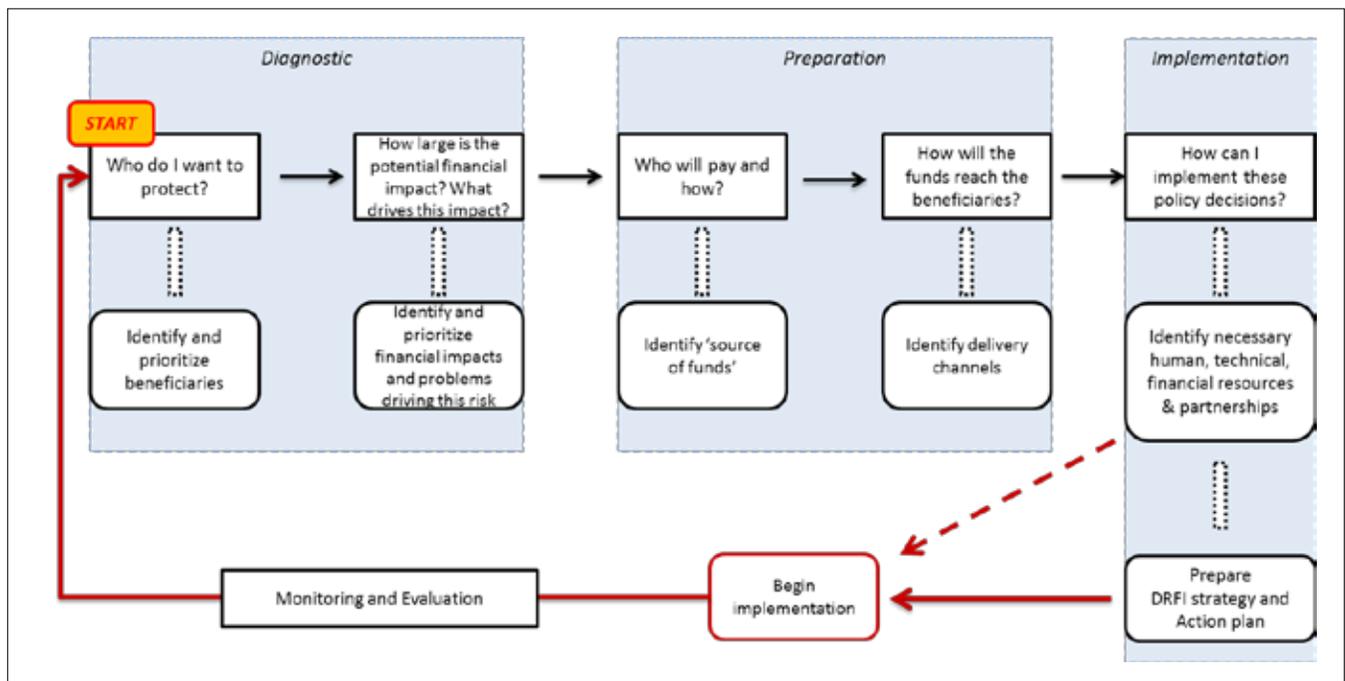
Although the overall goal of DRFI—to increase the financial resilience of society to disasters—is common across all countries, a government has many options to achieve this goal, depending on its circumstances and time frame. The Operational DRFI Framework helps governments and policy makers identify and prioritize solutions appropriate for their countries. Introducing a common language also enables and strengthens the international cooperation often required between governments and their partners as well as among governments to exchange experiences and good practice. A structured, consistent way of approaching disaster risk financing helps governments better identify and implement their priorities and enables international development partners and the private sector to better support them in doing so.

The Operational Framework is not, however, a blueprint for action, meant to provide detailed guidance on how to carry out each step. Such implementation requires the sustained engagement and commitment of the countries and their partners. Countries are diverse, and so are their DRFI needs and solutions. Low-income countries constrained by a lack of capacity may not use financial instruments in the same way that middle-income countries yield and fine-tune them. Small island developing states subject to financial shocks that can reach multiples of gross domestic product (GDP) face different challenges than large middle-income countries that are trying to safeguard low-income populations against disasters.

The Operational DRFI Framework is presented in three components that should be seen as one package and applied in an iterative way: (a) a decision tree for governments engaging in DRFI (figure F.1); (b) an overview of government actions to increase financial resilience of defined beneficiaries (table F.1); and (c) illustrative examples from international experience (table F.2).

The decision tree guides policy makers through a set of fundamental questions to guide the process of identifying the appropriate policy and developing the required actions to implement it (figure F.1). A government's DRFI engagement can be seen in three main phases: diagnostic, preparation, and implementation. As a first step, governments need to identify and prioritize the problems they want to address. Second, policy makers—in line with their priorities—need to define a set of solutions and develop a DRFI strategy. Finally, to implement the strategy, the government needs to design and execute an action plan.

**Figure F.1 Operational DRFI Framework: A Government Decision Tree**



Source: Adapted from “Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance” (Working Paper 94988, World Bank, Washington, DC, 2014). ©World Bank. Further permission required for reuse.

At each step of the decision process, policy makers can consult the second component of the Operational DRFI Framework, the matrix of policy objectives and actions (table F.1), to help answer the questions and develop and implement the DRFI Strategy. The steps in the decision process are as follows:

1. *Identify and prioritize overarching goals and beneficiaries* of planned DRFI engagement
2. *Assess risks* to identify the impacts that are of concern and the problems driving those impacts
3. *Arrange financial solutions*, starting by identifying and prioritizing sources of funds to mitigate financial impacts
4. *Deliver funds* to beneficiaries after identifying effective delivery channels of those funds
5. *Identify policy goals and actions needed*, consolidate them into a Strategy and Action Plan, and begin implementation
6. *Monitor and evaluate* implementation to refine policies and actions

**Table F.1 World Bank DRFI Program Operational Framework: Government Actions for Financial Protection**

Actions	Government actions for financial protection of the state		Government actions for financial protection of society	
	Government: national and local (sovereign DRFI)	Homeowners and SMEs (property cat risk insurance)	Farmers and herders (agricultural insurance)	Low-income population (social protection)
<b>Assess risks</b>	<ul style="list-style-type: none"> <li>• Collect and manage risk and loss data</li> <li>• Quantify potential disaster-related losses from fiscal and budget perspective</li> <li>• Assess potential post-disaster (short-term and long-term) funding gaps</li> </ul>	<ul style="list-style-type: none"> <li>• Collect and manage risk and loss data</li> <li>• Quantify potential disaster-related losses from property damage</li> <li>• Identify proportion of losses incurred by public and private stakeholders</li> <li>• Assess capacity of domestic insurance markets</li> </ul>		<ul style="list-style-type: none"> <li>• Collect and manage disaster risk and loss and impact data</li> <li>• Quantify potential disaster-related losses on low-income population</li> <li>• Quantify fiscal impact of potential disaster-related losses through social protection programs</li> </ul>
<b>Arrange financial solutions</b>	<ul style="list-style-type: none"> <li>• Develop financial decision-making tools</li> <li>• Develop national strategy for financial protection                             <ul style="list-style-type: none"> <li>- Secure immediate liquidity for budget support following disasters: risk layering including reserves, contingent credit, and catastrophe risk transfer</li> <li>- Secure longer-term reconstruction financing, such as insurance program for public assets</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Promote domestic demand for insurance                             <ul style="list-style-type: none"> <li>- Financial incentives through premium subsidies and/or tax breaks</li> <li>- Compulsory versus voluntary schemes</li> <li>- Awareness and education of consumers on insurance products</li> </ul> </li> <li>• Develop domestic supply of insurance                             <ul style="list-style-type: none"> <li>- Assess legal and regulatory environment to allow private sector to develop and test private insurance solutions while protecting consumers</li> <li>- Risk data collection, management, and sharing</li> <li>- Product development (indemnity and index-based)</li> <li>- Insurance pools</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>• Secure contingent funding for social protection programs against disasters</li> <li>• Complement or enhance social protection programs with insurance principles and market-based products including use of transparent [[AQ: word missing?]] for payouts</li> </ul>
<b>Deliver funds to beneficiaries</b>	<ul style="list-style-type: none"> <li>• Establish national disaster fund</li> <li>• Establish transparent, timely, and effective post-disaster loss reporting mechanisms</li> <li>• Establish post-disaster budget execution mechanisms to transfer funds from national to subnational level and from ministry of finance to line ministries</li> </ul>	<ul style="list-style-type: none"> <li>• Develop risk market infrastructure to support delivery channels                             <ul style="list-style-type: none"> <li>- Underwriting and claims settlement process</li> <li>- Delivery channels through insurance agents</li> <li>- Alternative delivery channels: banks, microfinance intermediaries, input providers, NGOs, and others</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>• Improve beneficiary targeting and assessing eligibility for post-disaster payouts</li> </ul>
<b>Linkages to DRM</b>	<b>Reduce underlying drivers of risk</b>			

Source: Adapted from "Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance" (Working Paper 94988, World Bank, Washington, DC, 2014).

Note: DRFI = Disaster Risk Financing and Insurance. SMEs = small and medium enterprises. cat risk = catastrophe risk. NGO = nongovernmental organization. DRM = disaster risk management.

Finally, the third component of the Operational DRFI Framework presents illustrative examples of how governments are implementing DRFI solutions (table F.2). While this decision process is presented sequentially, governments usually begin engagement in DRFI to address an acute challenge. It is important to develop a comprehensive strategy, but governments need not put off implementation for many years. Many actions can—and should—start immediately while a full diagnostic is carried out and a strategy is developed.

Table F.2 World Bank DRFI Program Operational Framework: Examples of Financial Protection

Beneficiaries	Government: national and subnational (sovereign DRFI)	Homeowners and SMEs (property catastrophe risk insurance)	Agricultural producers and herders (agricultural insurance)	Low-income population (social protection)
Assess risks	<p>The Government of <b>Colombia</b> included the assessment of contingent liabilities from disasters in its fiscal risk management strategy.</p> <p>In <b>Mexico</b>, R-FONDEN a probabilistic catastrophe risk modeling tool, creates probabilistic simulations of potential material and human losses from disasters.</p> <p><b>Morocco</b> has developed a probabilistic catastrophe risk modeling tool to assist the government in prioritizing its risk mitigation investments.</p> <p>The <b>Philippines</b> is developing a catastrophe risk model to evaluate options for risk transfers and insurance to reduce the fiscal burden of disasters.</p> <p>The Pacific Risk Information System, under the <b>Pacific Catastrophe Risk Assessment and Financing Initiative</b>, includes a database of over 3.5 million georeferenced buildings and infrastructure in 15 Pacific island countries. It was used to develop the Pacific Catastrophe Risk Insurance Pilot.</p>	<p>In <b>Taiwan, China</b>, the Residential Earthquake Insurance Fund (TREIF) has developed an earthquake risk model to strengthen the independence and professionalism of the government's earthquake risk assessments.</p> <p>The preparation of the <b>Southeast Europe and Caucasus Regional Catastrophe Risk Insurance Facility</b> includes extensive multihazard country risk assessments for climate and geological hazards.</p>	<p><b>India</b> has developed detailed agricultural risk assessment tools to help policy makers to better understand the economic consequences of drought, quantify such impacts, and investigate the impacts of risk coping strategies at both the farm and state levels.</p> <p>In <b>Mongolia</b>, livestock censuses and surveys are used to inform the government about the economic and fiscal impact of adverse weather events as well as the design and pricing of index-based livestock insurance policies.</p>	<p>In the <b>Philippines</b> a survey is mapping out the poorest communities, enabling better targeting of social welfare support to communities, including assistance related to disaster risk.</p>

Beneficiaries	Government: national and subnational (sovereign DRFI)	Homeowners and SMEs (property catastrophe risk insurance)	Agricultural producers and herders (agricultural insurance)	Low-income population (social protection)
<p><b>Arrange financial solutions</b></p>	<p><b>Contingent lines of credit</b> provide developing countries with funds immediately following disasters. Products are offered by the World Bank, the Inter-American Development Bank, and the Japan International Cooperation Agency.</p> <p>The first multicountry risk pool, the <b>Caribbean Catastrophe Risk Insurance Facility</b>, established in 2007, offers 16 small island-state countries over US\$150 million in hurricane and earthquake coverage.</p> <p>In 2006, <b>Mexico</b> transferred US\$450 million of earthquake risk to financial markets by combining the world's first government catastrophe (cat) bond (Cat MEX, totaling US\$160 million) and parametric reinsurance (US\$290 million).</p> <p>In <b>Colombia</b>, the government uses standardized terms and conditions informed by international best practices to purchase catastrophe insurance for its public buildings.</p>	<p>The <b>Turkish Catastrophe Insurance Pool (TCIP)</b>, a public-private partnership with the domestic insurance industry, provides compulsory, affordable earthquake insurance to homeowners, increasing catastrophe insurance coverage from less than 3 percent to over 40 percent of residential buildings in urban areas.</p> <p>The <b>Japanese public-private earthquake insurance program</b> for homeowners relies on the Japan Earthquake Reinsurance Company (JERC), an earthquake reinsurance pool backed by the government.</p>	<p>The Index-Based Livestock Insurance Pilot in <b>Mongolia</b> protects the livelihoods of 11,000 herders, equivalent to 22 percent in piloted provinces in 2012.</p> <p><b>India's</b> weather-based crop insurance has been in place since 2007 for 11 growing seasons, with 11.6 million farmers and US\$370 million covered in the most recent season. Meanwhile, the national crop insurance program since 2010 has offered more than 1.1 million farmers a total of US\$67 million coverage in yield crop insurance.</p> <p>In <b>Morocco</b>, the government and the agricultural mutual insurance company have established a crop insurance program for cereals which currently covers 700,000 hectares and will soon be extended to fruit trees.</p>	<p>The Productive Safety Net Programme (PSNP) in <b>Ethiopia</b> is aimed at enabling the rural poor facing chronic food insecurity to resist shocks, create assets, and become food self-sufficient.</p> <p>In 2011, reinsurance company MiCRO (Microinsurance Catastrophe Risk Organization) was established to provide insurance coverage to women-owned microenterprises in <b>Haiti</b>.</p> <p>Insurance products of the Center for Agriculture and Rural Development Mutual Benefit Association (CARD MBA) in the <b>Philippines</b> are mandatory for members of a network of institutions including CARD NGO and CARD Bank, providing scale and preventing adverse selection.</p>

Beneficiaries	Government: national and subnational (sovereign DRFI)	Homeowners and SMEs (property catastrophe risk insurance)	Agricultural producers and herders (agricultural insurance)	Low-income population (social protection)
<p><b>Deliver funds to beneficiaries</b></p>	<p>The Government of <b>Mexico</b> established a post-disaster loss reporting mechanism managed by FONDEN. Affected states can therefore access timely payments from the Natural Disaster Fund (FONDEN), reducing time-consuming coordination problems.</p> <p>In the <b>Cook Islands</b>, the establishment of the Disaster Emergency Trust Fund has served to reduce delays in emergency response.</p>	<p>As a public private partnership the <b>Turkish Catastrophe Insurance Pool (TCIP)</b> relies on the domestic insurance market for the distribution and claims settlement.</p>	<p>Distribution in the <b>Moroccan</b> multiperil crop insurance program takes place either by linkage to loans made by Crédit Agricole or by direct marketing of Moroccan Agricultural Mutual Insurance (MAMDA), the sole provider of agriculture insurance in the country, structured as a mutual.</p> <p>The national crop insurance program in <b>India</b> uses GPS-enabled mobile phones and video recording technology to enhance crop-cutting experiments, improving the accuracy of claims assessments while reducing fraudulent claims. Claims settlement takes place through direct payment to bank accounts.</p>	<p>Horn of Africa Risk Transfer for Adaptation (HARITA) was launched in Ethiopia in 2007 as a pilot program to address the needs of small-scale farmers through drought insurance, credit, and risk reduction, allowing farmers to pay for insurance through labor, an idea based on “food-for-work” programs.</p> <p>MiCRO’s coverage in <b>Haiti</b> is bundled with loans from Fonkoze, the country’s largest microfinance institution.</p>
<p><b>Linkages to DRM</b></p>	<p><b>Mexico’s</b> Natural Disaster Fund (FONDEN) has evolved to include financial accounts to finance investment in risk reduction. It promotes informed decisions by requiring states to complete a risk assessment (including development of a risk atlas) before being eligible for financing for risk mitigation projects.</p>	<p>After setting up the TCIP, the Government of <b>Turkey</b> legally abolished its obligation to fund the reconstruction of residential dwellings following earthquakes, strengthened building construction codes, and enhanced supervision thereof.</p>		<p>Members of <b>Ethiopia’s Public Safety Net Program (PSNP)</b> households must participate in productive activities that will build more resilient livelihoods, such as rehabilitating land and water resources and developing community infrastructure, including rural road rehabilitation and building schools and clinics.</p>

Source: Adapted from “Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance” (Working Paper 94988, World Bank, Washington, DC, 2014).  
 Note: DRFI = Disaster Risk Financing and Insurance. SMEs = small and medium enterprises. FONDEN = Natural Disaster Fund (Mexico). cat risk = catastrophe risk. NGO = nongovernmental organization. DRM = disaster risk management.

## Sources of Post-disaster Financing

Governments have access to various sources of financing following a disaster. These sources can be categorized as ex post and ex ante financing instruments. Ex post instruments are sources that do not require advance planning. They include budget reallocation, domestic credit, external credit, tax increase, and donor assistance. Ex ante risk financing instruments require proactive advance planning and include reserves or calamity funds, budget contingencies, contingent debt facility, and risk transfer mechanisms. Risk transfer instruments are instruments through which risk is ceded to a third party, such as traditional insurance and reinsurance, parametric insurance (where insurance payouts are triggered by predefined parameters such as wind speed of a hurricane), and alternative risk transfer (ART) instruments such as catastrophe (CAT) bonds.

The analysis of the fiscal management of disasters in Indonesia has identified possible post-disaster resource gaps.<sup>51</sup> This time-sensitive analysis supports the design of a cost-effective disaster risk financing strategy, because different financial instruments are available at different periods after a disaster (figure F.2).

**Figure F.2 Availability of Post-disaster Financial Instruments over Time**

Instrument, by type	Short term (1–3 months)			Medium term (3–9 months)			Long term (over 9 months)		
<i>Ex post financing</i>									
Contingency budget									
Donor assistance (relief)									
Budget reallocation									
Domestic credit									
External credit									
Donor assistance (reconstruction)									
Tax increase									
<i>Ex ante financing</i>									
Reserve fund									
Contingent debt									
Parametric insurance									
Traditional insurance									

Source: Ghesquiere, Francis, and Olivier Mahul, *Sovereign Natural Disaster Insurance for Developing Countries: A Paradigm Shift in Catastrophe Risk Financing* (Washington DC: World Bank, 2007).

Among the ex post (postdisaster) financing tools, contingency budget is the first to be immediately available after a disaster. Other ex post financing tools usually take more time to mobilize and are mainly available for the reconstruction phase. These include emergency recovery loans and post-disaster reconstruction loans from international financial institutions such as the World Bank.

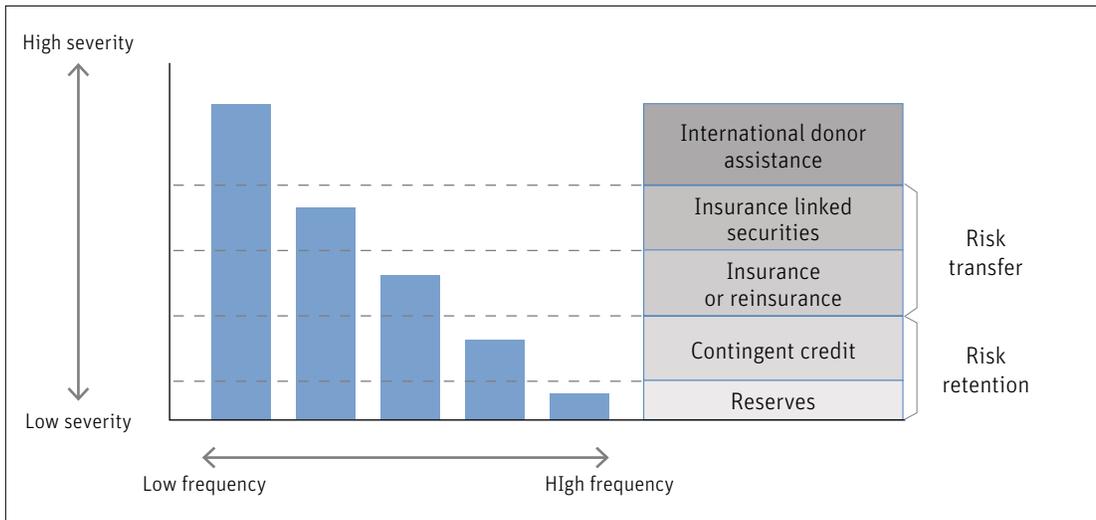
Ex ante financing instruments can provide immediate liquidity after a disaster. These instruments, which are designed and implemented before a disaster occurs, include national disaster reserve funds, contingent credit, and insurance. Small but recurrent losses can be retained through reserves

<sup>51</sup> World Bank, “Indonesia: Advancing a National Disaster Risk Financing Strategy—Options for Consideration” (Washington, DC: World Bank, October 2011).

and/or contingent credit. More severe but less-frequent events—occurring, for example, once every seven years or more—can be transferred to the insurance or capital markets. Finally, international post-disaster donor assistance plays a role after the occurrence of an extreme disaster.

Catastrophe risk layering can be used to design a risk financing strategy (figure F.3). Budget contingencies together with reserves are the cheapest source of ex ante risk financing and will generally be used to cover the recurrent losses. Other sources of financing such as contingent credit, emergency loans, and possibly insurance should enter into play only once reserves and budget contingencies are exhausted or cannot be accessed fast enough. A “bottom-up” approach is recommended: the government first secures funds for recurrent disaster events and then increases its post-disaster financial capacity to finance less-frequent but more-severe events. The level of fiscal resilience to disasters, which drives the optimal financial strategies against disasters, is a decision to be taken by the government based on economic and social considerations. Table F.3 presents a comparative analysis of the ex ante risk financing and risk transfer instruments.

**Figure F.3 Catastrophe Risk Layering**



Source: Adapted from “Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance” (Working Paper 94988, World Bank, Washington, DC, 2014).

**Table F.3 Contingent Financing Instruments for Disaster**

Product, by type	Benefits	Costs, risks, and constraints
Indemnity cat (re)insurance	<p><b>Risk transfer</b></p> <ul style="list-style-type: none"> <li>• No basis risk</li> <li>• Less technical work and investment involved in product design (follow-the-fortune approach)</li> <li>• Technology transfer expertise from international markets being replicated worldwide for decades</li> <li>• Less restriction of geography or peril for a specific contract</li> <li>• Liability is transferred from government balance sheet to financial markets</li> </ul>	<ul style="list-style-type: none"> <li>• Works better in mature markets with solid local delivery systems and insurance regulatory framework</li> <li>• Market focused on asset-based approach (concepts of interest for sovereigns like emergency relief, low-income housing, safety nets are considered usually noninsurable)</li> <li>• Difficult to create investor confidence on potential moral hazard when sovereign risk is involved</li> <li>• Up-front premium</li> <li>• One-year protection is the norm</li> <li>• Counterparty credit risk</li> <li>• Settlement of claims can take a long time</li> </ul>
Parametric (re)insurance	<ul style="list-style-type: none"> <li>• No moral hazard, and more transparent for risk-assuming counterparty</li> <li>• Rapid disbursement of funds</li> <li>• Multiannual protection may be feasible<sup>a</sup></li> <li>• Less insurance market infrastructure required (for example, claims verification)</li> </ul>	<ul style="list-style-type: none"> <li>• Basis risk</li> <li>• Extensive and high-quality data sets are required to model the hazard and quantify probability of a loss to the contract</li> <li>• High up-front costs (including cost of product development and premium)</li> <li>• Counterparty credit risk</li> </ul>
Cat bonds	<ul style="list-style-type: none"> <li>• Limited credit risk: vehicle fully collateralized, but collateral is invested, introducing some credit risk<sup>b</sup></li> <li>• Access to a broader source of funding (capital markets + insurance)</li> <li>• No moral hazard (depending on trigger type; indemnity trigger cat bonds still present moral hazard)</li> <li>• Multiannual protection (locked-in pricing three years usually)</li> <li>• Variety in options for triggers (indemnity, modeled loss, parametric and industry-loss linked products are possible)</li> <li>• Parametric and modeled loss triggers can disburse rapidly</li> <li>• Liability is transferred from government balance sheet to financial markets</li> </ul>	<ul style="list-style-type: none"> <li>• Basis risk for parametric and modeled-loss cat bond triggers</li> <li>• High up-front costs</li> <li>• Investors' appetite for only low-probability events (rarely below 1-in-75-year triggering events)</li> <li>• Limited geography or perils by transaction</li> <li>• Historically has traded above cat reinsurance for similar risk layer</li> <li>• Regulated as an investment security (not insurance), and therefore legal framework can be complicated for sovereigns</li> </ul>

Product, by type	Benefits	Costs, risks, and constraints
Cat derivatives (such as industry loss warranties)	<p><b>Risk transfer (continued)</b></p> <ul style="list-style-type: none"> <li>Limited basis risk for large diversified portfolios of assets (settled on third-party industry loss indexes or tailor-made indexes)</li> <li>Attractive to risk-assuming counterparty, as there is no moral hazard, and product is easy to understand</li> <li>Liability is transferred from government balance sheet to financial markets</li> <li>Flexibility about incorporating tailor-made indexes</li> <li>Multiannual protection available</li> <li>Flexibility with regards to perils or geography of protection</li> <li>Rapid payout</li> </ul>	<ul style="list-style-type: none"> <li>Works only using a mature, credible methodology to generate an aggregate industry loss estimation (not currently available outside of developed insurance markets)</li> <li>Only annual protection typically offered</li> <li>Counterparty credit risk (depending on where trade occurs; many contracts are negotiated directly between counterparties)</li> <li>Sufficient historic data and ground measurement tends to be limited in low-income countries</li> <li>Basis risk</li> <li>High up-front costs</li> <li>Counterparty credit risk</li> </ul>
Weather derivatives	<p><b>Risk financing</b></p> <ul style="list-style-type: none"> <li>Lower costs</li> <li>No basis risk (use of softer triggers that can be linked to government actions like declaration of disaster)</li> <li>Flexibility on financial terms (including a longer term than any of the other risk financing alternatives)</li> <li>Funds are ring-fenced and are not at risk of depletion as a result of political pressure for purposes other than disaster response</li> <li>No counterparty credit risk (where the counterparty is the World Bank as per the Cat-DDO)</li> </ul>	<ul style="list-style-type: none"> <li>Financial impact is retained in government balance sheet</li> <li>Institutions like the World Bank have an absolute size limit of 0.25 percent of GDP—very limiting in low-income countries, where the potential impact of disasters can usually be substantially higher</li> </ul>
Contingent credit multilaterals (for example, Cat-DDO)	<ul style="list-style-type: none"> <li>Limited credit risk (fully funded vehicles)</li> <li>Possibility to generate positive cost of carry (service of debt repaid through the vehicle)</li> <li>Multiannual availability</li> </ul>	<ul style="list-style-type: none"> <li>Basis risk (triggers and risks usually limited similarly to the cat bond space)</li> <li>Financial impact is retained in government balance sheet</li> </ul>
Structured financing vehicles		

Product, by type	Benefits	Costs, risks, and constraints
Finite risk contracts	<p><b>Structured risk financing (continued)</b></p> <ul style="list-style-type: none"> <li>• Can be used to combine risk retention (through reserving), risk financing, and risk transfer elements into the program</li> <li>• Flexibility to include a wider spectrum of risks (from lower- to higher-probability events) and flexibility in how much of the risk is transferred versus retained</li> <li>• Can combine both soft and tighter parametric triggers</li> <li>• Multiannual contracts (five- year terms not uncommon)</li> <li>• Contract includes cancellation</li> </ul>	<ul style="list-style-type: none"> <li>• “Next-generation instruments” intended to complement existing risk retention and transfer strategies, therefore suitable only for institutions with a sophisticated risk financing strategy in place and the technical capacity to accurately assess their risk in detail</li> <li>• Few countries have legislation in place to regulate these instruments</li> <li>• Lack of supervision has led some financial intermediaries in developed countries to use these tools to hide liabilities</li> <li>• Legal language is sophisticated</li> </ul>

Source: World Bank Disaster Risk Financing and Insurance Program, 2015.

Note: cat = catastrophe. Cat-DDO = Catastrophe Drawdown Option (of World Bank Development Policy Loan).

a. Parametric insurance is a relatively new concept, demonstrated, for example, by the Caribbean Catastrophe Risk Insurance Facility (CCRIF) established in 2007. These covers are more bespoke, and counterparties may be open to multiyear contracts such as that seen between Swiss Re and the Dominican Republic. The CCRIF paid out within two weeks of the devastating earthquake that hit Haiti in 2010.

b. The total return swap structure, and permitted asset rules for collateral investment, in widespread use before the global financial crisis (2008–09) exposed a number of bonds to credit issues during the crisis (largely because of the collapse of Lehman brothers). Since then, rules on permitted investments have tightened considerably, and the current trend is to invest all proceeds in U.S. Treasury money market funds.

c. Industry loss warranties trade for U.S. perils, European windstorms, and to a lesser extent, Japanese earthquakes. Third-party industry loss providers recognized and accepted by the market include U.S. Property Claim Services (PCS) and European companies (PERILS AG, Swiss Re Sigma, Munich NatCat services).

## Appendix G: World Bank Initiatives to Build Financial Resilience to Disasters

This appendix summarizes several examples of World Bank initiatives to help countries build financial resilience to disasters. They are adapted from “Financial Protection against Disasters: An Operational Framework for Disaster Risk Financing and Insurance” (Working Paper 94988, World Bank, Washington, DC, 2014).

### **Sovereign Disaster Risk Financing and Insurance (DRFI) for Middle-Income Countries**

#### ***SECO Initiative supporting Azerbaijan, Colombia, Indonesia, Morocco, Peru, South Africa, and Vietnam***

Supported by the State Secretariat for Economic Affairs of Switzerland (SECO), a sovereign DRFI initiative through the Disaster Risk Financing and Insurance (DRFI) Program of the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) is supporting selected middle-income countries to strengthen financial resilience and protect fiscal balance. With the help of the program, Colombia, for example, implemented international best practices insuring its investments worth US\$38 billion in road infrastructure concessions.

### **Disaster Risk Financing and Insurance for Small Island States**

#### ***Pacific Catastrophe Risk Insurance Pilot***

In response to requests from 15 countries, the World Bank, GFDRR, and other partners formed the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) in 2007 to help mitigate disaster and climate change risk. Under this initiative the countries worked together to implement the Pacific Catastrophe Risk Insurance Pilot, the first parametric catastrophe risk transfer transaction in the Pacific region. In early 2014 Tonga was the first country to benefit from a payout (US\$1.2 million) following cyclone Ian.

### **Developing Large-Scale Public-Private Partnerships in Agriculture Insurance for Smallholders**

#### ***Kenya***

The Government of Kenya has confirmed its intention to develop and launch a large-scale public-private partnership in agricultural insurance, building on appraisal work finalized in 2014 with the support of the World Bank-GFDRR DRFI Program. The Kenya program will have two components: (a) an area-yield index insurance program linked to crop credit for small, semicommercial and commercial maize and wheat growers; and (b) a livestock drought index insurance program for vulnerable pastoralists in four counties of northern Kenya. Expected to start by October 2015, the program is expected to reach on average 140,000 producers over the first five years. The Government of Kenya committed fiscal and human resources to the program. The DRFI Program is also supporting the government to consider the integration of these agricultural liabilities in an overall sovereign DRFI strategy.

## **Supporting Enhancements to Ongoing Public-Private Partnerships in Agriculture Insurance**

### *India*

Since 2006, the World Bank-GFDRR DRFI team has provided advisory services to the Government of India to move from a largely publicly implemented compensation scheme for farmers toward a public-private partnership in agriculture insurance. The initial scheme suffered from slow claims settlement, high basis risk due to challenges with data collection, and unintended disincentives distorting agricultural production decisions. The World Bank-GFDRR DRFI Program has worked with the relevant ministries and the public crop insurance company to provide technical and policy advice in support of transitioning toward a public-private partnership. This has significantly reduced the basis risk and claims settlement time, while also improving actuarial risk pricing, leading to more equitable distribution of subsidies to farmers.

## **Improving Insurance of Public Assets and Insurance Supervision in Middle-Income Countries**

### *Philippines*

In the Philippines the World Bank-GFDRR DRFI Program is helping build capacity in local insurance markets by improving the insurance of local government assets. Working with the Government Service Insurance System (GSIS), the state-owned monopoly insurer for public assets, the program will also help to introduce insurance policies based on international best practice, support access to reinsurance at better terms, and improve risk information and risk-based pricing. The project will also investigate the possibility of setting up a risk pool for homeowners and small business, an initiative strongly backed by domestic insurance companies.

## **Developing Property Catastrophe-Risk Insurance Markets**

### *Albania, the former Yugoslav Republic of Macedonia, Montenegro, and Serbia, to be expanded to the whole South East Europe and Caucasus region*

The South East Europe and Caucasus Catastrophe Risk Insurance Facility (SEEC CRIF) is a catastrophe- and weather-risk reinsurance program with the objective of increasing the number of homeowners, farmers, enterprises, and government organizations that are insured against weather-related risks and climate change. To implement the SEEC CRIF program, Europa Reinsurance Facility Ltd. (Europa RE), a nonprofit, government-owned organization, has been established as a specialized regional reinsurer. SEEC CRIF targets the entire SEEC region, but with an initial focus on the Balkans and the Caucasus. The program will continue to support the technical work for countries to join the facility and will work with the World Bank and other donor partners to finance country membership contributions.

## **Disaster-Linked Social Protection**

### *Kenya*

The Hunger Safety Net Program (HSNP), implemented by the Government of Kenya with support from the U.K. Department for International Development (DFID), provides unconditional cash transfers to chronically food-insecure households in the four poorest and most vulnerable counties in Kenya (Marsabit, Mandera, Turkana, and Wajir). Under Phase 1 of the program, approximately 100,000 households throughout these counties receive regular bimonthly payments to enable them to meet their daily consumption needs. In 2013 the program began looking into adding a disaster-linked

component to the HSNP to enable rapid scale-up of transfers to a possible 400,000+ households during acute drought crises. Alongside social protection colleagues, the World Bank-GFDRR DRFI Program has been advising key counterparts in the Government of Kenya on the key benefits (including more rapid response and increased transparency) and on the investments required, including insurable quality data, to use insurance principals to execute the scale-up of the cash transfers.

