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Building Morocco's Resilience

Inputs for an Integrated Risk Management Strategy



THE WORLD BANK



GFDRR
Global Facility for Disaster Reduction and Recovery



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Preface

Over the last few decades, risk management has evolved from a technical exercise to something much more strategic: a fundamental change in terms of how to think about and best improve risk resilience. This transformation began in the private sector but is now increasingly being adopted in the public sector, including at the level of heads of governments.

Towards the goal of strengthening Morocco's resilience to specific internal and external shocks, a broad initiative is being undertaken by the Government of Morocco (GoM) to develop a national strategy for integrated risk management (IRM). Through this initiative, Morocco aims to approach selected key risks the country faces in a more holistic manner—rather than looking at risks in “silos” (if at all) as has traditionally been the case. Thus far, this integrated approach has focused on three key risks: (i) natural disasters; (ii) commodity (energy) price volatility; and (iii) risks in the agriculture sector. These were selected by the GoM based on a preliminary risk identification phase which determined that they had high cumulative political, economic and social impacts, even though it was explicitly understood that additional risks (such as financial sector risk) are equally important systemically, and could over time become part of the ‘integration’ process.

These risks were also identified by the GoM as elements on which it wanted to work together with the World Bank. Given time and resource constraints, it was decided at the outset of this activity to build a solid foundation on a few key risks for which advanced risk assessments could be completed, in particular in the area of natural disasters. Clearly, the selection of the three risks is only a first step: in the longer term, and with stronger risk-management institutions that the GoM now intends to establish, the GoM will be able to include more risks in its integrated analysis of and approach to risk management. As such, this initial phase needs to be seen as part of a dynamic process in which the scope of risk management measures can be broadened over time.

This initiative began at the end of 2008 and has been supported by the World Bank and a core team of advisors, by the Global Facility for Disaster Reduction and Recovery

(GFDRR), by the Swiss Agency for Development and Cooperation (SDC), by the Trust Fund for Environmentally & Socially Sustainable Development (TFESSD) and by the FIRST (Financial Sector Reform and Strengthening) initiative. The work on disaster risk and disaster risk financing constitutes the largest part of the work financed by and conducted under the supervision of the World Bank and donors. The World Bank also conducted initial analyses for commodity price (energy) volatility risk, albeit to date less extensively. For risks in the agriculture sector, the World Bank engaged in ongoing dialogue with key stakeholders but did not commission specific analytical work (and as such the present report does not convey the full analysis that has been already conducted by Morocco in the agriculture sector).

This report is for the GoM as an input for its strategy for integrated risk management. It also serves as a summary of the results of the collaboration of the GoM with the World Bank (extensive other documentation is also available) This report may also be of interest to other governments, as an example of good practices and the step-by-step actions required to develop a national risk management strategy.

Section 1 of the report provides background on the changing state of risk management worldwide and highlights the importance of moving from disconnected risk management actions to a consciously and better coordinated set of actions at national and local levels across different types of risks. It also discusses the eight key steps for successful risk management, as well as some of the benefits that such a national IRM strategy provides. Reference is made to related initiatives occurring in other countries, recognizing that each country approaches IRM differently depending on its own culture, institutional arrangements, level of economic development, and level of institutional development. **Section 2** describes in detail the work done on natural disasters, commodity price (energy) volatility and agriculture risks for Morocco—the three key priorities selected by the GoM in 2008 for collaboration with the World Bank—and considers also disaster risk financing and insurance options. **Section 3** concludes the report by providing an initial roadmap for the implementation of Morocco's IRM strategy.

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Acronyms

| | |
|---------|--|
| AAL | Average Annual Loss (the estimated loss per year due to a hazard or hazards when averaged over a very long period) |
| AICI | Agriculture Insurance Company of India |
| BAM | Bank Al Maghrib |
| BCR | Benefit-Cost Ratio |
| CBDRM | Community Based Disaster Risk Management |
| CdC | Caisse de Compensation |
| CGE | Computable General Equilibrium (macroeconomic models) |
| CNRST | Centre National de la Recherche Scientifique et Technique |
| CORE | Center of Risk Excellence |
| COSO | Committee of Sponsoring Organizations of the Treadway Commission |
| CVC | Centre de Veille et de Coordination |
| DAPS | Department of Insurance |
| DRFI | Disaster Risk Financing Initiative |
| DRM | Disaster Risk Management |
| ERM | Enterprise Risk Management |
| EWS | Early Warning Systems |
| FEIP | Oil Revenues Stabilization Fund |
| FSEC | le Fonds de solidarité contre les événements catastrophiques |
| FWS | Flood Warning System |
| GFDRR | Global Facility for Disaster Reduction and Recovery |
| GIS | Geographic Information System |
| GoM | Government of Morocco |
| HCP | Haut Commissariat au Plan |
| IO | Input-Output (macro-economic models) |
| IRM | Integrated Risk Management |
| ISO | International Organization of Standardization |
| MAD | Moroccan Dirham Currency Symbol |
| MAGG | Ministry of General Affairs and Governance |
| MAMDA | Mutuelle Agricole Marocaine d'Assurances |
| MEF | Ministry of Economy and Finance |
| MEMEE | Ministry of Energy, Mines, Environment and Water |
| MENA | Middle East & North Africa (World Bank region) |
| MHCP | Ministry of Finance and Public Credit (Colombia) |
| MnhPRA | Morocco Natural Hazards Probabilistic Risk Analysis |
| Mol | Ministry of Interior (Morocco) |
| NAIS | National Agricultural Insurance Scheme (India) |
| NEAMTWS | North Eastern Atlantic, the Mediterranean and Connected Seas Tsunami Early Warning and Mitigation System |

| | |
|-----------|--|
| NORM | National Office of Risk Management |
| NRA | National Risk Assessment |
| NRR | National Risk Register |
| OECD | Organisation for Economic Co-operation and Development |
| PPP | Public-Private Partnership |
| RIMS | Risk Information and Management System |
| RRN | Risk Response Network |
| SCR | Société Centrale de Réassurance |
| SDC | Swiss Agency for Development and Cooperation |
| SEEC CRIF | Southeastern Europe and the Caucasus Catastrophe Risk Insurance Facility |
| TFESSD | Trust Fund for Environmentally & Socially Sustainable Development |
| WDR | World Development Report |
| WOG-IRM | Whole-of-Government Integrated Risk Management |

Executive Summary

This report is in support of the Government of Morocco (GoM)'s development of an integrated risk management strategy. It is driven in part by the phenomena of top decision makers and governments worldwide witnessing an accelerating number of major shocks—global financial crises, hyper volatility in commodity prices, devastating natural disasters, intercontinental pandemics as well as the changing nature of terrorism threats.

These shocks, which inflict human suffering and major social, economic and political disruption, are fundamentally changing how governments view the importance of good risk management and the need to strengthen national resilience. As a consequence, risk management has evolved from being a technical issue (when addressed at all) to a strategic consideration.

Indicative of the changing approach worldwide is that the World Bank, OECD, the World Economic Forum, and the G20 now consider risk management a key priority. In an increasingly interdependent world, managing risks requires recognizing that risks can no longer be managed in isolation. A more coherent enterprise-wide risk-management approach, led by top management, and consisting of assessing, prioritizing, managing and financing an organization's key risks, has become good practice in the private sector. A similar approach can also be very beneficial for governments, as recognized by the GoM.

Developing and adopting a national strategy for *integrated risk management* (IRM) will not only make Morocco better prepared to avoid future crises, and be more reactive and resilient if/when they occur, but also allow the GoM to make more informed decisions on overall resource allocation and prioritization. This is crucial because not all risks are equal, nor can they be similarly managed. Countries that adopt an IRM approach are likely to not only enjoy stronger economic growth and social stability, but also are more likely to attract foreign investment as investors will perceive the country as safer and more stable. However, it is important to note upfront that risk, in and of itself, is not necessarily the problem (without risk taking there would

be no entrepreneurship)—it is the lack of good risk management that IRM is aiming to address.

Morocco recognizes the strategic aspect of good risk management and is one of the vanguard countries developing an IRM strategy. In 2008, the GoM launched a broad initiative in close collaboration with the World Bank and its advisors to improve the management of some key risks affecting the Moroccan economy and its budget, as well as the social stability of the country. This report provides details on how this initiative began and the work undertaken to support Morocco's evolution to improved risk management. The emerging IRM strategy has addressed three key risks considered to be a priority by the government:

- ▶ **Natural disasters** (Morocco is exposed to earthquakes, tsunamis, floods, and droughts)
- ▶ **Commodity (energy) price volatility** (Morocco is highly dependent on oil imports)
- ▶ **Agriculture risks** (agriculture employs about 40% of Morocco's workforce and generates about 15% of GDP)

Of these, natural disaster risk was the most extensively assessed.¹ State-of-the-art probabilistic risk assessments for the entire country, reveal that floods, earthquakes and tsunamis are expected (on a probabilistic basis) to cost on average MAD 5.0 billion annually, of which flooding constitutes the biggest part. An extreme scenario would be a major earthquake striking a highly populated area of the country, which could cost MAD 100 billion, equivalent to 5.1% of GDP or 23% of the national budget. Morocco is also highly dependent on oil imports and the volatility of commodity prices had a MAD 30 billion negative impact on the national budget in 2011 alone.² For the agriculture

1 In the context of the World Bank-Morocco partnership a comprehensive risk assessment was performed for the natural hazards through the creation of MnhPRA.

2 GoM policy subsidizes the consumer price, absorbing the difference from international market prices. The MAD 30 billion is the difference between the budget commodity price subsidy and the actual amount paid

sector, the total exposure to various risks (drought, pest and diseases, and market price volatility) was estimated to be MAD 75 billion in 2008 (projected to increase to MAD 185 billion in 2020).

Quantifying these key risks allows Morocco to move to the next phase of the IRM initiative, which consists of better managing its risk exposure through dedicated investment programs, both in terms of physical infrastructure and financial protection solutions. The choice of which protection solutions to adopt will depend on several factors, including the willingness of the GoM to assume risk (that is, its risk appetite), what part of its national budget it wants to allocate to risk management, its capacity to borrow money from capital markets and international organizations, and the time horizon over which the government wants to implement its IRM strategy. Note also that these three categories of risks were selected as a priority to start this process; as the IRM strategy develops more risks can be gradually integrated.

Of course, Morocco does have a strong framework of existing institutional structures, programs and initiatives geared towards risk mitigation. For example, for managing disasters resulting from natural hazards, the GoM has in place good systems for crisis response managed through the Centre de Veille et de Coordination (CVC) within the Ministry of the Interior—supported by a corresponding legislative framework. The Department of Water formulated the National Water Strategy in 2009. This includes setting up early warning systems for floods, weather forecasting and flood risk plans for urban planning and watershed management. Morocco also has a National Flood Protection Plan which identifies the specific sites vulnerable to floods and identifies corresponding investment programs. Furthermore, the GoM has initiated several activities aiming to reduce the exposure of its economy to the prices of commodities, such as managing consumption, diversifying sources and increasing domestic production of energy, incentivizing increased storage and modernizing the existing compensation (subsidy) mechanisms. Finally, the Ministry of Agriculture and

FIGURE ES-1: Technical Reports and Sample Outputs of MnhPRA, from the Disaster Risk Portion of the Project



Marine Fisheries (MAMF) has recently developed a National Strategy for Agricultural Risk Management in an effort to shift from ex post crisis management to risk mitigation. Other important local initiatives are also underway.

However, until now, Morocco's approach to risk management has been highly sectoral. The initiatives listed above are often independently implemented and suffer from institutional fragmentation—a key shortcoming an integrated approach to risk management aims to address. To be successful and sustainable, Morocco's IRM strategy should be (i) based on a coordinated inter-ministerial action at the highest level of government, facilitated by a National Office of Risk Management (horizontal integration) and institutionalized within each line Ministry in partnership with local actors (vertical integration); (ii) based on a clear but flexible integrated risk management strategy with milestones and deliverables so one can measure progress over time; and (iii) supported by appropriate risk information and management systems across different types of risk. Depending on the risk, specific mitigation measures will be required and financial protection solutions will be different but can complement each other and generate co-benefits. Based on the work completed to date, Table ES-1 indicates some actions that could be considered by Morocco in this regard.

Collectively, the actions in Table ES-1 have emerged out of the policy dialogue between Morocco and the World Bank and, as such, constitute an initial input for Morocco's efforts in developing a national IRM strategy. The actions are risk-specific in many cases, but also include key cross-cutting institutional actions that will enhance mitigation of all risks under consideration here. A timeframe for each action, in terms of *S* (short term, 1–2 years), *M* (medium term, 2–5 years) and *L* (long term, > 5 years), is indicated. Many details need to be finalized before the actions in Table ES-1 can become an operational strategy—specific government ministries and agencies need to be tasked and resourced, to implement these, and other important, actions. It should be noted that since most of the work on agriculture risks was done by the GoM itself the level of details on this pillar in the present report is kept minimal; this is not to say that Morocco has not conducted extensive work on the matter but rather that the involvement of the IRM team remained informal.

Operationalizing an IRM strategy presents a significant opportunity for Morocco. It will help ease the implementation of required cross-sectoral linkages that make risk manage-

ment much more effective in an increasingly complex operating environment. (This will of course be done in parallel to sectoral strategies which require specific approaches to deal with a given type of risk.) For example, a massive flood will have different impacts on various ministries—the Ministry of Public Works will need to ensure that development occurs outside the flood zone; the Ministry of Agriculture will be involved if the flood affects farming communities; the Ministry of the Interior will co-ordinate security/emergency services; the Ministry of Health will provide treatment of victims in hospitals; and the Ministry of Finance would organize compensation of affected individuals and communities and the financing of reconstruction. Consideration of risks in an integrated manner will enable the government to understand the totality of risk; to make the necessary linkages; and to improve future infrastructure and related public investment decisions. It will also help the government to better anticipate budget needs and prioritize budget allocation; coordinate actions across ministries to improve communication; avoid overlapping actions; and benefit from economies of scale. This will in turn reduce the cost of mismanaged and underestimated risks and improve social resilience by allowing the government to be more proactive in attempting to reduce the economic and social impact of a massive shock. There might also be some cost-sharing with the private sector through dedicated public-private partnerships (PPP) if stronger national resilience enhances competitiveness of Moroccan businesses.

But for large crises, the government is often considered to be the risk manager of last resort, and has a *de facto* financial liability regarding major risks the country faces (for example, through ex ante subsidy and ex post compensation). Managing risks more strategically will also enable the Ministry of Finance to better manage this financial liability after a national crisis, which is often not budgeted for, be it a sharp increase in the price of food or oil, a natural disaster, or a major drought. Ultimately, an IRM strategy will help the GoM make better informed decisions on how risks compare, how a limited budget can be allocated across different risk-reduction initiatives, and how such policy can benefit from economies of scale across the country. This will also position Morocco as one of the more active countries on risk management, which as noted can serve as a strong signal for foreign investors.

Clearly, this is an ambitious and long-term agenda. Morocco could adopt a gradual approach to the implementation of this agenda, starting with a few key actions and then gradually scaling up the engagement. Through the initiative de-

scribed in this report, Morocco has now entered the group of countries (currently, mostly OECD countries) that have started to implement IRM strategies. While there is more to be accomplished, this step in itself constitutes an important and highly visible leadership move.

The framework Morocco is developing can also serve as a model for other governments—not only in the Middle-East and North Africa (MENA) region but also in other parts of the world—which recognize the national imperative to improve risk management, but do not necessarily know

where to start, nor what needs to be done, to develop an IRM strategy.

Note finally that this report is a summary of more than 20 technical reports that have been produced since 2008 with corresponding in depth quantitative analysis and computer-based modeling programs. These reports discuss in detail methodologies, data, assumptions, results, comparative analyses, international benchmarks and other aspects of Morocco's risks (see Appendix 1 for the list of outputs). All this documentation has been developed with extensive input from the GoM.

Table ES-1: Summary of Key Actions

| Cross-Cutting Institutional Actions | Time* |
|--|--------------|
| Establish a National Risk Management Office (NORM) | M |
| Develop an Integrated Risk Management Strategy | S |
| Establish a Risk Information and Management System (RIMS) | M |
| Create a Centre of Risk Excellence (CORE) | M |
| Natural Disasters | |
| <i>Programs and Institutions</i> | |
| Establish early warning systems for floods, tsunamis and earthquakes | S |
| Enhance hazard mapping and analysis for floods and earthquakes based on MhnPRA | S |
| Enhance building code compliance to reduce potential earthquake impact in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan) and extend to other provinces over time | S/M |
| Establish a program to educate public and private building owners about need for retrofits in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan) and extend to other provinces over time | S |
| Include DRM in <i>Plan Communal de Development</i> and enhance rescue and relief plans in communities identified as high risk by MnhPRA | M/L |
| <i>Structural Measures</i> | |
| Accelerate flood protection structural improvements in provinces with high flood risk (Kenitra, Tetouan, Casablanca, Sidi Kacem) and extend to other provinces over time | M/L |
| Implement earthquake retrofitting of public buildings in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan) and extend to other provinces over time | M/L |
| Invest in small-scale community-based risk resilient infrastructure in communities identified as high risk by MnhPRA | M |
| Commodity (Energy) Price Risk** | |
| <i>Programs and Institutions</i> | |
| Develop a commodity price risk management strategy and establish corresponding institutional management arrangements | S/M |
| <i>Risk Transfer</i> | |
| Commodity price hedging through financial instruments | S |

Continued on next page

Table ES-1: Summary of Key Actions

| Agriculture Sector Risk | |
|--|-----|
| <i>Programs and Institutions</i> | |
| Extend drought risk analysis to entire agricultural sector based on MhnPRA (which has covered so far only three crops) | S |
| Establish data collection systems for collection, management, and processing of agricultural data and weather information | S |
| Build institutional capacity for improved data management on risks in the agricultural sector | M |
| Enhance early warning systems for droughts M | M |
| <i>Structural Measures</i> | |
| Build irrigation networks in priority areas, including in Souss-Massa-Draa, Meknes, and Marrakech-Tensift | M/L |
| Invest in flood protection works in high-risk rural areas, including in Gharb-Chaouia-Ourdigha | M/L |
| Invest in equipment, for example synoptic stations, modeling, computers, software, satellite photos, etc., necessary for the implementation of the parametric insurance | M |
| Disaster Risk Financing and Insurance | |
| Operationalize Law 34-08 to establish a national catastrophe insurance program for private assets | S |
| Develop and implement an integrated disaster risk financing strategy that builds on the establishment of a national catastrophe insurance program (covering businesses and individuals) and the outcomes of a fiscal risk assessment (evaluation of government's exposure) | M |
| Promote agricultural insurance market development through technically-informed product design and transition to a stronger PPP | M |
| Evaluate the implementation of a national insurance program for public assets | M |

*S: short term (1–2 years); M: medium term (2–5 years); L: long term (> 5 years).

** Commodity (Energy) Price recommendations focus only on one aspect: how to use market-based commodity price risk hedging as a way to mitigate the short-term impact of commodity price volatility on Morocco's budget. Broader measures are of course also required, such as the reform of the subsidy system, diversification of energy supply, and improved energy efficiency.

SECTION I: A New Approach for Governments' Risk Management

1. A Changing Context

1.1 Risk Management is Becoming More Strategic

The number and nature of risks governments now face on a more regular basis and that increasingly jeopardize the economic development and social stability of their countries are changing. Catastrophes have occurred at an unprecedented rate in the past few years, including global financial crises, hyper-volatility in commodity prices (from oil to food), large-scale natural disasters (floods and droughts of great magnitude, massive storms, and devastating earthquakes), intercontinental pandemics, and the changing nature of terrorism threats. Today's world is also marked by mounting food and water scarcity, high climate variability, nuclear proliferation, and cyber risks. As with other countries, Morocco is not immune to many of these risks.

The frequency of high-impact events is likely to increase even further. A combination of a growing and rapidly urbanising population, particularly in hazard-prone areas, and the increasing frequency of disasters due to climate change mean that governments, as well as companies, will have to learn how to better manage the risk of extreme events.

As a result, developing and implementing adequate risk management strategies (which encompasses several complementary activities, from risk *perception* to risk *assessment*, risk *reduction* and risk *financing*) is also increasing in strategic importance.

The Government of Morocco (GoM), as other governments around the world, is now faced with the following question:

How can the GoM pro-actively develop more co-ordinated and effective methods of anticipating and managing major risks, while creating the foundations for a more resilient society should these risks realize into losses?

The World Bank has emerged as a leading partner for low- and middle-income countries in their efforts to manage risks, including those of natural disasters. For instance, the World Bank has developed a series of specific disaster risk management actions in several countries (Box 1).

More recently, the World Bank has recognized the need to go beyond natural disasters and has begun to articulate an approach to risk management that better captures the interconnected challenges of risk management, as evidenced by the 2014 World Development Report which focuses, for the first time ever, entirely on risk management (Box 2).

There also have been several other important initiatives addressing the need for efficient strategies to manage the increasing financial burden of catastrophes, delineating the roles and responsibilities of key stakeholders in the public and private sectors in the management of risks and establishing good practice risk management guidelines. For instance, the Organization for Economic Cooperation and Development (OECD) established the *International Network on the Financial Management of Large-Scale Catastrophes* in 2006 which promotes the exchange of information and experiences among policymakers, industry, and leading research institutions in both OECD and non-OECD countries. Furthermore, the OECD was recently asked to develop the joint G20/OECD framework on risk management published at the end of 2012. The World Bank and the UN were also associated with these new G20 activities, demonstrating a rapidly emerging interest on how to best address risk management challenges.

Additionally, the evolution of risk management as an integral responsibility of government is becoming increasingly apparent at many global forums, such as the World Economic Forum (WEF) which launched its Risk Response Network in Davos in 2010 and has devoted an increasing number of sessions on global risk management at its annual and regional meetings (Box 3).

BOX 1: World Bank's Five Pillars of Action on Disaster Risk Management (DRM)

Though the World Bank has been assisting countries on building resilience to disasters since the 1980s, its strategic role evolved with the creation of the Global Facility for Disaster Reduction and Recovery (GFDRR)—a multi-donor partnership and financing mechanism to mainstream disaster and climate risk management into development strategies and planning. Housed within the World Bank, GFDRR also acts as the Bank's focal point for oversight, partnership building, and business development in DRM. The growing strategic commitment of the World Bank to DRM is reflected in the number of Country Assistance and Partnership Strategies that now build disaster risk into their approach.

The DRM practice operates across five strategic pillars of action:

1. Post-Disaster Needs Assessment (PDNA) and Emergency Reconstruction & Recovery: large-scale emergency recovery programs such as those after the Aceh tsunami in Indonesia, the 2005 earthquake in Pakistan and the Wenchuan earthquake in China in 2008. There have been 26 PDNAs to date, supported by rapid mapping and damage validation through remote sensing and Earth observation, such as the one conducted in Haiti in 2010.
2. Disaster risk mitigation and related climate adaptation investment programs and multisector mainstreaming of DRM: risk mitigation programs, including those focusing on climate-related hazards, such as the India National Cyclone Mitigation Project.
3. Innovation and application of new technologies: innovative risk financing instruments such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and the Pan-African Drought Insurance Pool; remote sensing and geospatial analysis for mapping risks; analyzing intervention options and assessing post-disaster impacts; and leveraging public-private partnerships.
4. Global knowledge solutions and building access to data: actively informing the global DRM and climate change adaptation agenda with cutting-edge knowledge products, such as the *Housing Reconstruction Handbook*, and the seminal study on the economics of prevention *Natural Hazards, UnNatural Disasters*, etc.
5. Partnership development and donor coordination: through the GFDRR, building strategic and operational alliances with technical and political leaders in the DRM field.

Source: http://www.gfdr.org/sites/gfdr.org/files/WorldBank_DRM_Brochure_Jan2012.pdf

The Government of Morocco has the opportunity to become one of the leaders and early adopters of more strategic risk management at the country level and has already begun to share its vision at recent World Bank, OECD and WEF events in the above context.

1.2 From Managing Risks in Isolation to Integrated Risk Management

Within both private and public sector organizations, risk management until recently has been fragmented, with risks treated in isolation and their management undertaken in “silos.” While there may be a tendency at times to focus on specific risks, traditional organizational structures (with separated functions and hierarchical layers) have contributed to this “silo” mentality. As a result, there is a tendency to compartmentalize tasks into distinct, mutually exclusive categories. Although it is easier to manage small tasks, and to hope that the consequences from unforeseen events will be confined to a small area, unfore-

seen events and mismanaged risks tend to affect many parts of an organization simultaneously. Additionally, the interdependence of those parts and different risks needs to be better understood and managed.

In the private sector, recognition of these gaps has led to the rise of Enterprise Risk Management (ERM) (Box 4), which developed as a response to the inadequacy of the silo-based approach to risk management. ERM did not develop overnight but rather evolved as the process of risk management matured, where risks are quantified, compared with one another, managed in a coordinated manner and in an integrated way across an entire business.

As a result, ERM enables risk reduction actions to address multiple risks spanning multiple business sectors simultaneously and to generate economies of scale (for instance, by purchasing insurance coverage for multiple risks from one insurer at the same time rather than buying a multitude of small insurance contracts from several insurers for which the firm might not have the same negotiation power).

BOX 2: The World Development Report (WDR) 2014: Managing Risk for Development

The World Development Report (WDR) 2014 will concentrate on the role of risk management in development and poverty reduction. It will argue that responsible and efficient risk management is crucial not only to reduce the negative impacts of shocks and hazards, but also to enable individuals, households, and enterprises to pursue new opportunities for growth and prosperity. Responsible and efficient risk management requires a systematic approach that combines preparing for (ex ante) and coping with (ex post) risk.

Whether risks are imposed or assumed voluntarily, growth and development can be achieved only by confronting risks responsibly and efficiently. Risk management should, therefore, be a central concern at all levels of society. From both private and public perspectives, the goal of risk management is to mitigate the losses and improve the benefits that people may experience while conducting their lives and pursuing development opportunities.

Whether risks are idiosyncratic or systemic, risk management is a shared responsibility, requiring actions that individuals and social systems must undertake, often in coordination. It is virtually impossible for individuals to handle successfully all of the risks they face on their own. Effective risk management requires the participation of well-functioning social and economic systems—the household, the local community, the enterprise sector, the financial system, the state, and the international community—with each providing support to people's risk management in different yet complementary ways.

Looking at risks in an integrated manner helps define priorities, and avoids overspending on managing one risk while neglecting others. Synergies and tradeoffs exist in managing individual risks, while synergies offer opportunities to achieve more easily attainable initial targets and low-cost actions. A multi-stakeholder approach to national risk management enables these tradeoffs and synergies across risks to be identified and managed. It also makes the process of risk management less prone to political capture, and introduces critical accountability mechanisms.

Source: World Bank WDR team.

Today, ERM is seen as good practice by many corporations, even though its level of application varies widely. Because of growing pressures on CEOs and Boards of Directors to better manage a firm's risks in a holistic way, increasingly companies have implemented ERM while others are starting the process. For instance, a recent survey of U.S. firms indicates that the proportion that had completed their ERM strategy increased from 9% to 23% between 2009 and 2012; significantly for large corporations this proportion was 47%.³

Nonetheless, in substance, governments face the same issues as private sector firms, and are beginning to realize that whatever the nature of the risks, the government is often the risk manager of last resort. Most governments have a *de facto* financial liability vis-à-vis major risks the country faces as they will be asked to fulfil some of the financial needs when major risks do occur (for example through ex ante subsidy and ex post compensation).

This is specifically the case in countries where insurance coverage is low or non-existent, and where people and businesses rely on their government for assistance after a national crisis, whether this is a sharp increase in the price of food or oil, or a natural disaster. Such financial liability is typically not included in national budgets but has become more apparent as

countries face serious public deficit challenges. If the government is asked to provide compensation to counteract high increase in prices from international markets or to help victims of an earthquake, it is irrelevant to the Ministry of Finance what triggers the non-budgeted extra spending. Regardless of the cause, each extra dollar spent on disaster recovery or compensation is a dollar that will not be spent elsewhere or that has to be financed through debt issuance.

Any government wanting to build national resilience needs to develop the proper tools, which are discussed in the next section. There is also a need for increased institutional collaboration across different ministries, as none of them has full responsibility for managing the entirety of a risk. For instance, a massive flood will not just impact one sector of the economy, but many simultaneously. Different ministries will have oversight over one element of risk. Public

3 See Beasley, M., B. Branson, and B. Hancock. 2012. "Current State of Enterprise Risk Oversight: Progress is Occurring but Opportunities for Improvement Remain." ERM Initiative at North Carolina State University on behalf of the American Institute of CPAs Business, Industry & Government Team, available at http://poole.ncsu.edu/vol2/erm/ee/i/weblogs/research-documents/AICPA_ERM_Research_Study_2012_Final_Submission_July_16,_2012.pdf.

BOX 3: World Economic Forum Risk Response Network

The World Economic Forum's Risk Response Network (RRN) serves as a neutral, impartial and trusted platform that connects all of the Forum's risk related activities by: (a) convening relevant experts from all disciplines both physically and virtually to respond to global risks; (b) curating knowledge, experiences and practices from around the world that offer new solutions; and (c) catalysing partnerships, initiatives and research that shape global, regional and industry agendas.

The RRN concentrates currently on four core activities at the global, regional and industry levels.

Providing a Strategic Assessment of Global Risks: Each year over 1,000 experts worldwide evaluate 50 global risks in terms of their perceived likelihood and impact over a 10-year horizon and, most importantly, their interconnections across five categories of risks: economic, environmental, geopolitical, societal and technological. The findings also serve as the basis of the Forum's flagship publication on Global Risks published in January in advance of its Annual Meeting in Davos, Switzerland.

Improving National Resilience to Global Risks: Countries are increasingly vulnerable to exogenous shocks over which they have no control. Often such shocks emanate from risks that are difficult to predict and where there is little experience or knowledge on how to handle their impact. The RRN's primary effort in this context is to develop innovative ways to improve a country's resilience (i.e. its ability to absorb and recover from external shocks while preserving core functions of critical systems) via new diagnostic methods. It also aims to promote the establishment of a Country Risk Officer function in national governments similar to a Chief Risk Officer in multinational corporations, which is very much aligned with the IRM strategy discussed in this report.

Advancing Risk-Related Industry Initiatives: Forum industry communities have initiated major initiatives that focus on specific global risks. RRN objectives include fostering cross-industry collaboration and promoting knowledge and data sharing among public, private and academic institutions. Cyber-Resilience, Global Supply Chain Risks, Corruption in High-Growth Markets, Catastrophic Risks and Global Food Safety are among the industry workflows in this context.

Identifying and Evaluating Leading Practices: Via the Forum's virtual interaction and knowledge management platform (Toplink), the RRN connects experts and curates their experiences in the form of an interactive, online exchange which evaluates successful practices in improving resilience to major risks at the global, national or industry levels.

Source: World Economic Forum's Risk Response Network Team

Works to assure constructions are build outside of a flood zone; Agriculture if the flood affects farmers; Interior for security/emergency services; Heath for the treatment of the victims in hospitals; and Finance for indemnification of the victims and rebuilding destroyed public infrastructure.

In recognition of these elements, there is a growing trend in several countries towards better risk governance and risk management. Experience in countries like Canada,⁴ the Netherlands, the United Kingdom, and Singapore has shown that implementation of a government-wide comprehensive **integrated risk management** (IRM) framework reduces risks and saves resources. It also makes countries more attractive to foreign investments as they are more stable, being resilient to internal and external shocks. Boxes 5, 6 and 7 briefly describe the methods and approaches of some of these countries. However, it is important to note that there is no one-size-fits-all IRM design, so that ultimately the decision for IRM and its design must be made by the head of government and line ministries in light of

the specific country circumstances. Different governments approach risk management differently; some government teams are tasked stand-alone units (Netherlands, Singapore, Columbia) while others are integrated into a broader strategic unit (United Kingdom). Nonetheless, all these countries have recognized that a dedicated team must report to the highest level of decision making in the country.

⁴ According to the Treasury Board of Canadian Secretariat (2010), Risk Management is described as a systematic approach to setting the best course of action under uncertainty by identifying, assessing, understanding, making decisions on, and communicating risk issues, and is an integral component of good management. As a result, Integrated Risk Management promotes a continuous, proactive and systematic process to understand, manage and communicate risk from an organization-wide perspective in a cohesive and consistent manner . . . [i]t requires an ongoing assessment of risks at every level and in every sector of the organization, aggregating these results at the corporate level, communicating them and ensuring adequate monitoring and review. Integrated risk management involves the use of these aggregated results to inform decision-making and business practices within the organization.

BOX 4: Enterprise Risk Management

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) published an Enterprise Risk Management (ERM) standard in 2004, which is now widely recognized by risk management practitioners. It provides a framework for undertaking ERM and has gained considerable influence because it is linked to the Sarbanes-Oxley federal law requirement for companies operating in the United States. On a global level, the International Organization of Standardization (ISO) released its dedicated ISO 31000 risk management guide in November 2009, which is viewed as an internationally agreed-upon standard to provide firms with a unifying risk management framework. ISO 31000 is intended to be applied within existing management systems to formalize and improve risk management processes. When implementing ISO 31000, attention is to be given to integrating existing risk management processes in the new paradigm addressed in the standard. ISO 31000 'Harmonization' programs have centered on: (i) transferring accountability gaps in enterprise risk management; (ii) aligning objectives of the governance frameworks with ISO 31000; (iii) embedding management system reporting mechanisms; and (iv) creating uniform risk criteria and evaluation metrics.

While ERM strategies differ from by firm, industry and country, the strategy consulting firm McKinsey identified five building blocks in many successful ERM strategies.

- A risk dialogue forum for top management where the executive team reviews the risk profile of the company and discusses the risks associated with major decisions.
- A risk charter for the Board, with a clear definition of allocation of responsibilities of risk oversight processes.
- A user-friendly synthesized risk dashboard, which can be used by the top management and Board of the firm (typically an extension of that report and metrics already used by decision makers). This approach ensures that all the information is in one place.
- A risk appetite statement, which defines how the company decides to create value, and determines whether risks are acceptable or not.
- Risk management is to be embedded in all business decisions. ERM is most successful when it becomes a tool that helps business leaders balance risks and rewards and integrate risk more systematically in the evaluation of business opportunities.

This lesson from international experience is important for Morocco to move forward and why, as discussed in the next

section, a dedicated risk management office reporting directly to the head of the GoM is needed.

BOX 5: The UK Cabinet Office

The UK Cabinet Office (essentially the Prime Minister's office) established its strategy unit in 2002. The Strategy Unit was an elite group of 45 to 90 people which operated under Prime Ministers Tony Blair and Gordon Brown until its functions were transferred to other units in the Cabinet Office at the end of 2010. The Strategy Unit's role was to provide the head of government with in-depth strategy advice and policy analysis on key priorities. This included monitoring key national risks, reports to the Cabinet on progress achieved and responsibility for guidance on the risk management framework previously adopted. Its role was to increase policy-making at a strategic level within and between Ministries. It also provided the Prime Minister and all Ministers with longer-term thinking and dedicated studies to help decision-making.^a

The British government also monitors the most significant emergencies that the UK and its citizens could face over the next five years through the National Risk Assessment (NRA). This annual confidential assessment draws on expertise from a wide range of departments and government agencies. The National Risk Register (NRR), the public version of the assessment, publishes a number of scenarios, to better inform citizens and businesses of the hazards and threats facing the country. The purpose of making these scenarios available is to inform the public, and provide guidance on what the public can do to prepare for the consequences of the most likely risks, should they wish to do so.

a. See the "Orange Book": Her Majesty's (HM) Treasury. 2004. *Management of Risk— Principles and Concepts*. London: HMSO. See also: Cabinet Office. 2002. *Risk: Improving Government's Capability to Handle Risk and Uncertainty*. Strategy Unit Report, November 2002. London; HMSO..

BOX 6: Singapore

In Singapore, the Whole-of-Government Integrated Risk Management (WOG-IRM) framework aims to improve the risk awareness of all government agencies. Though most agencies are already aware of most of the risks that fall within their remit, some agencies have not deliberately and systematically identified the full range of risks. Agencies may also lack an awareness of how such risks are affected by the action or inaction of other agencies, and vice versa. In a growing interdependent world, being able to consider this interconnectedness of risks is especially critical. The tendency of an approach favoring risk avoidance in government agencies failures to consider how much is lost by foregoing opportunities or by not creating them. Singapore's WOG-IRM framework stands out as a good practice because it not only helps address gaps in risk management, but also identifies cross-agency risks that may have fallen through gaps in the system. It helps agencies to address their own vulnerabilities and to identify those that are contingent upon the vulnerabilities of others, while reinforcing the government's broader effort to evaluate and prioritize key risks in a holistic manner (OECD, 2009). The implementation of the WOGIRM strategy is tracked throughout the year and aligned with the annual budget cycle. This ensures that priority budget allocations are awarded to initiatives that address the key risks identified in the strategy. A Strategy Committee provides oversight and guidance by serving as the main platform to steer and review the overall implementation and progress. The Committee meets quarterly and comprises Permanent Secretaries from the various ministries across the government of Singapore.^a

a. Organisation for Economic Co-operation and Development (OECD). 2009. *Innovations in Country Risk Management*, Paris: OECD.

As noted earlier, experience shows that designing and implementing an IRM strategy for a country is not easily nor quickly accomplished and it is a more time-consuming process for an entire country than for a private sector company. It requires time, resources, expertise and leadership as well as a long-term vision for the country. However, if carried out correctly, the benefits could be felt widely across its population as well as its private sector and trade partners.

Box 8 provides an overview of the direct benefits from IRM. It is, however, also important to note that there are import-

ant and immediate co-benefits to investing in the implementation of an IRM approach and in resilience more generally. For instance, while investing in making existing or new infrastructure more resilient has a cost, it immediately creates a large number of jobs which has significant positive impact on the local communities where these investments take place. While this report provides cost-benefit analysis based on avoided losses from risk reduction measures, it is clear that the overall benefits of many of these measures would actually be higher because of the urban regeneration, jobs creation and overall economic activity these ini-

BOX 7: The Netherlands

In 2007, the Netherlands was one of the first countries to adopt a Cabinet's Strategy on National Safety. This Strategy seeks to examine all risks that can seriously affect the country on a common basis. For instance, in 2007 and 2008 a Cabinet's Taskforce Flooding was installed to develop worst credible flood scenarios and formulate a nationwide preparation. It cumulated in a week long exercise involving about 15,000 people from NGOs, different governmental organizations and different operational organizations. In 2009, following special attention to floods, the country organized the largest European Union exercise to test the assistance from Member States of the EU. That same year the National Risk Assessment paid special attention to pandemics (pre-empting the global outbreak of H5N1). In 2010–11, special attention was given to cyber risks, and associated issues. The National Steering Committee for National Safety ("Stuurgroep Nationale Veiligheid", SNV) was formed in 2011 to strengthen the holistic risk management approach. The SNV realizes coherence in national risk assessment and management at several levels of government policy, both regional and national, as well as international policy. The SNV advises the Dutch Cabinet and Parliament on risk reduction and regularly reports on National Risk Assessment and activities to strengthen capabilities and national risk management coherence.

As such, the national IRM strategy is also based on a whole-of-government approach instead of departmental tasking and on a systematic national risk assessment, which guarantees more flexibility and agility in the risk management and risk financing strategy process.

BOX 8: Benefits of Integrated Risk Management

Integrated risk management (IRM) has a number of clear benefits over traditional risk management. This is because IRM considers major risks in a consistent manner using common criteria and, at times, combines risk reduction vehicles and methods, whereas traditional risk management typically operates in silos, does not collate comparable risk data and separately pursues differing risk reduction options based on inconsistent criteria. Overall, IRM is a major step towards managing the complexity inherent in the many risks facing a nation. It does this through a transparent, continuous, multi-stakeholder processes that coordinates risk assessment and risk reduction efforts. It increases the systematic integration of the risk factors into a large number of day-to-day and strategic decisions—and helps to more efficiently allocate scarce risk reduction resources as well as monitor progress on multiple fronts.

The specific benefits of IRM include, among others: ^{a,b,c,d}

- **Identifying Risks and Preparedness:** IRM results in a more consistent identification and prioritization of key risks facing a country, which leads to a clearer understanding of the capabilities and capacities for reducing these risks.
- **Improving understanding of risk interdependencies:** Risks are too often treated in silos but they are becoming more and more interdependent. For instance, a massive flood will impact different ministries differently—Public works to ensure constructions are built outside of a flood zone; Agriculture if the flood affects farmers; Interior for security/emergency services; Health for the treatment of the victims in hospitals; and Finance for compensation of impacted individuals and communities and the financing of reconstruction.
- **Making Informed and Cost-Effective Decisions:** IRM is transparent, rational, and if implemented well can lead cost-effective decision making—its key value for decision makers is the ability to comprehensively consider options within the larger context and across multiple risks. Opportunities for synergy and leveraging, particularly in the financial arena, are more easily identified and implemented (highest 'bang for the buck').
- **Enhancing communication and coordination:** IRM promotes a common vocabulary and technology across ministries, breaks down "silos", enhances vertical and horizontal integration within the government and involves other key stakeholders (such as scientific organizations, community leaders, businesses, NGOs etc) to improve effective risk management.
- **Providing top decision makers with a complete dashboard of exposure and possible solutions:** By approaching risk management holistically, one can provide the right information top decision makers need rather than relying on piecemeal results from independent studies looking only at one aspect of a problem at a certain time. In doing so, the integration also typically elevates risk management to a more strategic level than smaller risk management initiatives could achieve.

Ultimately, an integrated risk management strategy will help governments make more informed decisions on how risks compare to each other, how limited budget can be allocated across different risk reduction initiatives, and how such policy can benefit from economies of scale across the country. Implementing an IRM approach would also position Morocco as one of the more active countries around the world on risk management, which in turn can serve as a strong signal for foreign investors.

a. Erwann Michel-Kerjan. "MENA Countries Need to Foster Their Risk Management Capabilities, But How?" *The Huffington Post*, October 26, 2010.

b. According to the US Department of Homeland Security.

c. CNA Institute for Public Research, <http://www.cna.org/learnaboutrisk>

d. http://www.franklincountyohio.gov/emahs/documents/irm_benefits.pdf

tiatives will generate. This is important politically because considering the overall benefits of any policy will make it easier to justify the required additional spending.

It is significant to note that the few countries that approach risk in a more integrated way are all developed economies, raising the question of whether IRM is achievable by developing countries as well.

This report suggests that IRM is achievable by developing countries, and provides a strategy for guiding an on-going IRM initiative launched by the GoM in 2008, in collaboration with a dedicated World Bank team and its advisors. This initiative is unique for a developing economy in its scope and the diversity of the risks on which it focuses.

It is also important to stress that the World Bank envisions that the collaboration with the GoM in the coming years will continue to help provide the country with the best expertise in the field and also to provide capacity building *within* Morocco. The World Bank has already started to do this in the IRM initiative by training representatives in several line ministries to some of the risk quantification tools developed for Morocco, by working closely with the scientific community and leading research institutions in the country, by collaborating with national experts in different dimensions of the work (e.g. development of macro-economic models, community-based disaster risk management) and by exchanging with the private sector (insurance industry and representatives from the General Confederation of Moroccan Enterprises). In summary, the work to date has been very inclusive.

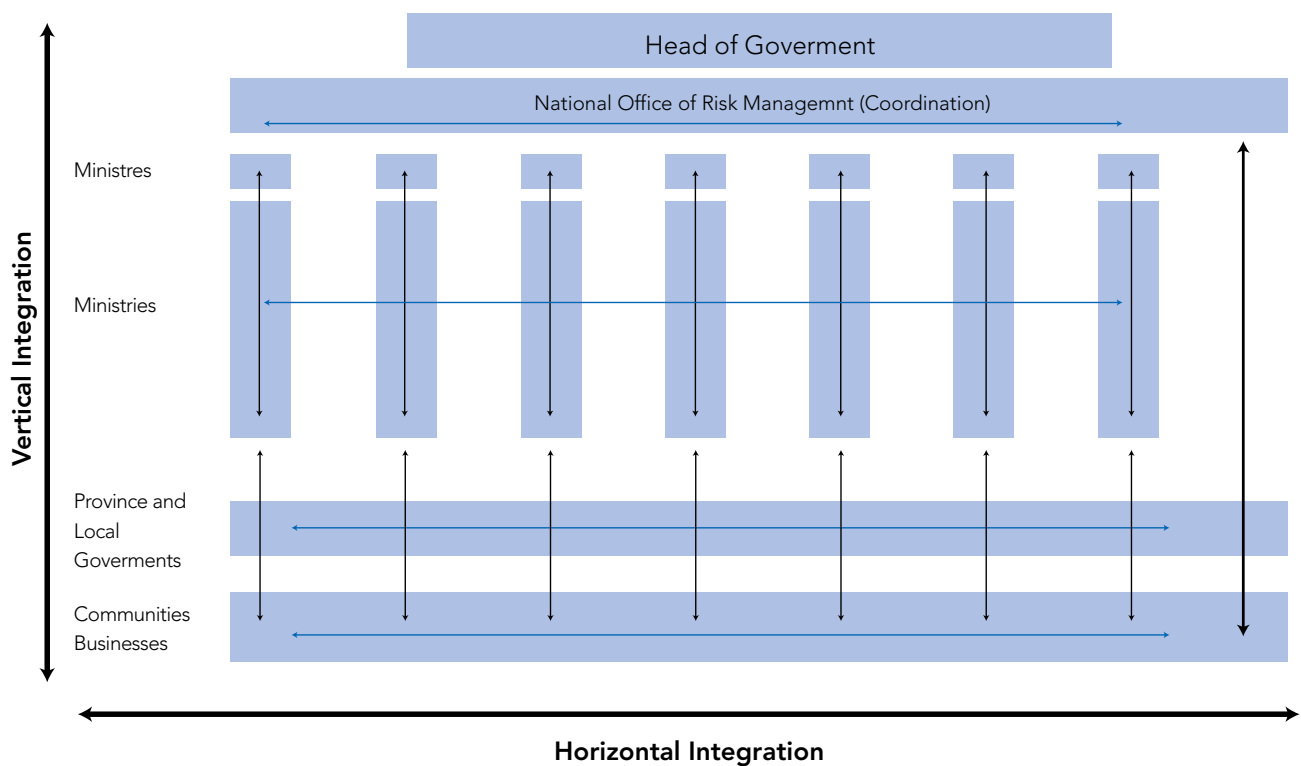
Figure 1 illustrates the organizational integration of risk management on two dimensions that the GoM might use as a guiding principle: *horizontal* and *vertical*. The *horizontal integration* means that the economic and social impacts of the risks are being discussed across different Ministries to provide the Head of Government in Morocco with a clear risk dashboard. Each Ministry will likely be responsible for managing risks associated with their activities and delivering

their objectives (Interior for security, Finance for economics, Energy for commodities, Urban for construction, etc.). The horizontal cross-ministerial integration helps to explain the different components of the risk and how collaboration is developed across Ministries to manage the entire risk cycle, not just part of it. Optimum allocation of resources from the national budget requires that risk criteria and risk mitigation alternative selection should be consistent government-wide. Additionally, several of the steps described in Figure 1 will be similar across many Ministries (e.g., risk quantification), so that efficiency and consistency suggest that a common set of tools be developed and employed government-wide.

Further efficiencies can be gained if the common set of tools is used not only by the national government, but also at the regional and local levels. To facilitate this coordination, a Moroccan *National Office of Risk Management (NORM)* should be established. NORM is envisioned as a comprehensive country-wide office for assessing, monitoring and managing risks at the national level, and promoting these activities at the regional and local levels.

NORM is not envisioned as an operational agency that replaces or competes with existing Ministries, but rather as a small office within the Head of Government's

FIGURE 1: Integrating Risk Management in a Country



BOX 9: An Integrated Approach to Fiscal Risk Assessment and Management in Colombia

The Government of Colombia (GoC) was one of the first movers in a growing number of countries concerned about taking an integrated, strategic approach to identification, quantification, disclosure, and management of fiscal risks. The GoC's interest in the topic was driven by a substantial series of calls on demand guarantees related to public-private partnerships (PPPs) in power, telecom, and toll roads in the 1990s (eventually resulting in cumulative payments by the government of 2% of GDP) that led to the passing of Law 448 of 1998, which dictates that the national government, territorial entities, and other decentralized entities should include in their public management the necessary appropriations to cover possible losses arising from contingent liabilities. It also mandates that (i) the national government develop and enforce methodology for estimation of contingent liabilities; (ii) the Ministry of Finance's General Directorate of Public Credit and the National Treasury have oversight over estimation and management of contingent liabilities; and (iii) that the national government establish a contingency fund for government entities and determine what type of risks were to be covered by the fund.

Since the passing of Law 448, the GoC has been improving and expanding its approach to fiscal risk assessment, disclosure, and management. In 1998, it established the Risk Management Subdirection in the Ministry of Finance to lead this effort. The Risk Management Subdirection began the process of quantifying and publicly disclosing fiscal risks in 2003 with the government's contingent liability to public credit operations. It has since expanded its methodology to assess and manage four other contingent liabilities, including natural disasters. In 2010, the first time that the government comprehensively assessed all of its contingent liabilities, the GoC identified natural disasters as its second largest contingent liability behind legal actions against the state.

Other middle-income countries have also established dedicated units in the Ministry of Finance responsible for overall management of most fiscal risks—for example, in Indonesia and Peru. Other countries have been expanding the scope of their debt management departments to monitor and manage risks from contingent liabilities.

Source: World Bank-GFDRR Disaster Risk Financing and Insurance Program, 2013.

Office, that develops data and facilitates data-driven management of risks by existing Ministries. Its role is to ensure coordination of current and future risk management activities across Ministries and to be a point of contact on government risk management for the private sector. To fulfill this vision, NORM will require specialized personnel and technical support. It is interesting to note that the concept of NORM is similar to the emerging recommendation in the World Bank WDR 2014 regarding the establishment of **National Risk Boards** to help manage multiple risks across horizontal and vertical boundaries in a country.

NORM could be complemented by a new *fiscal risk management unit* within the Ministry of Finance (any risks considered in Morocco will ultimately have an impact on the national budget) and work in concert with the Ministry of the Interior which handles crisis management at a national level.

Additionally, the integration needs to be *vertical*. While the members at the highest levels of government provide the vision, it is also important that this vision be translated into concrete action on the ground in order to make a difference. Information, awareness and coordination efforts should

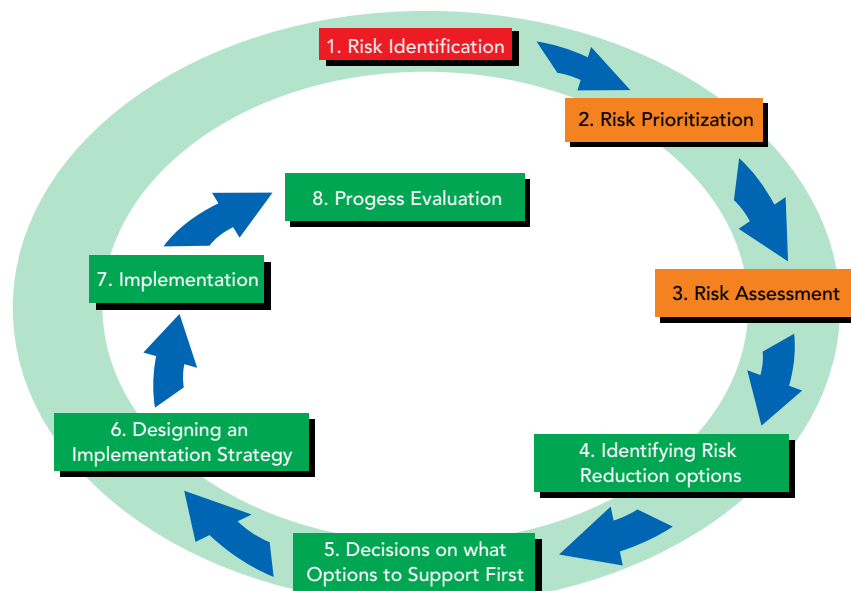
ideally flow through different levels of government to the communities (often the ultimate risk bearers), with commonly used risk metrics. This is facilitated by all agencies using the same data and analytical procedures. Once risk is identified and measured, it needs to be managed—that is, agencies should have a suite of risk reduction tools that are applied in a similar manner, according to similar criteria.

Finally, it is the decision of the government to know how much integration is required for each key risk. For instance, if investing in a levee or drainage system to protect a highly vulnerable city from flooding (e.g. Tangiers), the central government is likely to budget the spending in the national budget, but the implementation has to be made locally. However, if a decision is made to purchase financial protection on international markets to hedge against commodity price volatility, only the Ministers and their staff will be involved (most likely the Finance Minister), not the local communities.

1.3 The Risk Management Process

While there are numerous ways to define risk management, a successful risk management process typically follows the steps described in Figure 2.

FIGURE 2: Eight Steps of the Risk Management Process



Step 1: Identify the risks. It is necessary to understand the risks the organization or country faces (likelihood, magnitude, and cascading effect). Typically this identification process can result in a large number of risks, sometimes exceeding 30 or 40.⁵

Step 2: Prioritize the risks. Many of these risks do not pose large-scale problems and would not have major impacts should they occur. It is important to determine several key risks that have been judged critical for the organization or country. This does not mean that the risks that are not selected will not be managed—they might be addressed after the significant risks have been reduced to an acceptable level, or they may be more easily managed at a local level.

Step 3: Complete risk assessment. Currently, the technology exists to quantify risks fairly precisely. State-of-the-art methodologies (i.e., probabilistic risk assessment) should be used where appropriate. Collecting the right data can be a lengthy process and therefore an important aspect of risk assessment is to know in advance who will be the end user of the assessment. For example, engineers will require a different type of risk assessment than financiers or emergency planners. Once a risk assessment is completed for all the key risks that were selected, it is possible to compare those risks (order of magnitude) across the entire organization or entire country, or focus on an area of interest (e.g., if a city has a very large population or hosts a strategic industrial complex).

Step 4: Identify risk reduction options. This step depends on the organization or country under consideration. Risk culture is also an important factor because some solutions might be appealing in some organizations or countries but not in others. Also, the cost and benefit of implementing each one of these options needs to be calculated. This often requires re-running the whole risk assessment with and without these risk reduction measures in place and comparing the costs and benefits to find the most attractive ones.

Step 5: Decide what options to pursue first. Not all risk reductions solutions can be implemented. There are always budgetary constraints and competing demands. In theory, the solutions yielding the higher benefit/cost ratio should

⁵ It is important to note that risk, in itself, is not necessarily a problem—provided it is addressed consciously after an assessment of its potential costs and benefits. The World Bank's WDR 2014 on risk suggests that the identification and selection of risk management options should be based on the obstacles to efficient risk taking, i.e. on what is leading to excessive risk taking. The obstacles include incentive issues (e.g., when some actors responsible for risk taking do not support the consequences of their actions), information issues (e.g., when some actors take risks without the information on potential losses), behavioral issues (e.g., when the information is available but not in a form that makes it usable for decision-makers or when they make systematically biased decisions), and resource issues (e.g., when credit constraints make it impossible to implement economically-desirable actions).

be selected first (if the decision metric is financial), although other considerations can affect this decision (e.g., social priority).

Step 6: Design a risk reduction strategy. After risk reduction goals are set the strategy shows how the organization/country plans to achieve them through specific spending and actions over a defined timeline and level of investment (for example, per year per risk). The strategy also indicates who will be responsible for implementing these actions, and who will report to whom on the results. As discussed, the institutionalization of the strategy is critical.

Step 7: Implementation. This phase completes the tasks. Depending on the ambition and priorities of the country, this phase can be achieved over several years. It is also important to obtain tangible results early, to demonstrate that progress is occurring. As for any project, it is also import-

ant to establish and adhere to a timeline. Therefore, coordination of the implementation phase by the top leadership and ensuring the implementation team is accountable is crucial.

Step 8: Monitor progress and update the strategy. As risks are being better managed, progress toward the goals is monitored. Since the whole implementation can take several years, it is also important to monitor how the risk environment changes to adapt the strategy.

Currently, Morocco has undertaken steps 1, 2 and 3 (Section 2) and is now moving to step 4. It is important to note that the findings of these first three steps will be crucial for Morocco not only to determine risk reduction options (should they be physical, financial and based on specific public policies) (step 4) but also in designing and implementing the risk management strategy and monitoring progress (steps 5 to 8).

SECTION II

Integrated Risk Management in Morocco



Inter Ministerial meeting on Morocco's Integrated Risk Management Strategy – Rabat, January 2013

2. Introduction: Three Pillars of Morocco's Risk Assessment

Morocco is vulnerable to a varied number of important risks. Key risks include economic shocks (such as commodity price volatility for energy, food etc.), natural hazards (such as earthquake and associated tsunamis, floods, droughts etc.), technological hazards (such as building collapse, transportation accidents especially marine oil spill, etc.) and biological hazards affecting humans, livestock or plants. This vulnerability is further exacerbated by increasing urbanization and the imminent threat of climate change. Out of a total population of 30 million, currently 18 million live in urban areas, and it is anticipated that the urban population will increase by 4 million by 2025. Global climate change is projected to result in increased intensity and frequency of both droughts and floods; exposing up to 25 million urban dwellers to floods in the Middle East and North Africa region⁶ and resulting in a 30–50% drop in water availability, thereby exacerbating an existing severe water scarcity.⁷ In Morocco specifically, it can be argued that climate change has already contributed to increased floods and droughts in the last decade, reduced water quality and caused ground water aquifers to dry up at an increasing rate.⁸

As a result of increased awareness of the relatively high probability of key risks, the Government of Morocco has decided to consolidate, modernize and expand existing

risk prevention and mitigation initiatives into an integrated risk management strategy and program. To make the country more resilient to future shocks, the GoM launched an initiative in 2008⁹ aimed at improving the management of some key risks affecting the Moroccan economy and its budget, as well as the social stability of the country.

- 6 Abu Swaieih, L. 2009. *Disaster Risk Reduction Global and Regional Context, Regional Workshop on Climate Change and Disaster Risk Reduction in the Arab Region "Challenges and Future Actions"*, organized by ISDR, WB, GFDRR, LAS, AASTMT, Cairo, Egypt, 21–23 November 2009; and IPCC. 2007: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- 7 World Bank, 2007. "Making the Most of Scarcity: Accountability for Better Water Management Results in the Middle East and North Africa." *MENA Development Report*. World Bank, Washington, DC.
- 8 <http://www.arabwatercouncil.org/administrator/Modules/Events/IWRA%20Morocco%20Paper.pdf>.
- 9 This initiative was supported by a US\$2 million grant provided by the World Bank, the Global Facility for Disaster Reduction and Recovery (GFDRR), the Swiss Agency for Development and Cooperation (SDC), the Trust Fund for Environmentally & Socially Sustainable Development (TFESSD) and the FIRST initiative.

FIGURE 3: The Three Key Risk Priorities of the Moroccan IRM Strategy



But where should risk management start? Should Morocco be working on all the risks it is exposed to, from the minor ones to the large ones, or just a selection of those? Several inter-ministerial meetings and workshops were held in collaboration with the World Bank team in 2008 and 2009. The purpose of this risk identification phase was to identify and then prioritize about a dozen risks. The goal was to come up with a list of 3 or 4 key categories of risks that would (i) have a serious social impact on a number of people in the country should they materialize; (ii) have significant economic impact on citizens, businesses and the government budget; and (iii) be the most promising in terms of concrete steps that could be taken in the following five years to start better assessing these risks and find solutions that can be implemented to reduce the country's exposure to them.

Given time and resource constraints it was decided at the outset of this activity to build a solid foundation on a few key risks for which risk assessments could be completed as opposed to looking at too many risks simultaneously.

As a result of this selection phase, the GoM identified three priority risks, as a starting point, to explore options for analyzing and improving existing risk management practices. These are (i) natural disasters (a category of risks which includes floods, earthquakes, and tsunamis); (ii) commodity (energy) price volatility risk; and (iii) risks in the agricultural sector generally. These risks were selected as a result of the aforementioned preliminary risk assessment which determined that they had high cumulative political, economic and social impacts—although with an explicit understanding that additional risks (such as financial sector risk and technological risks) are equally systemically important. That does not mean that risks that were not in these three

categories are not being managed by GoM, but that they are not currently being integrated into the IRM strategy. The goal is, of course, to integrate them in the coming years.

The following discusses in more detail the results of the risk assessment and proposals for mitigation actions (steps 1 to 4 of the risk management process, as depicted in Figure 2). This work was a full collaboration between the GoM and the World Bank and its advisors and was intended to serve as input to Morocco's evolving risk management practices. In each step,

there was considerable consultation across Ministries and numerous stakeholders were involved, including government officials, universities and research centers, business leaders, civil society, and NGOs. Within the World Bank, the holistic nature of the IRM approach also required cross-department expertise and coordination, as well as world-class advisors to propose, design, and supervise the work necessary to launch the IRM strategy initiative.

The degree of risk assessment and progress differs from one risk to another. A significant part of the work focused on natural disaster risks (Section 2.1) and, to a lesser extent, on a need assessment performed on commodity (energy) price hedging (Section 2.2). While not covered specifically with the World Bank team, the GoM has been actively assessing and managing agriculture risks. The Bank team provided some guidance on risk management in the agriculture sector and some key aspects of this are presented at the end of this section.

It is equally important to note that the selection of three risks is only a first step: in the longer term, and with stronger risk-management institutions, the GoM will be able to include more and more risks in its integrated analysis of and approach to risk management. As such, this initial phase above all builds a strong foundation for risk management which can be extended over time.

2.1 Natural Disasters

2.1. a Morocco's disaster risk profile

Natural disasters such as earthquakes, floods, tsunamis or droughts are a potential source of great loss for Morocco. Even the largest and most technologically advanced economies

struggle to deal with such events: the 2011 Japan earthquake and tsunami (20,000 fatalities); the 2008 China earthquake (80,000 fatalities) and the 2005 Hurricane Katrina in the United States (which cost US\$150 billion) are examples of this. Disasters have also had devastating impacts in low- and middle-income countries: the 1999 Turkey earthquake (19,000 fatalities); the 2004 Indian Ocean tsunami (250,000 fatalities) and the 2008 Myanmar Cyclone Nargis (138,000 fatalities).

Each of these events occurred suddenly and was termed “*low probability*” beforehand and “*unprecedented*” afterwards. They resulted in massive national disruption and required the full attention of the central government to maintain its credibility and authority. Economically, such disasters have been ruinous, typically resulting in massive disaster relief from the national government (for the richest countries), new significant borrowing and short-term fiscal crises (for the less developed countries).

The lesson to be learned is simple yet crucial—*natural disasters happen, and a recent lack of disasters is not an indication of low risk*—in fact, recent quiescence can be a prelude to disaster.

The historic record for natural hazards in Morocco is relatively short and not always well documented. Table 1 summarizes the record for natural hazards, which indicates that hydro-meteorological risk, especially flood and drought/heat wave, has affected more people than any other phenomena, and has caused the most economic loss, while earthquake has caused the greatest loss of life, and is also a major source of economic loss.

Selected specific events include:

Floods

- ▶ 2002: Mohammedia and Berchid: 63 dead, collapsed houses, flooded hundreds of homes, hundreds of hectares of farmland affected.

- ▶ 2008: Tangier, 30 deaths, economic losses (industrial area).
- ▶ 2009: Al Gharb, 400 houses destroyed, 100,000 hectares of land destroyed with the cost of damage exceeding MAD 1 billion.

Earthquakes

- ▶ 1960: Agadir, magnitude 5.7, 12,000 killed.
- ▶ 2004: Al-Hoceima: 628 dead, 926 injured and 12,367 collapsed houses.

Locust invasions

- ▶ 1987–89, southern Morocco, cost MAD 1 billion
- ▶ 2003–04, southern Morocco and eastern zone, 2,832,000 hectares affected.

In order to supplement the historic record, and assist with the development of the national IRM strategy, a major inter-ministerial project addressed natural hazards risk in Morocco in a 2010–12 project coordinated by the Ministry for General Affairs and Governance (MAGG), with support from the World Bank, the Global Facility for Disaster Reduction and Recovery (GFDRR) and the Swiss Agency for Cooperation and Development (SDC).

The project developed a new GIS-based analysis tool, *Mn-hPRA* (“**M**orocco **n**atural **h**azards **P**robabilistic **R**isk **A**nalysis, see Box 10), which was used to analyze earthquake, flood, tsunami, drought and landslide risk in Morocco using state-of-the-art probabilistic risk assessment (or catastrophe models).

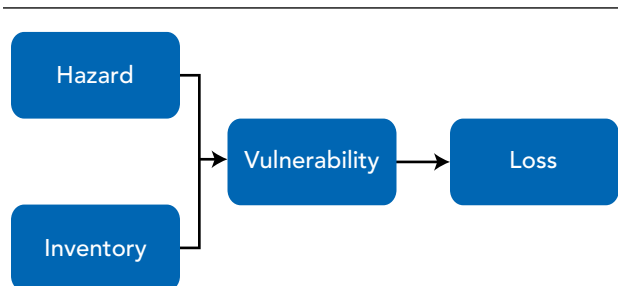
A probabilistic catastrophe modeling approach provides more value than a deterministic approach because it includes all the events that can cause damage, and it generates a detailed analysis of return period based on advanced hazard models. The four basic modules of a catastrophe model

Table 1: Partial Summary of Historic Major Natural Disasters in Morocco 1900–2008

| | Fatalities | Total Population Affected | Estimated Damage (MAD million) |
|---------------------|---------------|---------------------------|--------------------------------|
| Flood | 1,556 | 531,926 | 2,400 |
| Earthquake | 12,728 | 38,465 | 4,200 |
| Drought / Heat Wave | — | 412,000 | 7,200 |
| Total | 14,531 | 997,549 | 13,800 |

Source: EM-DAT.

FIGURE 4: Four Basic Modules of a Catastrophe Model



are: hazard, inventory, vulnerability and loss, as illustrated here:

For the first module, the risk of the hazard phenomenon is estimated (for instance earthquake or floods). This module includes two main parts. The first part addresses the occurrence and frequency of the events. It does this by first developing a stochastic event set; a set of simulated events characterizing the observed or scientifically modeled events and their probabilities of occurrence. The second part of the hazard module calculates the severity of the events at every site of the study region, in this case the entire country of Morocco.

The second module of a catastrophe model characterizes the inventory of the properties at risk. This can be a building of specific interest, a dwelling representative of the average construction type in a given area exposed to the hazard, or an entire portfolio of buildings with different characteristics (e.g., an entire city). For the MnhPRA project, the portfolio was the entire built environment of Morocco—a major undertaking since the analysis had to be done for all types of assets in Morocco (residential, commercial, industrial, public infrastructure, etc.). This required a com-

bination of data gathering, on-site-visit and satellite-based information.

The third module quantifies vulnerability, or how the properties or infrastructure at risk (i.e., the inventory) will physically behave under events generated in the hazard module. Vulnerability functions are the relationships between hazard intensity (e.g., water depth for flood or intensity of an earthquake) at the site and the level of damage experienced.

The last module is loss. Assume for the moment that the only uncertainty is the occurrence of an event. That is, for example, the occurrence of a flood in Casablanca follows a certain mathematical process that was specified in the hazard module. Given an event has occurred, the second part of the hazard module calculates the severity of the event across the entire city. The vulnerability module then calculates the mean damage ratio at each location given the characteristics specified in the inventory module. Lastly, the loss module considers the damage given the inventory exposure values and calculates the total loss at that location.

These losses are then compiled and collected in a table called an event loss table (ELT). A typical ELT is such that each row corresponds to a catastrophe event taken from a group of credible scenarios (e.g., flood) with an identification number (Event ID_j), an annual rate of occurrence (λ_j), and resulting loss (L_j) for ID_j, as described here:

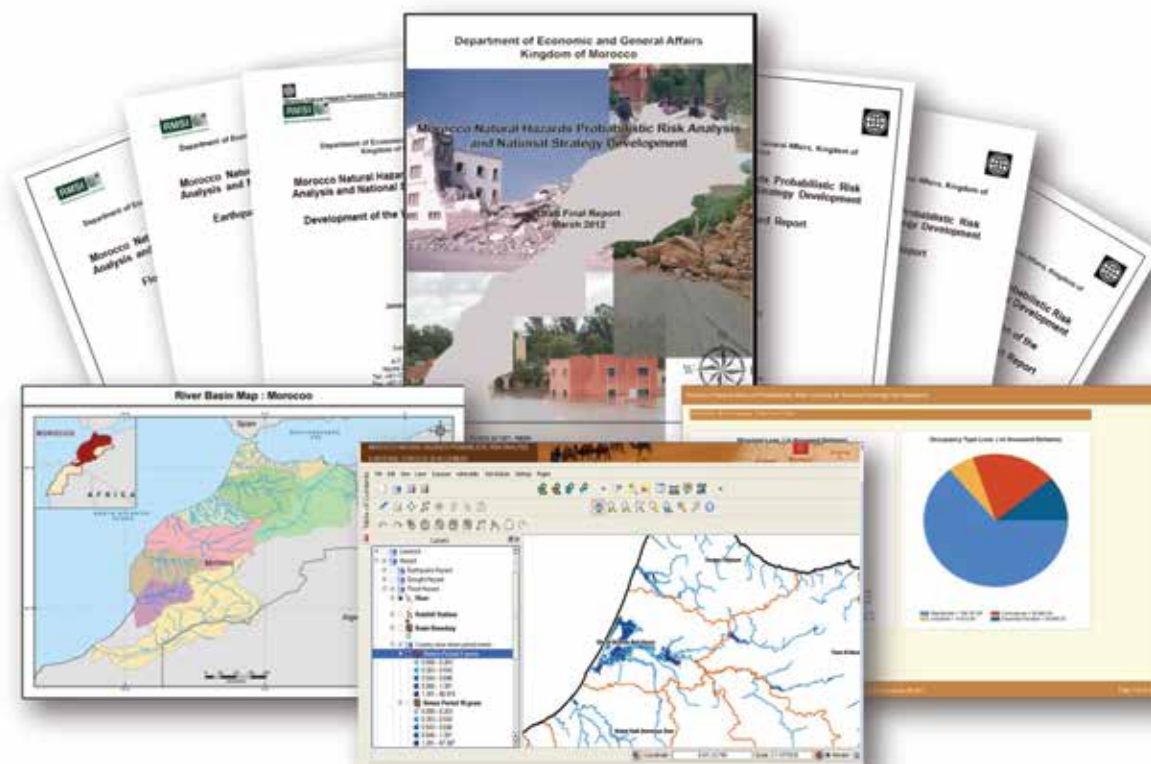
Combining information on frequency and severity of losses, the probabilistic catastrophe model generates the distribution of the expected losses associated with all possible scenarios of disasters (that for floods, then earthquakes, then tsunamis, and for the entire country). This is often expressed in terms of an aggregate loss exceedance probability (EP) curve. For a given portfolio of structures at risk, an EP curve is a graphical representation of the probability (p) that a certain level of aggregated loss $\$L$ will be exceeded in a given year. The Average Annual Loss (AAL) is the expected loss over all simulated events affecting the portfolio per year.

MnhPRA is the computer program that was developed to generate all of the aforementioned information in a user-friendly mode. The development of MnhPRA and its technical basis are extensively documented (Figure 5). MnhPRA provides the AAL for any type of inventory for a selected hazard in a selected location (e.g., risk of houses in Fez due to earthquakes). It also provides the accumulated exposure for the entire country to a specific type of disaster using this probabilistic risk assessment approach.

Table 2: Example of an Event Loss Table

| Event ID | Annual Rate of Occurrence | Loss |
|----------|---------------------------|-------|
| 1 | λ_1 | L_1 |
| 2 | λ_2 | L_2 |
| ... | ... | ... |
| k | λ_k | L_k |
| ... | ... | ... |
| K | λ_K | L_K |

FIGURE 5: Technical Reports and Sample Outputs of MnhPRA, from the Disaster Risk Portion of the Project



As described in Table 3, this program identified that Morocco has very substantial risk due to natural hazards. In order to better understand these summary statistics, it is necessary to examine what assets are at risk, what threatens these assets, and then in more detail specify the risk.

What assets are at risk? MnhPRA's estimates were based on the total value of the built environment in Morocco—that is, the replacement value of all houses, businesses, factories, roads, bridges, ports, vehicles and other man-made tangible objects at risk. **Morocco's built environment total value, or "exposure", is MAD 2.7 trillion or about MAD 90,000 per capita.** Buildings of all kinds represent about 70% of the total value at risk, with public buildings constituting about 10% of this, and a variety of infrastructure, such as ports, airports, rail and road, and the electrical network, accounting for the other 30% of the total value at risk.¹⁰

What could happen? Currently only a few partial answers are available. According to the probabilistic risk assessment estimates based on MnhPRA, over the next 30 years there is

a 95% chance of an earthquake or flood in Morocco causing losses amounting to MAD 5 billion, a 90% chance of an event causing losses of MAD 10 billion and a 65% chance of an event causing losses of about MAD 25 billion. However, floods are fairly frequent while earthquakes are rare (and tsunami even rarer). It was learned that a rare, but possible, earthquake or tsunami can be more damaging than a flood and that different hazards affect different parts of the asset portfolio differently. For earthquakes, buildings of all types represent about 93% of the AAL, while for floods building losses are about 75% of the AAL (and only 50% in the case of tsunami).

How much risk is acceptable or, conversely, how much is unacceptable? One common measure of risk that is often used is the Loss Cost, which is the AAL divided by the exposure.

¹⁰ This is only a partial listing of the value of the built environment, particularly those parts perhaps most vulnerable to physical damage. Many other items, such as road pavements, underground water and wastewater piping, electrical distribution infrastructure, and business and industrial stocks and inventories, are not included.

Table 3: Morocco Natural Hazard Estimated Losses for Varying Return Periods (MAD millions)*

| Hazard | Earthquake | | | Flood | | | Tsunami | | |
|--------------------|------------|-----------------|------------------|--------------|-----------------|------------------|------------|-----------------|------------------|
| | AAL* | 100-year return | 1000-year return | AAL* | 100-year return | 1000-year return | AAL * | 100-year return | 1000-year return |
| Residential | 506 | 8,670 | 24,604 | 1,895 | 12,092 | 14,718 | 23 | 57 | 17,639 |
| Commercial | 144 | 2,823 | 10,628 | 434 | 2,530 | 3,006 | 18 | 180 | 9,053 |
| Industrial | 35 | 674 | 2,704 | 471 | 2,231 | 2,569 | 18 | 148 | 8,898 |
| Govt. Buildings | 7 | 151 | 591 | 369 | 2,351 | 2,751 | 0 | — | 50 |
| Essential Facility | 97 | 1,564 | 3,918 | 1,005 | 8,328 | 9,762 | 1 | 5 | 1,421 |
| Infrastructure | 60 | 1,435 | 4,559 | 3 | 24 | 1,302 | 63 | 14 | 21,793 |
| Total | 850 | 15,317 | 47,004 | 4,177 | 27,556 | 34,108 | 124 | 404 | 58,854 |

* AAL = Average Annual Loss (million MAD) – that is, the estimated loss per year due to a hazard or hazards when averaged over a very long period, while “100” refers to a loss with an annual probability of occurrence of 0.01 (i.e., 1/100). “1000” similarly refers to a loss with an annual probability of occurrence of 0.001 (i.e., 1/1000).

A Loss Cost of 1‰ (i.e., one per mille or one-tenth of 1% of the asset value being lost each year) is often taken as a simple boundary for acceptance, for catastrophic type events. By that measure, floods are an unacceptable loss for all of Morocco, while earthquakes are marginally acceptable, and tsunamis generally a much lower and tolerable risk. On a preliminary basis, *nationally*, analysis shows that flood risk reduction should probably receive more resources than earthquake, while tsunami risk reduction is far less important.

However, the above results are *national* averages, which tend to spread the risk over the entire nation and hide for example that a risk for a particular province may be very high. In order to better understand Morocco’s risk, more detailed analysis is required. For that purpose, GIS-based tools such as MnhPRA are useful to analyze risks down to the commune level.

Earthquake risk to Morocco was assessed using MnhPRA (Figure 6). Earthquake risk is primarily concentrated in certain regions—mostly the North and, to a lesser extent, on a line running through Fez and Marrakech to Agadir. Five provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan), representing only 8% of the total national building exposure, have an earthquake AAL of 34% of the total national building earthquake AAL. This means that on average, for buildings only, 8% of the building exposure contributes 34% of the earthquake potential loss. Clearly, if the risk of 8% of Morocco’s buildings can be reduced, Mo-

rocco’s overall building earthquake risk to buildings can be significantly lowered.

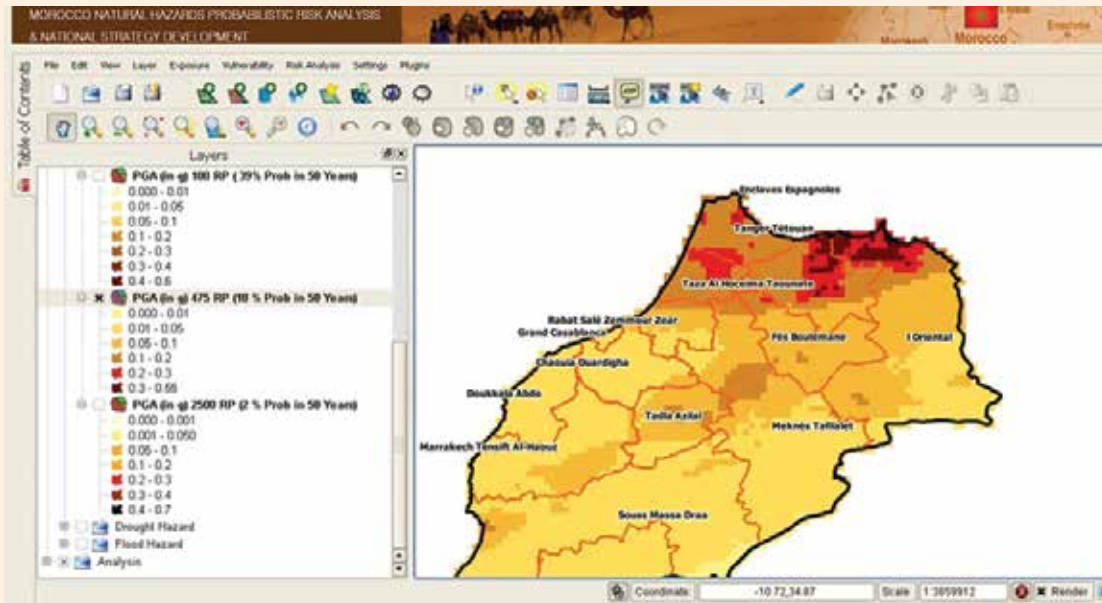
Of the different categories of asset types analyzed, publicly owned buildings are the direct responsibility of the government, and have a total value of MAD 17 billion. All other buildings are owned by, and the direct responsibility of, the private sector. Different categories of assets therefore represent different risk reduction approaches from administrative, disaster risk financing and insurance points of view (see Section 2.4).

Floods are a chronic problem for Morocco, annually causing millions of Dhiraams in losses. Figure 7 shows the Tangier Industrial Zone, flooded in 2008 from a channel that might have had a higher levee or flood wall. Using MnhPRA, Figure 6 shows that flood risk, as compared with earthquake, affects many more parts of Morocco (in fact, most provinces) but also affects only selected places (i.e., only some parts of each province).

Using the same criteria as was used for earthquakes—i.e., Loss Cost exceeding 1‰—the total value exposed to flood is much higher. For flood it is MAD 541 billion, compared to MAD 148 billion for earthquake. Additionally, flood risk tends to be much more frequent than earthquake, resulting in much higher Loss Costs. Although earthquake Loss Costs rarely exceed 2‰, flood Loss Costs in a number of cases are more than 10‰ (i.e., 1%). Further analysis identified that

BOX 10: MnhPRA – Morocco natural hazards Probabilistic Risk Analysis

A guiding principle of modern management is “*what gets measured gets managed.*” A key element of the Government of Morocco’s disaster risk management program has been the development of *MnhPRA*, a Geographic Information System (GIS) based software package that inventories the country’s assets at risk and the hazards that threaten these assets, and allows analysis to estimate the impacts of these hazards on the assets. *MnhPRA* thus permits measurement of disaster risk, a key step towards managing that risk.



MnhPRA is open-source software developed during 2010–12 under a project coordinated by an inter-ministerial committee and managed by Ministère des Affaires Générales et de la Gouvernance (MAGG), with technical support provided by the World Bank and the Global Facility for Disaster Reduction and Recovery and scientific review by a panel of Moroccan university professors. *MnhPRA* contains GIS databases of Morocco’s assets at risk—that is, Morocco’s population, the entire built environment of Morocco—all buildings, roads, bridges, railways, ports and airports, electric generation and transmission and other infrastructure, and selected agricultural crops. *MnhPRA* combines these asset databases with databases of hazards (currently, earthquake, flood, tsunami and drought) that threaten these assets, and links these two with vulnerability functions, to estimate fatalities, injuries and direct economic costs due to all possible disaster occurrences. An advanced model of the Moroccan economy, developed in conjunction with *Le Haut Commissariat au Plan (HCP)* then provides estimates of the overall impacts on the national economy. Results are provided in detailed tables at the commune level, summary tables at the province, region and national levels, and maps.

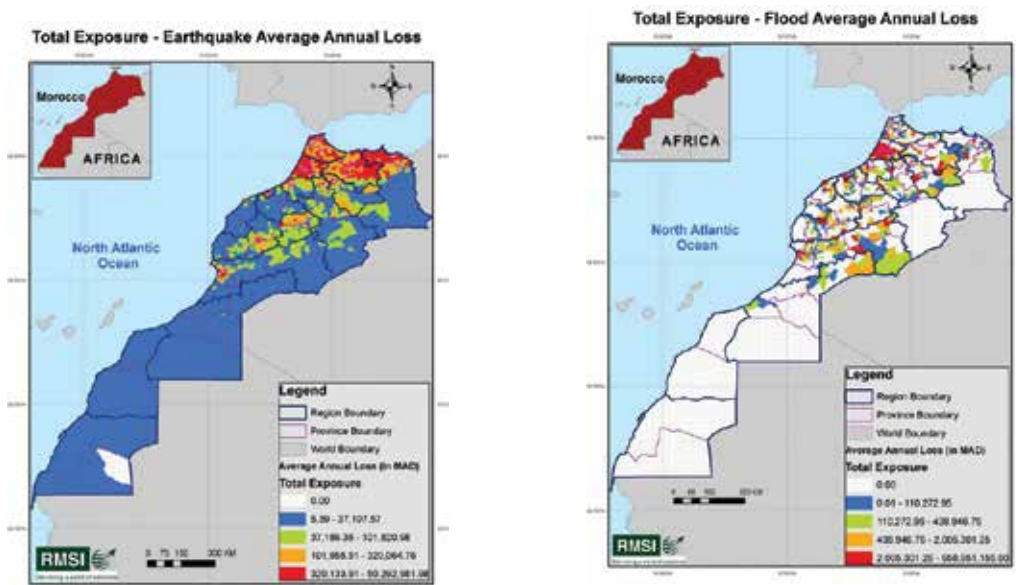
MnhPRA is an advanced powerful tool that allows both local and centrally coordinated management of natural hazards, using the same data so that decisions are made on a common basis. Towards this end, technical staff from a number of ministries attended training sessions for *MnhPRA*. Because it is open source and GIS-based however, *MnhPRA* is intuitive, easy to use and can be extended to other hazards, becoming Morocco’s fundamental tool for integrated risk management, thereby saving lives and reducing damage at a lower cost than if *MnhPRA* were not available.

four provinces (Kenitra, Tetouan, Casablanca and Sidi Ka-cem) contributed 60% of the total building flood AAL.

Tsunami is a significant threat to Morocco’s Atlantic and Mediterranean coasts—a repeat of the 1755 earthquake

would result in devastating waves as high as 10 meters at Casablanca. Analyses indicate that although the AAL from a tsunami is estimated to be only about 15% and 3% of earthquake and flood AAL, respectively, an infrequent (e.g., “500 year”) tsunami has the potential to be as

FIGURE 6: Average Annual Loss (AAL) for Earthquake and Flood by Commune



destructive as a great earthquake or flood, as experienced recently in the tragic 2004 Indian Ocean and 2011 Japan tsunamis.

Drought is a very significant risk to agriculture in Morocco—the sector employs about 40% of the nation's workforce and is the largest employer in the country.

FIGURE 7: Tangier Industrial Zone Flooded in 2008



Credit: Scawthorn, 2008.
Flooding resulted from the channel on the right; red line on left wall indicates level of flood.

BOX 11: “What-ifs” Scenarios

“What-ifs” are scenario analyses of the benefits and costs of a particular risk reduction, or mitigation, action. For example “*what if* schools in a high seismicity region are strengthened for an earthquake?” The “*what if...?*” question asks “*what* are the benefits *if...* [some action is taken].”

In the context of risk reduction, the benefits are typically avoided future losses, which are calculated based on probabilistic risk analysis techniques. While greater and greater benefits can be realized with increasing mitigation actions, since these actions come at some (increasing) cost, there is typically an ‘optimum’ level of mitigation, which is the point at which the decreasing loss equals the increasing cost of mitigation. Probably the most common method of determining the optimum level of mitigation is benefit-cost analysis, which seeks to determine the Benefit-Cost Ratio (BCR) of a particular mitigation action—the higher the BCR, the more bang (benefits, that is, avoided loss) for the buck (cost of mitigation).

Based on MnhPRA, *what-ifs* were developed for a total of 51 scenarios, ranging from strengthening of buildings, flood warning systems, structural measure of flood mitigation and evacuation mapping to elevating buildings to protect against floods. The scenarios considered high-risk areas such as Al-Hociema and Nador province for earthquake, Kenitra province for floods and coastal areas of the country for tsunami, as well as other key provinces such as Fes and Agadir.

The BCR for the 51 scenarios varied from 54.3 to 1.1. The total cost of mitigation for all 51 what-if scenarios was MAD 9.3 billion. The top ten scenarios in terms of BCR were:

- (i) Flood warning system for Ouregha sub basin (BCR = 54.3)
- (ii) Culverts on railway lines in Gharb plains (BCR = 34.6)
- (iii) Evacuation mapping for tsunami in coastal areas (BCR = 8.3)
- (iv) Mitigation of residential buildings for floods in new township near Kenitra (BCR = 8.2)
- (v) Mitigation of government buildings for floods in new township near Kenitra (BCR = 7.2)
- (vi) Strengthening of hospital buildings in Nador province (BCR = 5.8)
- (vii) Risk assessment for floods in new township near Kenitra (BCR = 5.7)
- (viii) Risk assessment for proposed schools in the country (BCR = 4.4)
- (ix) Mitigation of school buildings for floods in new township near Kenitra (BCR = 4.2)
- (x) Strengthening of schools in Nador province (BCR = 3.6)

Source: World Bank 2012. What If Scenario Analysis Report, Morocco Natural Hazards Probabilistic Risk Analysis and National Strategy Development. The Ministry of General Affairs and Governance, prepared by RMSI Ltd.

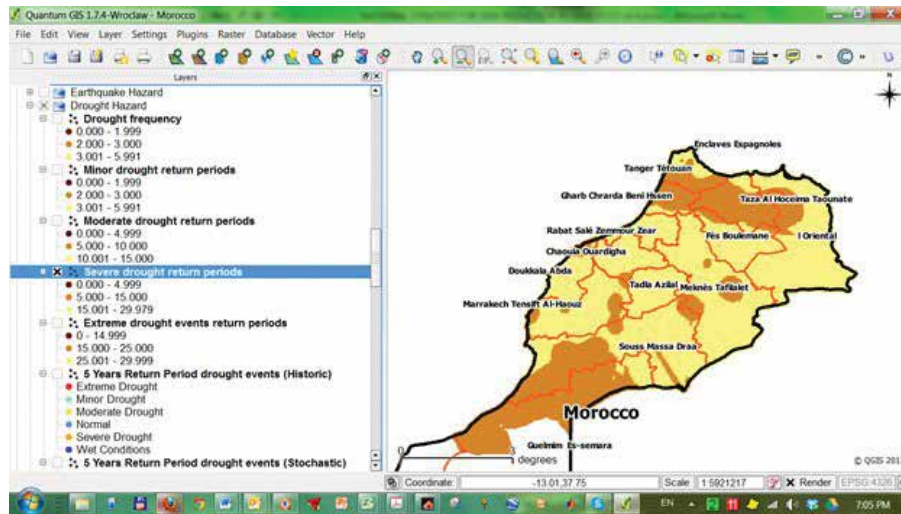
Historically, drought has caused severe problems in Morocco (Table 1). Especially at risk are the cereal-growing lowlands, which are subject to considerable variation in annual precipitation. On average, drought occurs in Morocco every third year, creating a volatility in agricultural production that is the main constraint on expansion in the sector.

A framework has been developed for quantifying and understanding drought impacts and attendant agricultural

risk on a national basis consistent with other risks, although results are only available for three cereal crops¹¹ which account for about 20% of the agricultural sector’s total production (Figure 8). Furthermore, impacts of drought on potable water supply and industrial production have not yet been similarly modeled.

¹¹ Barley [*Hordeum vulgare* L.], common wheat [*Triticum aestivum* L.] and durum wheat [*Triticum durum* Desf.].

FIGURE 8: Map Showing Return Periods for Severe Drought for the Three Crops Considered in MnhPRA to Date



Note: The brown areas are likely to suffer severe drought about every decade (5~15 years) while in yellow areas severe drought is less frequent (15~30 years).

2.1. b Disaster Risk Institutional and Legal Framework

Institutionally, the GoM has a number of agencies and Ministries mandated with the management of some aspect of disaster risk. These include, among others, the Ministry of Interior, the Ministry of Water and Environment, the Ministry of Health, the Ministry of Energy and Mines, and the Ministry of Education.

For disaster response, for example, the GoM has in place good systems for crisis response within the Ministry of Interior—supported by a corresponding legislative framework. As a result of the devastating Al-Hoceima earthquake in 2004, a Royal Commission set up by the King recommended the creation of (i) a National Coordinating Committee to coordinate emergency situations by bringing together different Ministries and technical and scientific committees during the disaster event; and (ii) the Centre de Veille et de Coordination (CVC) to manage the actual emergency situation on the ground, allocating resources (financial and physical), as well as coordinating stakeholders. The CVC also houses a ‘Situation or Crisis Room,’ dedicated to coordinating, supporting and assisting those deployed in the field during an emergency. The ‘ORSEC’ Plan (programme d’organisation des secours à l’échelon départemental, en cas de catastrophe), which is triggered at the time of a disaster (Circular no. 25 and 172), empowers the Ministry of Interior, through its Walis and governors at the provincial and local levels, to

take charge of the response phase. The Plan stipulates that the Central Government intervenes only when the governor seeks support (i.e. when the human and material resources at the local level are inadequate to manage the crisis). Although there is general consensus among the GoM entities and the communities on the efficacy of the CVC in terms of disaster response, since 2007 no ‘major’ disaster (of the magnitude of Al-Hoceima for example) has struck Morocco to evaluate the agency. However, the CVC is currently insufficiently equipped to predict upcoming hazards, or invest in activities that assist with the prevention and preparedness of communities before a disaster. A schematic of the institutional structure during a disaster is outlined in Figure 9.

On disaster prevention and preparedness, while a number of initiatives are in place, the GoM has a more fragmented approach. For example, from a legal perspective, the Department of Environment has the mandate of prevention of natural disaster risks (according to Decree n°2-99-922 instituted in 2000), as well as managing a potential crisis relating to marine pollution (according to the National Emergency Plan, applied since 2003), while all other crisis prevention is the responsibility of the Ministry of Interior (Decree from 1997), thereby reducing incentives to work together. Scientific agencies like the National Geophysics Institute (ING) conduct research on seismic activity in Morocco as well as map the national seismic hazard zones to design better building codes. Similarly, various national hydrologic basin offices collect data on rainfall and stream flow, and develop maps of flood zones.

BOX 12: Measuring and Enhancing Economic Resilience through IO and CGE Models^a

Measuring indirect economic effects of disasters (how the economy will adjust to a shock and how the population will be affected by households' income and consumption) requires specific *macro-economic models* that capture the interdependencies between all the sectors of the economy and *macro-economic actions* adopted by the government before the disaster, and to responses following a disaster. Those policies can reduce the economic and social impacts of disasters and support fast recovery.

Input-Output (IO) models, developed and used by the Haut Commissariat au Plan (HCP), allow the government to rapidly estimate the short-term total economic losses from a disaster by sector and for the whole economy

Computable General Equilibrium (CGE) models are more sophisticated and capture the long-term dynamics. For example, a manufacturing plant affected by an earthquake, could switch production to other plants not operating at full capacity in parts of the country not affected, thus limiting total production loss.

Key results of the analysis

The higher-order effects and total impacts of disasters are significant and complex:

1. The IO method calculates the total production losses (direct and indirect) that would be higher than the sole direct losses estimated by the probabilistic risk assessment, ranging from MAD 13.5 billion for a flood of 1,000 year return period, to MAD 52 billion, for an earthquake of 10,000 year return period; approximately 6% and 23% of the government budget, respectively. These total losses would be MAD 26.4 billion in the case of a 1,000 year return tsunami (or 11.6% of government budget). The evaluation by the CGE model shows that when markets and the adjustment mechanisms work more flexibly, the negative effects of direct loss of production, although relatively high, tend to be attenuated compared to the IO method.

2. The decline in economic activity would impact negatively household incomes, resulting in a reduction of consumption and standards of living. The financial capacity of the state can also be adversely affected and in a massive earthquake could experience a reduction of MAD 11 billion. It is therefore important to appropriately evaluate and account for the interconnectedness between industry sectors and economic agents (consumers, businesses).

Analysis of the sectoral distribution of total impacts reveals that the manufacturing and services sectors suffer from those interdependency effects more than other sectors, such as agriculture and mining, because they rely more on inter-industry relationships domestically and/or internationally and are located in the middle and at the end of production chains. Damages and losses on the other sectors propagate to these two sectors, resulting in larger economic disruption. However, the intensity of inter-industry relationships, or interdependencies, varies significantly, as do the impact effects.

3. The total losses calculated by the IO model are often typically higher by 25 to 30%, compared to the direct losses based on the estimation of physical losses found by RMSI, demonstrating that disaster losses can be more significant via ripple effects through interdependencies within an economy when the disaster affects critical assets. With the CGE, those losses are slightly lower than 25%, since it takes into account longer-term adjustment. The CGE model results are consistent with many international assessments, which show that the effects of disasters are lessened when the economy is developed and markets and adjustment mechanisms work properly.

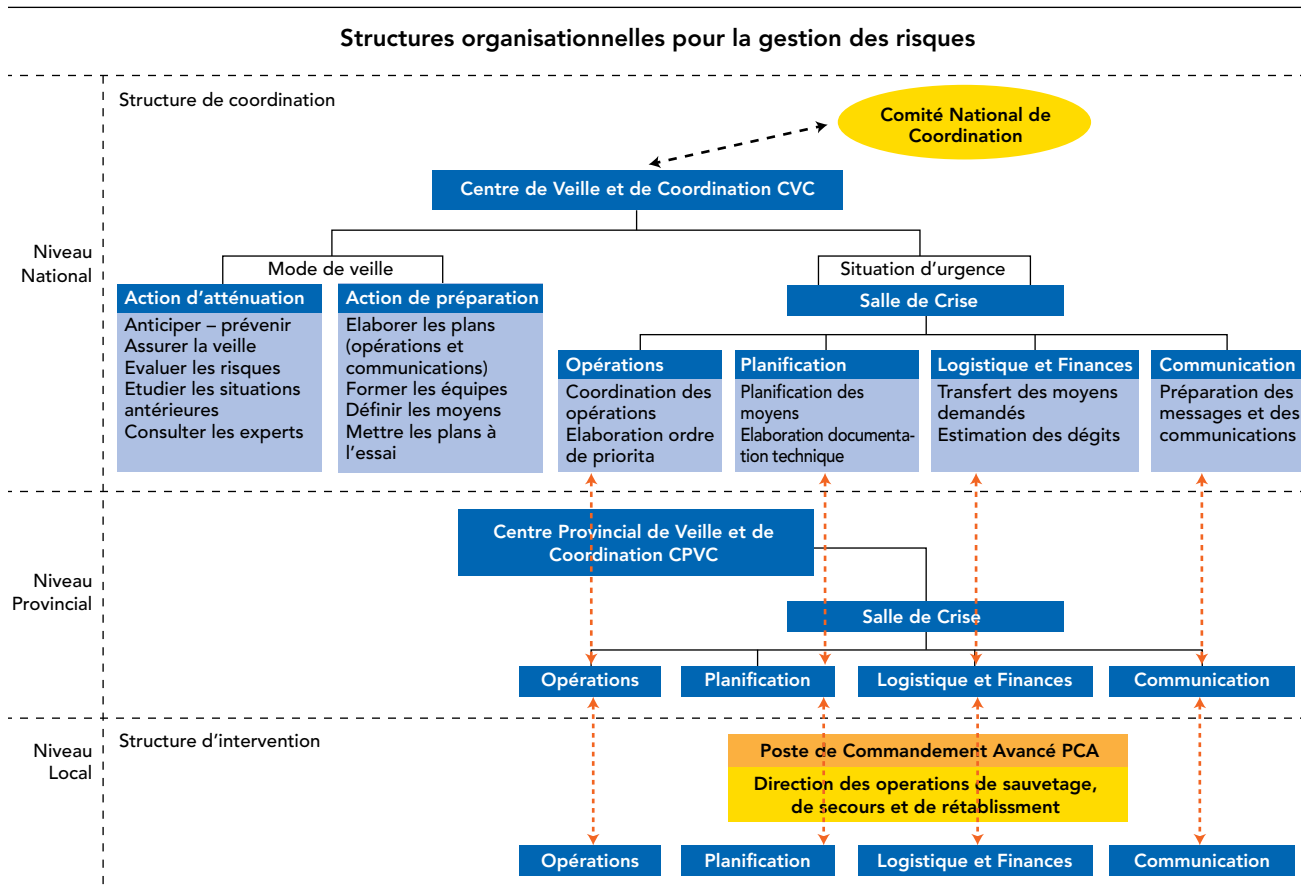
Taking the right macro-economic actions when a disaster happens is critical

Resilience-supporting public policy can significantly alleviate the negative impact of natural hazards on the economy and accelerate its rate of recovery. The two key economic policies—investment and productivity enhancement—simulated to counter the shock of a large earthquake would reduce GDP loss up to 40%. Household income could increase if the government implements such policies. This in turn will impact positively households' consumption, yielding an overall increase in the aggregate demand that will give an economic boost. Also, the worsening of the government deficit after the disaster would be significantly less if those economic resilience policies were implemented.

The development of the IO and CGE models provide the GoM with state-of-the-art analytic tools to improve macro-economic decision-making and can be used for disaster scenario and/or public policy mix. Based on international experience, these tools position Morocco as one of the most advanced non-OECD countries for disaster macro-economic policy evaluation capability.

a. The full economic analysis, undertaken under the direction of Professor Dukkali in Rabat as part of the World Bank IRM team, and in collaboration with the Moroccan HCP, is available in the 50-page report provided to the Government of Morocco: "Evaluating Direct and Indirect Economic Impacts of Natural Disasters: The Development of an Input-Output and a CGE Models for Morocco", 2012.

FIGURE 9: Schematic of Institutional Structure During a Disaster



Specific disaster risk mitigation programs exist for flood protection and preparedness for earthquakes. The Secretariat of Water formulated the National Water Strategy in 2009 which includes setting up early warning systems for floods, as well as weather forecasting, including flood risk plans for urban planning and watershed management. Morocco also has a National Flood Protection Plan which identifies the specific sites vulnerable to floods and identifies investment programs. Furthermore, as a consequence of the Al-Hoceima earthquake, the Moroccan building codes were updated in 2011 (RPS 2011) and now set the standards for calculation and design of structures to strengthen them against seismic shocks and enact the technical provisions of civil engineering and architectural design for buildings to withstand earthquakes.

2.1. c Options for reducing Morocco's risk due to natural disasters

A number of short, medium and long term mitigation actions could be undertaken by the GoM. The World Bank

supports countries through such actions, some of which are listed in Box 1 (Section 1.1). It is important to note that the GoM already has institutional structures in place with different responsibilities in the disaster risk management (DRM) cycle, such as the CVC. The suggestions regarding possible mitigation actions are not intended to overturn or duplicate any of the actions already put in place by the GoM, but rather are meant to supplement and augment the current risk management structures and programs.

Furthermore, flood mitigation differs from earthquake mitigation in that earthquake mitigation is structure-specific—typically each building must be addressed individually. Therefore, for a thousand buildings, on average the cost of earthquake mitigation will be a thousand times the cost of one building, everything else being equal. Flood mitigation, however, can be accomplished several ways—at the individual building level, but also (and more usually) collectively, via flood protection works such as urban flood walls, levees and dams. For this reason, protecting, for ex-

BOX 13: Risk Perception Survey of Communities in Morocco

Efforts to reduce disaster risks and implement risk reduction programs should build upon a community's knowledge and experience about hazards, vulnerabilities and disaster risk reduction while recognizing the importance of local customs, culture and materials. To capture this facet of community perception of risks, the World Bank together with the GoM (TFESSD financed) conducted a study in four urban and rural communes in the provinces of Guelmim, Hoceima, Taounate and Chefchaouen. The objective was to capture existing good practices in CBDRM, conduct a social qualitative assessment (survey questionnaire and focus groups) of risk perceptions based on experience of a previous disaster, and an institutional assessment of DRM structures.

The results were quite interesting: community interest to DRM seemed to vary based on (i) available financial resources (only 12% of respondents had a financial reserve of any kind); (ii) residential status (84% of respondents owned their own home and wished to reduce the potential damage to their property); (iii) the recurrence of hazards (89% of the respondents considered floods as the main risk, even in areas prone to earthquakes); and (iv) the type of hazard (for example, a sense of helplessness and acquiescence in the case of slow onset hazards like droughts). The role of the state seemed to vary depending on the geographic region (proximity), type of hazard (fast vs. slow onset) and the phase in the disaster cycle (high intervention during response and reconstruction but low during the ex ante phase). Although all respondents recognized their role in the management of natural hazards and the importance of community action, 81% thought that investing in risk management is a government responsibility (national and local).

All these findings are important indicators and inputs when designing mitigation and adaptation actions as the ultimate beneficiaries, responders and users of most of the risk reduction actions (infrastructure, insurance, etc.) are the communities.

Source: Etude préliminaire en gestion communautaire des risques de catastrophes naturelles, World Bank, April 2012

ample, only public buildings from flooding is typically irrelevant as either all buildings in a flood zone are protected, or none. Disaggregating exposures according to public and private ownership is less relevant.

Experience also shows that unless DRM efforts are sustainable at the individual and community level, it is difficult to reduce the losses and scale of the tragedy (also see Box 13 on Risk Perception Survey of Communities conducted in Morocco). Involving people from the initial programming stage of disaster management activities to final implementation increases both sustainability and effectiveness of disaster risk management. Efforts to reduce disaster risks should therefore build upon a community's knowledge and experience of hazards, vulnerabilities and disaster risk reduction. It is essential to recognize the importance of local customs, culture and materials while developing and implementing risk reduction programs. Box 14 shows government actions in CBDRM in Vietnam and the sustainability of risk reduction measures put in place.

While there are many methods to reduce natural hazards risk, this note proposes risk mitigation options under two broad categories: “*Programs and Institutions*” and “*Structural Measures*.”

Programs and Institutions

1. **Early warning systems**¹² are required for earthquakes, floods and tsunamis. Tsunami warning is probably the only mitigation that is feasible for this hazard for Morocco, and should begin with Morocco's participation in North Eastern Atlantic, the *Mediterranean and Connected Seas Tsunami Early Warning and Mitigation System* (NEAMTWS),¹³ while simultaneously developing and deploying a tsunami warning dissemination system that includes public education, tsunami evacuation signage and other measures to effectively utilize the technical warning. Earthquake warning is an emerging technology, but has operated in Mexico and Turkey for the last decade and is now becoming operational in Japan and the United States. It could be operationalized in the north of Morocco. Flood warning systems are already operational-

¹² EWS consist of a number of elements—data collection, processing and warning issuance decision-making, messaging and broadcast of the warning, and preparation and education of the warning recipients regarding appropriate actions to take in the event of a warning.

¹³ North Eastern Atlantic, the Mediterranean and Connected Seas Tsunami Early Warning and Mitigation System (NEAMTWS) was formed in 2005 with 39 member countries (Intergovernmental Coordination Group, 2007).

BOX 14: Building Resilient Communities in Vietnam

Since 2000, the Government of Vietnam has refined its approach to DRM by empowering provincial organizations and communities to plan for and respond to disasters. The national government has combined institutional capacity building efforts with risk reduction structural investments at the community and provincial levels. The main non-structural measures that have been adopted in Vietnamese communities are the establishment of early warning and evacuation systems and the organization of training programs for citizens, including evacuation drills. Similarly, the introduction of new technologies has led to increased public participation and transparency, with tools such as a cell-phone based monitoring system and a farmers' management information system. The structural measures for risk reduction at the community level include the construction of reservoirs, dams, drainage canals, rural roads and irrigation infrastructure built with new standards, as well as multi-purpose evacuation centers.

A key to the overall success of the program has been the inclusion of these measures in the community development plans, and the creation of Safer Community Plans. Similarly, the participation of all stakeholders, including villagers, relevant government agencies at all levels and international partners, ensures the durability and feasibility of the program. Finally, the linkage of physical investments with CBDRM activities through geographic clustering provides for greater synergies and a more comprehensive approach. What began as a pilot project in 2000 is now a model that is being reproduced by the government in nearly 6,000 communities.

Source: <https://www.gfdrr.org/node/1283>.

ized in some river basins in Morocco, and this mitigation approach should be greatly expanded (for instance with the purchase of many more modern weather stations).

2. **Hazard Mapping and Analysis** for floods and earthquakes needs to be enhanced, with priority given to areas of recent development, particularly 'new cities.' This would also enable the GoM to strengthen its standards of construction, interventions and prioritization during the phase of post-disaster reconstruction. Further and in-depth analysis will need to be conducted for high-risk areas that have been identified by MnhPRA—Kenitra, Tetouan, Casablanca, Sidi Kacem, and Larache for floods and Nador, Al-Hoceima, Berkane, Taza and Tetouan for earthquakes.
3. **Building Code Compliance** will need to be enhanced to reduce potential earthquake impact in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, and Tetouan) and be extended to other provinces over time, via a multi-pronged approach of education, management and enforcement. Education of builders, owners and building inspection personnel are all required, and need different content and formats. Worldwide, one of the main challenges is to make sure that modern codes are actually enforced. Some countries make the builders legally responsible for the quality of the building for five or ten years after construction is finalized (as does Chile for instance). This might be a requirement for Morocco to consider.

4. In the five provinces (Nador, Al-Hoceima, Berkane, Taza, and Tetouan) with high earthquake risk, establish a **program to educate private and public sector building owners** about the need for and benefit of seismic retrofit.
5. **DRM needs to be included in *Plan Communal de Développement*** and enhance rescue and relief plans in communities identified as high risk by MnhPRA.

Structural Measures¹⁴

- ▶ **1. Flood Protection** structural improvement programs need to be accelerated, particularly in provinces with high flood risk (Kenitra, Tetouan, Casablanca, Sidi Kacem, and Larache) and also be extended to other provinces over time. Additionally, the Agences du Bassin Hydraulique should be provided more resources, with risk-based allocation of the resources.
- ▶ **2. Earthquake retrofitting** of public buildings in the five high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, and Tetouan) should be undertaken, and be extended to other provinces over time. Preliminary studies (World Bank, 2012b) show that for the subject prov-

¹⁴ These methods tend to resist or channel the natural hazard.

inces, seismic retrofitting of essential facilities typically costs about 20% of replacement value.

- ▶ 3. Investment should be made in **small-scale community-based risk resilient infrastructure** in communities identified as high-risk by MnhPRA.
- ▶ In addition to these institutional reforms and structural measures, risk transfer interventions,¹⁵ including in the risk financing arena, are equally important. In recognition of the need for more effective risk financing in Morocco, the Ministry of Economy and Finance's (MEF) Department of Insurance (DAPS) has already started to develop a catastrophe risk insurance program for the residential and commercial sectors. More recently, the MEF has started considering a broader disaster risk financing and insurance approach that would address risk in other sectors, such as the agricultural sector, as well as manage disaster-induced volatility on the government's budget. These risk transfer aspects are discussed in more detail in Section 2.4.

2.2 Commodity (Energy) Price Volatility Risk

The second pillar of joint work between the GoM and the World Bank concerns commodity (energy) price volatility risk and its ultimate impact on the national budget. On a macro-economic level, the vulnerability of the Moroccan economy to commodity prices arises primarily from its heavy dependency on imported energy products. The two risks this engenders are **balance of payments risk**, given the pressure exerted on foreign reserves to acquire foreign goods, and **political risk**, in light of the energy security concerns. On a more micro-level, the government's policy of subsidizing various food and fuel products translates into a third type of risk, with direct impact on the domestic budget: **fiscal risk**, or the (recurring) contingent liability emanating from needing to cover the difference between international prices and fixed domestic prices.

As with other types of risks, the toolset available to managing commodity price risk includes one set of mechanisms, involving policy decisions and programs designed to **reduce** the exposure to risk in the long term, while a second set of mechanisms, involving risk management instruments, aims to **manage** the existing or remaining risk in the short term.

Morocco has made a number of policy decisions to reduce the exposure to commodity price risk. These include reforms to lower the level of subsidy, such as the 2012 deci-

sion by MAGG to increase the consumer prices of gasoline, diesel, and fuel oil, and the on-going preparation of a package of comprehensive reforms of the compensation system which will ease the burden on the budget. They also include the strategy developed by the Ministry of Energy, Mines, Environment and Water (MEMEE) to implement specific energy efficiency initiatives to control energy consumption, combined with simultaneous and significant investments to increase the share of renewable energy (wind, solar, hydraulic) from 25% (2013) to 42% (by 2020) of total energy production.¹⁶

While these policy decisions illustrate options that have potentially a long-term impact in reducing the risk profile of Morocco, it is important to recognize that they are also part of a pre-existing and on-going government decision making process that far exceeds the scope of the engagement on commodity price risk volatility to date—and are therefore not covered in this report. As originally envisaged, this document focuses more narrowly on the short-term mechanisms that aim to **manage** the existing **fiscal risk**, related to the subsidy system, with the mutual understanding that it only addresses one piece of a much broader and more complex set of issues. In this context, the options highlighted below could be considered by the GoM to reduce the impact of commodity (energy) price volatility on its budget.

The subsidy system in Morocco aims to provide a certain level of social protection to the economy and against increases in prices. By taking the role of a *de facto* insurer against price rises of imports on behalf of its constituents, the subsidy system exposes the government and the state budget to significant commodity price risk. This risk is driven mainly by three variables, namely (i) the volumes consumed/compensated; (ii) the market prices of the subsidized commodities; and (iii) the level of protection (subsidy) established by the government.

Managed through the *Caisse de Compensation* (CdC), the subsidy system has been a source of growing concern for the government. This has been due to its magnitude, which

¹⁵ These seek to spread the global impacts over many more people, so as to reduce the local (i.e., per person) impact to a tolerable level. The best example of risk transfer is financial, often in the form of insurance.

¹⁶ *Ministre de l'énergie, des mines, de l'eau et de l'environnement (MEMEE)*. 2011. *Strategie energetique bilan d'etape, Mai 2011*. <http://www.mem.gov.ma/Actualites/2011/aout/sen.htm>

Table 4: Hazards and Possible Interventions

| Hazard | 1,000 yr loss impact (MAD) | Priority Provinces | Priority interventions | Cost to mitigate Impact |
|-------------------|----------------------------|---|--|--|
| Earthquake | 47 | <p>High priority: Nador, Al Hoceima, Berkane, Taza, Tetouan,</p> <p>Medium priority: Larache, Chefchaouen, Taourirt, Tanger-Assilah, Taouate, Fahs-Anjra, Ouajda-Angad, Kenitra,</p> | <p>Structural strengthening of selected schools, hospitals, government buildings</p> <p>Earthquake insurance for private sector buildings (3)</p> | <p>Seismic Strengthening in High Priority Provinces</p> <p>All public buildings: approx. MAD 230 million</p> <p>All schools: approx. MAD 1.7 billion</p> <p>All Health Facilities: approx. MAD 700 million</p> |
| Flood | 34 | <p>High Priority: Kenitra, Azilal, Mohammedia, Taouate, Tetouan, Ouarzazate, Khemisset, Taourirt, Boulemane, El KelGa Des Sraghna, Larache, Chtouka-AitBaha, Taroudannt, Skhirate-Temara, Khenifra, Khouribga, Chefchaouen, SidiKacem, Meknes, Jerada, Benslimane, Mediouna, Nouaceur, Casablanca.</p> <p>Medium Priority: El-Jadida, Tan-Tan, Settat, Fes, Assa-Zag, MoulayYacoub, Sale, Chichaoua, Al Haouz, Zagora, Al-Hoceima, Inezgane-AitMelloul.</p> | <p>Flood warning system (FWS)</p> <p>Construct / raise levees and other structural flood protections</p> <p>Flood insurance for private sector buildings (3)</p> | <p>10 FWS to cover 3 regions: approx. MAD 400 million capital outlay and MAD 40 million annual operating costs.</p> |
| Tsunami | 59 | <p>All coast provinces (no priority): Ben Slimane, El Jadida, Safi, Kénitra, Casablanca, Guelmim, Tan-Tan, Laâyoune, Essaouira, Nador, Salé, Skhirate-Témara, Agadir-Ida ou Tanane, Chtouka-AitBaha, Tiznit, Chefchaouen, FahsAnjra, Larache, Tanger-Assilah, Tétouan, Al Hoceïma</p> | <p>Tsunami warning system</p> <p>Evacuation route identification and marking (i.e., signs)</p> <p>Flood insurance for private sector buildings (3)</p> | <p>Evacuation signage costs: approx. MAD 100 million capital outlay and MAD 2 million annual maintenance</p> |

Note: Earthquake: High Priority: Loss Cost > 1 per mille; Medium Priority: 0.5 per mille < Loss Cost < 1 per mille Flood: High Priority: Loss Cost > 5 per mille; Medium Priority: 1 per mille < Loss Cost < 5 per mille.

has increased every year but one (in 2009) over the past decade, as well as its unpredictable nature.

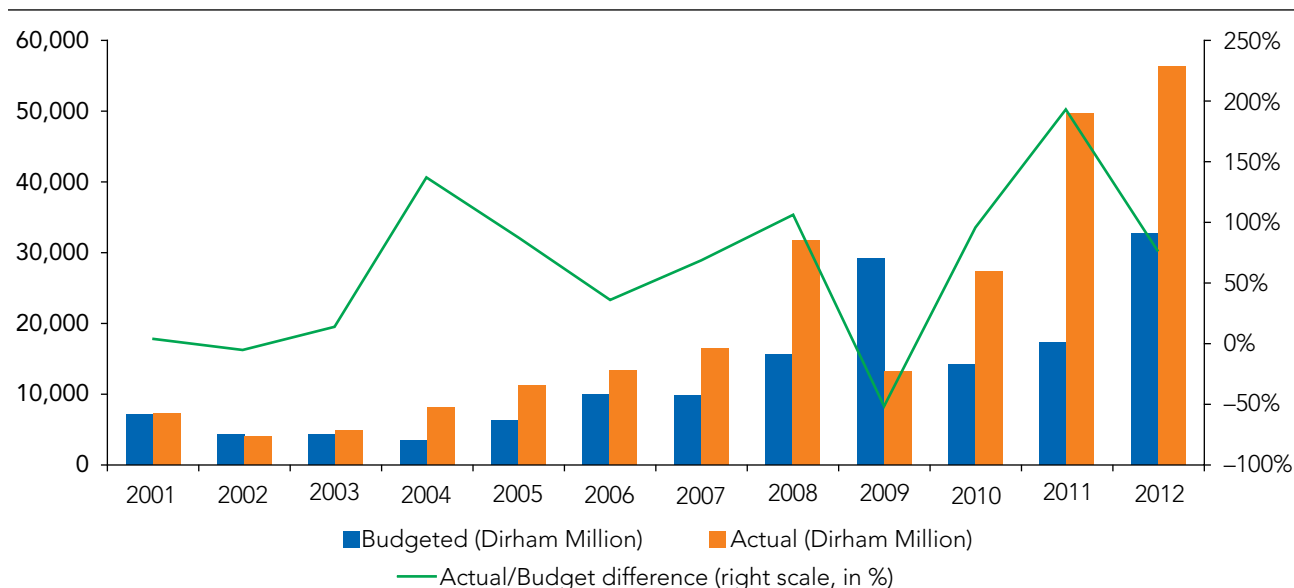
Subsidy expenditures are now the second line item in the budget of the government, after employee salaries, and, in 2012, reached a high of 6.2% of GDP. Since 2004, the volatility of commodity prices has resulted in actual subsidy payments surpassing the projected/budgeted amounts by 30% (2006) to a maximum of 190% (2011), as shown in Figure 10. Exposure to commodity prices has impacted negatively the government's ability to allocate its resourc-

es to its public investments to improve infrastructure and services.

Programs and Institutions

Article 44 of the Budget Law enables the government to actively manage price risk by means of risk management instruments. However, Morocco currently still lacks an overarching/comprehensive strategic approach and corresponding institutional framework for managing these risks. It is in this context that the following recommendation could be considered by the GoM:

FIGURE 10: Cost of Subsidies-Actual versus Budgeted



Source: MEF and World Bank.

1. Develop a Price Risk Management Strategy, including a corresponding institutional management framework:

Morocco could begin to develop an appropriate institutional framework by establishing a working group, or a more formal committee, to ensure that risk management activities are synchronized and coordinated among the stakeholders. A Price Risk Management Strategy could then be developed, in consultation with the working group or committee. Developing the strategy could include the following critical steps:¹⁷

- ▶ **Assess risk.** This step identifies the risk composition (products, price level, time frame, and volume) and defines a base case and evaluates it against a variety of market scenarios.
- ▶ **Document objectives.** This is achieved by establishing the realistic limits of the approach, obtaining consensus from a broad range of stakeholders, and clearly communicating what the hedge strategy is and is not designed to do. This may include clearly establishing the price to be defended (i.e., through a link to price levels assumed in the budget) in order to avoid the ambiguities and political risks associated with trying to time the market and desired hedging transactions.
- ▶ **Evaluate the enabling environment.** This includes the governance and legal framework, coordination with other policies, staff capacity, information systems, public disclosure, and audit processes.

- ▶ **Conduct technical analysis.** This includes a cost-benefit review of products and approaches and simulations and/or scenario analysis of prototype hedging strategies; this may include the virtual testing of hedging strategies in order to gain practice with new policies and procedures before implementation.
- ▶ **Build capacity.** This step covers capacity-building of staff, stakeholders, and key decision makers.
- ▶ **Establish robust institutional arrangements.** This should occur at every stage in the process.

Risk Transfer

Several well-known risk management solutions can be used to protect the budget by transferring risk to market counterparties, either by means of physical instruments¹⁸ and/or financial instruments. Table 5 and the discussion below provide an overview of a selected number of hedging in-

17 Yépez-García, Rigoberto Ariel and Julie Dana. 2012. *Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean*. Washington, DC: World Bank. DOI: 10.1596/978-0-8213-9577-6. License: Creative Commons Attribution CC BY 3.0

18 These include storage arrangements (i.e. strategic reserves), strategic timing of purchases and sales, forward contracts, minimum/maximum price forward contracts, price-to-be-fixed contracts and long-term contracts with fixed or floating prices.

Table 5: Overview of Selected Commodity Price Risk Instruments: Advantages and Disadvantages

| Product | Interest | Benefits | Cost / Risks / Constraints |
|-------------------------|---|---|--|
| Forwards | Integrating price risk management solutions into physical supply contracts. | Since forwards are physical supply contracts, the risk management solution is embedded in the supply contract, and there is no need for a separate contract/documentation. Pricing of forward contracts can be customized to the needs of the hedger: prices can be fixed, floating, or include caps/floors and collars (a pre-agreed range or band). Depending on the pricing formula used, forwards have the same benefits as the financial products described below. | May be complex for government to implement if it is not directly involved in physical importing. Depending on the pricing formulas used, will have the same costs/risks/constraints as the financial products described below. |
| Futures | Establishing fixed price certainty without interest in taking advantage of future upside or downside price movements. | There are no upfront costs. It is possible to lock in forward prices through a financial contract. | Locks in fixed prices and limits the hedger's ability to take advantage of positive price movements that may occur in the future. Creates unknown and unpredictable future liability since hedger will owe the market counterparty if the market moves in an adverse direction. Requires financing of a credit line or a credit guarantee. Requires managing cash flow/liquidity requirements to support (potential) daily margin calls. |
| Options | Establishing a cap or floor on prices but maintaining flexibility to take advantage of lower or higher prices that may occur in the future. | The hedger can lock in maximum and minimum prices and take advantage of positive price movements that may occur in the future. | Has an upfront cost, or premium, pricing for which is market-driven and can be volatile. On an indicative basis, premium costs can range from 5 to 12% of the value of the underlying price for 6–18 month coverage. |
| Collars | Establishing a price band or range. | Price exposure is limited to a price band (collar) that has both a ceiling and a floor. The upfront costs can be lower since the hedger is, for example, simultaneously buying a call option and selling a put option. | Creates unknown and unpredictable future liability since hedger will owe the counterparty if the market moves below the price floor. Requires financing of a credit line or a credit guarantee. Requires managing cash flow/liquidity requirements to support (potential) daily margin calls. |
| Swaps | Establishing price certainty without interest in taking advantage of future upside or downside price movements. | There are no upfront costs. As with futures contracts, swaps can be used to lock in fixed price levels. Swaps provide the ability to simultaneously manage two commodity exposures or financial flows. | Creates unknown and unpredictable future liability. Requires financing of a credit line or credit guarantee. Requires managing cash-flow requirements to support (potential) daily margin calls. |
| Commodity linked | Combining price protection into a loan so that repayment obligations are lower when prices move in an adverse direction. | On a more macro level, these instruments could be used to connect borrowing or financing programs to the performance of a specific commodity index. | Can be more complex to structure. May not be effective as a hedge for specific, short-term commercial exposures. |

Source: Yépez-García, Rigoberto Ariel, and Julie Dana. 2012. *Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean*. Washington, DC: World Bank. DOI: 10.1596/978-0-8213-9577-6. License: Creative Commons Attribution CC BY 3.0.

struments, along with some of their costs, benefits and implementation constraints.

1. **Physical instruments** include storage arrangements (i.e., strategic reserves), strategic timing of purchases and sales, forward contracts, minimum/maximum price forward contracts, price-to-be-fixed contracts and long-term contracts with fixed or floating prices. These instruments consist of contractual negotiations between buyers and sellers, and concern the terms of the actual physical exchange of goods. Physical instruments have the advantage of being relatively simple arrangements from an operational, legal, accounting and auditing perspective but may not be practical for governments who are typically not directly involved in the supply chain.
2. **Financial instruments**, which include futures, options, swap and collar contracts, as well as commodity-linked bonds and loans, are purely financial arrangements that operate independently from the supply chain and physical delivery of the underlying commodity. Such instruments, known in finance as *derivatives*, require strong institutional arrangements and highly-skilled teams. This is because of the higher degree of complexity in terms of documentation, relationship with financial counterparties, pricing, recording, and monitoring throughout the life of those financial contracts.

It is important to note that *a priori* no single risk management instrument is superior to another, and that the selection of one specific instrument should be based on a comprehensive evaluation of (i) the specific risk that needs to be managed, and (ii) the costs, benefits and constraints associated with each instrument.

It is also important to keep in mind that the use of these sophisticated financial instruments is also risky. Because they are traded on international markets, there is always a currency risk (that is, the risk of a change in the relative value of two currencies; for instance Moroccan dirham versus the euro or U.S. dollar), credit risk (that is, the possibility that the counterparty that bears some of the risk Morocco wants to hedge actually defaults) and basis risk (the risk of using an instrument whose value does not match exactly that of the intended commodity). These additional risks specific to the use of these hedging financial instruments need to be seriously evaluated before the signature of the contract and managed during the validity of the contract.

The use of risk management instruments in the private/commercial sector is widespread. Implementation of com-

modity risk management strategies by sovereigns is much less common and practices are not as well established as in the private sector. Although a few governments actively manage their exposure to commodity prices, information about these programs is often not publicly available and lessons learned are relatively new. Box 15 summarizes the experience of one such country, Mexico, which was willing to share its strategy and vision with the World Bank.

It will be important for the GoM to make decisions on what type of response is judged the most appropriate. One option is of course to continue financing these fiscal shocks through increasing public deficit and debt. Whether this is the optimal strategy needs to be determined after proper quantification of the cost and benefits of alternative strategies.

Although the MEF is best positioned to take the lead in the development of the commodity price risk management strategy, and its implementation, an integrated approach is critical for its success and sustainability, given that several key stakeholders will have complementary views and need to be involved. These include the Ministry of General Affairs and Governance (MAGG), which has oversight of the implementation of the government's subsidy policy; the Ministry of Energy, Mines, Environment and Water (MEMEE), the primary domestic expert on the local and international fuel market dynamics; and the Bank Al Maghrib (BAM) which, as the central bank, has the ability to provide front/back office technical support to the MEF with access to market information and management of relationships with market counterparties. Adopting an integrated approach to risk management could help enable these institutional linkages to be established and the National Office of Risk Management (NORM) could play a key role.

2.3 Risks in the Agriculture Sector

The third pillar of joint work between the GoM and the World Bank focuses on agriculture, which is critical to the economic and social equilibrium of the country. As mentioned earlier the work on agricultural risk was led by the GoM and no independent analytical work was commissioned by the World Bank.

2.3. a Morocco's agriculture risk profile

Agriculture is a major sector of the Moroccan economy; its role is crucial for growth because of its downstream (as a supplier of goods to be processed or marketed on local, na-

BOX 15: Mexico's Oil Hedging Strategy: Institutional Capacity for Risk Management

Mexico's state-owned oil company, PEMEX, the world's third largest oil production company, pays taxes and levies totaling about 60% of sales. This represents more than one-third of overall government revenues, meaning that the federal budget is vulnerable to oil price declines. In response, Mexico's Ministry of Finance and Public Credit (MFPC) has implemented an oil price hedging program—part of a three-pronged, public finance strategy to guarantee sustainability, including adequate liquidity and financial risk management.

Each year, Mexico's Congress establishes a projected oil price for budgetary calculations, based on a pre-established formula using historical and futures prices. The MFPC designs and executes the oil hedging strategy based on the projected price, with funding from the Oil Revenues Stabilization Fund (FEIP), created in 2001. Any revenues obtained from the hedging transactions are used to offset lost revenues from price declines that have adversely affected oil marketing and sales. Currently, the government implements the hedging program using the purchase of put options, giving it the right, but not the obligation, to sell oil in the future at a pre-determined strike price equivalent to the projected price set in the budget for the next year. This strategy creates a floor in the price for oil exports giving the country an opportunity to take advantage of upward price movements should they occur. Typically, the government transacts 12-month, put-option contracts, with a strike price equivalent to the projected oil price used to develop the national budget. Institutionally, the MFPC develops the hedging strategy and purchases put options for the following year; it pays the premium from the FEIP via its financial agent, the Central Bank, which runs a competitive process for each transaction to determine market counterparties. In the early program years, Mexico hedged 20–30% of its net oil exports.

Mexico's oil hedging program has been operating for nearly a decade. A strong set of institutional arrangements has provided a solid foundation for the government's risk management strategy. Its systematic approach has resulted in increased sophistication and capacity. The government has a clear and consistent message, which it takes care to communicate to the public. The objective of the hedging strategy is not to profit directly from a fall in the price of oil, but to hedge the existing financial risk that Mexico faces, owing to its heavy dependence on oil revenues.

Source: Yépez-García, Rigoberto Ariel, and Julie Dana. 2012. *Mitigating Vulnerability to High and Volatile Oil Prices: Power Sector Experience in Latin America and the Caribbean*. Washington, DC: World Bank. DOI: 10.1596/978-0-8213-9577-6. License: Creative Commons Attribution CC BY 3.0

tional and international markets) and upstream (as a consumer of inputs including labor and services) effects on the economy.¹⁹ Agriculture contributes 15% of national GDP and 23% of Morocco's exports. The sector is the largest employer in Morocco, providing jobs to nearly 40% of the national labor force; and a critical 75% of rural employment. According to a study by the Ministry of Agriculture²⁰, the three most important risks are drought, pest and diseases, and market price volatility; the three most exposed sectors are vegetables, olive trees and cereals; and the three regions most exposed are Sousse-Massa-Draa, Meknes, and Marrakech-Tensift.

Given the importance of the sector to the national GDP, fluctuations in agricultural production due to rainfall significantly impact the national GDP figures (see Figure 11 which depicts a strong positive correlation between agriculture production and the national growth domestic product).

As 90% of Moroccan agriculture is traditional and rain-fed based,²¹ the sector is highly vulnerable to climatic related risks. Additionally, because of fast and sometimes uncon-

trolled urban development, the volume of available fresh water for agriculture is decreasing significantly, posing an important challenge to the sector.²²

It is estimated that the total exposure of the agriculture sector to various risks (drought, pest and diseases, and market price volatility) was MAD 75 billion in 2008, and likely to increase to MAD 185 billion in 2020.²³

19 Haut Commissariat au Plan (HCP). 2012. *HCP en collaboration avec le Conseil Général du Développement Agricole. Prospective Maroc 2030. Agriculture 2030. Quels Avenirs pour le Maroc?*

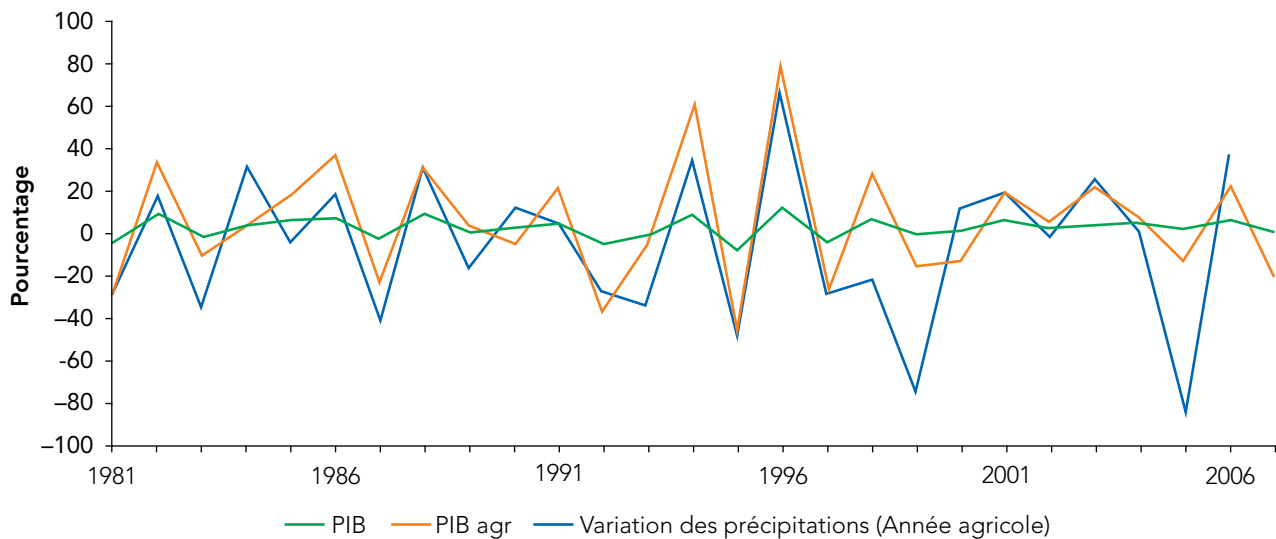
20 Ministère de l'agriculture et de la pêche maritime (MAPM): *Strategie de la gestion des risques dans le secteur agricole*.

21 Ministère de l'agriculture et de la pêche maritime (MAPM): 2010. *Etude sur la gestion des risques et la mise en place d'un système d'assurance agricole au Maroc. Identification et hiérarchisation des risques agricoles, Novembre 2010*.

22 ——— 2011. *Changement climatique et agriculture: impact et implications politiques*. Juin 2011.

23 ——— 2010. *Etude sur la gestion des risques et la mise en place d'un système d'assurances agricoles au Maroc*.

FIGURE 11: Rainfall Variations, GDP, and Agricultural GDP (1981–2006)



Source: Indicateurs du développement dans le monde et Direction de la Météorologie nationale.

Drought is one of the biggest risks in the sector and there have been longer episodes of droughts in recent years. This could worsen even more in light of the looming threat of climate change. The impact of drought on cereal production (covering only three crops—see also Section 2.1 a) has been estimated to cost the economy of Morocco about MAD 2.6 billion a year.²⁴ This is equivalent to about half the estimates of the average annual loss due to floods (see Table 3 in Section 2.1 a). This comparison provides an important benchmark for the government. Droughts and floods are very different risks and affect different social-economic systems—farmers for droughts; residences, businesses and infrastructure operation for flood (and to some extent farmers too if crops are inundated). Having one common model makes it possible to compare and contrast the impact of different hazards across different sectors of the economy.

2.3. b Institutional and legal framework in the agriculture sector

Given the importance of the sector to the economy and communities, the GoM has a number of initiatives, programs and legal structures in place to potentially mitigate risks.

The Ministry of Agriculture and Marine Fisheries (MAMF) has recently developed a National Strategy for Agricultural Risk Management (until 2020) in an effort to shift from ex

post crisis management to risk mitigation, ex ante investments and new insurance products. This strategy aims to reduce the vulnerability of small farmers against agricultural risks; promote and secure agricultural investment; and provide direct public support to insurance products for better agricultural risk management.

The instruments of risk management implemented by the Ministry of Agriculture can be classified into three types according to their distinct approach to risk:

- ▶ **Treatment and support instruments following the occurrence of a risk** (“ex post” approach): they aim to relieve the victims after the occurrence of a disaster, by providing technical, financial, material, or health assistance.
- ▶ **Prevention and mitigation instruments** (“ex ante” approach): they are intended to reduce the likelihood of risk occurrence and mitigate their impact.
- ▶ **Insurance-transfer instruments** (“ex ante” approach): they cover the main crops and animal production and apply to all types of agriculture production (i.e. modern and other).

Some specific programs to achieve this aim include the Plan Maroc Vert, the Programme national d'économie d'eau en irrigation, and the Programme d'extension de l'irrigation à l'aval des barrages. In terms of investing in agriculture risk

mitigation infrastructure, the GoM established the MAD 170 billion Plan Maroc Vert (PMV) for the period 2008–20. This aims to transform this sector into a stable source of growth, competitiveness, and broad-based economic development in rural areas through a combination of agricultural investments and systemic public sector reforms. Although primarily an investment program, it can also help to increase the risk resilience of the agricultural section. Institutionally, a National Agency for Agricultural Development has been set up within the Ministry to oversee the agricultural strategy and the PMV.

The National Program of Irrigation Water Conservation (Programme national d'économie d'eau en irrigation, PNEEI)—a 15 year development program, at MAD 37 billion, seeks to invest in the modernization of individual and collective irrigation systems and improved agricultural water management. The Program of Irrigation from Constructed Dams (Programme d'extension de l'irrigation à l'aval des barrages) aims to create new irrigation systems and strengthen existing ones around dams (either already under construction or projected for 2008–12). This program of MAD 18 billion has led to the extension of 10 irrigation channels since 2008.

Morocco also has a portfolio of insurance programs aimed at protecting farmers against a range of risks. These include:

- ▶ **The agricultural insurance programs, subsidized by the state:** “The multiple peril crop insurance” covers four types of cereals. Launched in 2011–12, it aims to cover one million hectares by 2014. Another insurance program covers hail. An agreement was signed between the State and the Moroccan Mutual Agricultural Insurance (MAMDA) for the agricultural campaigns 2009–10, 2010–11 and 2011–12. It supports farmers and encourages them to purchase this insurance (a state grant is provided if they do).
- ▶ **New agricultural insurance programs subsidized by the state to be launched:** Private multi-risks insurance that would cover perennial crops (olive and fruit trees) and vegetables is expected to be available to the market soon. The parametric insurance products are also being studied: they would provide coverage against climatic hazards associated with rainfall, insuring not the occurrence of a loss but the realization of an index. In this context a pilot is underway in the areas of Meknes and Chaouia, as part of a collaboration between the Min-

istry of Agriculture and Marine Fisheries (MAMF), the National Institute of Agronomic Research (INRA) and the National Directorate of Meteorology (DMN). Such index-based insurance would cover cereals and legumes against the effects of drought. Another insurance (“named peril”) would cover crops against a given risk. There are also plans to develop products for white meat sectors and sugar crops.

- ▶ **Insurance products which are not subsidized by the state:** The main products offered by the private insurance cover agricultural machinery, farm liability, agricultural fires, and livestock mortality.

2.3. *c* Options to mitigate risks in the agriculture sector

While a detailed analysis of the different options goes beyond the scope of this IRM strategy report, several options are worth consideration.

Programs and Institutions

1. Extend Drought Risk Analysis to entire the agricultural sector based on MhnPRA (which has covered so far only three crops).
2. Establish Data Collection Systems for Collection, Management, and Processing of Agricultural Data and Weather Information.
3. Build Institutional Capacity for Improved Data Management on Risks in the Agricultural Sector.
4. Enhance early warning systems for droughts.

Structural measures

1. Build and/or modernize Irrigation Networks in priority areas, including in Souss-Massa-Draa, Meknes, and Marrakech-Tensift.
2. Invest in Flood Protection works in high-risk rural areas, including Gharb-Chaouia-Ourdigha.
3. Invest in equipment, including for example, weather stations, modeling, computers, software, satellite photos, etc., necessary for the implementation of the parametric insurance

Further information on risk transfer interventions in the sector is detailed in the section on Risk Financing (Section 2.4).

2.4 Disaster Risk Financing and Insurance²⁵

Morocco's exposure to risks, including those in the three subsectors reviewed above, imposes a significant financial burden on its population, enterprises, and government (as insurer of first or last resort). The adoption of an IRM strategy will reduce these adverse impacts through risk prevention and mitigation. In recognition of the need for more effective risk financing in Morocco, the Ministry of Economy and Finance's (MEF) Department of Insurance (DAPS) has already started to develop a catastrophe risk insurance program for the residential and commercial sectors. More recently, the MEF has started considering a broader disaster risk financing approach that would address risk in other sectors, such as the agricultural sector, as well as manage disaster-induced volatility on the government's budget.

Financial impacts of disasters in Morocco

The probabilistic risk assessment discussed in Section 2.1 (see Table 3), reveals that each year, on average, Morocco is likely to suffer about MAD 5 billion in direct damages as a consequence of floods, earthquakes and tsunamis. This number is even higher if one consider the ripple effects on other sectors of the economy (as calculated through IO and CGE models; see Box 12). Once every 100 years, on average, Morocco will face damages totaling around MAD 60 billion, equivalent to an estimated 7% of GDP. These figures represent physical damages and do not take into account indirect socio-economic impacts, which are estimated to be significant. Floods drive losses at both of these levels, although the contribution of earthquake becomes increasingly important as events become less frequent but more severe.

The impacts of natural hazards could place a significant fiscal burden on the Government. Although the GoM's fiscal exposure to the impacts of natural hazards (focusing here on floods, earthquakes and tsunamis) needs to be assessed in more detail. Examination of the costs that the GoM could incur to reconstruct public assets and some portion of residential assets (such as those of low income households) provide insight into basement figures for its direct losses. Each year, damage to essential facilities, government buildings, and infrastructure is estimated at MAD 1.4 billion, or 0.6% of the central government's annual budget.²⁶ This figure could climb much higher if an extreme event occurred (Tables 6 a and b). A one-in-100 flood, for example, could

inflict damages to public assets in excess of 4.4% of the Central Government's annual budget. While the GoM does not bear the full cost of damages to residential assets, its effort to establish a public-private partnership (PPP) for catastrophe risk insurance suggests that it acknowledges an implicit contingent liability to this sector. Losses in the residential sector cannot be further disaggregated into losses to high-, middle-, and low-income populations, but it is notable that residential assets represent 41% of the value at risk in Morocco and are the greatest driver of damages across hazards and return periods.²⁷ Even if only considering low-income populations, with greater than 36% of households being rural or slum dwellers,²⁸ the reliance on the government for post-disaster aid for asset reconstruction and livelihood support could be significant.

Quantifying the expected losses to the aforementioned assets from natural hazards does not take into account indirect fiscal impacts nor does it account for the time dimension of spending needs. In conjunction with major disaster-induced expenditure, the government could face revenue reductions (e.g., reduced tax revenue linked to economic disruption) and concurrent adverse macroeconomic conditions (e.g., recession) that could further destabilize its fiscal balance. Additionally, aggregate loss figures do not provide a sense of the time dimension of spending on disasters; for example, the government's ability to quickly mobilize resources (e.g., through budget reallocation, use of contingency budgets, etc.) to restore essential facilities and infrastructure as soon as possible following an event is an essential key factor in determining how quickly society can recover. Table 6 a and b below use findings of the probabilistic risk assessment for natural disasters described earlier in section 2 of the report (see Table 3) to show specifically the maximum probable loss a 100-year return period event would cost (in direct damage only).

24 World Bank. February 2012. *Morocco Natural Hazard Probabilistic Risk Assessment*. Washington, DC.

25 This section is authored by the World Bank GFDRR Disaster Risk Financing and Insurance Program. It draws heavily on Boudreau, L and O. Mahul. 2013. "Integrated Disaster Risk Financing and Insurance Strategy in Morocco." Working Paper, GFDRR, World Bank, Washington, DC.

26 Central Government Budget figures for 2011 were used for this assessment.

27 World Bank. 2012. *Morocco Natural Hazards Probabilistic Risk Analysis and National Strategy Development*. Washington, DC.

28 *Ibid*

Tables 6a & b: Average Annual Loss and Maximum Expected Loss (MEL) for a 1-in-100 year event for selected assets (MAD million)

a.

| AAL | Flood | Earthquake | Tsunami |
|----------------------|--------------|------------|------------|
| Residential | 1,895 | 506 | 23 |
| Essential Facility | 1,005 | 97 | 1 |
| Industrial | 471 | 35 | 18 |
| Commercial | 434 | 144 | 18 |
| Government buildings | 369 | 7 | 0 |
| Infrastructure | 3 | 60 | 63 |
| Total | 4,177 | 850 | 124 |

b.

| Max Exp. Loss (MEL) | Flood | Earthquake | Tsunami |
|----------------------|---------------|---------------|------------|
| Residential | 12,092 | 8,670 | 57 |
| Essential Facility | 8,328 | 1,564 | 5 |
| Industrial | 2,231 | 674 | 148 |
| Commercial | 2,530 | 2,823 | 180 |
| Government buildings | 2,351 | 151 | — |
| Infrastructure | 24 | 1,435 | 14 |
| Total | 27,556 | 15,317 | 404 |

Note: Essential facilities include schools, health units, police, and fire stations. Infrastructure includes utility and transportation systems.

Current approach to disaster and agriculture risk financing in Morocco

Currently, the government's full contingent liability to natural disasters remains to be assessed. Beyond its explicit contingent liability for emergency response and restoration of public assets, the state faces an implicit contingent liability for damages to uninsured private assets, including residential and commercial, and for agricultural losses since the victims are likely to turn to the government for compensation after a large disaster. The government's contingent liability emanating from the private sector is likely significant; property insurance penetration, for example, is low, and very few policies carry voluntary extensions for catastrophe risk.²⁹

The government retains its exposure to catastrophe risk, primarily relying on ex post measures to finance disaster losses. Public funding for disasters is determined after their occurrence, mainly relying on an *ad hoc* approach to identification and allocation of resources. The government has established, however, a special fund for emergency relief operations, capacity building for emergency responders (e.g., the Civil Protection), and investment in prevention and early warning systems. The special fund, in place since 2009, was capitalized by a MAD 100 million grant from Saudi Arabia, a MAD 300 million grant from the Hassan II Fund for Economic and Social Development, and state budget allocation of MAD 200 million; the budget allocation for the special fund was renewed throughout the period 2010–12.

Since the late 2000s, in recognition of the need for more effective risk financing in Morocco, the Ministry of Economy and Finance's (MEF) *Direction des Assurance et de la Prevoyance Sociale* (DAPS) started to develop a catastrophe risk insurance program for the residential and commercial sectors. More recently, the MEF has started considering a broader disaster risk financing approach that would address risk in other sectors, such as the agricultural sector, as well as manage disaster-induced volatility on the government's budget. The legislation (still being finalized) towards the national catastrophe insurance program (*project de loi n. 34-08*) would introduce a mandatory multi-hazard catastrophe extension for property insurance policies with fixed tariffs as well as the creation of a solidarity fund for catastrophes (*le Fonds de solidarité contre les événements catastrophiques—FSEC*) that will compensate uninsured victims. The bill covers both natural disaster and terrorism, although the focus of this report is on natural disasters.³⁰ The FSEC will be funded via contributions (to be defined), a percentage of catastrophe

²⁹ In 2011, Morocco's non-life insurance market penetration was approximately 2%; above neighboring Tunisia (1.5%) and Algeria (0.6%), but well below the Western European average of 3.2%. Swiss Reinsurance Co., Ltd. Economic Research and Consulting. 2012. *World Insurance in 2011: Non-life Ready for Take-off*. Sigma 03/2012, Zurich.

³⁰ A report providing an international benchmark of terrorism risk insurance programs and insights for Morocco was delivered to the Government of Morocco by the World Bank team as part of the IRM initiative. Michel-Kerjan, Erwann O. 2011. *Managing and Insuring Terrorism Risk: International Insights for the Government of Morocco*. World Bank Report, October 1, 2011. Washington, DC.

insurance premiums collected via the mandatory extension, and the government. DAPS is the technical leader for the development and proposal of Law 34-08 to establish the catastrophe insurance program.

The proposed catastrophe insurance program would rely on a PPP to effectively allocate responsibility for catastrophe risk among stakeholders in Morocco. The law would increase the number of residential, commercial, and industrial properties insured against catastrophes and would include the domestic insurance sector, the *Société Centrale de Réassurance* (SCR), the international reinsurance market, and the government (possibly via the FSEC) in the risk financing strategy. The law would clarify the government's contingent liability for financial support to Morocco's (un)insured population, as a global limit on the amount payable from the government under the program would be set.³¹ As of early 2013, the government is considering a series of modifications to the proposed law (Box 16).

As discussed in Section 2.3 of this report, the government has also long supported subsidized agricultural insurance to manage catastrophe and extreme weather risk in the agricultural sector. The current agricultural insurance program is largely supported by the state and distributed by the agricultural mutual MAMDA. The government's vision for the program is based on two pillars: (i) indemnity-based insurance for large farms and (ii) area yield-based or weather-based index insurance for small farms. Additionally, as discussed earlier, the government recently launched multi-peril crop insurance for the 2012–13 growing season, covering about 500,000 hectares. It aims to insure one million hectares by 2015. A second insurance program for arboriculture and horticulture, primarily targeted at olive groves, is being launched in 2013. Both programs include significant premium subsidies, estimated at about 80% of the premium. A third index insurance pilot program is in preparation to launch in 2014–15.

Four complementary options for improving Morocco's financial resilience to disasters and risks in the agriculture sector

The risk financing options presented in this report build on the catastrophe risk profiling conducted during the first phase of the integrated risk management initiative, the Government of Morocco (GoM)'s current risk financing activities and the GoM's expressed risk financing interests. It is consistent with the World Bank GFDRR disaster risk financing and insurance framework.

Option A. Operationalize Law 34-08 to establish a national catastrophe insurance program for private assets.

The GoM could invest in supporting information technology (IT) for data collection and management and risk market infrastructure to implement the proposed Law 34-08. Strong IT system(s) will be essential for operationalizing the proposed law and managing a wide range of functions critical to optimal management of the catastrophe insurance system. The experiences of other countries and regions with national catastrophe insurance programs, such as Turkey and Southeastern Europe, in establishing IT systems to manage their programs could be leveraged

The government could also further refine the catastrophe insurance program's risk financing strategy (illustrated in Box 17) based on actuarial analysis, and could secure (contingent) capital to ensure the scheme's claims-paying capacity, including the FSEC's liability for uninsured populations, at a determined level of solvency. The government could conduct actuarial analysis, building on the MnhPRA capacity that has now been developed and for which several line ministries have been trained, to determine the optimal claims-paying capacity of the catastrophe insurance program as well as the optimal capitalization of the FSEC.

Option B: Develop and implement an integrated disaster risk financing strategy that builds on the establishment of a national catastrophe insurance program and the outcomes of a fiscal risk assessment.

The development of the strategy could be informed by a fiscal disaster risk assessment and a review of public financial management of disasters in order to quantify the government's contingent liabilities to disasters and to identify any potential funding gaps based on the government's fiscal risk profile. The development and implementation of such an integrated disaster risk financing strategy as an important component of the overall IRM strategy would equip the government to enact an effective post-disaster response while maintaining its long-term fiscal balance and reduce its contingent liability to disasters in the long-term.

Option C: Promote agricultural insurance market development through technically-informed product design and transition to a stronger public-private partnership.

The government could promote sustainable scale-up of its

³¹ World Bank. 2012. *Note Technique sur l'analyse du cout du régime de couverture*. World Bank Policy Note, February 2012. Washington, DC.

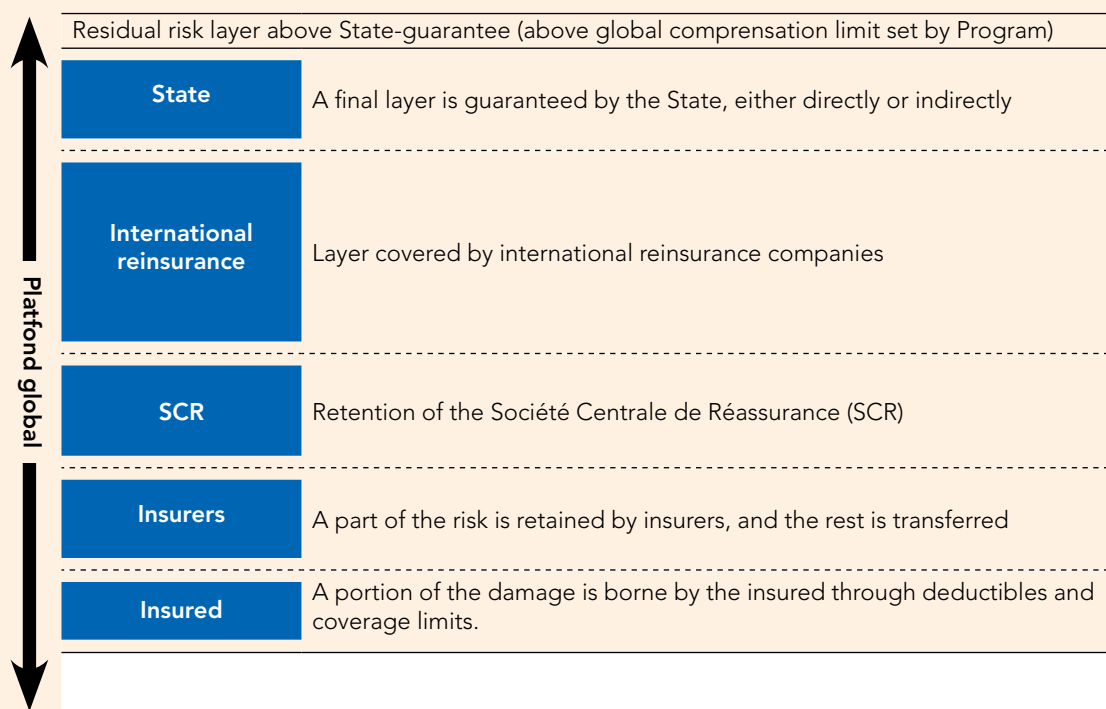
BOX 16: Proposed Modifications to Law 34-08

Following a reexamination of the proposed Law 34-08^a and consultation with the insurance sector, the government is considering a number of modifications to the provisioned law that will clarify the scope of the law and the risk financing responsibilities of the stakeholders in the law. The proposed modifications can be summarized as follows:

Insurance policies and design: The catastrophe insurance would cover a list of named perils, as opposed to the broader coverage for unnamed perils previously anticipated. Deductibles and limits for each type of exposure (e.g., vehicle, residential, commercial, industrial) would be set by regulation and these may be adjusted over time based on the scheme's maturity and risk financing capacity.

Risk financing responsibilities and limits: Moroccan insurers would retain a tranche, totaling between MAD 500 million and MAD 1 billion, of the catastrophe risk transferred through the program. The government would act as reinsurer for a top risk layer, the size of which will be determined annually or over a multi-year period depending on the amount required to secure an adequate level of solvency for the scheme and to overcome the volatility of the international reinsurance market. This intervention would either be direct or via the *Fonds de solidarité contre les événements catastrophiques*. Finally, a global limit on the amount payable under the compulsory catastrophe insurance program would be set via regulation. If damages incurred under the program exceed this overall limit, the amount paid out under the program will be adjusted so that it does not exceed the overall limit.

The catastrophe insurance program's revised risk financing strategy is as follows:



Source: World Bank-GFDRR Disaster Risk Financing and Insurance Program, with information from DAPS, 2013.

a. The technical revisions made to the proposed legislation Law 34-08 on the catastrophe insurance program are broadly build on the main recommendations of the World Bank *Note Technique sur l'analyse du cout du régime de couverture* of February 2012.

agricultural insurance programs, which are currently expanding to cover more farmers, through enhancements to their design. While the programs exhibit some features of international best practice, they rely heavily on public

premium subsidization and other public support. The government could more effectively support these programs through investment in information infrastructure as public goods, including the collection and management of agri-

BOX 17: The Southeastern Europe and the Caucasus Catastrophe Risk Insurance Facility (SEEC CRIF)

The Southeastern Europe and the Caucasus Catastrophe Risk Insurance Facility (SEEC CRIF) project is facilitating the development of national catastrophe and weather risk markets in SEEC through the design and introduction of innovative, low-cost insurance products, insurance business production technologies, regulatory reform, consumer education, and provision of reinsurance services. The project is supported by the World Bank, UNISDR, the European Commission, the Swiss State Secretariat for Economic Affairs, and the Global Environment Facility.

SEEC CRIF is being implemented through the creation of a specialty government-owned catastrophe risk reinsurer, Europa Reinsurance Facility Ltd. (Europa Re), with the view to improving access to weather risk and catastrophe risk insurance for millions of households, small businesses, and governments in the Facility's member states. Established in 2009 in Switzerland, Europa Re employs an independent Board of Directors and is managed by a professional management team. SEEC member governments are Europa Re's shareholders; currently, Albania, the former Yugoslav Republic of Macedonia, and Serbia have joined the Facility, with others in discussions to join.

Europa Re is currently completing probabilistic high resolution regional earthquake and flood risk models for the SEEC member countries. The models will be used for the purposes of underwriting and pricing flood and earthquake risk in these countries. It is also developing a web-based underwriting and risk-pricing platform that will provide insurers with automated real-time underwriting, pricing, and reinsurance decisions for all risks assumed through the sales of approved catastrophe insurance products in member countries. This platform will allow participating insurers to keep track of all policies issued through the portal and will enable them to report, and Europa Re to settle, insurance claims. Finally, Europa Re will utilize the platform to track its risk accumulations by location and type of risk.

Source: Europa Reinsurance Facility, 2013.

cultural production and weather data, and the revision of ratemaking to foster private sector participation. Building on international experience in India (see Box 18), Mongolia, and elsewhere, could support the government in moving toward effective, sustainable agricultural insurance programs.

Option D: Evaluate the implementation of a national insurance program for public assets. The GoM's disaster risk financing strategy could include an evaluation of the current insurance coverage of public assets, including those under construction and/or management of concessionaires. A strategic approach to insure these assets would

BOX 18: Improving India's National Agricultural Insurance Scheme Through Risk Data Infrastructure Relying on Innovative Technology

Developed in 1999, the National Agricultural Insurance Scheme (NAIS) offers insurance for food and commercial crops through the state-owned insurer, Agriculture Insurance Company of India (AICI). The Government of India supports the NAIS through a substantial subsidy (over US\$2.5 billion since its inception) and has faced key challenges in its operation, including budgeting for its claims liability ex post events and a lack of risk-based pricing in the system.

Since 2005, the Government of India has been working to address these challenges by transitioning NAIS from the ex post regime to an ex ante financed, market-based insurance program. This involved extensive work and technical support from the World Bank; AICI's technical capacity was built to transition NAIS to a market based approach. Analytical tools and prototype actuarial software were developed to statistically analyze weather index insurance products and develop actuarially sound rating methodologies, which in turn led to more targeted distribution of government subsidies. The quality and timeliness of the data was improved, using innovative mobile technology in crop-cutting experiments and developing an auditing function and improved database. An area-yield based insurance product was piloted and is now beginning to scale up, providing farmers with more reliable insurance coverage.

Source: World Bank-GFDRR Disaster Risk Financing and Insurance Program, 2013.

BOX 19: Overhauling Insurance of Public Assets in Colombia

The Ministry of Finance and Public Credit (MHCP) in Colombia has developed and is implementing a national disaster risk financing strategy, which includes improving its approach to the insurance of public assets, with prioritization of central government buildings and PPPs in the first phase. In 2011–12, the MHCP reviewed the state of insurance coverage of public assets. Using the results of the review, the Government of Colombia (GoC) is now moving to a centralized approach to the insurance of central government buildings that will pool risk into one diversified, well-structured portfolio to pass to insurers through a group insurance policy. This approach will lower operating costs and increase the GoC's bargaining power. More recently, in light of US\$22.5 billion worth of new infrastructure concessions over 2013–14, the GoC is enhancing insurance requirements for PPPs based on international (re) insurance market standards.

Source: Programme d'assurance et de financement des risques de catastrophes WB-GFDRR 2013.

allow the government to reduce its fiscal exposure to natural disasters by transferring a portion of these risks to private insurance markets (see Box 19).

Additional options to be considered by the Government of Morocco

The GoM may also wish to consider a number of other options for improving its capacity to effectively finance and to

execute a disaster response while protecting its long-term fiscal balance. Two complementary actions currently being undertaken by several governments are the establishment and/or strengthening of mechanisms for post-disaster budget execution (e.g., national disaster funds) and disaster loss assessment and tracking systems. These actions could be included in the government's disaster risk financing strategy, linked to the pillar on budget management of disaster risk.

SECTION III

Moving from Risk Assessment to Integrated Risk Management in Morocco

3. Morocco: The Road Ahead

The previous sections of the report have discussed the benefits of developing an IRM approach, and have highlighted the vulnerability and exposure of the Moroccan economy and population to natural hazards, commodity (energy) price volatility and risks in the agriculture sector, and have suggested some recommendations to mitigate these risks.

Section 1 discussed the eight steps of a successful risk management strategy. Section 2 showed how Morocco addressed steps 1 to 3 (risk identification, risk prioritization and detailed quantitative assessment of the selected key risk priorities). Morocco, independently and in partnership with the World Bank and its advisors, has considered possible risk mitigation options for the three pillars of its emerging IRM strategy (step 4). Those options were also discussed in Section 2 of this report.

The Government of Morocco is now beginning to act on steps 5 to 6; that is, *which options to support first and the design of an implementation strategy*. This concluding section discusses the next steps and the possible actions in the short, medium and long term.

As demonstrated throughout this report, examining risks in an integrated manner would enable the GoM to make the necessary linkages and thereby improve future infrastructure and related public investment decisions; better anticipate budget needs and prioritize budget allocation; coordinate actions across ministries to improve communication; avoid overlapping actions and benefit from economies of scale; reduce the cost of mismanaged and ignored risks; and improve social resilience by being more proactive before a negative event occurs in attempting to reduce its economic and social impact.

To move from risk identification to integrated risk management, a set of cross-cutting institutional arrangements may

be needed. As suggested in Section 1, these arrangements could include the following:

- ▶ **A National Office of Risk Management (NORM)** could support the development of a coherent, consistent national risk-reduction strategy. This strategy can be based on consistent management, analysis, and measurement of the risks to Morocco. Management of these risks will require consistent methods and criteria for differentiating acceptable from unacceptable risks, and for allocating resources according to a risk-based approach. To achieve this goal—coordinated risk analysis, measurement, decision-making and resource allocation—a special office (NORM) will need to be created within the GoM. The first task of NORM would be to improve on the recent national MnhPRA risk analysis performed with the World Bank by acquiring and using more detailed data. NORM's mandate is not to replace decisions by line Ministries, but rather to enhance the decision-making process and the coordination across ministries and types of risks. It would report to the Head of Government. It is crucial, based on lessons learned from the private sector and from other countries that have embarked on an IRM strategy, that such an office be staffed by highly competent, influential and respected individuals. In Morocco, the head of NORM should be at least a Director in the administration. The number of staff in the office will be a decision to be made by the government, although it may be suitable to start with half a dozen and expand over time. Openness and collaboration with line Ministries is also critical, as is NORM's role in fostering vertical integration of risk management (for instance by organizing, under the auspices of the Chef de Gouvernement, an annual meeting with the Ministers and Walis to discuss specific risk-related issues).³²
- ▶ **A Risk Information and Management System (RIMS)** will be required for the cross-ministry government-wide exchange and management of geo-referenced exposure,

³² NORM is similar in spirit as the concept of a "National Risk Board" developed for the WDR14 on Risk.

hazard and risk data. RIMS will be the information exchange between NORM and each line Ministry, assuring timely and accurate exchange of data. Use of the same data by all agencies will foster consistency in analysis.

- ▶ **A Centre of Risk Excellence (CORE)** is also needed, to support NORM and RIMS. NORM is a small coordinating and operational bureau within the Government, tasked with monitoring and coordinating risk management. CORE will be established in an academic or research institution (e.g., CNRST) to provide the technical support to NORM and RIMS. CORE will maintain and improve MnhPRA, RIMS and their associated databases. It will research emerging risk management tools, and maintain a dialogue with the international risk management community, to ensure Morocco is using the best tools for risk management. CORE will also provide training in MnhPRA and RIMS, and participate in graduate education to train the next generation of risk managers.
- ▶ NORM, RIMS and CORE will enhance coordination and efficiency across government agencies. As discussed in Section 1, NORM could be complemented by a new **fiscal risk management unit** within the Ministry of Finance (the risks considered in Morocco will ultimately have an impact on the national budget) and work in concert with the Ministry of Interior's CVC which handles crisis management at a national level (for instance by providing the CVC with additional information and analytics using MnhPRA to optimize its crisis management process).

These cross-cutting institutional actions will need to be complemented by the risk mitigation activities outlined in Section 2 and summarized in Table 7.

Of course, this is an ambitious agenda and implementation will take time. Cohesive action by the Government will need resources, commitment, communication and ownership of different stakeholders—both at the national and local levels—so that the strategy can be a true collaboration between the GoM and the local communities. Also, developing the strategy will only be the first step. To achieve the intended outcomes and outputs, all stakeholders will need to continuously refine the strategy in an iterative and collaborative process. Finally, the actions summarized in Table 7 are only indicative of some activities on which the GoM can focus—and not a full and comprehensive set.

The World Bank-GoM Partnership on integrated risk management began in 2008 and is now entering the third phase (see Figure 12). The World Bank and the GoM are in early

discussions on which specific areas to support going forward as integrated risk management is being operationalized. Early discussion suggests that the financial and technical assistance support could fall into the following two broad categories: (a) **institutional reform and policy development** and; (b) **priority risk mitigation projects**. As has been mentioned in Section 2, the Government has already instituted a number of programs and initiatives and the objective of the World Bank support will not be to duplicate ongoing activities but to support the development of the IRM strategy, build integrated institutional frameworks and scale up the existing risk mitigation initiatives in place (both in physical infrastructure and financial protection solutions).

To illustrate, **on institutional reform and policy development**, the World Bank could support the creation of NORM, RIMS and CORE; the implementation of the IRM strategy, including associated sectoral investment plans (this note provides the inputs to the Strategy); the development of an integrated risk financing strategy; or the implementation of the catastrophe risk law. **On risk mitigation pilot projects**, the Bank could support investments in retrofitting public buildings; flood protection investments; investments in small-scale community based risk-resilient infrastructure; and creation and capitalization of guarantee funds required for the continued evolution of the disaster and risk insurance markets. This list summarizes only initial suggestions and other priority institutional development, policy reform and risk mitigation pilots could equally be supported.

In conclusion, many countries around the world have witnessed how internal (natural disasters) or external shocks (commodity price volatility, financial crises) can have serious domestic impacts by destabilizing the social-economic balance. These shocks have also proven to be roadblocks to growth in many developing economies.³³ Significantly improving risk management capacity and doing so in an integrated manner is recognized as good practice today. Implementing such an integrated risk management strategy is neither simple nor quick. It requires expertise, coordination and leadership at the top, with a clear understanding of how key risks will affect all levels of society, from citizens, businesses, local communities to the government itself and the economy. It also requires building the institutions that will carry on this task through successive elected administrations.

33 Erwann Michel-Kerjan, "Are Extreme Events Roadblocks to Growth?" *The Huffington Post*, April 2011. http://www.huffingtonpost.com/erwann-michelkerjan/earthquake-finance_b_949551.html

Table 7: Summary of Key Actions

| Cross-Cutting Institutional Actions | Time* |
|--|--------------|
| Establish a National Office of Risk Management (NORM) | M |
| Develop an Integrated Risk Management Strategy | C |
| Establish a Risk Information and Management System (RIMS) | M |
| Create a Centre of Risk Excellence (CORE) | M |
| Natural Disasters | |
| <i>Programs and Institutions</i> | |
| Establish early warning systems for floods, tsunamis and earthquakes | S |
| Enhance hazard mapping and analysis for floods and earthquakes based on MhnPRA | S |
| Enhance building code compliance to reduce potential earthquake impact in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan) and extend to other provinces over time | S/M |
| Establish a program to educate public and private building owners about need for retrofits in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan) and extend to other provinces over time | S |
| Include DRM in <i>Plan Communal de Development</i> and enhance rescue and relief plans in communities identified as high risk by MnhPRA | M/L |
| <i>Structural Measures</i> | |
| Accelerate flood protection structural improvements in provinces with high flood risk (Kenitra, Tetouan, Casablanca, Sidi Kacem) and extend to other provinces over time | M/L |
| Implement earthquake retrofitting of public buildings in high earthquake risk provinces (Nador, Al-Hoceima, Berkane, Taza, Tetouan) and extend to other provinces over time | M/L |
| Invest in small-scale community based risk resilient infrastructure in communities identified as high risk by MnhPRA | M |
| Commodity (Energy) Price Risk** | |
| <i>Programs and Institutions</i> | |
| Develop a commodity price risk management strategy and establish corresponding institutional management arrangements | S/M |
| <i>Risk Transfer</i> | |
| Commodity price hedging through financial instruments | S |
| Agriculture Sector Risk | |
| <i>Programs and Institutions</i> | |
| Extend drought risk analysis to entire agricultural sector based on MhnPRA (which has covered so far only three crops) | S |
| Establish data collection systems for collection, management, and processing of agricultural data and weather information | S |
| Build institutional capacity for improved data management on risks in the agricultural sector | M |
| Enhance early warning systems for droughts | M |
| <i>Structural Measures</i> | |
| Build irrigation networks in priority areas, including in Souss-Massa-Draa, Meknes, and Marrakech-Tensift | M/L |
| Invest in flood protection works in high risk rural areas, including in Gharb-Chaouia-Ourdigha | M/L |
| Invest in equipment, for example synoptic stations, modeling, computers, software, satellite photos, etc., necessary for the implementation of the parametric insurance | M |

Continued on next page

Table 7: Summary of Key Actions

Disaster Risk Financing and Insurance

| | |
|--|---|
| Operationalize Law 34-08 to establish a national catastrophe insurance program for private assets | S |
| Develop and implement an integrated disaster risk financing strategy that builds on the establishment of a national catastrophe insurance program (covering businesses and individuals) and the outcomes of a fiscal risk assessment (evaluation of government's exposure) | M |
| Promote agricultural insurance market development through technically-informed product design and transition to a stronger PPP | M |
| Evaluate the implementation of a national insurance program for public assets | M |

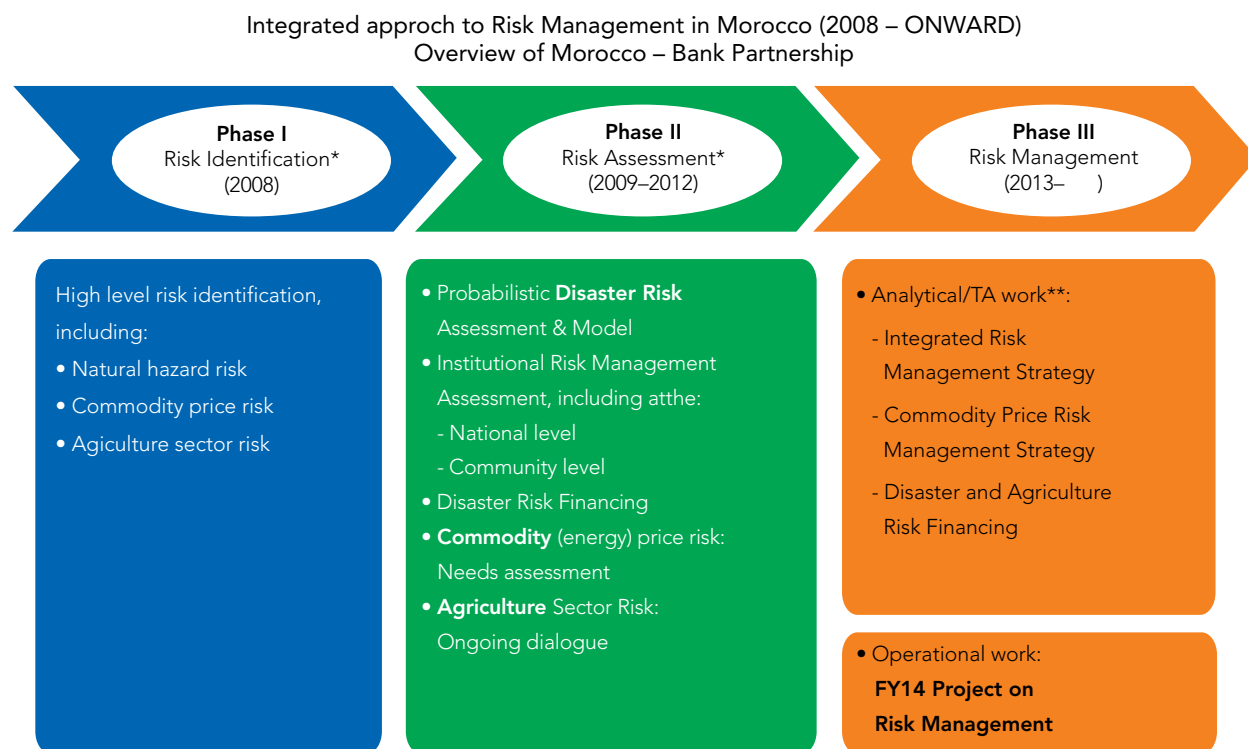
* S: short term (1–2 years); M: medium term (2–5 years); L: long term (> 5 years) C: court terme (1–2 ans); M: moyen terme (2–5 ans); L: long terme (> 5 ans).

** Commodity (Energy) Price recommendations focus only on one aspect: how to use market-based commodity price risk hedging as a way to mitigate the short term impact of commodity price volatility on Morocco's budget.. Broader measures are of course also required, such as the reform of the subsidy system, diversification of energy supply, and improved energy efficiency.

Morocco has embarked in a very innovative initiative in collaboration with the World Bank and its advisors. Substantial progress has been made to quantify the risks to which Morocco is exposed, using state-of-the art techniques that have been developed in the risk assessment field. Solutions to reduce this exposure have been proposed (both physical and financial) and Morocco can now decide how best to reduce its exposure, to a variety of risks, including floods,

earthquakes, tsunamis, numerous agriculture risks, or the spiking price of oil and other commodities that Morocco needs to import on a massive scale. By commencing this initiative, Morocco has now entered the group of countries (most of which are OECD countries) that have started to implement IRM strategies. While more needs to be accomplished, that step constitutes an important and highly visible leadership move.

FIGURE 12: GoM-WB Risk Management Partnership, 2008–current



Sources: The World Bank.

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APPENDIX 1:

IRM Project Outputs

The following are the key outputs of the Morocco-Bank Partnership on risk management completed since its inception in 2008. All documents are available at the *Ministère des Affaires Générale et de la Gouvernance*:

Phase 1 (October 2008–March 2009):

Preliminary risk assessment phase (identification) including through one World Bank mission (November, 2008) and major inter-ministerial meeting.

Outputs:

- (1) Report on *Integrated Catastrophe Risk Management*. While referring to Catastrophe Risk, this report used the term in the broad sense to specifically include natural hazards, price volatility in the energy sector and agricultural risk.

Phase 2 (April 2009–February 2013):

Detailed risk assessments supported by the World Bank, including through ten missions (November 2009, April 2010, May 2010 April 2011, June 2011, November 2011, March 2012, June 2012, September 2012 and December 2012).

Outputs:

- (1) Ten aides-memoires detailing key findings each mission;
- (2) Commodity Price Volatility:
 - a. Report on Managing Commodity Price Risk in Morocco: Current Situation.
 - b. Workshop on the management of commodity price risk.
 - c. Terms of Reference for future technical assistance and execution services.
- (3) Disaster Risk:

This work focused on probabilistic risk modeling for earthquakes, tsunamis, floods, landslides and drought for the entire country and the built environment.

- a. Probabilistic modeling (comprising a detailed method of quantification) and software (Mn-

hPRA) for risk assessment of natural disasters for the country, delivered to MAGG and installed in different Ministries.

- b. Four training sessions on MnhPRA for ministries and CNRST / scientists. Based on an agreement with the GoM and documented in a letter, the data used in MnhPRA provided by the government are owned by the government and remain the government's property.
 - c. Detailed probabilistic risk assessments at the national level, produced by the consulting firm RMSI, comprising 11 reports.
 - d. "Vision note" on integrated risk management for the Government of Morocco.
 - e. Terms of Reference for the creation of a National Office of Risk Management ("NORM").
 - f. Study on Community Based Disaster Risk Management.
 - g. Report and presentation on the financial coverage of catastrophic risks: A new strategic challenge for many countries.
 - h. "Synthesis note on the analysis of the Bill 34.0".
 - i. Report on methods of financial coverage of and insurance against terrorism: International perspectives (e.g., France, England, Germany, USA, and Switzerland) and its applications to Morocco.
 - j. Report on macroeconomic modeling of risks of natural disasters and development of a new model (IO and CGE) for Morocco (for use by the High Planning Commission and other interested parties).
- (4) Agricultural Sector Risk:
- a. Support to the government (Ministry of Agriculture) through several meetings in 2010 and 2012, regarding (i) the identification and prioritization of agricultural risks, (ii) a retrospective assessment of instruments developed at the national level to deal to agricultural risks, and (iii) a study on international practices on agricultural risk insurance.



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