Reducing Disaster Risks from Natural Hazards

An Evaluation of the World Bank's Support, Fiscal Years 2010–20

IEG
Independent Evaluation Group

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1818 H Street NW
Washington, DC 20433
Telephone: 202-473-1000
Internet: www.worldbank.org

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EDITING AND PRODUCTION
Amanda O'Brien

GRAPHIC DESIGN
Luísa Ulhoa
Carol Siegel

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Contents

Boxes

Figures

Appendixes

Abbreviations

ASA	advisory services and analytics
CAT DDO	catastrophe deferred drawdown option
CMU	Country Management Unit
DPF	development policy financing
DPO	development policy operation
DRM	disaster risk management
DRR	disaster risk reduction
ENB	Environment, Natural Resources, and Blue Economy
EWS	early-warning system
FCV	fragility, conflict, and violence
FY	fiscal year
GFDRR	Global Facility for Disaster Reduction and Recovery
GP	Global Practice
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IPF	investment project financing
IWRM	Integrated Water Resources Management
NBS	nature-based solution
O&M	operation and maintenance
OECS	Organisation of Eastern Caribbean States
PDNA	Post-Disaster Needs Assessment
SCD	Systematic Country Diagnostic
SIDS	small island developing states

All dollar amounts are US dollars unless otherwise indicated.

Acknowledgments

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Overview

Disasters caused by natural hazards are increasingly threatening the lives and livelihoods of the world's poor and disaster-vulnerable populations. Disasters resulting from natural hazards cause billions of dollars in damages per year, and these costs are rising due to population growth, rapid and unplanned urbanization, low-quality infrastructure, and ineffective disaster risk governance. Some 82 percent of deaths since 1970 caused by natural hazards and extreme weather occurred in low- and lower-middle-income countries, where most people living in poverty reside (World Bank 2020c). Climate change is further exacerbating negative disaster impacts by contributing to more destructive and frequent droughts, floods, and storms. These disasters disproportionately affect poor populations, especially disadvantaged or vulnerable populations, who typically reside in areas with high exposure, lose larger shares of their wealth to disasters, and have limited assets and access to social networks for coping and recovery.

This evaluation focuses on the World Bank's support for reducing disaster risks caused by natural hazards. Disaster risk reduction (DRR), as defined by the United Nations Office for Disaster Risk Reduction, "aims to prevent new—and reduce existing—disaster risk while managing residual risk, all of which contribute to strengthening resilience to achieve sustainable development" (UNDRR 2016). According to the Sendai Framework for Disaster Risk Reduction 2015–2030, DRR practices are multihazard and multisectoral: they address disaster risks caused by natural, environmental, technological, and biological hazards. This evaluation focuses on one type of DRR—that is, efforts to reduce disaster risks caused by natural hazards. To assess these efforts, the evaluation uses universally accepted terminology associated with efforts to minimize exposure and vulnerability, as well as other activities that can limit negative disaster effects. "Exposure" is the situation of people, infrastructure, housing, production capacities, and other tangible and intangible (for example, cultural) assets located in hazard areas (UNDRR 2016). "Vulnerability" refers to the conditions determined by physical, social, economic, and environmental factors that increase the susceptibility of an

individual, a community, assets, or systems to the impacts of hazards (UNDRR 2016).

Investing in DRR has strong economic and social benefits, yet underinvestment in DRR globally—particularly in disaster risk mitigation and preparedness—remains an issue. Resilient infrastructure investments can have a present value of $4 return on each dollar invested (Hallegatte, Rentschler, and Rozenberg 2019). When countries rebuild infrastructure after disasters to be more resilient, they can reduce the negative impact of future disasters on well-being by as much as 31 percent (Hallegatte, Rentschler, and Walsh 2018). Universal access to an early-warning system (EWS) can reduce asset and well-being losses from disasters by an estimated $35 billion per year. An EWS can also contribute to a decrease in mortality (Hallegatte et al. 2017). Yet only 4.1 percent of total official development assistance for disasters was directed toward disaster prevention and preparedness between 2010 and 2019 (UNDRR 2021). This is due to insufficient resources for investment at the country level, limited knowledge of disaster risks and vulnerabilities, and existing government preferences for politically visible post-disaster initiatives rather than pre-DRR measures.

Purpose and Scope of the Evaluation

The purpose of this evaluation is to surface lessons on the World Bank's support for DRR. The evaluation focused on World Bank support to address disaster risks caused by natural hazards, not on other types of hazards or stresses. It covers disaster risks caused by floods, droughts, earthquakes, cyclones, volcanic disruptions, tsunamis, and landslides. Areas of DRR support covered include risk identification; risk reduction activities, such as resilient infrastructure, buildings, and protective works; the integration of DRR into institutions, policy, and planning; preparedness activities, including support for EWSs; and disaster risk finance. The evaluation does not cover elements of disaster response and recovery that do not have DRR activities. The evaluation does not cover the International Finance Corporation or the Multilateral Investment Guarantee Agency because DRR is not a major corporate priority for either organization.

Main Findings

The World Bank has approved a large and growing portfolio of DRR activities that help clients mitigate, prepare for, and recover from disasters caused by natural hazards. The World Bank has tripled its DRR support since fiscal year 2010, approving 634 lending operations and 504 nonlending products with DRR activities, and it has expanded DRR lending operations into many countries where this type of lending was historically infrequent. The growth of DRR support is associated with the World Bank's corporate prioritization of climate change adaptation, the special theme on climate change of the International Development Association (IDA), the presence of the Global Facility for Disaster Reduction and Recovery, and a supportive global authorizing environment.

Strategic Alignment

The World Bank's support for DRR has been highly relevant. It focuses its DRR work on those countries with the most serious natural hazards. It often uses multiple and synergistic pillars of DRR engagement that include hazard identification, resilient infrastructure, early-warning and preparedness activities, and disaster risk finance on occasion. The World Bank has also shifted its focus from post-disaster response toward risk reduction, which it has built into nearly all disaster response activities. The share of World Bank DRR projects that engage in predisaster, as compared with ex post, steadily rose from 50 percent in fiscal year 2010 to 80 percent in fiscal year 2020, whereas the share of projects supporting disaster response without DRR elements declined from 30 percent to 0 percent between 2010 and 2020.

The World Bank has made significant progress in mainstreaming DRR in lending operations, but there has been less uptake in some sectors. The number of mainstreamed DRR projects has quadrupled over the evaluation period, with growth occurring across most relevant Global Practices (GPs). However, many GPs are starting from a low base: the share of all approved operations that include DRR activities remains low in Agriculture and Food and Energy and Extractives, and mainstreaming does not happen evenly across relevant subsectors. These gaps may be because of the tendency of

the World Bank to focus its DRR activities on exposed infrastructure in urban areas while it has less familiarity with or emphasis on DRR in other sectors.

World Bank support for DRR in IDA countries, small island developing states, and low-income countries experiencing fragility, conflict, and violence (FCV) has been particularly comprehensive. The World Bank has provided at least some lending support for DRR in almost all IDA countries facing the most serious hazards and has provided lending support for all of the most serious hazards in more than 60 percent of IDA countries. There is also even more comprehensive coverage of nonlending work in IDA countries. Similarly, the World Bank has provided DRR lending support for 95 percent of small island developing states that face the most serious hazards and 85 percent of countries experiencing FCV as well as the most serious hazards, most of which are eligible for IDA assistance.

However, there are coverage gaps in the Middle East and North Africa and in Europe and Central Asia and varying levels of coverage across hazard types. In these Regions, DRR lending for serious hazards is more often lacking, as there are fewer lending projects with DRR activities, infrastructure operations are less likely to include mainstreamed DRR, and DRR support is less integrated. Coverage gaps are associated with the prevalence of International Bank for Reconstruction and Development countries that cite the high direct costs and opportunity costs of borrowing for DRR, the presence of fragility and conflict that impede DRR uptake, financing decisions to prioritize high-intensity and frequently occurring hazards, and other external factors such as European Union directives that focus on floods but not other hazards. Some hazard types that are rarer (tsunamis, volcanic eruptions) or less catastrophic (landslides) receive less attention than others (floods, cyclones, droughts, and earthquakes) in World Bank engagements.

Building Country Engagement

The World Bank has overcome constraints to DRR client uptake by persuading the right decision makers using evidence-informed engagements and by engaging in disaster reconstruction or sector programs. Rigorous analytical work that quantifies risks, assesses costs and benefits, and communicates impacts has influenced clients to undertake DRR actions. Many of these

analyses were funded by the Global Facility for Disaster Reduction and Recovery. Working with committed government actors with decision-making power was a key factor: when the World Bank mainly worked with disaster agencies, progress on DRR was slow. The World Bank's support for disaster reconstruction has been an important entry point for engaging on DRR, as has the credibility earned from sustained sector engagements.

Effectiveness of World Bank Disaster Risk Reduction Activities

The World Bank is often not able to demonstrate the effects of its DRR activities on reduced exposure and vulnerability, which has consequences for its ability to make a development case for risk reduction. Most DRR operations do not provide sufficient information to establish the level of DRR being achieved. This inhibits the World Bank's understanding of the level at which DRR contributes to development impacts, such as reduced economic loss and mortality. This lack of information is especially apparent for resilient infrastructure investments and development policy operations. Most resilient infrastructure investment projects lack information on resilience standards. Many development policy operations lack evidence on the results of policy changes.

The World Bank is increasingly identifying and addressing the needs of some groups that are disproportionately impacted by disasters; however, for other groups, there is slow progress and limited reporting on DRR benefits. There is more meaningful coverage of gender-DRR issues, but few operations integrate the needs of other identified disaster-vulnerable groups, including persons with disabilities, the elderly, children, and youth.

Although DRR engagements in conflict-affected situations have addressed disaster vulnerability, they have missed opportunities to use conflict-sensitive approaches to mitigate conflict risks and to pursue peace-building opportunities. Conflict can be a key driver of disaster risk, and disaster risk may exacerbate preexisting conflicts and increase the risk of violence. Yet there is no established methodology for conducting a hybrid Post-Disaster Needs Assessment that integrates a conflict lens, and efforts to develop a DRR-FCV program in the World Bank have been stymied by a lack of donor support.

The evaluation assessed results and generated lessons on factors of effectiveness for four key approaches that have been reported on by the World Bank in its periodic updates to the Board of Executive Directors. These approaches were (i) disaster-resilient infrastructure, (ii) EWSs, (iii) disaster insurance, and (iv) DRR policy reforms. The evaluation found the following:

- DRR investment projects often build effective relevant infrastructure, but most of these projects do not explicitly address operations and maintenance that are required for long-term resilience aims. This shortcoming is more evident in core disaster projects mapped to the Urban, Disaster Risk Management, Resilience, and Land GP, as compared with sectoral infrastructure projects.
- The World Bank has been more effective in developing EWS infrastructure than in delivering EWS services, such as forecasting capacity and community-preparedness activities.
- Disaster insurance activities have had a limited impact on transferring disaster risk because insurance programs have had difficulty in reaching scale. However, disaster insurance activities have made progress in raising awareness, building capacity, and developing products.
- Although development policy financing projects with DRR policy actions have mostly achieved their disaster-related indicators, they often have not demonstrated downstream impacts or changes in disaster-related behaviors in the real economy.

The World Bank has been able to achieve highly successful results on DRR through flagship programs where it brought the full weight of the institution to bear using sustained engagement, prioritization in policy dialogue, sizable lending programs, access to trust funds, and catalyzation of financing from others. By necessity, the World Bank can do this for only a limited number of cases at a time, so it must consider when its involvement in a program has been sufficient and when to change course to tackle the next difficult problem where it has a comparative advantage.

Recommendations

Recommendation 1. **Incorporate DRR activities in regions and sectors and for hazards that exhibit significant coverage gaps.** In countries facing high risks from disasters caused by natural hazards, the World Bank can address coverage gaps through analytical work, mainstreaming, or core DRR activities, including by (i) conducting country-level analytics on disaster costs and impacts of DRR for key sectors, (ii) relying on country management to proactively engage clients on DRR and encourage task teams to integrate DRR considerations in projects, (iii) integrating DRR specialists into sector dialogue, and (iv) assessing the need for coverage of low-frequency but catastrophic hazards such as volcanic eruptions and tsunamis.

Recommendation 2. **Identify and measure the effects of DRR activities on exposure and vulnerability to strengthen the development case to clients facing serious disaster risks.** The generation of ex post DRR evidence on probable outcomes involves clearer articulation in project documents of the particular resilience standards used for infrastructure in that context, use of and reporting on verification mechanisms for compliance with these standards, and greater use of ex post modeling of the incremental impacts of DRR activities on expected damage, loss, and mortality from disasters. This evidence generation can occur in projects or from results assessments of DRR activities implemented in different contexts.

Recommendation 3. **Integrate the needs of populations that are disproportionately vulnerable to disasters caused by natural hazards into DRR project targeting and design, implementation, and results reporting.** This can be accomplished by strengthening collaboration between the GPs working on disaster activities with poverty and social development experts in the World Bank through the development and application of data, tools, analyses, and tracking systems.

Recommendation 4. **In countries affected by serious natural hazards and fragility and conflict risks, identify and assess the ways in which hazards and conflict interrelate, and use this knowledge to inform country engagement and project design.** This should form a part of the way the World Bank is increasingly addressing compound risks at the coun-

try level. Taking such steps may require strengthened collaboration and knowledge exchange between World Bank DRR and FCV teams, the use of integrated multirisk analysis tools, and adapted program designs that address the interlinkages between disaster and FCV risks.

Management Response

Management of the World Bank welcomes the evaluation report by the Independent Evaluation Group called *Reducing Disaster Risk from Natural Hazards: An Evaluation of the World Bank's Support, Fiscal Years 2010–20*.

Overall

Management welcomes the report's finding that the World Bank's support for disaster risk reduction (DRR) has been highly relevant and has made significant progress in mainstreaming DRR in its lending operations and analytic work. Management will strive to incorporate lessons to continue improving. Management notes the observation that World Bank support for DRR in International Development Association countries, in small states, and in fragile and conflict-affected situations has been particularly comprehensive. Management also appreciates the conclusion that the World Bank's sustained engagement in DRR; its prioritization of DRR both through increased investment (DRR support has tripled since fiscal year [FY]10, as the report noted) and policy dialogue; and its sizeable lending programs have achieved highly successful results. The report also identifies useful opportunities for improvement, many of which are already being explored by the World Bank, making some aspects of the recommendations redundant, albeit well directed. As stated in the Management Action Record FY22, management has observed that the effects of the Independent Evaluation Group's evaluations often start long before the issuance of the formal report, as evaluation processes highlight key issues, inspire new ways of thinking, and enable real-time learning and adaptation. Management and the Independent Evaluation Group have had a dedicated discussion on the recommendations for this evaluation to solidify their shared understanding of possible actions and evidence for future Management Action Record reporting.

Management notes that the report focuses primarily on disaster insurance rather than framing it in the broader strategic context of disaster risk finance (DRF). Although the report acknowledges that disaster insurance is a part of the World Bank's overall DRF efforts (59), the report suggests a focus on risk insurance—the

first chapter indicates the projects discussed in the report pertain only to disaster insurance (5). Disaster insurance is just one aspect of DRF, and there is much more to the World Bank's work on DRF than disaster insurance as narrowly defined in the report. Beyond insurance, the World Bank's DRF strategies build on a risk-layered approach that addresses risk retention and risk transfer supported by World Bank interventions;[1] uses disaster funds;[2] promotes adaptive social protection schemes;[3] manages a national program of insurance of public assets;[4] and promotes domestic catastrophe risk insurance markets.[5] The World Bank has also mobilized more than $5.5 billion in private risk capital through catastrophe bonds, risk pools, and other parametric insurance programs to cover emerging markets and developing economies against disasters and climate shocks. Although the report provides good coverage of the World Bank's work in East Asia and Pacific, it could do more to discuss the successful establishment of risk pools such as the Caribbean Catastrophe Risk Insurance Facility.

Management emphasizes that World Bank–supported insurance instruments are intended to facilitate access to market-based disaster risk insurance solutions within broader country-driven DRR strategies. The decision to purchase such products is the responsibility of the beneficiaries, be they governments, businesses, or households. DRF and risk transfer, of which insurance is but one instrument, should be placed within the broader DRR strategy of a country. High-frequency and high-impact events are expensive for countries to insure against without broader mitigation measures in place. A range of products are needed to provide DRF, while measures to reduce disaster risk take place in parallel. This explains the report's observations that World Bank–supported disaster insurance activities targeting businesses and households did not always reach scale (60–62).[6] It is important to have firm plans to reach set targets alongside any chosen coverage as demonstrated in the Mexico and Colombia examples included in the report.

Recommendations

Management agrees with the first recommendation while noting that the World Bank is already developing risk assessments to better incorporate DRR activities in regions, sectors, and hazards—that have had coverage gaps—and it will continue to do so, incorporating insights from the report.[7] This in-

cludes high-impact low-frequency events. The World Bank has undertaken considerable work on awareness-raising and risk identification for different hazards.[8] It merits emphasis that World Bank diagnostics and engagements are (i) strategic, given resource limitations; and (ii) demand-driven, given the competing development priorities of client countries. There are various underlying reasons for the coverage gap, including limited client bandwidth and the fact that immediate disaster responses are sometimes outsourced to humanitarian organizations, as highlighted in box 2.1 of the report. The report itself notes that hazard types that are far less frequent or less catastrophic in impact receive less attention when compared with more frequent and damaging hazard events. Although less frequent but potentially damaging hazard events are important to assess, convincing clients to borrow to address the risk of such events is difficult, given the lower probability of the occurrence of a disaster, and the lower development priority for clients.

Management agrees with the second recommendation on the importance of generating more ex post evidence while emphasizing that the identification and measurement of the potential effects of DRR activities is challenging, as there is no agreed or uniform level of acceptable risk. It is important, instead, to provide information on risk, impact, and associated uncertainty to ensure that decision makers are informed. This would include (i) disaster risk and potential impacts on the performance of projects or systems of concern; (ii) project or system robustness, whether it concerns construction standards or economic returns in the face of disaster risks; and (iii) impacts of climate change on the intensity and frequency of disasters as they pertain to resilience standards and project performance. Avoiding losses is another way to assess investment effectiveness. The World Bank measures co-benefits in terms of functionality of infrastructure be it of retrofitted schools, hospitals, or other public facilities; improved road networks and so on; the positive socioeconomic impacts; or climate co-benefits.[9] The World Bank's Resilience Rating System and climate and disaster risk stress testing in its economic analysis are key resources for the evaluation of the robustness of DRR activities. The World Bank has done considerable work in these areas and would certainly benefit from generating more systematic ex post evidence of effects.

Management agrees with the third recommendation on the need to systematically integrate population segments vulnerable to disasters in DRR

interventions and will build on its own analytical work on the matter, such as the 2017 report *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters*. Meaningful engagement of affected communities is undertaken for sustainable risk reduction measures and to ensure that they respond to local priorities. The World Bank has already moved in this direction through its integration of disaster and climate risk management in its Community-Driven Development programs in a few countries such as Bangladesh, the Philippines, and Indonesia, and through the development of devolved climate finance in Kenya (the latter incorporates participatory climate risk assessments into the development planning process). There has been analytical work carried out by the World Bank in Africa, Europe and Central Asia, Latin America and the Caribbean, and South Asia to advance social inclusion in disaster risk management through resilient investments across Global Practices. The World Bank established a group of practitioners that convenes the Urban, Disaster Risk, Resilience, and Land Global Practice, the Global Facility for Disaster Reduction and Recovery, the Social Sustainability and Inclusion Global Practice, and the Gender Group to provide technical assistance and guidance to task teams on the inclusion of vulnerable population segments. Adaptive social protection is another instrument intended to reach vulnerable populations. Several World Bank–supported Social Protection Systems were designed to assist population groups that are among the most vulnerable to disasters, that is, women, children, elderly people, persons with disabilities, and poor people. For example, in Fiji after Cyclone Winston, the Fiji National Provident Fund (pensions) and Social Pension Scheme (family benefits) were used to deliver assistance to all enrollees. Relaxed targeting (that is, no assessment of direct impact) or secondary means testing ensured timely disbursements credited with accelerating Fiji's recovery.[10] There are other instances of catastrophe deferred drawdown options with prior actions related to persons with disabilities.[11]

Management agrees with the fourth recommendation, although it considers it redundant, as the World Bank has already undertaken significant innovative work in identifying and assessing the ways in which natural hazards and conflict interrelate. Management strives to ensure that such diagnostics permeate operations. The World Bank launched a global program on the disaster risk management–fragility conflict, and violence (FCV) nexus in 2021.

However, diagnostics and analysis on this critical area has been informing the World Bank's work for much longer—the 2008 Post-Disaster Needs Assessment undertaken in Myanmar after Cyclone Nargis identified DRR actions specifically aimed at addressing root sources of conflict and fragility in the country. In subsequent years, the World Bank worked with development partners to support annual post-Nargis Social Impact Assessments to understand how DRR had an impact on drivers of fragility. Additionally, there were numerous in-conflict damage and needs assessments conducted specifically in Middle East and North Africa and Africa that integrated DRR principles—such as Build Back Better—into the analysis to address DRR-FCV link. In the FCV group, the Global Crisis Risk Platform continues to strengthen the World Bank's analytical understanding of the nexus between disaster risk and conflict. For example, the recently completed retrospective studies of floods and droughts in Ethiopia and Kenya explore the interaction of natural hazards with FCV dynamics. Similar studies are underway for Honduras and Pacific Island countries. In addition, the World Bank's Regional Risk and Resilience Assessment (RRA) of the Central Asia-Afghanistan border areas and its Afghanistan RRA both address the nexus between natural hazards and FCV. The Lake Chad RRA (2021) and the Sahel RRA (2019) similarly discuss the link between access to natural resources and conflict heightened by the impact of climate change or drought on production systems, livelihoods, and food security of communities, leading to displacement and increased conflict. The Global Crisis Risk Platform and the Global Facility for Disaster Reduction and Recovery through the Program for Disaster Risk Management in Situations Affected by Fragility, Conflict, and Violence will continue and further strengthen their collaboration on the nexus between natural hazards and FCV, including under the recently developed Crisis Preparedness Gap Analysis diagnostic tool and a Compound Risk Monitor, which is currently being developed by the Global Crisis Risk Platform.

Reference

Tanner, Thomas, Swenja Surminski, Emily Wilkinson, Robert Reid, Jun Rentschler, and Sumati Rajput. 2015. *The Triple Dividend of Resilience: Realising Development Goals through the Multiple Benefits of Disaster Risk Management*. Washington, DC: World Bank Group.

[1] Examples of risk retention include reserves and contingent credit; examples of risk transfer include Parametric Insurance and Cat Bonds; and examples of World Bank interventions include the Colombia, Philippines, and Tonga Catastrophe Deferred Drawdown Options, among others.

[2] For example, the Mozambique Disaster Risk Management and Resilience Program-for-Results (P166437).

[3] For example, the Malawi Social Support for Livelihoods Resilience Project (P169198).

[4] For example, the Indonesia Disaster Risk Financing and Insurance Project (P173249).

[5] For example, the Morocco Integrated Risk Management and Resilience Program-for-Results Project (P144539).

[6] The report concedes that disaster insurance activities have made progress on raising awareness, capacity building, and product development (43).

[7] https://www.gfdrr.org/en/disaster-risk-country-profiles; and impacts of DRR in the wider form of resilience; https://unbreakable.gfdrr.org/)

[8] See https://volcano.si.edu/gallery/VideoCollection.cfm; andhttps://www.gfdrr.org/en/feature-story/results-resilience-building-volcanic-resilience-guatemala. See also the World Bank–supported Technical Deep Dive on Seismic Risk and Resilience also extended to tsunamis.

[9] Tanner, Thomas, Swenja Surminski, Emily Wilkinson, Robert Reid, Jun Rentschler, and Sumati Rajput. 2015. *The Triple Dividend of Resilience: Realising Development Goals through the Multiple Benefits of Disaster Risk Management*. Washington, DC: World Bank Group.

[10] Fiji Climate Vulnerability Assessment.

[11] The Tuvalu First Resilience development policy operation with a Catastrophe Deferred Drawdown Option (P170558) approved in December 2019 is one example. The development policy operation included a Prior Action that the Tuvalu National Policy for Persons with Disability be approved and relevant indicators to monitor implementation progress thereof.

Chairperson's Summary: Committee on Development Effectiveness

The Committee on Development Effectiveness met to consider the Independent Evaluation Group evaluation *Reducing Disaster Risks from Natural Hazards: An Evaluation of the World Bank's Support, Fiscal Years 2010–20* and the draft World Bank management response.

The committee welcomed the evaluation and commended the Independent Evaluation Group and World Bank management for their collaborative engagement. Members appreciated the participation of the global director of the Urban, Disaster Risk Management, Resilience, and Land Global Practice and the Fragility, Conflict, and Violence Group director in the discussion, next to Operations Policy and Country Services. They were pleased to learn that management was in broad agreement with the evaluation's overall findings and recommendations. They applauded the disaster risk reduction (DRR) portfolio growth both in terms of financing volumes and mainstreaming within client portfolios. Members underscored the importance of the World Bank's analytical and convening role to drive DRR and climate resilience progress toward sustainable development. To this end, they also called for greater collaboration among the World Bank, International Finance Corporation, and Multilateral Investment Guarantee Agency as well as continued coordination with other development partners. Members urged management to improve DRR outcome indicators in operations and to work with task teams to incorporate them more consistently.

Members welcomed management's ongoing efforts to address coverage gap issues in the Middle East and North Africa and Europe and Central Asia Regions, and in the agriculture and energy sectors, some of which include work on risk assessments using innovative approaches and remote sensing technology. Although some members raised concerns about the decline in the number of projects supporting disaster response without a DRR element (30 percent in FY10 to 0 percent in FY20), they were reassured by the Independent Evaluation Group's explanation that the World Bank included a focus on DRR in all instances when it provided disaster response support in line

with corporate goals of moving DRR elements upstream. To address coverage gaps, management was encouraged to apply not only a demand-driven approach to DRR operations but also a supply-driven approach to better incorporate DRR activities in Regions and sectors with coverage gaps.

1 | Background and Context

Disasters caused by natural hazards are increasingly threatening the lives and livelihoods of poor populations, especially those who are disadvantaged and marginalized. Disasters resulting from natural hazards cause an average of about $300 billion in annual damages, costs that are rising due to population growth, rapid and unplanned urbanization, low-quality infrastructure, and ineffective disaster risk governance (Hallegatte et al. 2017). Disasters from natural hazards result in civilian deaths and massive displacement and are responsible for increasing global poverty. The World Bank has reported that 82 percent of all deaths since 1970 that were caused by weather, climate, and water hazards occurred in low- and lower-middle-income countries, where most poor populations reside (World Bank 2020c). Disasters especially affect poor populations, who typically reside in areas with higher exposure, lose larger shares of their wealth to disasters, and have limited assets and access to support systems for coping and long-term recovery (Hallegatte et al. 2017). Marginalized and disadvantaged people—including women and girls, children and youth, persons with disabilities, and the elderly—are most susceptible to disaster risks because they are among the least endowed and most disconnected from support systems for coping and recovery.

Climate change is further exacerbating the negative impacts of disasters caused by natural hazards. Approximately twice as many climate-related disasters occurred between 2000 and 2019 compared with the period between 1980 and 1999 (UNDRR 2020a). Rising sea levels increase the likelihood and intensity of flooding, threatening 1.3 billion people and $158 trillion in assets, while projections forecast increased drought events (GFDRR 2016). Mitigating the risks of these disasters is essential for climate change adaptation and building the resilience of at-risk communities (UNDRR 2020b).

This evaluation focuses on the World Bank's support for reducing disaster risks caused by natural hazards. Disaster risk reduction (DRR), as defined

by the United Nations Office for Disaster Risk Reduction, "aims to prevent new—and reduce existing—disaster risk while managing residual risk, all of which contribute to strengthening resilience to achieve sustainable development" (UNDRR 2016). According to the Sendai Framework for Disaster Risk Reduction 2015–2030, DRR practices are multihazard and multisectoral: they address disaster risks caused by natural, environmental, technological, and biological hazards. This evaluation focuses on one aspect of DRR—that is, efforts to reduce disaster risks caused by natural hazards. To assess this aspect of disaster risk, the evaluation uses universally accepted terminology associated with efforts to minimize exposure and vulnerability, in addition to other activities that can limit the negative effects of disasters caused by natural hazards. "Exposure" is the situation of people, infrastructure, housing, production capacities, and other tangible and intangible (for example, cultural) assets located in hazard-prone areas, whereas "vulnerability" refers to the conditions determined by physical, social, economic, and environmental factors or processes that increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards (UNDRR 2016).

Investing in DRR has strong economic and social benefits and is essential for achieving climate change adaptation. Resilient infrastructure investments have a present value of $4 return on each dollar invested (Hallegatte, Rentschler, and Rozenberg 2019). When countries rebuild infrastructure after disasters to be more resilient, they can reduce the negative impact of future disasters on livelihoods and well-being by as much as 31 percent (Hallegatte, Rentschler, and Walsh 2018). Meanwhile, universal access to an early-warning system (EWS) can reduce asset and well-being losses from disasters by an estimated $35 billion per year (Hallegatte et al. 2017). EWSs and other disaster risk measures also contribute to a decrease in mortality due to disasters (UNDRR 2019b). Expanding DRR plays a central role in achieving the World Bank's goals for climate change adaptation and resilience, as laid out in its *Climate Change Action Plan 2021–2025* (World Bank 2021a).

Underinvestment in DRR—particularly in disaster risk mitigation and preparedness—remains an issue globally despite DRR's documented benefits.

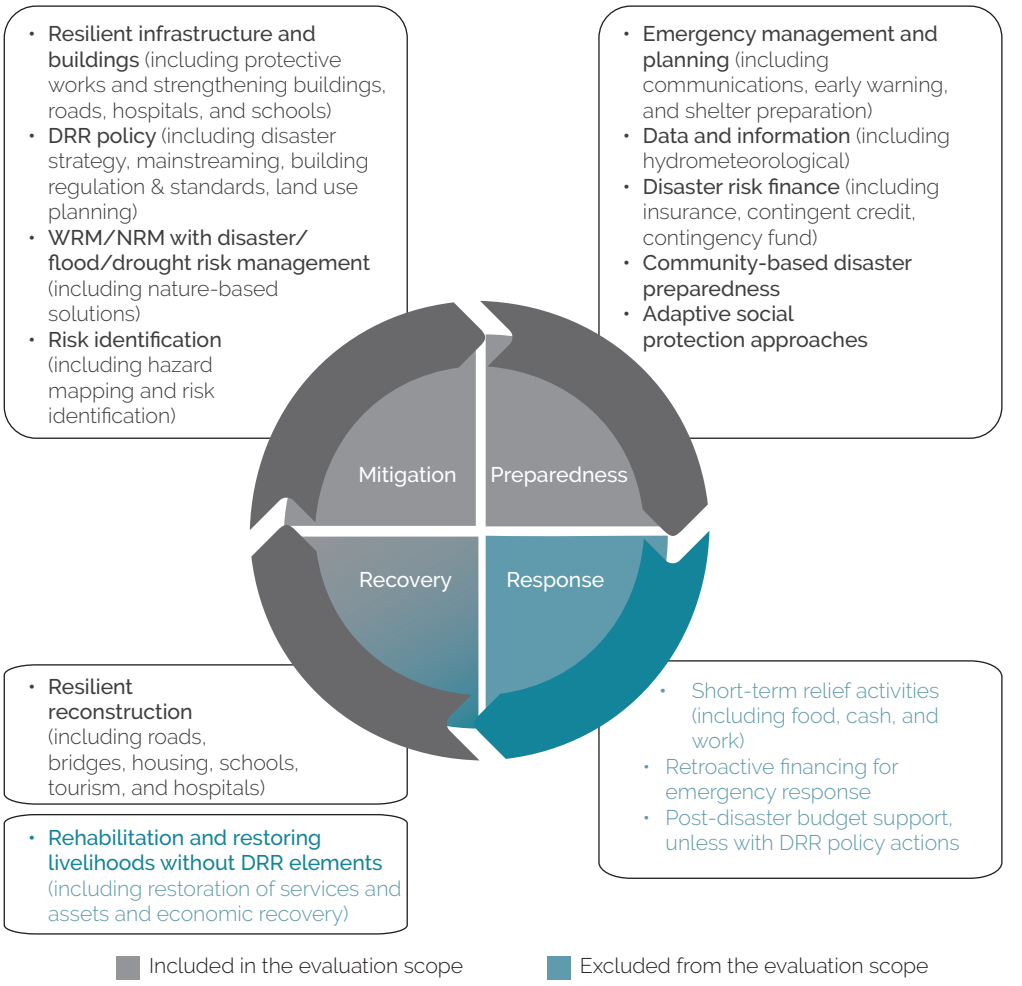
Only 4.1 percent of total official development assistance for disasters was directed toward disaster prevention and preparedness activities between 2010 and 2019 (UNDRR 2021). This is due in part to countries lacking sufficient resources to invest in DRR and having limited knowledge of disaster risks and vulnerabilities. Some governments also tend to prefer politically visible post-disaster (rather than predisaster) measures. Similarly, more international development assistance funds have been available for disaster response and recovery than for DRR (Keefer 2009; Tanner, Bahadur, and Moench 2017; Wilkinson 2012; World Bank 2013b).

Purpose and Scope of the Evaluation

The purpose of this evaluation is to surface lessons on the World Bank's support for DRR. The evaluation focused on World Bank support to address disaster risks caused by natural hazards, not on other types of hazards or stresses. It covers disaster risks caused by floods, droughts, earthquakes, cyclones, volcanic disruptions, tsunamis, and landslides. Areas of DRR support covered include risk identification; risk reduction activities, such as resilient infrastructure, buildings, and protective works; the integration of DRR into institutions, policy, and planning; preparedness activities, including support for EWSs and community approaches; and the offering of financial protection through disaster risk finance. These areas are shown in figure 1.1 (the dark-gray quarters). The evaluation does not cover elements of disaster response and recovery that lack DRR activities (the light-green activities in figure 1.1). There were 634 World Bank lending projects and 504 advisory and analytical products with DRR aims.

The evaluation includes World Bank support for DRR between 2010 and 2020. It does not cover International Finance Corporation or Multilateral Investment Guarantee Agency activities because DRR is not a major corporate priority for either group.

Figure 1.1. Evaluation Scope



Source: Independent Evaluation Group, using globally accepted phases of disaster (for example, United Nations Office for Disaster Risk Reduction).

Note: Activities are illustrative examples (not exhaustive). DRR = disaster risk reduction; NRM = natural resource management; WRM = water resource management.

Evaluation Questions and Methods

This evaluation answers the following two questions: (i) Has the World Bank's support for DRR been relevant, and what factors have facilitated or limited the relevance of this support? (ii) How effectively has the World Bank supported DRR, and what factors explain this effectiveness?

To answer the first evaluation question, the team assessed three aspects of relevance regarding the World Bank's support for DRR. First, the team conducted a global natural hazard analysis to assess whether the World Bank has engaged in those places where different hazard types pose, or are likely to pose, serious threats. Second, the evaluation assesses the degree to which the World Bank has evolved its approach to DRR in line with good practices. Third, the evaluation team conducted country case studies that identify lessons on client engagement to determine what works to raise awareness and undertake DRR actions in client countries.

To answer the second evaluation question, the team assessed three aspects of effectiveness regarding the World Bank's support for DRR. First, the evaluation team conducted a monitoring and evaluation analysis to identify how the DRR project portfolio articulates and captures DRR results and outcomes. Within the portfolio, the evaluation team also assessed how projects identify, address, and track results for groups disproportionately vulnerable to disasters. Second, the evaluation team assessed results and generated lessons on factors of effectiveness for four key activities in the portfolio: resilient infrastructure, EWSs, disaster insurance, and DRR policy reforms. Third, the evaluation team conducted a success case analysis whereby it identified and drew lessons from instances in which World Bank DRR activities have achieved highly successful results.

2 | Engaging Strategically in Countries Experiencing Disaster Risk

The World Bank has tripled its disaster risk reduction (DRR) support since fiscal year 2010, with a considerable expansion of DRR lending operations into new countries. The expansion of DRR is associated with the World Bank's prioritization of climate change adaptation, the International Development Association's special theme on climate change, the support of the Global Facility for Disaster Reduction and Recovery, and a conducive global authorizing environment for DRR.

The World Bank's support for DRR has been highly relevant and focused on countries with the most serious natural hazards. The World Bank's support often uses multiple and synergistic pillars of DRR engagement that include hazard identification, the development of resilient infrastructure, early-warning and preparedness activities, and disaster risk finance on occasion. DRR has been increasingly mainstreamed into sector operations. The World Bank has also shifted its focus from post-disaster response toward risk reduction and has built risk reduction into nearly all disaster response activities.

World Bank support for DRR has been comprehensive in International Development Association countries, including in low-income countries experiencing fragility, conflict, and violence, where it has addressed multiple pillars of DRR engagement through lending and nonlending activities.

However, there are coverage gaps in the Middle East and North Africa and in Europe and Central Asia, as well as across hazard types. Some hazard types that are rarer (tsunamis, volcanic eruptions) or less catastrophic (landslides) receive less attention in World Bank engagements than do others (floods, cyclones, droughts, and earthquakes).

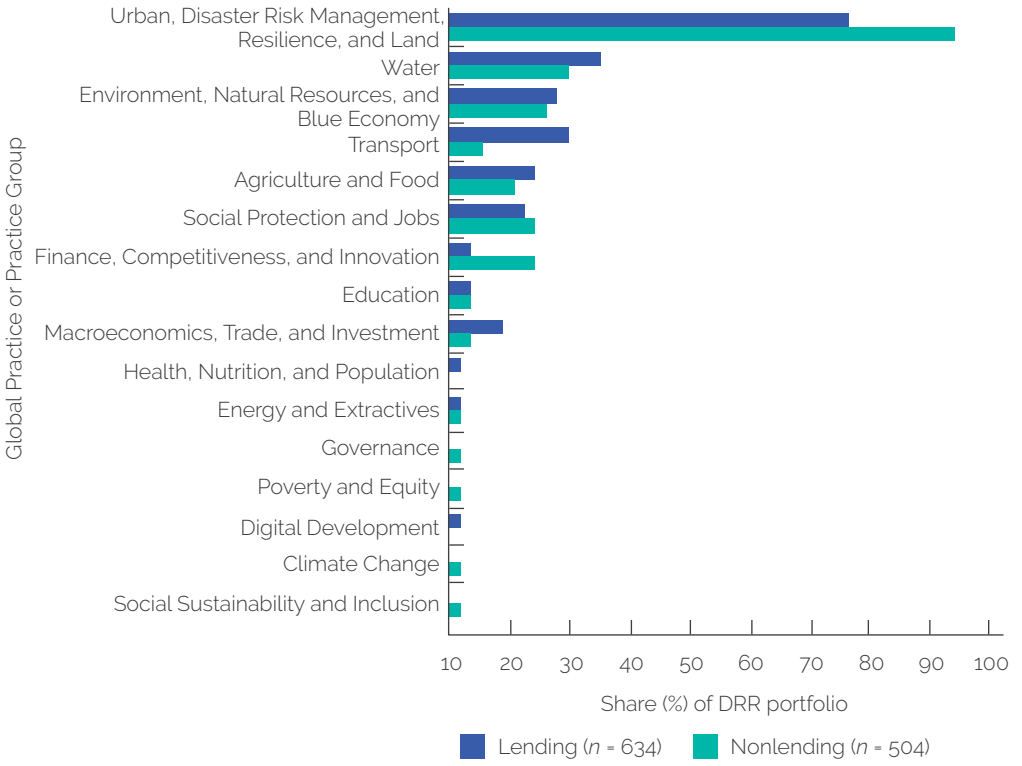
Although Global Practices are increasingly mainstreaming DRR considerations into operations, the share of such operations remains low for the Agriculture and Food and Energy and Extractives Global Practices, and mainstreaming does not happen evenly across subsectors.

This chapter assesses the relevance of the World Bank's engagement in countries experiencing disaster risk. First, it examines broad portfolio trends. Second, it uses global natural hazard data, disaggregated by hazard type, to identify overlaps and gaps with Systematic Country Diagnostics (SCDs) and lending and advisory portfolios (see appendix A for the methodology). Third, it uses portfolio data to assess the extent to which the World Bank has undertaken DRR in line with good practices (appendix A explains the source of good practices).

Portfolio Composition and Trends

The World Bank has approved a large portfolio of DRR activities that help clients mitigate, prepare for, and recover from disasters caused by natural hazards. Between fiscal year (FY)10 and FY20, the World Bank approved 1,130 operations with DRR activities, including 634 lending and 504 nonlending products (420 country and 84 regional). Of these, 543 are investment project financing (IPF), 82 are development policy financing (DPF), and 9 are Program-for-Results financing. Projects mapped to the Urban, Disaster Risk Management, Resilience, and Land Global Practice (GP) make up almost half of the total portfolio, whereas Water GP and Environment, Natural Resources, and Blue Economy (ENB) GP projects make up roughly one-quarter of the portfolio; all three GPs have sizable amounts of both lending and nonlending projects (figure 2.1). The Social Protection and Jobs, Agriculture and Food, and Transport GPs account for much of the remaining lending projects, whereas the Finance, Competitiveness, and Innovation GP has a larger share of nonlending projects (8 percent) but a smaller share of lending ones (2 percent). GP mappings also do not capture the nature of cross-sectoral teams, such as the involvement of Finance, Competitiveness, and Innovation GP staff working on projects mapped to the Urban, Disaster Risk Management, Resilience, and Land GP. Both lending and nonlending activities support a range of DRR activities, including capacity building, policy reforms, hazard identification, resilient infrastructure, and protective works; disaster risk finance (for example, insurance); and hydrometeorological monitoring and EWSs, as well as community-preparedness activities. In the aftermath of disasters, these operations also support resilient recovery.

Figure 2.1. Disaster Risk Reduction Portfolio Composition, by Global Practice Share (FY10–20)



Source: Independent Evaluation Group.

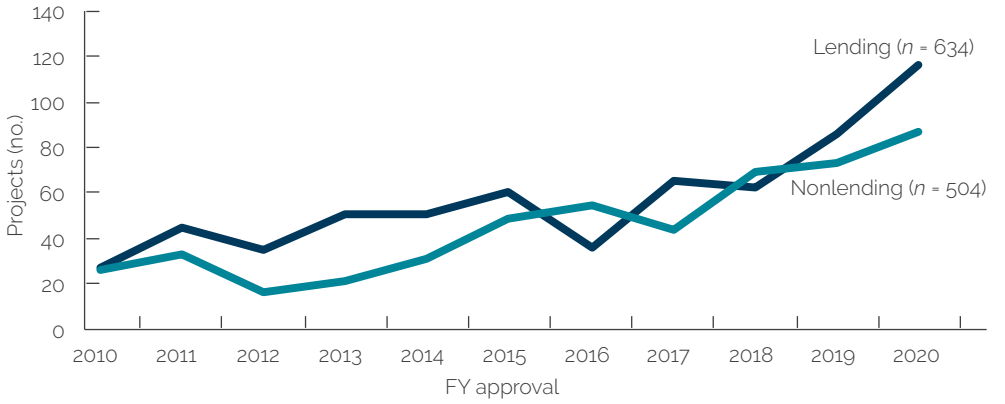
Note: DRR = disaster risk reduction; FY = fiscal year.

The World Bank has more than tripled its support for DRR over the evaluation period. DRR lending projects and nonlending activities have steadily increased during FY10–20 (figures 2.2 and 2.3). More than one-third of the DRR lending portfolio was approved in FY19–20. DRR nonlending has also grown steadily. The growth in DRR activities has accelerated since FY16.

There has been a considerable expansion of DRR lending operations into many new countries where DRR lending historically has been absent. DRR lending activities were approved in 100 countries between FY16 and FY20, up from 75 countries in FY10–15. The share of newly approved DRR lending projects has increased across all Regions (see figure 2.3), with recent increases in West Africa, the Middle East and North Africa, and Europe and Central Asia, where DRR lending was sparse before. In West Africa, the slight growth of DRR is driven by the integration of DRR considerations into social

safety nets and urban development, especially in coastal cities and for urban flooding. In the Middle East and North Africa, expansion is explained by the initiation of dedicated disaster risk management (DRM) programs (such as in Morocco) and the integration of DRR into urban development, including in wastewater management in West Bank and Gaza, housing in the Arab Republic of Egypt, and slum upgrading in Djibouti.

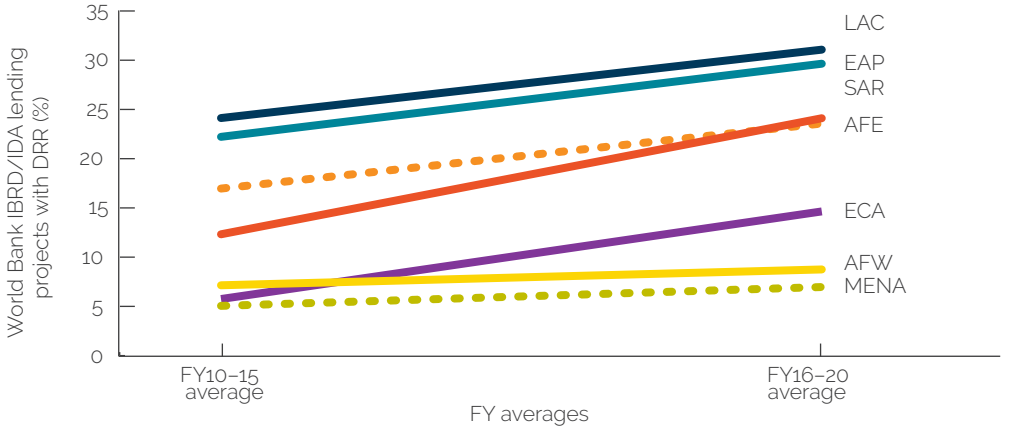
Figure 2.2. World Bank Nonlending and Lending Projects with Disaster Risk Reduction Activities (FY10–20)



Source: Independent Evaluation Group.

Note: FY = fiscal year.

Figure 2.3. Disaster Risk Reduction Lending Projects as a Share of All Projects, by Region (FY10–20)



Source: Independent Evaluation Group.

Note: AFE = Africa East; AFW = Africa West; DRR = disaster risk reduction; EAP = East Asia and Pacific; ECA = Europe and Central Asia; FY = fiscal year; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SAR = South Asia.

The expansion of DRR support is associated with the World Bank's prioritization of climate change adaptation, the special theme on climate change of the International Development Association (IDA), the support of the Global Facility for Disaster Reduction and Recovery (GFDRR), and a conducive international authorizing environment for DRR. The World Bank has made climate change a corporate priority since 2008 and has put greater emphasis on adaptation and resilience in its climate portfolio since the publication of the *World Bank Group Climate Change Action Plan 2016–2020.* Consistent with the corporate strategic directions, Country Management Units (CMUs) have identified and promoted projects that support climate adaptation, including through DRR engagements. IDA's special theme on climate change, its emphasis on adaptation and disasters, and its core indicator on DRR have also encouraged corporate efforts to prioritize DRR in IDA countries. GFDRR support has played a major role in enabling growth of DRR by financing analytical work and technical assistance and developing a critical mass of disaster experts to support World Bank project teams. A supportive international authorizing environment for DRR associated with the Sendai Framework may have also played a role by generating demand from clients who were signatories to this framework. Greater interest in DRR from major donor countries influenced IDA priorities and provided trust fund resources, especially to GFDRR.

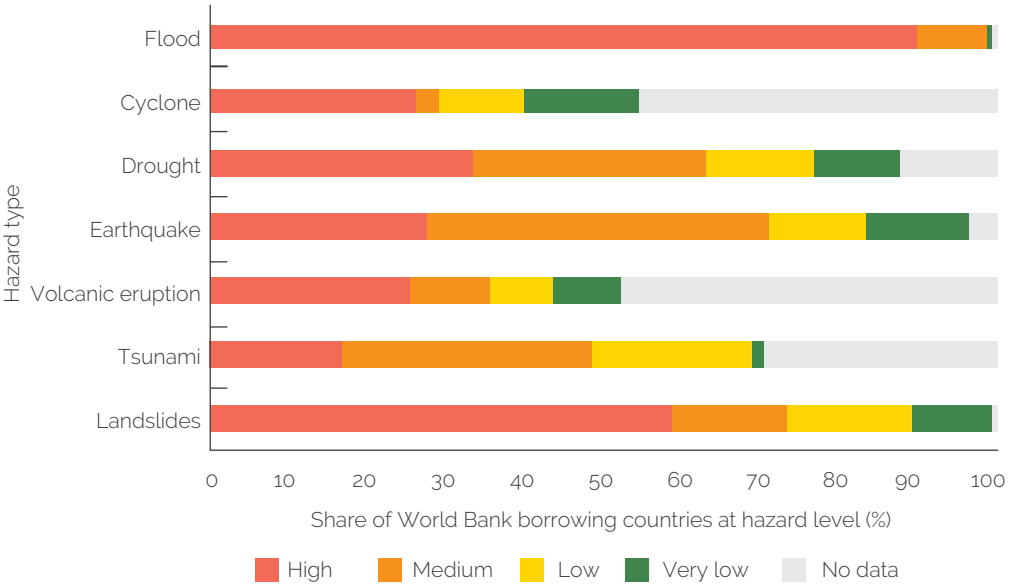
Strategic Alignment of the World Bank's Disaster Risk Reduction Portfolio

This evaluation assesses the World Bank's strategic DRR focus by determining whether it has primarily supported DRR in the countries where specific natural hazards are most serious. The evaluation team identified the hazard level for seven natural hazard types for the 138 countries that had at least one lending project, using global data from ThinkHazard!, a tool developed by GFDRR that indicates the likelihood of different natural hazards affecting areas (ranging from high to very low levels; see appendix A). Countries with high hazard levels are those where the likelihood of a hazard event of at least a specific magnitude exceeds a threshold probability, as defined in ThinkHazard! Subsequently, the team assessed the extent to which the

World Bank identifies disaster risks in its SCDs and incorporates risk reduction in its lending and nonlending activities, as well as how this coverage differs across hazards and countries.

Nearly all World Bank client countries face serious natural hazards, especially flooding. Among all 138 borrowing countries, 133 are at high hazard levels for at least one hazard type (figure 2.4). High flood hazard levels are ubiquitous among borrowing countries, with 90 percent of countries having a high flood hazard level. High landslide hazard levels are also relatively common across World Bank borrowing countries (59 percent). Forty-six countries have a high drought hazard level; these countries are concentrated in Asia, the Sahara-Sahel belt, and western South America. Furthermore, 38 countries have a high hazard level for earthquakes; these countries are largely situated in the Pacific Ring of Fire and in Asia. High hazard levels for cyclones, volcanic eruptions, and tsunamis are comparatively less common.

Figure 2.4. Hazard Levels across Borrowing Countries, by Hazard Type



Source: Independent Evaluation Group.

Note: n = 138.

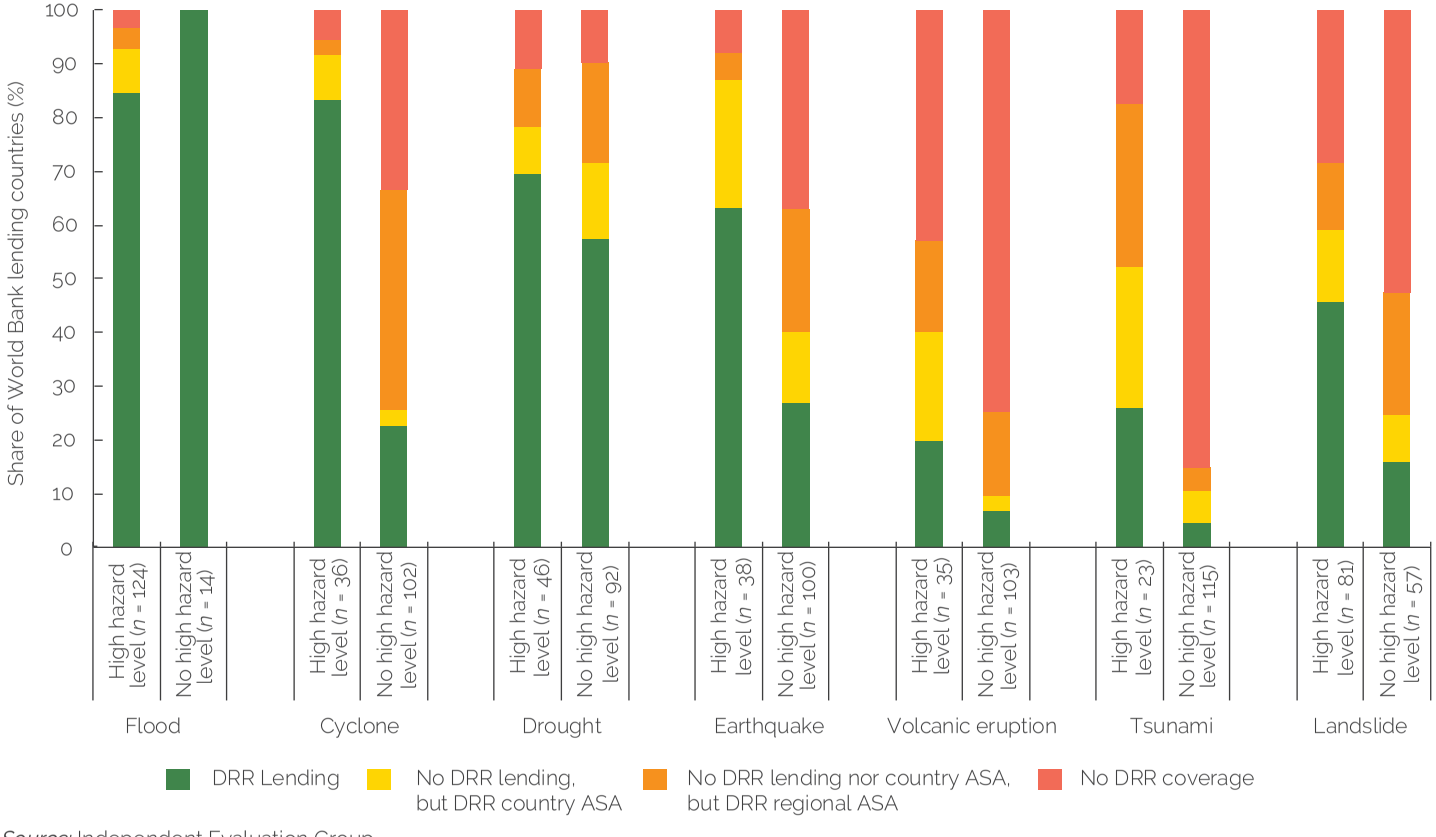
In general, the World Bank strategically focuses its DRR work on those countries where hazards are most serious. Across most hazard types, the World Bank provides hazard-specific DRR more often in countries with high hazard levels than in countries with lower hazard levels (figure 2.5).[1] For flood and

drought, the difference in country coverage is smallest, as these hazards are universally well covered. For cyclones, earthquakes, volcanic eruptions, tsunamis, and landslides, the targeting of countries with high hazard levels is much more pronounced. Countries with high hazard levels also tend to receive more lending and nonlending interventions in line with their specific hazard risks, as compared with countries with lower hazard levels.

The World Bank has supported flood, cyclone, drought, and earthquake risk reduction in most countries with serious hazards. The World Bank has supported risk reduction through lending activities in more than 80 percent of countries facing high hazard levels for floods and cyclones and more than 60 percent of countries facing high hazard levels for droughts and earthquakes. Furthermore, it has supported nonlending risk reduction activities in most of the remaining countries with high hazard levels. As a result, only between 3 percent and 11 percent of countries with high hazard levels have no lending or nonlending across these four hazard types. In contrast, World Bank lending support for risk reduction in countries with high hazard levels has been lower for volcanic eruptions (20 percent), tsunamis (26 percent), and landslides (46 percent). However, a substantial share of nonlending support for these three hazard types has been through regional activities. Across these three hazard types, between 17 percent and 43 percent of countries with high hazard levels have no coverage.

Serious hazards are being comprehensively addressed in IDA countries and in small island developing states (SIDS). In more than 60 percent of IDA countries with high hazard levels, the World Bank is providing lending operations that address all corresponding hazard types (figure 2.6). In almost all remaining high hazard–level IDA countries, the World Bank is addressing at least one or several high-level hazards through lending. There is even more comprehensive coverage of nonlending work in IDA countries: 82 percent of IDA countries are receiving nonlending support for all high-level hazards. Similarly, in 95 percent of SIDS with high hazard levels, the World Bank is providing lending operations that address at least one, several, or all corresponding hazard types. This share is lower but still high for fragility, conflict, and violence (FCV; mostly in IDA-FCV) countries (85 percent).

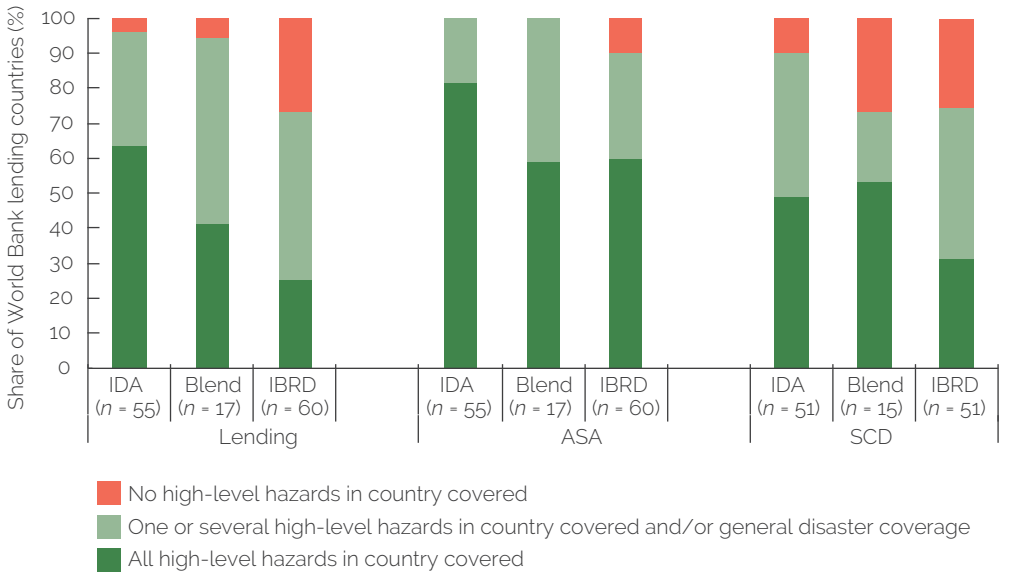
Figure 2.5. Hazard-Specific Disaster Risk Reduction Lending and Nonlending in Countries, by Hazard Type and Country Hazard Level (FY10–20)



Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; DRR = disaster risk reduction; FY = fiscal year.

Figure 2.6. Extent of Disaster Risk Reduction Coverage for High-Level Hazards in Countries, by Lending Status (FY10–20)

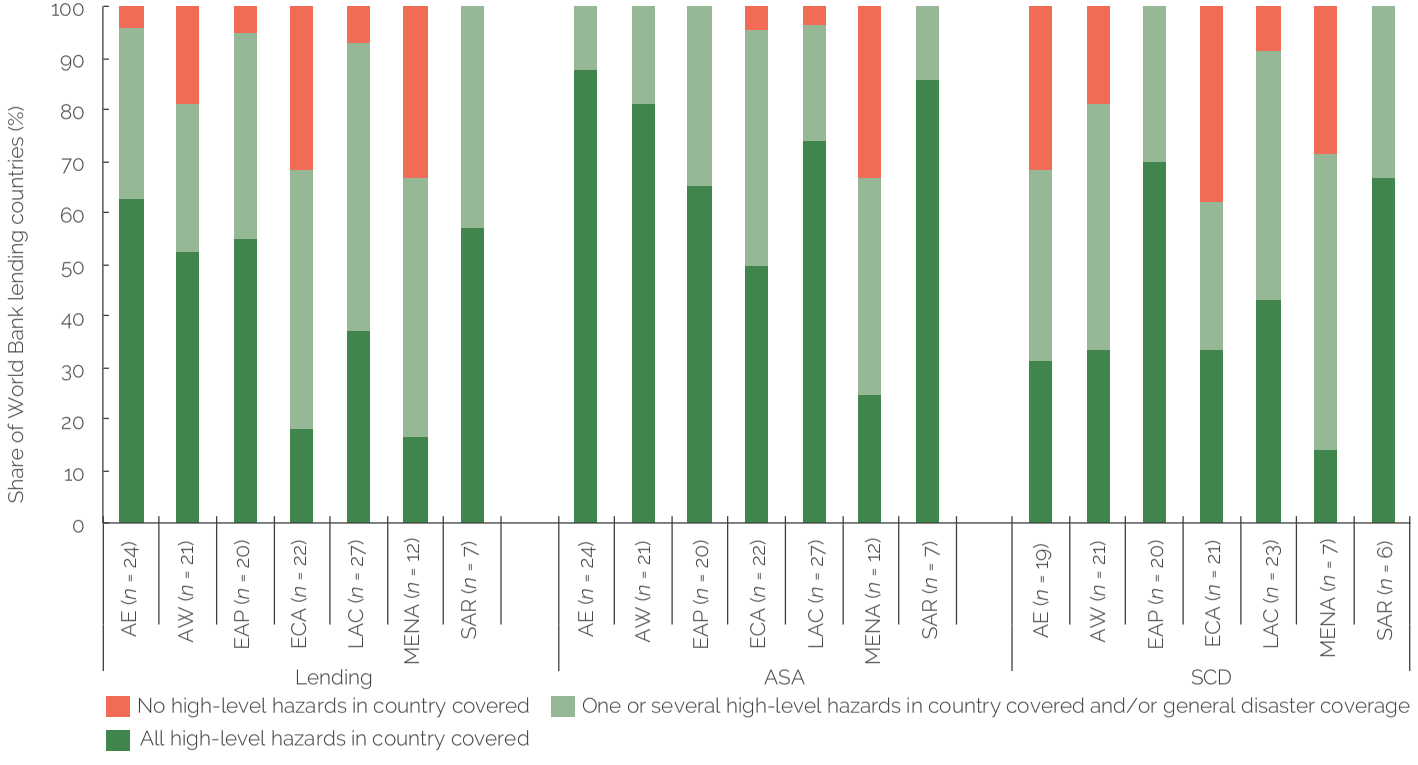


Source: Independent Evaluation Group.

Note: ASA = advisory services and analytics; FY = fiscal year; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; SCD = Systematic Country Diagnostic.

There are DRR coverage gaps for some serious hazards in the Middle East and North Africa and Europe and Central Asia. These gaps are shown in figure 2.7, whereas box 2.1 explains potential reasons for these gaps. In the Middle East and North Africa, infrastructure investments in Iraq, Jordan, Lebanon, Tunisia, and the Republic of Yemen have not incorporated flood or drought risk reduction elements, even though these countries face high hazard levels for floods and drought. In Europe and Central Asia, countries with high flood hazard levels have not incorporated flood prevention measures into their infrastructure lending in Armenia, Azerbaijan, and Ukraine. Countries in Europe and Central Asia with high seismic risks—Armenia, Azerbaijan, and Georgia—have not incorporated seismic risk activities into their infrastructure investments (whereas seismic risks have been covered by lending in the Kyrgyz Republic, Tajikistan, and Türkiye). It is also noteworthy that the World Bank has only supported disaster risk finance and no other elements of DRR in some countries in Europe and Central Asia with high hazard levels—Albania, Kazakhstan, and North Macedonia.

Figure 2.7. Extent of Disaster Risk Reduction Coverage for High-Level Hazards in Countries, by Region (FY10–20)



Source: Independent Evaluation Group.

Note: AE = Africa East; ASA = advisory services and analytics; AW = Africa West; EAP = East Asia and Pacific; ECA = Europe and Central Asia; FY = fiscal year; LAC = Latin America and the Caribbean; MENA = Middle East and North Africa; SAR = South Asia; SCD = Systematic Country Diagnostic.

In Europe and Central Asia, and to a lesser extent in the Middle East and North Africa, nonlending activities were used to supplement a lack of investment demand. In Middle East and North Africa countries where there is no flood-specific DRR lending, the World Bank provided a few important pieces of analytical work, including one regional advisory services and analytics (ASA) on water security; an ASA on disaster resilience in the agricultural sector in Jordan and Lebanon; climate and disaster studies in Tunisia; and a DRR training exercise in the Republic of Yemen, which was held before the current war. In countries in Europe and Central Asia with high earthquake hazard levels, the World Bank helped catalog at-risk schools in Armenia and integrated DRR into Azerbaijan's housing strategy. For Europe and Central Asia countries with high flood hazard levels, the World Bank integrated DRR into urban planning and Integrated Water Resources Management (IWRM) technical assistance in Armenia and Croatia and provided ASA on flash floods in Georgia. The World Bank has also provided Europe and Central Asia with regional ASA focused on broad DRR awareness raising.

Box 2.1. Reasons for Disaster Risk Reduction Coverage Gaps in the Middle East and North Africa and Europe and Central Asia Regions

Several factors may explain lower coverage for disaster risk reduction (DRR) in the Europe and Central Asia and Middle East and North Africa Regions. Both Regions are predominantly made up of International Bank for Reconstruction and Development clients, where the borrowing costs for DRR are sometimes seen to be high. In the Middle East and North Africa, there is a difference between the gradual uptake of DRR actions in the Maghreb—especially in Morocco, where technical support has underpinned DRR policy reforms—and the conflict-affected countries in the region where there has been modest to no uptake of DRR, in part because conflict and governance issues have been higher priorities than DRR in World Bank engagements. The Middle East and North Africa Region has also received less financing from the Global Facility for Disaster Reduction and Recovery (only 4 percent of this support over 2010–20) in comparison with other Regions, a factor that may explain the dearth of DRR analytical work there. The Europe and Central Asia Region has several small countries with a limited International Bank for Reconstruction and Development envelope that constrains

(continued)

Box 2.1. Reasons for Disaster Risk Reduction Coverage Gaps in the Middle East and North Africa and Europe and Central Asia Regions (cont.)

the number of sectors in which the World Bank can engage. Other regions with small countries are eligible for International Development Association support, including under the broader International Development Association eligibility for small states. European Union (includes potential) candidates have been more motivated to borrow for flood prevention than other hazards because the European Union has a flood prevention directive with which members must comply, but not a directive for any other hazard.

Source: Independent Evaluation Group.

In general, SCDs in countries facing serious natural hazards adequately diagnose and discuss corresponding disaster risks, and lending for DRR is more common in countries with such SCDs. About two out of five SCDs adequately cover all high-level hazards in the country, while another two out of five adequately cover at least one or more high-level hazards (see appendix A for assessment criteria). Only 3 percent of SCDs fully lack DRR analysis and content. However, the depth of risk analysis and DRR content varies widely across SCDs: from SCDs that only list the hazards and refer to isolated DRR actions within sections on climate resilience to SCDs with disaster risk maps and integrated DRR strategies in dedicated sections. Furthermore, SCDs provide (i) higher coverage for floods, cyclones, earthquakes, and droughts (69 to 79 percent) compared with tsunamis, volcanic eruptions, and landslides (47 to 50 percent); (ii) higher coverage in IDA countries (figure 2.6); and (iii) lower coverage in Europe and Central Asia and the Middle East and North Africa (figure 2.7). In this sense, lending, nonlending, and SCD patterns are similar. Adequate coverage for high-level hazards in SCDs is associated with higher lending coverage for the corresponding hazard types (that is, positive correlation across all hazard types except drought).

Aligning Disaster Risk Reduction Support with Good Practices

This section of the evaluation examines whether the World Bank has evolved its approach to DRR in line with stated good practices. These good practices are derived from the World Bank's report to the Board of Executive Directors, *Mainstreaming Disaster Risk Management in World Bank Group Operations* (published in 2014, 2016, 2018, and 2020). These good practices include (i) the pursuit of integrated approaches, (ii) a focus on predisaster vulnerability reduction, (iii) the mainstreaming of DRR considerations in sectors, and (iv) appropriate use of nature-based solutions (NBSs).

Integrated Approaches

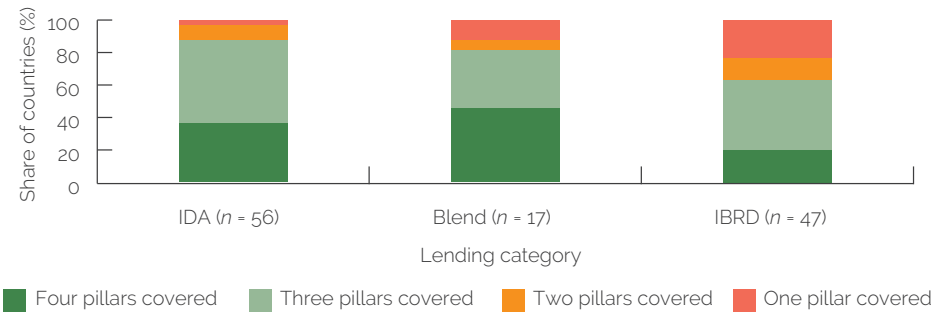
The World Bank and external frameworks cite the need for "integrated approaches" to achieve effective DRR. Integrated approaches use multiple and synergistic pillars of engagement to help clients mitigate disaster risk and are expected to be more effective than partial approaches. The evaluation classifies these approaches into four pillars, adapted from the World Bank's pillars and based on the Sendai Framework: (i) risk identification; (ii) risk reduction activities, especially resilient infrastructure and assets (including resilient reconstruction in post-disaster situations); (iii) preparedness activities, especially support for EWSs; and (iv) financial protection. To assess whether the World Bank is pursuing integrated approaches, the evaluation categorized the lending data in line with these pillars and analyzed the extent of country engagement on multiple pillars.

The World Bank pursued at least three pillars of support in about 80 percent of countries that received DRR lending. Fifty-five countries received a combination of three engagement pillars (45 percent of countries that received DRR lending), whereas 39 countries received all four pillars (32 percent). Of countries that received three pillars, most (84 percent) received support for hazard risk identification, resilient infrastructure, and early-warning and preparedness activities. Countries with four pillars also received support for financial protection. All but five countries that received support for three or more pillars had more than one DRR lending project.

In IDA countries, the World Bank is providing strong coverage of serious hazards and often addresses these hazards through multiple pillars of engagement, including in FCV countries. Eighty-eight percent of IDA countries with DRR lending had three or four DRR pillars (figure 2.8). Combined with the fact that most IDA countries with high hazard levels had lending that addressed all corresponding hazard types (see previous section on strategic alignment), this analysis finds that IDA is well covered. The World Bank also supported three or four pillars in 78 percent of FCV countries, most of which were IDA countries as well.

World Bank support for DRR is comparatively less integrated in International Bank for Reconstruction and Development (IBRD) countries, including in IBRD SIDS. Although 64 percent of IBRD countries engaged in three or four DRR pillars (figure 2.8), several countries (23 percent of all IBRD countries with DRR lending) had just one pillar, either for financial protection (including in Albania, Antigua and Barbuda, Costa Rica, Kazakhstan, North Macedonia, and Trinidad and Tobago) or for resilient infrastructure (as in Croatia, Ecuador, Palau, and Uruguay). Overall, 40 percent of IBRD SIDS had only one or two DRR pillars, compared with 18 percent of IDA SIDS that had two or fewer.

Figure 2.8. Extent of Disaster Risk Reduction Coverage across Country Lending Categories



Source: Independent Evaluation Group.

Note: Colors show the number of disaster risk reduction pillars supported in each country. IBRD = International Bank for Reconstruction and Development; IDA = International Development Association.

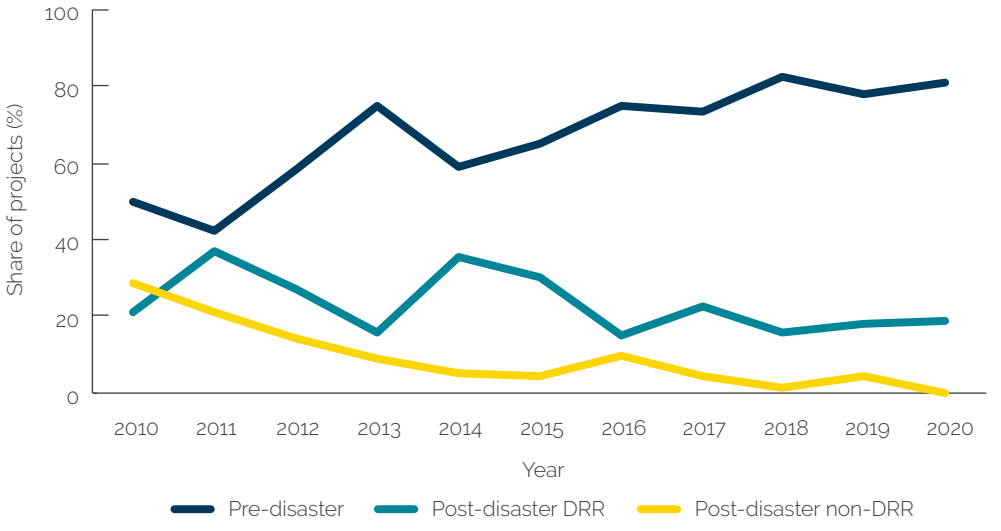
The World Bank provided less integrated DRR support to the Europe and Central Asia and Middle East and North Africa Regions, which are also the Regions least likely to include DRR lending for high-level hazards. The World Bank has provided three or more pillars to all countries receiving DRR

lending in East Africa and to between 75 and 88 percent of countries in the East Asia and Pacific, Latin America and the Caribbean, Western and Central Africa, and South Asia Regions. However, only 50 percent of Middle East and North Africa countries and 59 percent of Europe and Central Asia countries receiving DRR lending had three or more pillars of DRR support.

Pre- and Post-Disaster Risk Reduction Assistance

There is an increasing share of lending projects that support predisaster DRR activities as compared with post-disaster activities. Good practice on DRR emphasizes the importance of ex ante actions to reduce exposure and vulnerability. The share of World Bank DRR projects that engage in predisaster activities, compared with post-disaster ones, rose from 50 to 81 percent between FY10 and FY20 (figure 2.9). Moreover, the share of projects supporting disaster response without DRR elements declined from 29 to 0 percent between FY10 and FY20. Although there will likely always be a need for disaster response projects, the number of these projects that do not include risk reduction elements should go to zero over time.

Figure 2.9. Share of Pre- and Post-Disaster Risk Reduction Projects, by Type (FY10–20)



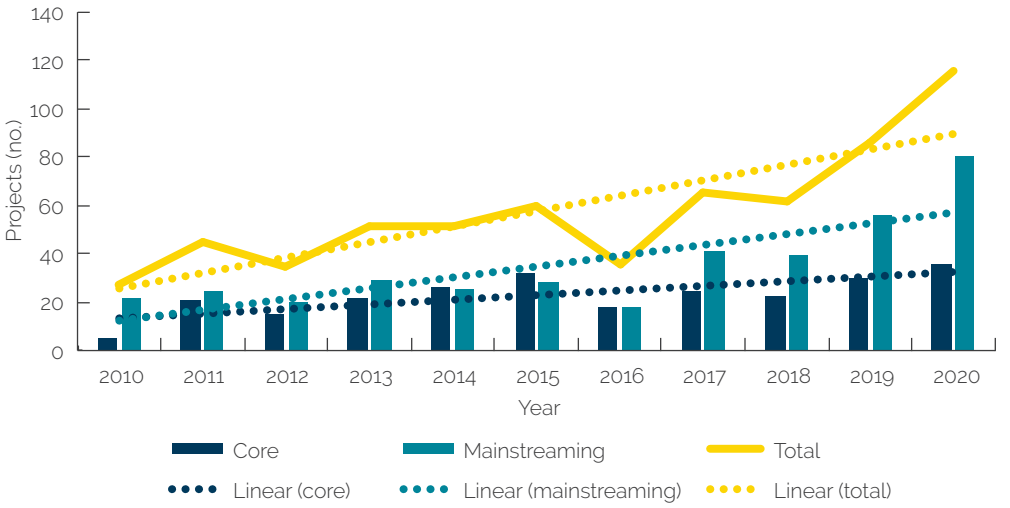
Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; FY = fiscal year.

Mainstreaming Disaster Risk Reduction into Sectors

The number of mainstreamed DRR projects has quadrupled. "Mainstreaming" refers to the integration of DRR elements into sector operations that have non-DRR aims. "Core" DRR projects have an explicit DRR development objective, theory, and activities. Most DRR projects are mainstreamed (60 percent), meaning they are sector operations that contain DRR elements. Both core and mainstreamed projects have increased over time, but mainstreamed projects have increased at a higher rate, from 22 projects in FY10 to 80 in FY20 (figure 2.10).

Figure 2.10. Share of Core versus Mainstreamed Disaster Risk Reduction Projects (FY10–20)



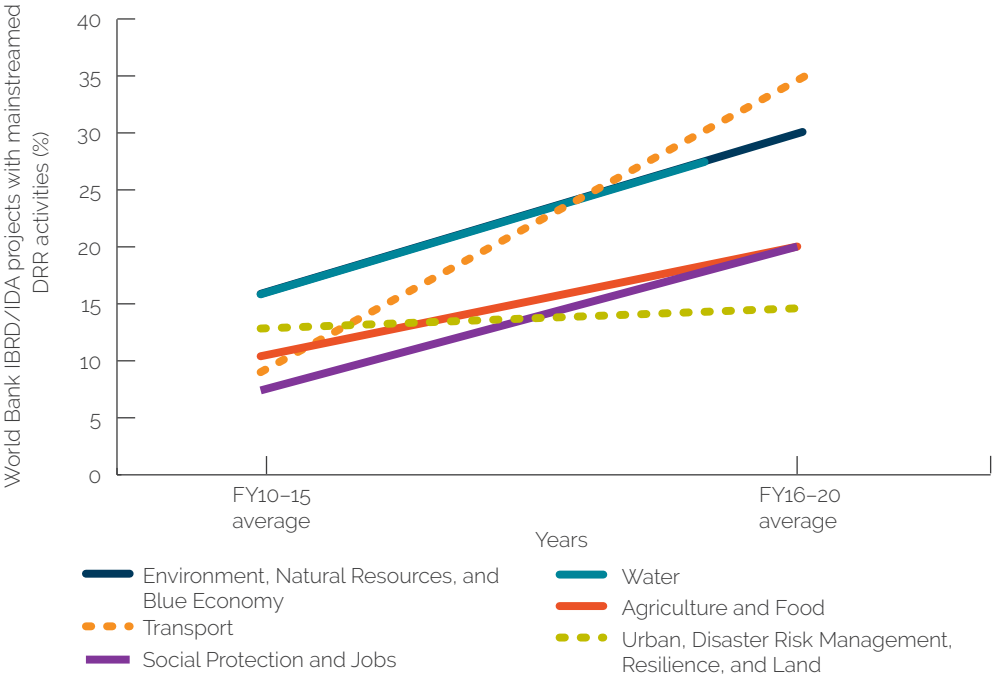
Source: Independent Evaluation Group.

Note: n = 634. FY = fiscal year.

DRR has been increasingly mainstreamed into sector operations across all key GPs; many GPs, however, are starting from a low base. The Water GP and the ENB GP have nearly doubled their share of operations that include mainstreamed DRR activities during the evaluation period (figure 2.11). The Agriculture and Food GP doubled, the Social Protection and Jobs GP nearly tripled, and the Transport GP quadrupled their shares of projects with mainstreamed DRR; however, these GPs started from a very low base (figure 2.11). The share of mainstreamed projects in the Urban, Disaster Risk Management, Resilience, and Land GP—the GP primarily supporting core operations

(70 percent of its DRR operations are core)—stayed the same, at just below 15 percent. There were only six projects in the Energy and Extractives GP with DRR activities. The DRR elements of these projects focused on reducing disruption from disasters and improving disaster preparedness. For example, some renewable energy projects sought to improve resilience through enhanced siting and by financing protective works. (Note, however, that dam safety projects were not included in the evaluation scope.)

Figure 2.11. Share of World Bank Projects with Mainstreamed Disaster Risk Reduction Activities (excludes core disaster risk reduction projects)



Source: Independent Evaluation Group.

Note: The Energy and Extractives Global Practice is excluded, as only 1–2 percent of projects had mainstreamed DRR. DRR = disaster risk reduction; FY = fiscal year; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association.

DRR activities are increasingly being mainstreamed into water sector operations across countries of different types and through multiple subsector activities. The share of all Water GP lending operations with mainstreamed DRR activities rose from 16 to 27 percent between FY10 and FY15 and between FY16 and FY20 in 39 countries—of which 50 percent are IDA countries, 15 percent are Blend, and 35 percent are IBRD countries—while the share of

core DRR projects remained the same (6–7 percent). There has been consistent attention to DRR in IWRM activities, a tripling of DRR activities in water supply and sanitation activities, and an introduction of DRR considerations into wastewater management since 2015. The increased mainstreaming of DRR in Water GP operations occurred alongside the launch in 2017 of the World Bank's Water Security Diagnostic Initiative, which supported a broad shift in relation to water systems thinking. During the second half of the evaluation, project objectives and themes were more focused on water security, sustainable supply, reduced water loss, and efficiency in water systems.

The ENB GP is mainstreaming DRR considerations through its climate and green growth policy agenda, sustainable land management, and, increasingly, coastal and basin operations. The share of all ENB GP lending operations with mainstreamed DRR activities rose from 16 to 29 percent between FY10 and FY15 and between FY16 and FY20 in 27 countries—of which 56 percent are IDA countries, 4 percent are Blend, and 40 percent are IBRD countries—while the share of core DRR projects has remained steady at approximately 10 percent during both periods. One-fifth of this portfolio are development policy operations (DPOs) that support climate and disaster resilience. The shift includes increased focus, although small in project numbers, on support for coastal and marine management and the introduction of climate adaptation and resilience projects with DRR activities.

The World Bank is significantly expanding its support to strengthen disaster preparedness by mainstreaming DRR considerations in its adaptive social protection programs. Adaptive social protection programs are flexible programs that can protect poor households from climate and disaster shocks before they occur, with the help of predictable transfers, the building of disaster-resilient community assets, skills-building programs, and the scaling of these programs, especially by providing cash transfers in the face of extreme events. These projects recognize the role that governments need to play in building a shock-responsive social protection system and improving household resilience. The share of Social Protection and Jobs DRR mainstreamed lending projects rose from 7 to 20 percent between FY10 and FY15 and between FY16 and FY20, with new projects in 26 countries, mostly in Africa. The World Bank also tripled the amount of Social Protection and Jobs DRR country analytical work between FY10 and FY20.

The Agriculture and Food GP has doubled the share of its lending projects that include mainstreamed DRR, mostly through efforts to integrate climate resilience into value chains, but there is low focus on the disaster resilience of livestock and fishing communities. The share of all Agriculture and Food GP lending operations with mainstreamed DRR activities rose from 10 to 20 percent between FY10 and FY15 and between FY16 and FY20 in 29 countries—of which 52 percent are IDA countries, 19 percent are Blend countries, and 30 percent are IBRD countries—while the Agriculture and Food GP rarely supports DRR core activities (2 percent during both periods). Eighty-five percent of mainstreamed agricultural projects focused on integrating DRR into crop value chains; very few mainstreamed DRR into livestock and fisheries.

There has been significant progress in mainstreaming DRR in the Transport GP; however, these activities are less frequent in transport operations in Europe and Central Asia and in Sub-Saharan Africa. Although the share of DRR mainstreamed Transport projects rose from 8 to 27 percent, only 6 percent and 10 percent of the Europe and Central Asia and Sub-Saharan Transport portfolios, respectively, included mainstreamed DRR activities. Eighty-six percent of Transport projects with DRR mainstreaming are in middle-income countries, in part because 79 percent of Transport projects approved during the evaluation period were in middle-income countries.

Mainstreamed DRR activities increasingly cover drought risks. Forty percent of projects that mainstream DRR include a focus on drought management in 60 countries. The number of lending operations that mainstream activities to address drought risks has increased from 60 during the first half of the evaluation period to 91 during the second half. Social Protection programs were four times as likely to cover drought risks in the second half of the evaluation period as compared with the first half. The Water GP has increased the number of regional and country-level IWRM projects that strengthen institutional capacity for drought management, such as in the Nile Basin, the Horn of Africa, northeast Brazil, and India (for groundwater management). The Agriculture and Food GP has increasingly focused on drought and pastoral and livestock welfare in Africa.

Mainstreaming of DRR in World Bank operations is associated with staff awareness and relationships, CMU and government champions, and the availability of core disaster risk specialists. Three factors are associated with successful DRR mainstreaming. First, the extent to which staff actively promote and engage on DRR depends on the professional backgrounds and interests of country directors, country managers, task team leaders, program leaders, and practice managers, as well as their relationships with disaster specialists. Core disaster staff turnover acts as a constraint in this respect. Second, DRR support benefits from champions who are capable of coordinating the exercise, both in the government and in the World Bank, as there are often multiple stakeholders with diverging interests involved. Third, successful DRR mainstreaming may require a dedicated core of disaster specialists to contribute their expertise in projects led by other GPs.

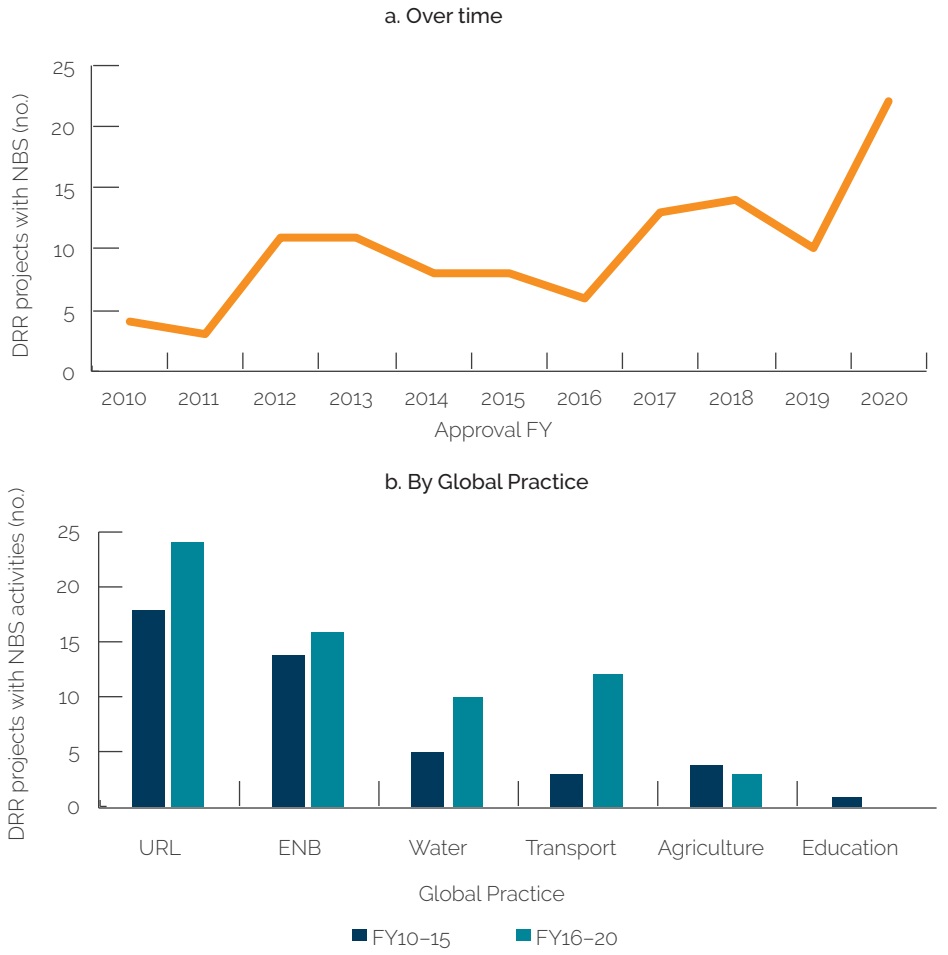
Nature-Based Solutions

NBSs can be a cost-effective approach for DRR and can also contribute to climate change mitigation and adaptation goals. NBSs for DRR are approaches that use natural systems to provide DRR and mitigation services, which are a subset of broader NBSs. NBSs for DRR can include the use of bioengineering approaches to increase road resilience, mangrove planting, and the development of riverside parks to protect cities. The general financial case for using NBSs to enhance DRR has been well documented, although it has also been noted that costs and benefits depend on local conditions (World Bank 2019f; WWAP 2018). In combined infrastructure gray-green approaches, green activities can reduce the cost of services by reducing the cost of gray components (by reducing capital and operation and maintenance [O&M] costs).[2] Green infrastructure can also generate ancillary social, economic, and environmental benefits related to human health and livelihoods, food and energy security, ecosystem rehabilitation and maintenance, climate adaptation and resilience, and biodiversity (WWAP 2018). For example, according to the Global Commission on Adaptation, the global benefits of protecting mangroves are more than five times the cost of doing so, as they protect 15 million people from annual flooding (World Bank 2021c).

Although it does so infrequently, the World Bank is increasingly using NBSs as part of DRR approaches. Since 2010, the World Bank has supported 110

DRR projects in 48 countries (plus 4 regional programs) that use NBSs, representing 17 percent of the DRR lending portfolio. NBSs have increased since 2010, although from a low base (figure 2.12).

Figure 2.12. Disaster Risk Reduction Lending Projects with Nature-Based Solutions Activities over Time and by Global Practice



Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; ENB = Environment, Natural Resources, and Blue Economy; FY = fiscal year; NBS = nature-based solution; URL = Urban, Disaster Risk Management, Resilience, and Land.

However, NBSs for DRR are still concentrated in environmental and urban sector projects. Sixty-five percent of DRR NBS activities were implemented by the Urban, Disaster Risk Management, Resilience, and Land (38 percent) and ENB (27 percent) GPs (figure 2.12). Two-thirds of NBSs–Urban, Disaster Risk Management, Resilience, and Land GP activities are in core DRR projects, often aimed at reducing hydrometeorological risks. The ENB

GP uses NBSs for coastal and marine management to mitigate flood risks and as part of land and watershed management to mitigate flood, landslide, erosion, and drought risks. The World Bank has integrated NBSs into 10 percent of all post-disaster operations with DRR elements and 20 percent of predisaster operations. The Water GP is increasingly integrating NBSs, with 10 DRR operations with NBSs approved in the second half of the evaluation versus 5 DRR operations in the first half. These DRR operations include green urban drainage infrastructure, watershed and catchment management, and riverine protection in China, Poland, and Uganda. There is also an increasing number of regional efforts—especially in East Africa—where the Water and ENB GPs collaborate on DRM activities with NBSs at basin or catchment levels. NBSs in transport operations typically include planting vegetation or using other bioengineering measures to stabilize slopes or improve drainage to increase the resilience of critical infrastructure to floods and landslides.

The use of NBSs in DRR operations is constrained by an insufficient level of evidence on NBSs' benefits, as well as clients' and staff's lack of familiarity with these approaches and their perception that the approaches are too complex. Although the use of NBSs is increasing, little is known about their effectiveness in the portfolio. Such analysis requires rigorous considerations of costs and benefits, including social and environmental (such as ecosystem services and climate change) benefits. An analysis also requires scientific understanding of how NBSs function to reduce disaster risk. As noted by the Global Program on Nature-Based Solutions for Climate Resilience, "just planting a tree or protecting a forest, however, is not necessarily NBS" (Zanten et al. 2021). Although mangrove planting is a popular restoration approach, many planting projects fail to restore a functioning mangrove system, often due to inadequate understanding of socioeconomic conditions, ecological conditions, or a lack of community support. As such, it is critical to ensure that NBSs are, in fact, solutions (Zanten et al. 2021). Staff who are less exposed to programs such as the Global Program on Nature-Based Solutions for Climate Resilience, which is situated within the same GP as the GFDRR and the City Resilience Program, may be less familiar with NBSs and less able to benefit from the technical support offered by those programs. Recently, African regional directors requested greater GP collaboration on

NBSs. However, adoption of NBSs is also challenged by perceptions that they are too complex because they require many staff specializations and time-consuming engagement with land users. World Bank staff cited the short timeline of World Bank projects as a limitation and the need for greater skills integration.

[1] The evaluation team considered countries that (i) had at least one World Bank lending project between fiscal year 2010 and fiscal year 2020 and (ii) have an assigned lending status (International Development Association/International Bank for Reconstruction and Development/Blend) in 2022.

[2] For example, the use of mangrove restoration along the coasts of Vietnam to enhance existing gray infrastructure and reduce flood risk significantly cut the cost of damages to the dikes and resulted in large amounts of savings associated with avoided damages to private property and other public infrastructure (IFRC 2011).

3 Building Country Engagement on Disaster Risk Reduction

Influencing countries to undertake disaster risk reduction (DRR) is challenging due to the intangible and long-term nature of the benefits of DRR.

Rigorous analytical work that quantifies risks, assesses costs and benefits, and communicates impacts has influenced clients to undertake DRR actions. Much of this analytical work has been funded by the Global Facility for Disaster Reduction and Recovery.

Targeting the right actors and levels of government has been an important factor in the World Bank's ability to catalyze DRR action. When the World Bank has primarily targeted disaster agencies, progress on risk reduction investments or legislative change has been slow, whereas progress has occurred more quickly when the World Bank has targeted ministries of finance or planning or critical line ministries.

The World Bank's support for disaster reconstruction has been an important entry point for engaging on DRR, as have the trust earned and relationships forged through sustained sector engagements.

In small island developing states, important elements for enabling DRR involve tackling thin capacity, donor fragmentation, high transaction costs, and implementation difficulties. DRR engagements in fragility, conflict, and violence contexts have addressed disaster vulnerability but missed opportunities to address drivers of conflict and issues of social fragility.

This chapter provides lessons on what has worked and what has not in the World Bank's efforts to influence clients to undertake DRR. Despite the economic and social rationale for DRR, underinvestment in DRR has persisted in many countries (UNDRR 2015; World Bank 2013b). Nevertheless, the World Bank has often sought to influence clients to undertake DRR, especially by using its upstream advisory and analytical work and policy dialogue. What has made these efforts successful? The evaluation answered this question with an explanatory case method using 10 country studies. (See appendix A for methods details; see also appendix B, "Country Case Study Summaries.")

Influencing countries to undertake DRR faces particular challenges due to the intangible and long-term nature of DRR benefits. DRR activities involve investing today to benefit from reduced negative impacts from disasters tomorrow. These benefits are intangible and probabilistic, depending on the timing and magnitude of future hazard events. Many DRR investments do not have a direct financial return. Countries lack resources to invest in DRR and have a limited understanding of disaster risks and vulnerabilities, and their governments tend to favor politically visible post-disaster (rather than predisaster) measures.

Role of Nonlending

Rigorous analytical work that quantifies risks, assesses costs and benefits, and communicates impacts has played a central role in convincing key actors to undertake priority DRR activities. Analytical work that quantifies the magnitude and likelihood of future economic and fiscal costs of disasters has raised governments' awareness of the importance of and economic rationale for DRR and contributed to their decisions to prioritize DRR investments and policy measures. Laying out the cost-effectiveness of spending up front to make infrastructure resilient to reduce future repair and reconstruction costs has helped persuade governments to pay this additional cost. Presenting data in a compelling way, such as quantifying the number of at-risk students and teachers in nonresilient classrooms, has shown that DRR can be a credible political proposition. Quantifying risk across sectors

has enabled governments to set priorities and address critical risks first. For example, in Brazil, a flood damage and loss assessment for the state of Santa Catarina conducted risk profiling for resilience planning and produced municipal-level flood maps to identify flood asset exposure risks. This assessment helped convince the state government to include DRR in its operations and decision-making processes. In Manila, the Philippines, the World Bank used risk modeling and three-dimensional simulations of flood event scenarios to engage the central government and convince mayors to pursue transboundary flood management. In Mozambique, analytical work on the cost of disasters and likely increases due to climate change made a financial and fiscal case for DRR and showed the finance ministry that the lack of DRR was hampering development by requiring scarce public funds to be used for reconstruction rather than new investment. In interviews, stakeholders identified several aspects of good practice, including (i) making use of existing studies, (ii) engaging within existing data systems, (iii) communicating data and key messages in accessible ways, and (iv) ensuring that data underlying analysis are shared with government.

World Bank DRR analytics carried out in a consultative manner with governments have provided the detailed technical knowledge needed for investment and policy engagements while also enabling ownership and uptake. Analytical work on DRR has often facilitated investment or policy programs by not only identifying actions to take based on best practices but also building familiarity and capacity with technical partners. Technical assistance provided to governments has brought in international expertise in ways that have enabled governments to develop their own fit-for-purpose DRR strategies, improving ownership in the process. For example, in Brazil, the World Bank's state-level agricultural risk assessments underlay the integration of drought risk management concerns in sector projects. In Kerala, India, exhaustive ASA was undertaken on policy, institutional, and legislative reforms to inform the development of the Rebuild Kerala Development Programme, the government's flagship road map for resilience. World Bank experts provided advice and feedback on the government-led report, then supported its adoption through a programmatic DPO series.

Much of this DRR analytical work would not have been undertaken without grant financing, especially that provided through GFDRR, and these grants have helped fill gaps in country skills with international expertise. Countries are often reluctant to borrow for DRR-related technical assistance or analytics or to spend their own resources on expensive international consultants. However, DRR is a relatively new agenda in many client countries, and countries' civil services personnel often lack the necessary skills to introduce international best practices. Grant financing, then, is critical to provide the necessary analytical foundation for DRR. GFDRR has been critical because of the scale of its support, the depth of its own technical contributions, and its ability to commit to long-term programs of analytics. In the Philippines, grant financing was crucial for undertaking preparatory work for raising awareness, building capacity, and creating client demand. Many interviewees credited trust funds with enabling the World Bank's extensive DRR engagement because these funds provide sustained resources to allow uninterrupted support. In Romania, the government's ability to access European Union grants to procure reimbursable advisory services was critical for enabling the preparation of a seismic risk reduction strategy and flood management plans. The reimbursable advisory services compensate for gaps in civil service capacity. Two cautions are worth noting: First, grant-based technical assistance may be inefficient and ineffective if it exceeds client absorptive capacity. In the Organisation of Eastern Caribbean States (OECS), stakeholders expressed concern that there had been an overload of DRM analytics and technical assistance in recent years, driven by easy access to trust-funded grants, and that the analytics and assistance may have exceeded clients' capacity to make use of it or investment programs to operationalize it. Second, the constrained envelope for grant financing raises the question of whether advanced engagements could be weaned off of grant financing to allow this financing to be directed to other critical work.

Strategic Engagement

Targeting and engaging the right actors and levels of government have been important factors in the World Bank's ability to catalyze DRR investments or major policy reforms. Disaster agencies often have insufficient resources, capacity, or influence to enable DRR investments or actions at scale. Consequently, in countries where the World Bank has been successful in influencing clients to undertake DRR, it has strategically targeted central ministries with the power to influence agendas, such as finance and planning ministries, or critical line agencies with the mandate and capacity to undertake investment. For example, in the state of Bihar in India, the World Bank's engagement on flood risk reduction was successful because it primarily engaged the Water Resources Department rather than the Disaster Management Department. In the Philippines, cultivating uptake and ownership of DRR from the Bureau of the Treasury and the Department of Finance was critical for enabling high-level policy dialogue, achieving policy reform, and mainstreaming DRR throughout line ministries.

When the World Bank has primarily targeted disaster agencies, progress on catalyzing risk reduction investments or legislative change was slow. Disaster agencies have been key partners for disaster preparedness, coordination, and establishment of disaster strategies, but they tend to lack the capacity and influence to undertake investment programs at scale or to lead on policy reforms requiring sector agency implementation. Disaster agencies often have multiple mandates that they prioritize over DRR. Many have an institutional history and culture focused on civil protection, disaster response, and crisis management. During the coronavirus (COVID-19) pandemic, for example, many disaster agencies played a central role in pandemic response. In Armenia, the Ministry of Emergency Situations was the principal counterpart for the World Bank on DRR engagement, and it has the primary mandate for DRR. Although the ministry has made substantial progress on disaster policy frameworks and capacity building, it lacks the capacity and resources to undertake DRR actions while fulfilling its civil protection and crisis response role, and it had limited influence on other ministries. In Nepal, the

National Reconstruction Authority—responsible for disaster response and management—had little ability to address DRR in projects because of its reconstruction mandate. Disaster agencies have most effectively supported DRR when they played a supportive and coordinating role with line ministries and served as a supplier of technical expertise, without assuming sole responsibility for risk reduction, as in the OECS.

In many countries, much of the responsibility for risk reduction falls to regional or municipal governments, so engaging these governments has been important. In Brazil, the choice to partner with influential agencies with which the World Bank had an existing track record and relationship—the national interior ministry, the National Water and Sanitation Agency, and state governments—as well as the national disaster agency, was a key to success on drought risk mitigation. Working with and building the capacity of subnational stakeholders at the urban level and below has been important for promoting flood DRR. In India, most progress on DRR has come from engagements with state governments.

World Bank engagement of governments' committed counterparts ("champions") has been universally critical for achieving significant DRR progress by elevating the issue and providing sustained support for a long-term agenda, while an absence of champions has made progress difficult. Committed counterparts are important for DRR progress because the intangible and long-term nature of DRR results means that it does not have a natural constituency, and political economy factors will not usually prioritize it absent leadership. In Kerala, high-level support for resilience from the chief minister enabled the World Bank to engage the government on a long-term risk reduction agenda. In Ethiopia, an absence of champions contributed to inaction on flood risk reduction. Political instability or frequent turnover has often undermined DRR when champions are lost. In Armenia, too few individuals in government were willing to champion DRR, and this was compounded by changes in government and high turnover.

It has sometimes been possible for the World Bank to help government champions for DRR emerge through the insights included in its analytical work, long-standing sector relationships, knowledge exchange, or disaster

reconstruction. As noted, ASA has sometimes persuaded decision makers to promote DRR. Champions have sometimes emerged through relationships formed through prior sector work: in Brazil, the World Bank developed champions for drought risk management through years of engagement on IWRM and agriculture. Knowledge exchange and study tours have sometimes helped raise awareness and foster buy-in for senior officials. In Bihar and Kerala, international study tours to flood mitigation programs helped cultivate DRR support from senior officials. Disaster reconstruction efforts are high profile and visible and attract influential and ambitious leaders, so the World Bank's willingness to engage on disaster reconstruction and use it as a platform for risk reduction can convert influential leaders into DRR champions. However, at times, the World Bank must wait patiently until a time arises when such a champion is empowered.

Institutional Alignment and Incentives

Country management focus on, and support for, DRR has been a necessary condition for progress on DRR. CMU support is critical for enabling DRR by creating space in country programs, policy dialogue, and lending; by allocating budget and staffing resources; by setting expectations for mainstreaming in sectors; and by supporting GPs to work together. Strong CMU support was present in nearly all case studies; in cases where CMU support was lacking, progress was minimal. Leadership from country directors and managers with DRR experience was often important. In the Philippines, engagement on seismic risk reduction benefited from a country director who had experience from flagship World Bank seismic programs in Türkiye and China. In Romania, a country manager who had a technical background in disasters played a key role in the World Bank's reengagement on DRR after a hiatus.

Key Entry Points for Disaster Risk Reduction Engagement

In countries that experience frequent or high-intensity disasters, it has been easier to engage governments to act on risk reduction and for the World

Bank to convince governments to borrow for DRR. OECS countries are well aware of the need for DRR given extreme disaster frequency and vulnerability. This has made these clients very receptive to engaging with the World Bank on DRR, with little need for awareness raising through ASA. In Ethiopia, the frequency of drought risks and associated food insecurity has contributed to the country's prioritization of drought management in DRM strategies, disaster financing, and investment plans, while the less severe effects of floods have made it more difficult to progress on flood management. In the Philippines, the high frequency of floods and cyclones resulted in a high level of awareness of disaster impact, but lower awareness of the risks of low-frequency earthquakes meant that more work was needed to catalyze seismic risk mitigation.

The World Bank's support for disaster reconstruction has been an important entry point for DRR. It has often been difficult to get governments' attention for DRR until a serious disaster strikes. Afterward, governments often prioritize reconstruction, responding to immediate needs and political demands. The World Bank's willingness and reliability in helping governments with recovery and reconstruction have often created a platform for introducing risk reduction elements and setting the stage for ambitious future risk reduction. In Bihar, India, it was initially difficult to gain traction on a risk reduction agenda because of the government's prioritization of reconstruction and its limited fiscal resources and institutional capacity. However, by providing financing for reconstruction, the World Bank helped position itself as a long-term partner, which enabled sustained dialogue and engagement that led to risk reduction investments. Case studies in Bihar and Kerala found that long-term risk reduction can be politically popular and contribute to electoral success so long as quick disaster response and effective reconstruction efforts are prioritized. In both cases, state governments were reelected after disaster events, and interviewees attested that this was partly due to effective state responses to disaster events. In Mozambique, the World Bank's deployment of quick disbursing instruments after cyclones and floods helped build credibility and influence with the government and partners. In other cases, disaster response was the principal entry point for risk reduction.

The World Bank's ability to use disaster response to catalyze risk reduction has often depended on preexisting diagnostics that identify DRR priorities in disaster-prone countries that could be incorporated into a new disaster response engagement.

Post-Disaster Needs Assessments (PDNAs) that identify risk reduction actions and priorities and assess damage and loss have been important to foster risk reduction. The PDNA is an internationally accepted methodology for determining the physical damages, economic losses, and costs of meeting recovery needs after a disaster. PDNAs supported by the World Bank have been a useful platform for convening government and development partners to generate a shared vision of disaster reconstruction that includes risk reduction, which is necessary to develop an adequately funded disaster recovery framework that incorporates DRR. In the Philippines, the World Bank–supported PDNA after typhoons in 2009 undertook a multistakeholder dialogue and paved the way for a long-term DRR engagement. In Bihar, the PDNA after severe floods identified and initiated a dialogue on risk reduction options. In contrast, in Ethiopia, an absence of post-disaster damage assessments despite major flooding was a missed opportunity for dialogue and opportunities to engage on flood-related DRR.

DRR engagements have been enabled by the trust earned and relationships forged by the World Bank through its sustained sector engagements. In case studies, clients reported that they valued the technical competence and global knowledge provided by the World Bank, as well as its reliability in times of crisis. In India, long-term national engagements, such as the 25 years of support for improved water resources management, provided an opportunity to support the development of capacity and systems such as for flood forecasting, real-time hydrometeorology, and reservoir management. In Morocco, the World Bank's policy and investment engagement on DRR was made possible by trust from a government based on the technical expertise shared during the development of a key study assessing Morocco's resilience. In Romania, the World Bank's work and relationship with the finance ministry on prior crisis responses and broader development generated trust from the government in ways that enabled DRR engagement.

Local World Bank staff, who are not required to rotate frequently, have played an important role in building and sustaining the government relationships needed to enable long-term DRR engagement. In Brazil, local staff developed sectoral knowledge and forged institutional relationships with national and state counterparts necessary to enhance and sustain engagement on drought risk management. Staff permanence also facilitated collaboration among IWRM, agriculture, and rural development agencies.

Engaging on Disaster Risk Reduction in Small Island Developing States and Those Facing Fragility, Conflict, and Violence

In SIDS, such as the OECS, the most important elements to address to enable DRR include thin capacity, donor fragmentation, high transaction costs, and difficulties of implementation. Capacity constraints are systemic in SIDS: a few highly capable government staff bear most responsibility; there is high staff turnover and emigration, in addition to diseconomies of scale. Increased overseas development assistance for disaster and climate programs has also been characterized by fragmentation. In the OECS, the World Bank's efforts to address capacity and fragmentation have had mixed results, with implementation bottlenecks and limited absorptive capacity remaining significant obstacles. The World Bank has sought to address these issues by creating umbrella regional DRR platforms, using World Bank–executed trust funds to fill gaps and optimize impact, applying simplified procedures for small states, and providing hands-on support for project management, procurement, and safeguards, among other measures. The availability of financing is not a binding constraint, given deliberate efforts by the World Bank to devote funding to DRR in SIDS, sharp increases in concessional and grant financing, and expanded IDA envelopes with eligibility for SIDS and increased base IDA allocations.

DRR engagements in countries affected by FCV—such as Mozambique—have addressed disaster vulnerability but missed opportunities to concomitantly address drivers of conflict and issues of social fragility. Disasters caused by natural hazards can trigger conflict, acting as a threat multiplier

in situations with existing historical grievances. The World Bank's support for resilient reconstruction in Mozambique after the 2016 floods necessarily targeted its disaster-prone central and northern regions. However, as these are also some of the country's most politically fragile regions, more could have been done to assess and address conflict risks and, if possible, identify opportunities for peace building.

The World Bank's DRR engagement in Mozambique reflects many of the challenges identified in broader contexts in which disasters and conflict coexist. Disaster needs assessments conducted in FCV contexts have contributed to the World Bank's understanding of the situation in the field by providing actionable information to teams and creating a platform for coordination among actors. However, while these assessments address the impacts of conflict, including on conflict-affected populations, there is no process for assessing the conflict sensitivity of the needs assessment itself or the recommended priorities. It would be important for a conflict lens to be applied to the priorities established to make sure that implementing recommendations would not create or exacerbate existing grievances. This step requires a clear theory of change for how structural causes of conflict will be addressed in situations where these tools are used for peace building. Efforts to develop a DRR-FCV exchange began to yield relevant lessons, but the program has lacked adequate support from DRR donors (box 3.1).

Box 3.1. The Disaster Risk Management–Fragility, Conflict, and Violence Nexus Program

An increasing number of countries are affected by natural hazards and protracted conflict, which are mutually reinforcing and exacerbated by climate change. Fragility, conflict, and violence can be key drivers of disaster risk, and disaster risk may exacerbate preexisting conflicts and increase the risk of violence. This growing recognition of intersecting risks prompted Global Facility for Disaster Reduction and Recovery staff, together with the World Bank, to develop a Disaster Risk Management–Fragility, Conflict, and Violence Nexus program to promote cross-fertilization of knowledge and skills. Although studies, trainings, and pilot activities were launched, this initiative

(continued)

Box 3.1. The Disaster Risk Management–Fragility, Conflict, and Violence Nexus Program (cont.)

has not received wide donor support because it has been suggested that donors fear spreading disaster risk reduction money too thin and outside of areas experiencing high-intensity hazards, even though early analyses appear to have been yielding valuable observations. For example, in Papua New Guinea, a lack of conflict sensitivity in response to a disaster ran the risk of triggering conflict between the government and communities with existing grievances. Yet the program has not advanced since a secondee appointed by a singularly supportive donor was recalled and the lead staff retired.

Source: Independent Evaluation Group.

4 | Effectiveness of the World Bank's Disaster Risk Reduction Activities

Most disaster risk reduction (DRR) operations are not providing sufficient information to understand the level of DRR being achieved, which inhibits an understanding of DRR contributions to development impacts. Most resilient infrastructure investments lack information on resilience standards; many development policy operations lack evidence on the results of policy changes.

The World Bank is increasingly identifying and addressing the needs of some groups that are disproportionately impacted by disasters; however, for other groups, there is slow progress and limited reporting on DRR benefits.

DRR investment projects often effectively support infrastructure construction, but they do not explicitly address operations and maintenance that are required for long-term resilience. This shortcoming is more evident in core disaster projects mapped to the Urban, Disaster Risk Management, Resilience, and Land Global Practice than in sectoral infrastructure projects.

The World Bank has been more effective in developing early-warning systems infrastructure than in delivering early-warning system services (for example, forecasting and community-preparedness activities).

Disaster insurance activities have had a limited impact because insurance programs have had difficulty in reaching scale. However, these activities have made progress in awareness raising, capacity building, and product development.

DRR policy reforms have achieved about three-quarters of their indicators, but just more than one-third of indicators capture evidence on downstream effectiveness. Development policy operations have provided valuable disaster-contingent financing.

The World Bank has been highly effective on DRR when it has had sustained engagement using multiple instruments and interventions and when it has deliberately engaged to achieve replication by others.

This chapter assesses the extent to which the World Bank articulates and measures disaster risk–related outputs and outcomes, as well as the results and factors of effectiveness for key DRR approaches. It does this first by assessing the articulation of intended DRR results and how these results are measured in the DRR lending portfolio. It also includes an analysis of DRR project beneficiaries, with a particular focus on how projects identified, addressed, and tracked benefits for disaster-vulnerable groups. Second, this chapter assesses results and generates lessons on factors of effectiveness for four key approaches in the DRR portfolio: disaster-resilient infrastructure, EWSs, disaster insurance, and DRR policy reforms. Third, this chapter presents findings from an analysis of cases in which World Bank DRR activities had highly successful results.

Identifying and Measuring Disaster Risk Reduction Results and Outcomes

Most DRR operations are not providing sufficient information to understand the level of DRR being achieved (for example, reduced exposure and vulnerability), which inhibits an understanding of DRR contributions to development impacts (reduced economic loss and mortality). Although most DRR IPFs have outcome-oriented objectives, such as to build resilience or reduce exposure or vulnerability to disasters, many of these projects do not provide sufficient information to determine whether these goals are being met. Although 89 percent of all IPFs have some DRR indicators in their project documentation, for 61 percent of these, indicators are often articulated only at an output level. For example, for projects that seek to achieve DRR through resilient infrastructure, the most frequently occurring indicator is the length of infrastructure or protective works constructed. Outcome indicators for IPF that support resilient infrastructure could include, for example, the standard to which the infrastructure was built and the contribution of that infrastructure to reduced exposure and vulnerability. For DPOs, only 35 percent of operations had at least one outcome indicator. Box 4.1 includes examples of relevant outcome indicators to assess World Bank IPFs and DPOs' contributions to development impacts.

While the share of projects that include DRR outcome indicators is rising, so is the share of projects that have no DRR indicators, which is associated with

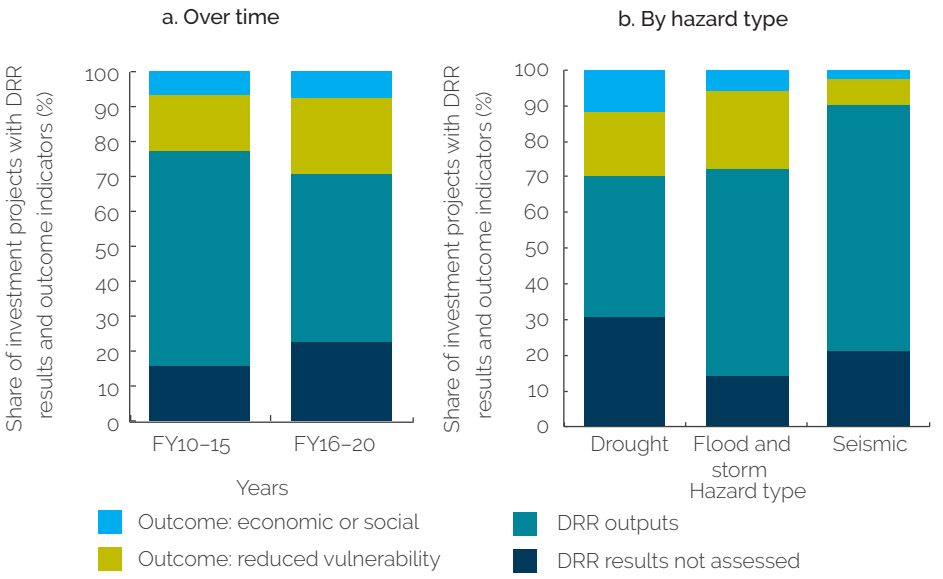
the increased number of sectoral operations that include mainstreamed DRR activities. Figure 4.1 shows that 28 percent of the DRR projects approved in the second half of the evaluation period included DRR-related outcome indicators, as compared with the 24 percent of DRR projects approved in the first half. From the first half of the evaluation period to the second half, the share of projects with DRR activities but without any indicators of DRR results rose from 16 to 24 percent. This decline in the inclusion of DRR indicators was mainly found in mainstreamed sector projects whose objectives often included aims to enhance the climate resilience of infrastructure or to build resilience through sustainable land and water activities. Some core projects that support post-disaster emergency operations also lacked DRR indicators.[1]

Box 4.1. Good Practice Outcome Indicators for Disaster Risk Reduction in World Bank IPFs and DPOs

For investment projects that seek to build resilience to flood risks, informative disaster risk reduction indicators include the following: the number of people protected from a flood of a certain recurrence interval due to the infrastructure having been built to a resilient standard (as in the Dar es Salaam Metropolitan Development Project); an estimated increase of per capita farmer income or a reduction in economic losses occurring from floods due to resilient infrastructure (as in the Huai River Basin Flood Management and Drainage Improvement project); or a decrease in the number of days of interrupted traffic due to flooding (as in the Jamaica Disaster Vulnerability Reduction Project). For investment projects that address drought risks, such as the Shire River Basin Management Program or the Strengthening Climate Resilience Project in Zambia, good indicators included an estimated change in risk levels of disaster-vulnerable households (due to improved water management) and the increased level of household incomes derived from diversified and disaster-sensitive sources. Other good outcome metrics include decreased time for the restoration and resumption of use of assets and services (for example, restoration of economic activities, access to health care and schools). For development policy financing operations, useful outcome indicators included improvements in lead time for flood operations (Mozambique), the percentage of smallholder agricultural land covered by disaster insurance (Mexico), and an increase in the share of new buildings that comply with building standards (Grenada).

Source: Independent Evaluation Group.
Note: DPO = development policy operation; IPF = investment project financing.

Figure 4.1. Outcome Indicators for Disaster Risk Reduction Investment Projects (FY10–20)



Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; FY = fiscal year.

DRR results reporting significantly varies by hazard: the reduction of flood risk is more likely to be measured than the reduction of drought risk. Most projects that aim to reduce the risks of flood and storm (84 percent of 407 flood projects) articulate and include indicators that measure some level of DRR result. However, almost one-third of projects that address drought risks (31 percent of 174 projects) do not measure drought-related results (figure 4.1). These projects are often multihazard projects that include metrics for flood-related events but not for drought. Outcome-level reporting for seismic risk is also rare, as it is challenging to measure or predict a reduction in risk related to earthquake impact. As compared with other hazards, earthquakes are infrequent, even in areas where there is significant risk. Only 9 percent of the DRR portfolio that addressed seismic risks (8 projects) used outcome indicators in their disaster risk–related reporting (figure 4.1). Projects in St. Vincent and the Grenadines and Grenada are good examples, as they included estimates for the number of beneficiaries with reduced risks due to the enhanced resilience of public buildings.

Targeting and Tracking Disaster-Vulnerable Groups

People living in poverty, who are more likely to live and work in areas with high disaster exposure, face high risks from disasters. Efforts to mitigate poverty and disaster risks are complementary, as poor populations are highly affected by disasters (Hallegatte et al. 2017). Disasters can lock already poor individuals into poverty traps because their assets are too minimal to recover even in the long term (Hallegatte, Rentschler, and Walsh 2018).

There are populations that are disproportionately negatively affected by disasters because they are both highly exposed to disaster risk and extremely vulnerable (most susceptible to disaster impacts). The World Bank is producing a body of analytics that considers the needs of disaster-vulnerable persons (Erman et al. 2021; Krylova, Sirker, and Haile 2021; Williams 2020; World Bank 2022b, 2022c). To determine how DRR projects have identified, addressed, and tracked benefits for groups that disproportionately suffer from disasters, the evaluation conducted a content analysis of 135 closed projects and compared these with the content of 82 projects approved in FY20 (see appendix A). The most-referenced disaster-vulnerable groups for which this evaluation could assess trends include women and girls, children and youth, persons with disabilities, and the elderly (other disadvantaged groups may include ethnic minorities or migrants, for example). The disaster-related vulnerabilities of these groups are described in box 4.2.

The World Bank is increasingly identifying and addressing the needs of some groups disproportionately impacted by disasters; however, for other groups, there is slow progress and limited reporting on DRR benefits. Findings for the most frequently referenced disaster-vulnerable groups are discussed in the following sections.

Box 4.2. Marginalized and Disadvantaged Groups at Risk of Suffering the Most from Disasters

Women and girls. Disasters disproportionately impact the life expectancy of women. A study of 141 countries found that disasters lower women's life expectancy more than men's due to higher morbidity and more severe economic impacts, including higher rates of unemployment. Female-headed households are more exposed—for example, in Bangladesh, there are three times as many female-headed households in flood-prone zones as in noneroded ones. The risk of gender-based violence and child marriage is also prevalent after disasters.

Children and youth. Children compose one-third of the global population and one-half of the extremely impoverished population. Disasters affect household welfare in ways that reduce children's access to nutritious foods and health services, leading to permanent stunted growth of children, and their access to education, contributing to declining enrollment rates and an increase in the number of dropouts. In Africa, enrollment rates declined 20 percent in drought-affected regions, with similar post-disaster impacts reported elsewhere.

Persons with disabilities. More than 1 billion people live with disabilities, 80 percent of whom reside in developing countries. The United Nations estimates that 20 percent of the world's poorest populations have a disability. Limited mobility, discrimination, and other barriers increase vulnerabilities during a disaster. For instance, the fatality rate for persons with a disability in Japan after the 2011 Tohoku earthquake and tsunami was four times higher than that of the general population.

Elderly individuals. Studies indicate that by 2050, one in five people in developing nations will be more than 60 years old. The elderly are particularly vulnerable to hazards due to lack of mobility, preexisting health issues, nutritional needs not considered during emergencies, and isolation from families and social services.

Sources: Arnold et al. 2018; De Silva and Burton 2008; Erman et al. 2021; Hallegatte, Rentschler, and Walsh 2018; Shetty 2012; UN 2021; World Bank 2020a.

Although women and girls are increasingly being integrated into the design and tracking of DRR activities, significant gaps remain in integrating them into DRR planning processes, particularly at local levels. Sixty-three percent of FY20 projects versus 21 percent of closed DRR projects integrate gender considerations in DRR activities and increasingly measure gender-related DRR outcomes, including by focusing on women's agency in decision-making. Sixty-five percent of FY20 projects versus 29 percent of closed DRR projects integrated indicators to track gender-related DRR benefits.

The World Bank is increasingly identifying and addressing the vulnerability of children and youth in DRR contexts but often not tracking these disaggregated results. Twenty-eight percent of FY20 projects versus 10 percent of closed DRR projects integrate youth considerations in DRR activities. However, only 39 percent of the FY20 projects and 43 percent of the closed DRR projects that integrate youth tracked their results, except for safer school and emergency shelter activities (where awareness was increased, exposure was decreased, or education services were resumed).

There is very slow progress in integrating the needs of persons with disabilities and the elderly into DRR activities, and no DRR disaggregated results have been tracked. Eighteen percent of projects approved in FY20 versus 4 percent of all closed DRR projects integrate considerations regarding persons with disabilities in DRR activities; the elderly are integrated in 12 percent of FY20 projects and 7 percent of closed DRR projects. However, only one project tracked results for persons with disabilities, and none tracked results for the elderly. Projects supporting persons with disabilities and the elderly included accessibility standards, mobility, and building-use considerations, but few integrated these groups into DRR decision-making (except community-based DRM committees in Vietnam and Indonesia). The Istanbul Seismic Risk Mitigation Project developed guidance titled "First 72 Hours for the Individual and Family in an Earthquake" and effectively used accessibility standards in the construction of public facilities. A noteworthy trend is that projects approved in IDA countries in FY20 include these groups, whereas for closed projects, these groups were only cited in IBRD projects.

Results of Key Approaches and Explanatory Factors of Effectiveness

This evaluation reviewed results achieved and factors of effectiveness for four key activities. It was infeasible for the evaluation to carry out a systematic review of results given the large and heteronomous nature of the DRR portfolio. Instead, the evaluation reviewed key activities based on portfolio size and consultations with World Bank management. These key approaches included (i) disaster-resilient infrastructure, (ii) EWSs, (iii) disaster insurance, and (iv) DRR policy actions. For each activity, the evaluation reviewed completion reports for all closed projects that featured this activity and identified results achieved or not achieved, as well as factors of effectiveness.

Disaster-Resilient Infrastructure

The World Bank has successfully built or strengthened disaster-resilient infrastructure or protective works in two-thirds of projects that had this aim, whereas significant shortfalls in other projects were mainly associated with engineering capacity, procurement issues, and delays due to working in areas at high risk for disaster. There were 60 closed IPFs with disaster-related objectives that included construction or rehabilitation of resilient infrastructure, including irrigation and drainage, roads, schools, and hospitals or protective works. These projects included 174 indicators relating to resilient infrastructure. Two-thirds of these projects fully or mostly achieved their infrastructure targets. Another quarter failed to deliver planned infrastructure due to weak engineering designs, procurement issues, and delays caused by hazards. For example, in India, a coastal protection project achieved only half of its planned embankments due to delays caused by storms. The project had difficulties in obtaining bids for small civil work projects in high-cost remote areas, and it underestimated the time needed to obtain environmental permits for work. A project in Mozambique rehabilitated only half of the planned dikes and levees because of cost overruns and procurement delays. In Haiti, less than half of the planned multihazard-resilient evacuation shelters were reconstructed due to insufficient coordination unit capacity, delays in procurement, insufficient resources for resettlement compensation, and financing delays from high turnover in ministers.

Enhancing design standards is critical for achieving resilient infrastructure, but project documents do not provide sufficient information on the standards applied to validate probable DRR results. Design standards that contemplate an appropriate level of resilience are important in both the construction and rehabilitation of infrastructure and assets. Incorporating the evolution of hazards over time due to climate change, deforestation, and urbanization is also essential. If projects use a probabilistic risk estimation, they can calculate the cost implications of different levels of resilience, enabling risk-informed decisions on standards. In the absence of an estimation, asset owners may be taking on hidden contingent liabilities, which will demand future investments. In most of the projects reviewed (92 percent), the introduction of design standards was used to strengthen the resilience of infrastructure assets. However, explicit references to standards used for resilient infrastructure (for example, that infrastructure is resilient to a 1-in-50-year flood rather than a 1-in-20-year flood) were included in only 35 percent of the completion reports for these projects. Other projects referred to a general intent to build resilience or build back better, or they provided anecdotal evidence that the strengthened resilience was effective, normally when a disaster occurred before project completion. Furthermore, only 7 projects out of 60 indicated that the resilience standards proposed were informed by a fully probabilistic risk estimation—one that not only informs the resilience standards adopted but also can be used to calculate future expected losses using conventional financial risk metrics, such as average annual loss and probable maximum loss. None of the projects indicated whether climate change was integrated into probabilistic risk metrics. Twenty-two projects did not refer to risk identification or estimation at all.[2]

Efforts to identify and address territorial or system-level risks amplified the effectiveness of infrastructure activities to achieve wider resilience aims. Twenty projects out of 60 (primarily in the Water and ENB GPs) included activities that addressed underlying risk drivers, such as strategies for water rights management or forest management or inadequately planned urban development. For example, in Xinjiang, China, a strategy for water rights management complemented water storage infrastructure improvements to address drivers of environmental degradation and falling water tables and reduce drought risk. In Dakar, Senegal, a flood reduction project included

both stormwater drainage infrastructure and the integration of flood risk consideration into urban planning, including solid waste management.

Most resilient infrastructure projects did not explicitly address deficiencies in O&M, which is likely to undermine the long-term resilience of built or rehabilitated infrastructure. A justification for many resilient infrastructure projects is that infrastructure has deteriorated over time due to deficient O&M, to the point where a new project is required to rehabilitate the infrastructure. Moreover, for resilient infrastructure, this deterioration is often associated with exposure to hazards. Unless budgets and arrangements for O&M are adequate, a cycle of build-neglect-repair/replace is likely to continue, which undermines resilience. Out of 60 projects, 16 directly addressed O&M deficiencies through measures such as the creation of new budget lines, institutional reforms, or design of new revenue or pricing mechanisms for infrastructure services. Of these, only 1 project at closure raised concerns about the sustainability of O&M. In contrast, 19 of the 30 projects that did not directly address O&M deficiencies raised concerns about effectiveness and sustainability of O&M at closure (in 4 projects, documentation was insufficient to draw a conclusion). These concerns included the weak institutional capacity of agencies responsible for planning and implementing O&M, the absence or insufficiency of existing budget lines for O&M, a lack of clarity over institutional responsibilities (leading to weak accountability), and so on. Although in some projects funds were provided for O&M during the project, Independent Evaluation Group validations often raise concerns that this is unlikely to solve underlying deterioration. Efforts to address O&M were more common in sectoral projects such as those mapped to the Water or Transport GPs, while only 2 of the 29 resilient infrastructure projects mapped to the Urban, Disaster Risk Management, Resilience, and Land GP directly addressed O&M deficiencies. This may be because it is more difficult to address sectoral infrastructure issues such as O&M in multisector disaster operations, and sector specialists prioritize these issues to a greater degree than disaster specialists.

Community engagement in the development of local resilient infrastructure systems is associated with the systems' effective construction or rehabilitation and likelihood of sustainability. Local infrastructure systems provide essential services to individuals, households, communities, and businesses

and can include water, drainage, sanitation, local road, health, and education facilities. There are 26 closed and evaluated DRR projects that used community approaches to help build resilient local infrastructure systems. All 26 projects met their infrastructure targets; evidence attributes results to the enhanced relevance of the infrastructure and ownership by communities for their O&M. Two-thirds of the projects went deeper by engaging communities in consultations on DRR activities and delegating decision-making responsibility to community organizations. Engaging community organizations to discuss the most appropriate approaches and solutions to local infrastructure systems was an explicit component of these projects and was undertaken at the planning stage. These projects addressed the sustainability of local infrastructure systems (including ecosystem services) on which local livelihoods and welfare depend. Community ownership of local infrastructure systems and services strengthened sustainability and facilitated longer-term O&M of the infrastructure assets, a necessary factor for achieving sustained disaster resilience.

Early-Warning Systems

The World Bank often supports the development or strengthening of EWSs to help reduce disaster risks in advance of hazard events. EWSs are defined as "integrated systems of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities, systems, and processes that enable individuals, communities, governments, businesses, and others to take timely action to reduce disaster risks in advance of hazardous events" (UNDRR 2016). The World Bank has helped develop or strengthen EWSs in 150 projects across 69 countries since FY10, of which 35 projects (32 IPF and 3 DPF) are closed and evaluated and are the subject of this assessment. (There were also 47 nonlending projects covering EWSs outside the scope of this effectiveness assessment.)

Effective EWSs require support for four interlinked elements. These elements are derived from a World Meteorological Organization checklist (WMO 2018). First, EWSs require the collection and curation of disaster risk information—"comprehensive data collection, mapping and analyses of all dimensions of disaster risk, including hazards, exposure, vulnerability, and capacity, related to persons, communities, organizations, and countries and

their assets." Second, they require equipment, technologies, and capacity building for multihazard detection, monitoring, analysis, and forecasting of the hazards and potential consequences. Third, they need support for communication and dissemination to ensure people receive timely warnings and to facilitate coordination and information exchange. Fourth, they require support for disaster preparedness, public awareness, and response capabilities—institutions and people that are enabled to act early and respond to warnings through risk education. The following sections elaborate on the effectiveness of World Bank support in achieving these interlinked elements.

Disaster Risk Information

The World Bank's support for hazard mapping, a critical component of disaster risk information systems, has enabled clients to map the probable location and intensity of disasters but often not the vulnerability levels of affected populations or their capacity to respond. In the EWS portfolio, hazard mapping included the development of hydrometeorological models, flood risk and landslide susceptibility maps, cyclone hazard risk atlases, digital elevation maps, aerial photography, and geographic information systems. In all but three EWS projects, support for hazard mapping successfully helped clients (for example, hydrometeorological and DRM agencies) identify where hazards are likely to occur, as well as their likely intensity and frequency. However, the same projects reported much less on how they assessed the potential vulnerability of affected groups. Two examples where vulnerability was assessed were in Rio de Janeiro and in Togo. In Rio de Janeiro, the World Bank supported hazard mapping in 15 municipalities with landslide risk, resulting in the identification of 16,000 inhabitants living in high-risk areas. In Togo, the World Bank helped update an urban topography map, establish a database on settlements, and assess the population's vulnerability to floods.

Detection, Monitoring, Analysis, and Forecasting

Although EWS infrastructure has been put in place, intended forecasting capabilities were only successful in half of all projects with this aim. The World Bank built or repaired hazard detection, monitoring, analysis, and forecasting infrastructure and technologies in three-quarters of closed EWS projects. EWS forecasting infrastructure includes meteorological, hydrological, and

seismic monitoring stations; weather stations; and radar systems. All but two projects achieved their infrastructure aims. However, efforts to enhance the accuracy, availability, and timeliness of forecasting through technological innovation and capacity building were successful only in half of these projects. For example, in Mozambique, hydrometeorological monitoring stations were transmitting hourly data for forecasting at project close. However, projects in Brazil, Peru, Chad, and Haiti failed to meet their forecasting goals. In Brazil, data collection stations for precipitation and water levels were off-line at project close, and while equipment was acquired, software to process EWS information was not installed. In Peru, none of the EWS subprojects were completed due to cumbersome review and clearance procedures required by the government. In Chad, network issues prevented the transmission of data from the stations. In Haiti, the hydrometeorological system was not operational at project close. In Madagascar and Somalia, where the World Bank partnered with the United Nations and humanitarian agencies, there was a lack of reporting on forecasting capabilities.

A World Bank stocktaking of southern African EWSs shows how a lack of sustainable funding and, relatedly, the lack of maintenance of observation infrastructure undermine gains made in forecasting capacity. A stocktaking of EWSs in 16 southern African countries found that significant portions of their observation infrastructure, including sensors, radars, and weather stations, were no longer operational. According to the agencies interviewed, this is due to a lack of sustainable funding for transport, spare parts, and staff to repair and calibrate the infrastructure. Rainfall radar, for example, was operational in only 3 of the 16 countries; many other types of infrastructure had fallen into disrepair (World Bank 2021f).

Although EWSs work best when they include impact-based forecasting, only half of the projects articulate this intent, with most achieving this aim. Impact-based forecasting targets specific vulnerable groups, generating targeted alerts associated with required actions (for example, making disaster-related decisions or enabling evacuation). Of the 35 closed EWS projects, 17 supported impact-based forecasting, and 14 achieved this aim. In India, Mozambique, Moldova, and São Tomé and Príncipe, impact-based forecasting helped fishermen decide whether to go to sea. In India, impact-based forecasting activities in a cyclone risk mitigation project enabled a local government to

suspend fishing activities and evacuate 200,000 fishermen ahead of the landfall of Cyclone Fani. In Moldova, Nepal, and Vietnam, farmers were provided agrometeorological information and weather forecasts to enable decisions about planting; in Nepal, this resulted in improved productivity and reduced crop losses during floods. In Malawi, Togo, and China, impact-based forecasts helped authorities change the water discharge volume of dams and reservoirs ahead of extreme rainfall events to reduce flood impacts.

A key element of successful impact-based forecasting is the targeting that is enabled through participatory design. Engaging directly with communities enables experts to identify the types of decisions that can be informed by forecasting, the information needed to make those decisions, and the communication style to use, adapted to the capacity of communities (Baudoin et al. 2016; Sufri et al. 2020). Participatory approaches were often key elements of success in implementing forecasting. They enabled continuous improvement of design and trust-building—a critical factor in whether communities choose to heed a warning. In São Tomé and Príncipe, the project team engaged with fishing communities to understand how they make decisions about when to go to sea. Having learned that the fishermen placed trust in traditional forms of weather detection and community information exchange, the project enhanced the utility of its forecasting and alert system. Furthermore, the trust established through participatory approaches enabled the project team to have effective discussions with communities on relocation.

Almost one-quarter of the closed portfolio achieved expanded lead time through enhanced forecast capacity, enabling communities to better prepare and respond to imminent hazard risks. The expanded lead time for severe weather warnings refers to the increased amount of time that communities are given to prepare for and respond to sudden onset hazards. One-quarter of closed EWSs aimed to increase lead time or timeliness, and all but one reported positive outcomes. For example, in Moldova, the lead time for severe storm weather warnings was expanded from three to six hours. In Vanuatu, the increased lead time of seismic monitoring helped the government issue evacuation orders after the occurrence of a 7.6 magnitude earthquake in 2018.

Coordination, Communication, and Dissemination

The degree of coordination among relevant agencies was a common marker of success in EWS projects. Effective EWSs require timely communication and information exchange among agencies that manage meteorological, hydrological, climate, and disaster response. All but two EWS projects with interagency coordination achieved their data analysis and hazard forecasting aims. The Mekong Integrated Water Resources Management Project demonstrates that "it is essential to identify roles, responsibilities, and coordination mechanisms from the project outset. Without coordinated procedures across the agencies responsible for forecasting, hydrology, and risk communication, it is not possible to have a functional EWS" (World Bank 2020i). Likewise, the successful Moldova EWS project shows that "the multiple systems needed for hydrometeorological services delivery—including observation, data management, meteorology, hydrology, climatology, visualization, forecasting, and dissemination—must communicate effortlessly with each other" (World Bank 2017h).

Effective emergency communications in times of disaster require building the redundancy and robustness of telecommunication and electric power infrastructure. The need for redundancy in disaster communication and dissemination systems was a lesson of effectiveness in EWS projects in India, São Tomé and Príncipe, Togo, and Mozambique. In these projects, the World Bank supported multiple communication channels among populations that had uneven access to technologies. These included horns, radio warnings, cell broadcasts, or interactive voice-response technologies fused into a multichannel warning system.

Disaster Preparedness, Public Awareness, and Response Capabilities

Enhancing communities' disaster preparedness is key to maximizing the effects of upstream DRR investments—and saving lives—but few projects demonstrate that such preparedness activities will be effective in the face of disaster. Investments in EWS communication systems, shelters, and evacuation routes do little to reduce vulnerability if communities cannot react to

warnings promptly. Mock drills, for example, can increase awareness about safe evacuation procedures and save lives. Of the 20 closed EWS projects that sought to strengthen disaster preparedness and response capacity, 60 percent did not report on community-preparedness results and another 10 percent included claims not backed by evidence. Only three projects included verifiable evidence on the effectiveness of preparedness activities. In India, the training of 535 village DRM task forces and the conduct of mock drills facilitated timely evacuation and strengthened local search and rescue capacity. In Mozambique, a beneficiary survey found that daily forecasts and impact-based warnings changed behavior.

Sustainability of Early-Warning Systems

Only a few EWS projects—all of which exclusively support EWSs—incorporate the factors that enable the O&M of EWS. The O&M of networks of sensors, weather stations, alert equipment, and other technology is key to operating EWSs. Only 4 of the 35 closed projects—in India, São Tomé and Príncipe, and Togo—supported EWS maintenance. These were "stand-alone" projects; EWSs were the main aim. However, projects that included an EWS as a component did not focus on O&M. A World Bank stocktaking of EWSs in African countries found that a lack of sustainable financing is responsible for limited EWS service provision. In these countries, river gauge and hydrometeorological infrastructure is often in disrepair (World Bank 2021f). Power and connectivity are key issues, adversely affecting telemetry networks and communications among stations, central offices, and end users.

Disaster Insurance

Disaster insurance is an important part of the World Bank's work on disaster risk finance. The World Bank's support to clients on disaster risk finance includes mechanisms such as reserves, contingent credit, catastrophe bonds, disaster funds, adaptive social protection schemes, parametric insurance, insurance for public assets, and promotion of catastrophe risk insurance markets. This evaluation focuses on disaster insurance as a key activity because there is a body of evidence on results; many other aspects of disaster risk finance have been supported primarily through analytics and advisory

services, which have not been evaluated, or are part of more recent projects that have not yet been completed.

Disaster insurance works to increase the preparedness of affected public or private entities by transferring disaster risk. Insurance schemes collect premiums and make payouts should a disaster occur and thus can improve preparedness and enhance resilience by reducing the financial impact of disasters. However, the potential of disaster insurance to achieve DRR impacts depends on the size and scale of its coverage: if the number of participants or share of assets covered is too low, then the payout will be too limited to meaningfully offset the negative impacts of disasters. The World Bank has approved 46 lending operations (23 IPF and 23 DPF) with disaster risk insurance in 30 countries, of which 20 are closed and have an Implementation Completion and Results Report, supporting 13 insurance programs. These operations have supported disaster and asset data collection, modeling and risk assessments, market research, adoption of authorizing laws or policies, development of insurance products, awareness raising, and the financing of premiums. Insurance is offered in different forms for sovereigns, businesses, or households for indemnity or index-based approaches, and it covers a range of hazards. There are also 40 disaster insurance nonlending activities outside the scope of this assessment.

Disaster insurance activities targeting businesses or households have had difficulty reaching scale and sometimes lack evidence on coverage. Of eight insurance schemes of this type supported by closed operations, only half have evidence of insurance uptake targets being achieved, and one was a small pilot. For the other four cases, schemes failed to achieve their targets or provided inadequate evidence. For example, in Kerala, India, an agricultural insurance program achieved two-thirds of its intended increase in the number of farmers covered. In Mongolia, a herder insurance scheme reached only 11 percent uptake despite years of awareness raising. Herders often insured only small parts of their herd to access subsidized loans, and the program was ill attuned to traditional risk mitigation strategies (World Bank 2020b). Several disaster insurance projects may report on awareness, access, or payouts but not on insurance coverage. In these cases, claims are made about the high level of insurance access enjoyed by affected populations because products have been developed where none existed before. In

Sri Lanka, an operation supporting a national household disaster insurance scheme reported on total payouts but not penetration rates or the number of beneficiaries.

Insurance programs have struggled to achieve high penetration rates in part because clients have found it difficult to make insurance mandatory without public subsidy. World Bank efforts to go straight to a mandatory catastrophe insurance program have usually been unsuccessful; the World Bank has been more successful when it has built disaster insurance demand incrementally, including by focusing on submarkets to demonstrate success. Although mandatory insurance is desirable for its ability to maximize the size of the insurance pool and avoid adverse selection problems, it may not be achievable without significant prior experience with voluntary programs, and it is politically challenging to implement. In the case of the South East Europe and Caucasus Catastrophe Risk Insurance Facility, the governments of North Macedonia, Serbia, and Kazakhstan expressed strong political reservations against making catastrophe insurance compulsory. Consequently, penetration rates were much lower than planned: in North Macedonia, these rates were only 1 to 2 percent, compared with the planned 10 to 15 percent. Some projects have stepped back from efforts to support mandatory insurance, instead focusing on alternative market-based solutions. For example, in Kazakhstan, when the authorities postponed the implementation of a compulsory catastrophe insurance program, they launched insurance products in the agriculture sector and weather-risk market. The work featured extensive consultations with farmers to assess affordability and set premiums suitable to local conditions. Targeted coverage rates were achieved for agricultural insurance programs in Mexico and Colombia that covered low-income smallholders, but these schemes required tight targeting and public subsidies.

Projects supporting sovereign insurance have often been only partially successful because many countries have achieved only moderate coverage or have dropped coverage completely. Often, the small size of sovereign insurance contracts means that while they provide valuable liquidity to support disaster response, they cover only a small portion of the cost of disasters to governments. For example, the World Bank played a critical role in establishing the Caribbean Catastrophe Risk Insurance Facility, a multicounty parametric insurance pool that provides insurance coverage to governments for

cyclones, earthquakes, and storms at a relatively low cost. The World Bank has been successful in supporting the expansion of participating countries, and the program has widened the hazards it offers coverage for, but countries have not significantly increased coverage levels. Across sovereign insurance programs, governments also often signal a desire for insurance coverage for frequently occurring disaster events but find the cost of insuring such events too high. Several countries have discontinued their use of World Bank–supported sovereign disaster insurance. Some Pacific Island countries dropped participation in a regional parametric insurance program because the disasters they faced were not trigger events. The Solomon Islands dropped its insurance coverage because it did not receive a payout to cover earthquake or storm damage, because the earthquake damage was not sufficient to meet the selected threshold, and the wind speed of the storm fell short of the cyclone level needed to trigger payments, despite significant flooding. Similarly, Vanuatu and the Marshall Islands dropped coverage because the insurance covered cyclones but not damages from drought (experienced by the Marshall Islands) or from volcanoes (experienced by Vanuatu). Other countries, however, have continued their coverage, such as Samoa and Tonga. In the Philippines, the government chose not to renew the parametric disaster insurance program supported by a World Bank DPO, finding that a catastrophe bond better met their disaster risk financing needs.

Despite their limitations, disaster insurance activities have made progress on awareness raising, capacity building, and product development and have mobilized private capital. These are important building blocks for future progress on insurance market development and the broader ability of governments to manage their financial disaster risks. For example, in the Marshall Islands and Vanuatu, experience with insurance projects and associated policy dialogue increased government capacity to consider financial disaster risk and made the countries more sophisticated consumers of financial DRM products, including noninsurance approaches. In the Philippines, risk modeling developed for a discontinued parametric insurance program helped enable the creation of a catastrophe bond. Disaster insurance and other catastrophe risk instruments have also served to mobilize private capital, which is critical because public funds alone cannot offer sustainable disaster risk finance solutions.

Disaster Risk Reduction Policy Reforms

The World Bank has used policy lending instruments to engage on DRR policy reform and to provide disaster-contingent credit. The World Bank approved 84 DPOs since 2010 (14 percent of the DRR portfolio) that include DRR policy actions. An important subset (27 operations) are catastrophe deferred drawdown options (CAT DDOs), which provide a contingent credit line that can be accessed after a disaster, rather than disbursement at the time of approval, and have policy actions related to improving disaster policy. Of the 84 operations, 33 are closed and have completed self-evaluations, which are the subject of this effectiveness analysis.

DPOs supporting DRR policy reforms have achieved nearly three-quarters of their DRR indicator targets, but only a small number of these indicators captured downstream results. Many DPOs with DRR actions have broad objectives that are not closely related to disasters, so achievement of indicator targets is a more useful metric of success than achievement of objectives. DPOs have supported the adoption of disaster and emergency strategies and plans, disaster mainstreaming in public investment plans and sectors, resilient infrastructure, and disaster risk finance. Across the evaluated DPO portfolio, there were 119 DRR indicators. All but five of the evaluated operations included relevant DRR indicators, and 72 percent achieved their targets. However, a majority (61 percent) of indicators captured upstream measures such as the issuance of regulations or approval of frameworks, while a smaller percentage of them (39 percent) captured downstream measures such as tracking implementation of policy measures at a subnational level, operationalization of new institutions, or changes in behaviors.

Factors of Effectiveness for Disaster Risk Reduction Policies

DPOs are most effective when they include a strong policy matrix and monitoring framework with indicators that can show tangible progress of risk reduction actions, yet many DRR prior actions have been very process oriented. A significant share of DPOs' prior actions (28 percent) was excessively process oriented and did not give confidence that a policy change would be achieved. For example, in Panama, a prior action required only that an

agency submit to the executive branch a proposal for enabling the agency to design, develop, and implement financial protection measures. In Sri Lanka, a prior action required cabinet approval to establish a steering committee to monitor a program for sharing spatial data. In Honduras, a prior action defined responsibilities for local emergency plans, not their adoption. Stronger operations included substantive prior actions: in the Philippines, operations included a requirement for direct budget allocations for risk reduction programs, implementation of a risk layering strategy by setting up new financial instruments, and the operationalization of an earthquake resilience program.

CAT DDOs have provided a timely and important source of post-disaster financing that meets government needs. An advantage of the instrument has been its soft trigger mechanism, which has enabled governments to access funds when needed based on a declaration of emergency and to finance emergency response and recovery. This avoids a problem faced by parametric financial mechanisms in which financial support is unavailable if a disaster occurs that does not precisely fit the parametric trigger (for example, a cyclone that causes severe flooding but does not meet a wind speed trigger). Recently approved CAT DDOs have included public health emergencies as a triggering event, and nearly all CAT DDOs were triggered in 2020 to support COVID-19 response activities: the outstanding balance of CAT DDOs fell from roughly $2 billion to $100 million in 2020. Countries that chose not to trigger their credit line either did not yet have a severe COVID-19 situation or waited to trigger until they had passed through cyclone season. An important factor for successful use of contingent credit lines is the need for clarity and understanding on trigger conditions to ensure they are used to improve financial DRM and not merely as easily accessible budget support. For example, in the first generation of CAT DDOs, some clients did not understand the expectations for trigger and saw it as general budget support: in the first Philippines CAT DDO, the government triggered the $500 million credit line only a week after it became effective, for a relatively minor disaster (World Bank 2017i). These issues have been largely resolved through World Bank dialogue with the client, greater familiarity with the instrument, and World Bank analytics that help the government optimize the timing of drawdowns. In Serbia, improved government understanding of

the instruments' procedures reduced the disbursement lag from 28 days for the first withdrawal to 5 days for their third withdrawal.

A key advantage of DPF including CAT DDOs has been their use as a platform to engage ministries of finance and budget and economic planning agencies. As discussed in chapter 3, these agencies have the influence and leverage to allocate resources to DRR and to influence line agencies to act. DPFs that engage on disaster risk finance have been a useful entry point for engaging finance ministries, as it touches on their core business. For example, in Peru, the first CAT DDO was able to engage the Ministry of Economy and Finance on a financial protection strategy against disasters, including through the use of a range of instruments: a fiscal stabilization fund, sovereign bonds, contingent finance, and catastrophe bonds. Yet, in countries where substantial DRR engagements already exist, DPF operations have been most effective when they leveraged analytical work and relationships built through other instruments. In Grenada, a multisector DPO on broader fiscal risk management made progress on regulatory systems for physical planning (though not on compliance with building codes) by building on government relationships and technical knowledge developed through DRR investments.

DPF has been most effective at catalyzing DRR implementation when combined with other lending instruments and supported by complementary technical assistance. Policy lending operations have often been most effective when combined with investment lending. In the Philippines, DPF and IPF generated mutual leverage, with a CAT DDO providing the policy framework for disaster-sensitive community-driven development and conditional cash transfers, while these mechanisms were implemented through IPF. In Sri Lanka, DPF supported overall resilience policy, while IPF supported the implementation of resilient infrastructure design for roads. Nearly all evaluations of DPF highlight the role of technical assistance in building the capacity needed to operationalize and implement policy reforms. Adopting international best practices on DRR is relatively new in many countries, so civil services often do not have the necessary skills. For example, in Sri Lanka, DPF helped achieve the adoption of a national disaster management plan and a national spatial data infrastructure concept that was lagging for years, while technical assistance supported implementation of the plan and data infrastructure.

The absence of sufficient engagement with subnational governments has meant that DRR and DPF have not always achieved desired downstream results. Engaging on a subnational level is important for DRR, as many DRR responsibilities are carried out by regional, municipal, or local governments, so policy changes at the national level must be implemented and operationalized through local authorities. However, many DPF programs have had difficulty achieving downstream results because of the focus of the instrument and World Bank team engagement on national government counterparts, as well as due to lower technical capacity and coordination challenges at the local level. For example, a CAT DDO in Sri Lanka supported a national policy and plan for disaster management, but only one of nine provinces adopted a standard bylaw issued to regulate and supervise its implementation, and only two of nine provinces completed basin-wide risk mitigation investment plans required under the policy.

Achieving Highly Successful Disaster Risk Reduction Results

The World Bank has sometimes been highly effective in achieving disaster risk reduction results that go beyond the direct effects of project interventions. This evaluation identified what has worked to achieve DRR results in client countries in highly successful cases. An activity was defined to be highly successful if it effectively addressed a major developmental challenge (relevance), addressed root causes to support a change in trajectory (depth of change), or is leading to large-scale impacts (scale of change). These highly successful results exist on a pathway toward achieving transformational change. The evaluation conducted four case studies on specific DRR engagements deemed to be highly successful (see appendix A). Box 4.3 describes the cases, and the following section describes success factors.

Box 4.3. Examples of Highly Successful Disaster Risk Reduction Results

Flood preparedness and risk mitigation in Bihar, India. In Bihar, the World Bank has contributed to flood mitigation and preparedness at scale. Bihar is India's most flood-prone state, with 76 million people facing recurring flood threats. Devastating floods in 2008 affected more than 3.3 million people. The World Bank supported flood disaster risk reduction through $470 million in lending for the Bihar Kosi Flood Recovery Project (2010–18) and the Bihar Kosi Basin Development Project (2015–). These projects supported structural improvements for 70 kilometers of embankments in the Kosi river basin, decentralized approaches to embankment monitoring and maintenance, flood forecasting, and early-warning systems that have been scaled to other basins. Flood forecast systems have improved to the point of providing 90 percent accuracy in forecasts at a lead time of 72 hours, and work is being done to expand this to five days. This enables vulnerable people to evacuate before floods hit, reducing deaths and losses. The World Bank is continuing to help expand these measures to the entire state.

Resilient schools in Mozambique. Improving the resilience of schools in Mozambique has been critical because the schools' structural weakness and exposure to disasters have resulted in an average of 550 classrooms being destroyed annually by cyclones and floods. The World Bank achieved success by using advisory services and analytics to develop structurally resilient school building designs and standards, supporting policy changes to adopt these standards for all new construction, financing an initial set of school retrofits through a Program-for-Results, and working with partners to establish a sectorwide funding platform for school reconstruction. Since 2016, all newly constructed classrooms have followed resilient design standards, and 5,762 classrooms were constructed after the standards (as of 2019). All schools constructed under the standards survived the severe cyclones in 2019.

Integrated flood management in Metro Manila, the Philippines. Manila, a megacity with a population of 13.5 million, faces severe flood risks. A 2009 typhoon caused flooding that submerged 80 percent of the city, killed hundreds of people, and caused damage equivalent to 2.7 percent of the national gross domestic product. The flood management system was haphazard and reactive, based on administrative boundaries. Since then, the city has changed its trajectory to adopt an integrated, coordinated, and long-term approach to flood management through a master plan.

(continued)

Box 4.3. Examples of Highly Successful Disaster Risk Reduction Results (cont.)

The plan development required building evidence-based consensus among agencies responsible for flood management and all metro-area mayors. The World Bank supported a Post-Disaster Needs Assessment that convened stakeholders in relation to recovery and disaster risk reduction. It also used consultative analytical work to conduct a detailed risk assessment, leading to the design and approval of the Flood Management Master Plan in 2012, laying out flood mitigation works that would cost approximately $7.5 billion over a 20- to 25-year period. The World Bank then supported feasibility and design studies to operationalize the plan. In 2018, the World Bank approved $500 million for the Metro Manila Flood Management Project, which finances the plan's implementation. Once complete, the plan will have dramatically reduced urban flood risk.

Seismic risk mitigation in Istanbul, Türkiye. Istanbul is a megacity of 15 million people and the nation's economic engine, but it faces severe vulnerability from earthquakes. The probability of a major earthquake between 2004 and 2034 was estimated at 62 percent, with damage of $20 to 60 billion. It has achieved a major reduction in earthquake vulnerability through a program that improved the resilience of public buildings. The World Bank provided $563 million to the Istanbul Seismic Risk Mitigation and Emergency Preparedness Project (2005–15) that financed many earthquake risk mitigation measures, including emergency communication and information management systems, emergency response capacity, public awareness and training, and retrofits and reconstruction of public buildings. The project's subnational place-based multisector model and its creation of a highly effective project coordination unit established a platform capable of attracting significant financing. As of 2021, the program had attracted €2,219 billion from eight donors (including the World Bank), conducted resilient reconstruction for 430 buildings, and retrofitted 1,105 buildings, focusing on hospital and schools. These upgrades represent 83 percent of all of Istanbul's vulnerable schools and 53 percent of vulnerable hospitals. The upgrades will reduce damage and save lives: an economic analysis for the World Bank financing only (a quarter of the program) estimated that damage to the improved buildings would be reduced from 40 to 5 percent and that at least 3,000 lives would be saved in the event of an earthquake.

Sources: Independent Evaluation Group case studies; World Bank 2017f.

Analytical work that brings international best practices and robust technical assessments has often been integral to catalyzing and designing highly successful interventions. In Bihar, the World Bank supported increased state-level flood resilience by providing international knowledge on improved embankment designs and building government acceptance for these designs through consultation and trainings. The World Bank also made available experts to help develop and test flood models and drew on regional work on inundation mapping and flood risk forecasting to support systems and knowledge development. In Mozambique, analytical work that included risk assessments and a catalog of resilient architecture and construction convinced government officials to adopt new models of school construction with higher up-front costs to reduce reconstruction costs. In Manila, extensive flood risk assessments coupled with feasibility and design studies of priority flood protection measures contributed to the city's change trajectory toward developing a citywide flood management system. In Istanbul, ASA contributed to a rank-ordered list of investment priorities based on vulnerability. This analysis helped the city achieve a significant reduction of seismic risk in its public buildings by helping it balance competing priorities, insulating the project from political pressure, and helping the project retain a focus on earthquake risk mitigation rather than other activities. The rank-ordered list of investment priorities also made scale-up easier.

Highly successful DRR results were achieved through adaptive approaches that prioritized the development needs of the client. In Bihar, the World Bank accepted the clients' need to prioritize reconstruction, with an understanding that over time the balance could be adjusted toward risk reduction. In Mozambique, the World Bank's approach allowed for some unconventional designs—for example, schools constructed by communities that would not meet formal design standards but would be safer than the status quo and feasible to implement. In Manila, parts of the master plan addressed chronic solid waste issues that compromised the integrity of pumping mechanisms.

Highly successful results have often been achieved when the World Bank has deliberately engaged in supporting replication by others. In Bihar, the World Bank initially focused on piloting improved designs for embankment strengthening, which were applied to the most degraded embankments, and these techniques were replicated and scaled up through subsequent

investments. Flood forecasting work initially focused on a single river basin, but additional World Bank support—including technical assistance to enable flood forecasting systems to use public domain software, as well as other institutional- and capacity-strengthening efforts—helped expand the system across the entire state. In Mozambique, an aspect of success was that the World Bank was able to promote the new standards through an Education Sector Support Fund that pooled all donor financial assistance for school construction. By providing training, fiduciary supervision, and construction oversight, the World Bank reduced other donor concerns about corruption risks so that they were willing to contribute to the fund. In Manila, convening other development partners in relation to a common vision helped attract trust fund support and cofinancing of infrastructure plans. In Istanbul, the World Bank helped establish a strong platform, including implementation arrangements and financial, procurement, and monitoring and evaluation systems. Based on this well-functioning and transparent system and confidence in World Bank standards, other international finance institutions added their support, substantially increasing the scale of results achieved. However, the project model of subnational multisectoral approach to earthquake risk reduction has not been replicated elsewhere in Türkiye because its modality required exceptional features and specific enabling legislation and did not follow the preferred centralized approach of the national government.

Given its highly technical nature, achieving highly successful DRR results has required a strong focus on institutional strengthening and awareness raising through demonstrations and trainings to shift mindsets. In Bihar, developing capacity to reliably forecast and disseminate flood events required sustained effort to strengthen institutions and establish new ones with the requisite technical skills to use and maintain the new systems. The World Bank helped shift mindsets through study tours for senior officials, knowledge exchange through workshops, and the embedding of expert consultants in new flood centers. Acceptance from engineers came from growing familiarity and recognition that new designs were lower cost and more sustainable. In Mozambique, continuous institutional support and capacity building in a low-capacity context helped overcome complex procurement challenges to achieve more resilient schools. The World Bank helped improve site

selection and construction practices through both on-the-job training for contractors and communities and quality control processes. In Istanbul, the World Bank's support for creating a semiautonomous, highly capable, professional project coordination and implementation unit was critical for achieving the significant level of progress on seismic risk reduction.

In all case studies, success has required sustained engagement over a decade or more and the use of multiple instruments and interventions. In Bihar, the World Bank had a 14-year engagement and has used two main investment lending operations plus trust-funded technical assistance. In Manila, long-term engagement since 2009—buttressed by an extensive trust-funded technical assistance program—has been key to building political and technical buy-in, and investment financing was necessary to operationalize the plan. In Istanbul, sustained World Bank support provided technical knowledge, credibility to decision makers that proposed solutions met international good practice standards, and confidence that tenders were competitive and fair. The project also built on relationships, trust, and preparatory work carried out under a prior earthquake reconstruction project.

[1] Examples of emergency projects include investment operations that seek to restore agricultural (including fishing) livelihoods and devastated rural and urban infrastructure in small island developing states such as Dominica and Samoa, as well as in Haiti and Zimbabwe, but that do not measure anticipated risk reduction effects associated with flood or drought.

[2] Although this may be because risk estimations were carried out in other studies or projects not mentioned in the project documentation, in these cases, it is not possible to verify how effective the standards were in strengthening asset resilience. Similarly, it is difficult to ascertain from the project documentation reviewed how effectively standards were implemented in practice in the field.

5 | Conclusions and Recommendations

The World Bank is successfully supporting clients to increasingly take up DRR actions through strategic and comprehensive country engagement. The World Bank has developed a large portfolio of lending and non-lending DRR activities, tripling its support over the past decade. The World Bank focuses its DRR work on those countries with the most serious natural hazards. It often uses multiple and synergistic pillars of DRR engagement that include hazard identification, resilient infrastructure, early-warning and preparedness activities, and, occasionally, financial protection. DRR has been increasingly mainstreamed into sector operations across all key GPs. Support for DRR in IDA, SIDS, and IDA-FCV countries has been particularly comprehensive. The World Bank has also shifted from post-disaster response toward predisaster risk reduction and has built risk reduction activities into nearly all disaster response operations. This large program of DRR is likely to contribute to climate change adaptation.

The increasing coverage of DRR across countries is driven by a corporate prioritization of disaster support, the availability of dedicated trust funds, and client demand. The growth and expansion of DRR support is associated with the World Bank's corporate prioritization of climate change adaptation, IDA's special theme on climate change, the technical and financial presence of GFDRR, and the supportive global authorizing environment, including the Sendai Framework for Disaster Risk Reduction, which may have influenced donor funding and client demand.

The World Bank has shown that it is able to overcome political and financial constraints to DRR client uptake by engaging the right decision makers using rigorous evidence and by building on disaster reconstruction efforts. Analytical work that quantified risks, assessed costs and benefits, and communicated impacts has highly influenced DRR uptake. Another key determinant was the chosen government entry point: there was faster progress and better agency coordination when the World Bank worked with ministries

of finance as compared with when it mainly worked with disaster agencies. Two other key client entry points have been the World Bank's support for disaster reconstruction and the credibility earned from sustained sector engagements. Targeting subnational entities that can implement DRR policy measures and investments, including capacity building, has also been key to achieving downstream DRR effects. However, in SIDS, the World Bank should seek further opportunities to reduce donor fragmentation and ensure that analytical work is not excessive, does not overwhelm country capacity, and has a line of sight to investment or policy reform programs.

However, there are gaps in coverage for some regions, sectors, and hazards that require attention. There are DRR coverage gaps in Europe and Central Asia and the Middle East and North Africa for all serious hazards. There are constraints to DRR lending in many IBRD countries in these regions. In these regions, there are many small clients with limited lending envelopes, and in the Middle East and North Africa, there are conflict-affected countries where immediate conflict-related needs and governance concerns may be priorities. Because many of these countries are borrowing from IBRD for infrastructure, they have the potential to address DRR through mainstreaming. Although the World Bank has made significant progress in mainstreaming DRR in lending operations, there has been less uptake in some sectors: the share of DRR mainstreamed lending operations is relatively low in Agriculture and Food and Energy and Extractives, and mainstreaming is uneven across subsectors. DRR mainstreaming in Transport is less frequent for operations in Europe and Central Asia and in Sub-Saharan Africa. Some hazard types that are rarer (tsunamis and volcanic eruptions) or less catastrophic (landslides) receive less attention in World Bank engagements than do others (floods, cyclones, droughts, and earthquakes). Gaps in coverage could be addressed by mainstreaming DRR considerations into existing sectoral engagements in these countries and by undertaking efforts to overcome political and financial constraints to DRR uptake.

While the World Bank is conducting analytical work on the needs of disaster-vulnerable groups, there has been slow progress on incorporating their needs into lending projects. The World Bank is increasingly identifying and addressing the needs of women, who are disproportionately impacted

by disasters; however, for other groups, there is slow progress and limited reporting on DRR benefits. Few operations integrate the needs of identified disaster-vulnerable groups, including persons with disabilities, the elderly, children, and youth.

Although DRR engagements in conflict-affected situations have addressed disaster vulnerability, they have missed opportunities to use conflict-sensitive approaches to mitigate conflict risks and to pursue peace-building opportunities. Conflict can be a key driver of disaster risk, and disaster risk may exacerbate preexisting conflicts and increase the risk of violence. Tools for conducting disaster needs assessments were not designed to integrate conflict considerations. DRR projects in conflict-affected areas have often not been designed with a conflict-sensitive approach. Efforts to develop a DRR-FCV program in the World Bank have been progressing slowly.

There is a need to bring a service provision lens to mature DRR engagements, shifting focus to prioritize issues of sustainability and maintenance, including for resilient infrastructure and EWSs. DRR investment projects have often effectively supported relevant infrastructure, but most do not explicitly address O&M that is required for long-term resilience. This shortcoming is more evident in core disaster projects mapped to the Urban, Disaster Risk Management, Resilience, and Land GP, as compared with sectoral infrastructure projects. The World Bank has been more effective at developing EWS infrastructure than in delivering EWS services, such as forecasting capacity and community preparedness.

There is also a need for the World Bank to consider the context and circumstances in which disaster insurance should be made a priority. Disaster insurance activities have had a limited impact on transferring disaster risk, as insurance programs have had difficulty in reaching scale. In many cases, the benefits from risk transferred and payouts made have been relatively modest compared with the cost of premiums paid and the intensive time, resources, and effort put into product development. For many clients, contingent finance or other mechanisms may be preferred. However, insurance activities have contributed to awareness raising, capacity building, and product development.

The World Bank's frequent inability to demonstrate the effects of its DRR activities on reduced exposure and vulnerability has consequences for its ability to make a development case for risk reduction. Most DRR operations are not providing sufficient information to establish the level of DRR being achieved. This inhibits an understanding of the level at which DRR contributes to development impacts, such as reduced economic loss and mortality. This is especially important for resilient infrastructure investments, as most of these projects lack information on resilience standards, even after they are completed. Developing an evidence base on the impacts and cost-effectiveness of NBS is also critical for unlocking internal barriers that impede their uptake. Developing evidence on the results of policy changes is also critical for DPOs, which often lack such evidence.

The World Bank has been able to achieve highly successful results on DRR with sustained engagement, prioritization in policy dialogue, sizable lending programs, access to trust funds, and catalyzation of financing from others. By necessity, it can do this for only a limited number of cases at a time, requiring consideration of when its involvement in a program has been sufficient and when to change course to tackle the next difficult problem where it has a comparative advantage.

Recommendations

Recommendation 1. **Incorporate DRR activities in regions and sectors and for hazards that exhibit significant coverage gaps.** In countries facing high risks from disasters caused by natural hazards, the World Bank can address coverage gaps through analytical work, mainstreaming, or core DRR activities, including by (i) conducting country-level analytics on disaster costs and impacts of DRR for key sectors, (ii) relying on country management to proactively engage clients on DRR and encourage task teams to integrate DRR considerations in projects, (iii) integrating DRR specialists into sector dialogue, and (iv) assessing the need for coverage of low-frequency but catastrophic hazards such as volcanic eruptions and tsunamis.

Recommendation 2. **Identify and measure the effects of DRR activities on exposure and vulnerability to strengthen the development case to clients facing serious disaster risks.** The generation of ex post DRR evidence on probable outcomes involves clearer articulation in project documents of the particular resilience standards used for infrastructure in that context, use of and reporting on verification mechanisms for compliance with these standards, and greater use of ex post modeling of the incremental impacts of DRR activities on expected damage, loss, and mortality from disasters. This evidence generation can occur in projects or from results assessments of DRR activities implemented in different contexts.

Recommendation 3. **Integrate the needs of populations that are disproportionately vulnerable to disasters caused by natural hazards into DRR project targeting and design, implementation, and results reporting.** This can be accomplished by strengthening collaboration between the GPs working on disaster activities with poverty and social development experts in the World Bank through the development and application of data, tools, analyses, and tracking systems.

Recommendation 4. **In countries affected by serious natural hazards and fragility and conflict risks, identify and assess the ways in which hazards and conflict interrelate, and use this knowledge to inform country engagement and project design.** This should be part of the World Bank's efforts to identify and address compound risks at the country level. This may require strengthened collaboration and knowledge exchange between World Bank DRR and FCV teams, the use of integrated multirisk analysis tools, and adapted program designs that address the interlinkages between disaster and FCV risks.

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APPENDIXES

Independent Evaluation Group

Reducing Disaster Risks from Natural Hazards

Appendix A. Methodology

The evaluation uses a theory of change to guide its understanding of the World Bank's contribution to disaster risk reduction (DRR) in client countries (see figure A.1). This theory was developed based on a review of strategy and project documents and consultations with key stakeholders in the World Bank. The rationale for the theory is outlined in the evaluation's Approach Paper (World Bank 2021). The evaluation questions and methods were designed to test many of the causal assumptions embedded in this theory by assessing the relevance and effectiveness of World Bank support for DRR.

The evaluation questions were as follows:

Question 1: Has the World Bank's support for DRR been relevant, and what factors have facilitated or limited the relevance of this support?

a. To what extent has the World Bank supported DRR for hazards posing serious disaster risks in disaster-vulnerable countries?

b. What has worked in the World Bank's efforts to influence clients to undertake DRR, including in partnership with other stakeholders?

c. To what extent has the World Bank evolved its approach to DRR in line with good practices?

Question 2: How effectively has the World Bank supported DRR, and what factors explain this?

a. How well does the World Bank articulate and capture DRR outcomes, including for whom they are intended, and how can this be improved?

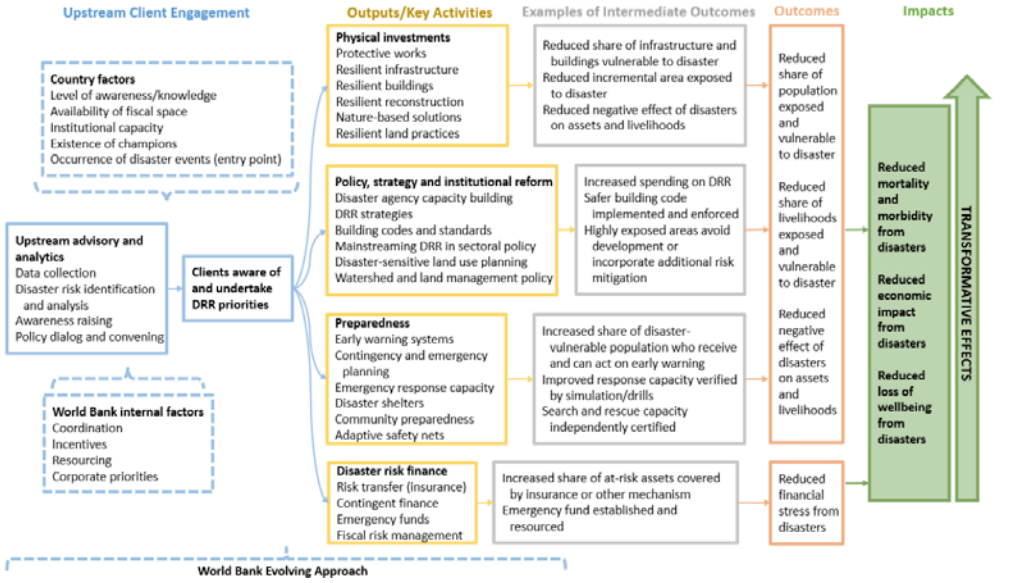
b. For key DRR approaches and activities, how effective have they been?

c. What has worked to achieve transformative DRR effects in client countries in the most successful cases?

The design used a "building blocks" approach that first featured a round of data collection and analysis of portfolio trends, followed by several deep dives to derive explanatory factors to generate enhanced learning. The

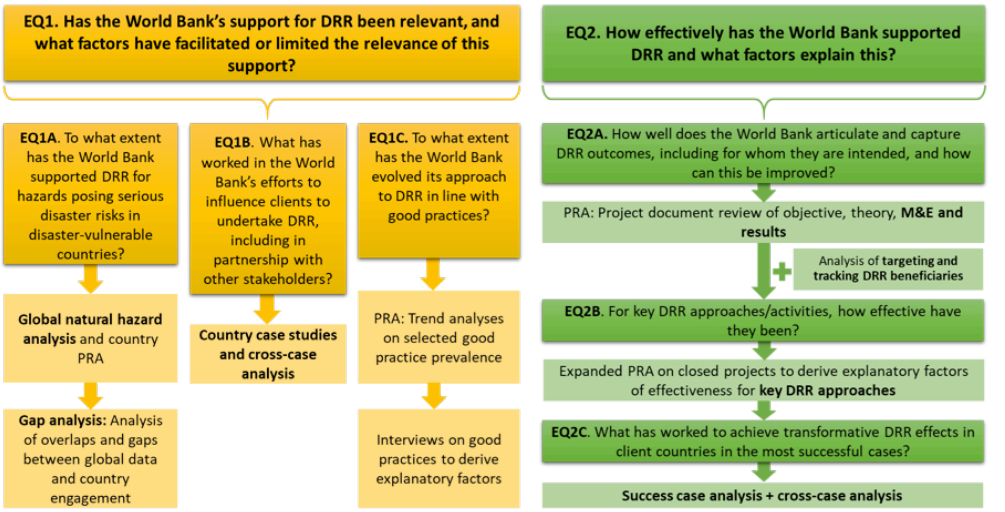
design and the accompanying methods are included in figure A.2 and are explained in sequence in the following sections.

Figure A.1. Evaluation Theory of Change



Source: Independent Evaluation Group.Note: DRR = disaster risk reduction.

Figure A.2. Evaluation Design



Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; M&E = monitoring and evaluation; PRA = portfolio review analysis.

Evaluation Portfolio

Portfolio Identification

The evaluation team used several methods and means of verification to identify the relevant World Bank lending and nonlending portfolio of projects with DRR activities that were approved between fiscal year (FY)10 and FY20. These included (i) project theme data, (ii) text analysis of operational data, (iii) manual inputs from technical consultations, and (iv) manual screening and verification. Relevant World Bank operational themes were identified (see table A.1) to generate an initial list of 743 lending and 715 nonlending projects.

To ensure comprehensiveness, the evaluation team then used text analysis to supplement the theme code search. First, the team created a DRR search taxonomy: a list of key words and phrases that frequently occur in the DRR space, such as the names of specific hazard types (disaster, flood, drought, hazard, catastrophe, earthquake, seismic, cyclone, hurricane, typhoon, landslide, mudslide, tsunami, volcanic eruptions, and so on). The search was performed in key parts of project descriptions (project titles, project development objectives, project descriptions, activity summaries, component titles, indicator titles, and abstracts). Using this text analysis, the team identified an additional 326 lending and 634 nonlending projects. This increased the total number of projects for manual screening and verification to 1,069 lending and 1,349 nonlending projects.

Inputs from operations management and past evaluations were also incorporated manually. For example, the evaluation team used an existing portfolio of nature-based solutions (NBSs) for DRR that was provided to them by the World Bank. Parts of the NBS portfolio were imported manually if the projects were not already captured through themes and text analysis (as described in the previous paragraph).

Table A.1. Theme Codes Relevant to the Evaluation Used for Portfolio Identification

Theme		Description
75	Disaster risk management	Processes for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development.
751	Disaster response and recovery	Activities supporting response, recovery, and reconstruction after a natural disaster in affected countries; equipping governments and DRM practitioners with the necessary skills and resources to conduct their own post-disaster assessments and resilient reconstruction planning; and supporting the implementation of large reconstruction programs.
752	DRR	Technical advice, capacity building, and implementation assistance for governments, civil society, and the private sector to create and improve policies and legislation needed for better land-use planning and to drive investment aimed at reducing risk based on risk information.
753	Disaster preparedness	Activities aiming to improve forecasting and early-warning systems, contingency and emergency response plans, civil protection services, and protocols to help local communities anticipate, prepare for, and quickly respond to disasters.
754	Flood and drought risk management	Used to capture support for physical infrastructure investments, including both greenfield and rehabilitation projects, and/or institutional capacity-building support to strengthen flood and drought risk management.

(continued)

331	Disaster risk finance	*Agricultural Market Development:* Development of micro- or meso-level insurance products and markets in support of disaster risk financing for agriculture. Involves increasing the capacity to use domestic insurance markets to support financial protection of households and firms against disasters. *Insurance-Based Solutions for Resilient Livelihoods:* Application of insurance-based tools and approaches in disaster risk financing for resilient livelihoods. Involves applying actuarial skills and techniques to the design of shock-responsive safety net systems that provide financial protection to vulnerable households and communities. Responds to growing momentum to explore the use of cash transfers as a response mechanism to disasters and facilitating a greater role for national actors in humanitarian response. *Sovereign Disaster Risk Financing:* Increasing the capacity of sovereigns to better plan, prepare for, and manage the financial aspects of disaster-related risks. Links to work on public financial management, public debt management, macroeconomics and fiscal stability, and the structuring and execution of financial solutions. *Subnational Disaster Risk Financing:* Increasing the capacity of subnational and state-owned enterprises to better plan, prepare for, and manage the financial aspects of disaster-related risks. Links to work on public financial management, public debt management, macroeconomics and fiscal stability, and the structuring and execution of financial solutions. *Public Financial Management of Natural Disasters:* Developing policy frameworks and implementation plans to support a more comprehensive approach to public financial management of natural disasters.

Source: World Bank 2016 theme code definitions.

Note: DRM = disaster risk management; DRR = disaster risk reduction

Subsequently, the evaluation team manually screened all lending and nonlending projects identified through the above searches (n = 2,418) to verify their relevance to the evaluation scope, per inclusion and exclusion rules that were developed in line with the evaluation theory of change. Table A.2 presents these portfolio rules. Project development objectives, component titles, project abstracts, and key performance indicators were screened during this process. The evaluation team excluded projects outside the evaluation scope, false positives (for example, projects with phrases such as "hazardous waste" or "flood the market"), and projects without documentation in the operations portal. To further tighten the nonlending product selection, we included only major nonlending product types (for example, core advisory services and analytics, technical assistance–nonlending, and economic and sector work) and only country or regional (as opposed to global) products. Because nonlending products are used in the relevance analysis (Evaluation Question 1), which is situated at the country level, we further excluded 52 regional and multicountry nonlending products that are not "country granular"—that is, they do not provide specific analyses or hands-on and applicable recommendations at the level of underlying countries. In addition, as the majority of nonlending products' outputs such as reports or presentations are not readily obtained by an automated method, the evaluation team manually checked 831 nonlending products on the operations portal to ensure that selected products comply with the inclusion and exclusion rules.

Table A.2. Portfolio Inclusion and Exclusion Rules Explained

Included Content			Excluded Content	
Mitigation	Preparedness	Recovery	Response	Other[a]
Mainstreaming DRR/DRM and climate/disaster risk into strategy, policy, and planning (including land-use planning)	Disaster risk and emergency preparedness, including emergency management and planning (for example, communications, shelters, hospital preparedness, health shocks)	Resilient post-disaster reconstruction with DRR	PDNA (for example, post-damage needs and loss assessment)	Projects with CERCs but without DRR

(continued)

Disaster-resilient infrastructure (for example, roads, ports, airports, housing, slum upgrading, schools, tourism, medical facilities, protective works) Identification of disaster risk/hazard (for example, agricultural risk assessment, vulnerability assessment, hazard mapping) Knowledge and learning (for example, disaster mitigation evaluation, information systems) Global DRR convening and awareness raising WRM, NRM, nature-based solutions, climate-smart and resilient agriculture with disaster risk mitigation (for example, drought, flood)	Strengthening weather and climate information systems, including hydrometeorological systems EWSs (including ICT/data systems), community-based EWSs Financial disaster risk management (for example, contingency fund, disaster insurance, catastrophe risk insurance, sovereign, agricultural risk insurance) Capacity building for PDNA and disaster relief (recovery phase) Disaster-responsive social protection and safety nets	Post-disaster recovery with DRR	Disaster reconstruction without DRR/DRM Disaster response/recovery without DRR/DRM Locust/pest control/response Disaster-related food and nutrition security	General urban services (for example, water supply and sanitation, water pollution, wastewater treatment, governance, municipal finance) WRM/NRM without DRR Infrastructure without DRR Risk mitigation for non–disaster-related shocks (for example, commodity, supply chain) Food and nutrition security (non-disaster-related) Social protection for conflict or other non-disaster emergencies General CDD without DRR Public health emergencies (for example, Ebola, COVID-19) Animal health/disease General energy security (not related to disasters) Spatial/land-use planning without DRR General PFM without DRR Non–disaster-related emergency systems (for example, crime, medical, 911) Dam safety Water scarcity/security without link to drought

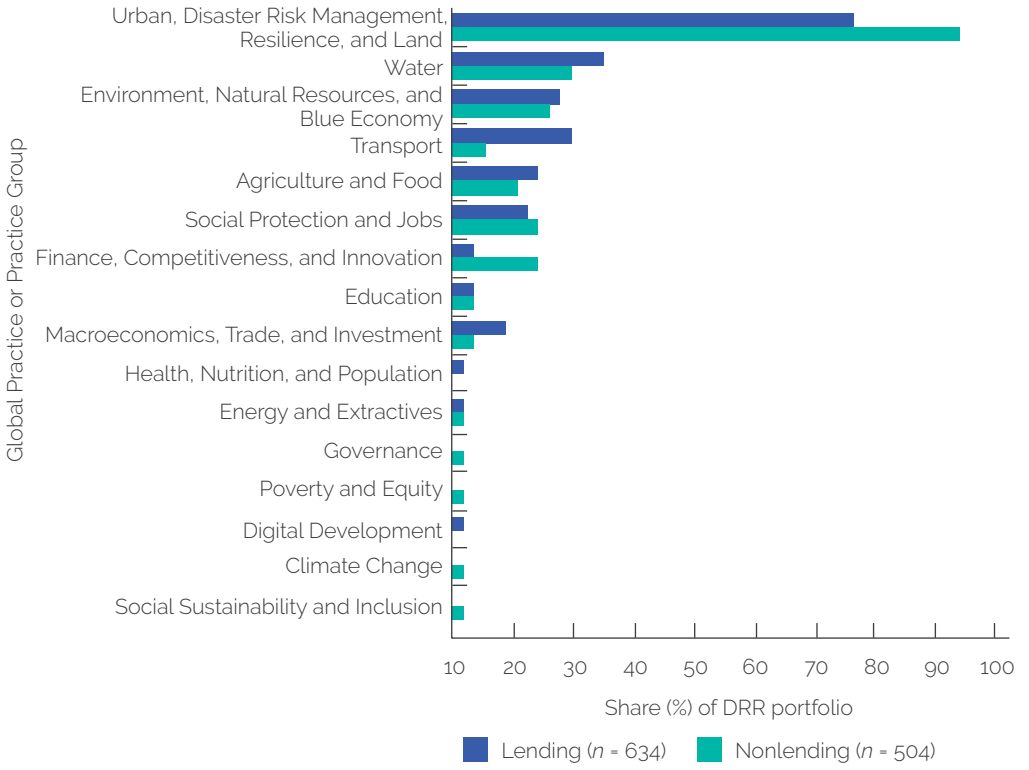
Source: Independent Evaluation Group.

Note: CDD = community-driven development; CERC = Contingency Emergency Response Component; COVID-19 = coronavirus; DRM = disaster risk management; DRR = disaster risk reduction; EWS = early-warning system; ICT = information and communication technology; NRM =natural resource management; PDNA = Post-Disaster Needs Assessment; PFM = public financial management; WRM = water resource management.
a. Many projects with DRM theme codes or that were identified by text analysis were found to be false positives.

Portfolio Description

The portfolio identified by the processes described includes 634 lending projects (including 90 with additional financing), with a total commitment of $63.8 billion; 535 of these projects are investment project financing, 82 are development policy financing, and 8 are Program-for-Results projects. The portfolio also includes 504 nonlending products, of which 83 percent are country-level products and 17 percent are region-level products. Thirty-seven percent of lending and 47 percent of nonlending activities are mapped to the Urban, Disaster Risk Management, Resilience, and Land Global Practice. Additionally, a sizable number of projects are mapped to the following Global Practices: Water; Environment, Natural Resources, and Blue Economy; Agriculture and Food; Social Protection and Jobs; and Transport (see figure A.3).

Figure A.3. Disaster Risk Reduction Lending and Nonlending by Global Practice



Source: Independent Evaluation Group.

Portfolio Characterization and Content Analysis

The evaluation team conducted a portfolio review of lending projects, which included content analysis of project documentation in line with a coding protocol. The team developed a coding template, which was used to document and analyze various elements relevant to the evaluation scope, questions, and methods. As outlined in table A.3, the coding template included (i) whether a project had an explicit DRR-related project development objective; (ii) whether a project was designed in response to a specific disaster or not; (iii) which specific natural hazard types were targeted by project finance interventions; (iv) a description of DRR-related interventions, linked to natural hazard types, that were financed; (v) which intervention typologies, linked to natural hazard types, were financed (an inventory of commonly occurring intervention typologies and subtypologies was developed inductively to complement those in the theory of change); and (vi) where relevant, countries that were supported with DRR interventions in regional projects.

The evaluation team analyzed the composition of the nonlending portfolio by clustering similar products and identifying the natural hazard types that each product targeted. First, the team classified nonlending products into similar clusters based on product titles to facilitate characterization and analysis. Second, the team consulted product abstracts and additional information available on the operations portal (including, but not limited to, briefings, policy notes, studies, reports, and presentations) to determine which specific hazard types the product addresses. Nonlending products were considered to address a specific hazard type if they (i) provide concrete recommendations on how to address the specific hazard type or (ii) conduct technical studies on the hazard type (such as measurement of seismic risk). Otherwise, nonlending products were considered to address disasters in general.

Table A.3. Disaster Risk Reduction Portfolio Lending and Nonlending Coding Protocol Summary

Project Types	Coded Features
Lending	DRR PDO (flag) Pre-/post-disaster project (flag) Targeted hazard types Intervention description(s), linked to hazard type Intervention typology/typologies, linked to hazard type Lessons M&E (see Monitoring and Evaluation and Results Analysis section for details) Targeting and tracking DRR beneficiaries (see dedicated section for details) Country list (for regional projects)
Nonlending	Product level (country, regional) Country list (for regional projects) DRR product clusters Targeted hazard types

Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; M&E = monitoring and evaluation; PDO = project development objective.

Finally, the lending and nonlending portfolios at project level were combined and transformed into a country-level portfolio to enable relevance analyses at country level. Projects specific to a country were mapped to that country, whereas regional projects were mapped to each specific country on which they focus. This database transformation was effectuated through the statistical software RStudio, allowing for automated iterative updates of the country database as the portfolio identification and characterization advanced and seamless integration with other information at the country level (for example, hazard levels, Systematic Country Diagnostic [SCD] content, and so on).

Limitations of Portfolio Review

A small number of DRR lending and nonlending products lack sufficient documentation in the operations portal and thus could not be included in the portfolio review analysis. The evaluation team excluded these products because the information required to determine and code DRR elements was absent. For example, many of the DRR nonlending activities that do not have clear output documentation included trainings and workshops. Similarly, several trust-funded lending projects did not have sufficient project documentation to enable review and analysis.

Evaluation Question 1 Relevance

Has the World Bank's support for DRR been relevant, and what factors have facilitated or limited the relevance of this support?

The evaluation team assessed three aspects of relevance regarding the World Bank's support for DRR. First, the evaluation team conducted a global natural hazard analysis to assess whether the World Bank has engaged strategically in those places where different hazard types pose, or are likely to pose, serious threats, as well as whether there are gaps in coverage. Second, the evaluation team conducted trend analyses on good practices to assess the degree to which the World Bank has evolved its approach to DRR. Third, the evaluation team conducted country case studies to source lessons on client engagement and to determine what works to raise awareness and "buy-in" for DRR action at the country level.

Global Hazard Analysis and Gap Analysis

The evaluation team assessed whether the World Bank engaged strategically in those places where different natural hazard types pose, or are likely to pose, serious threats. To this end, the evaluation team juxtaposed global natural hazard data with the World Bank's DRR lending and nonlending portfolio and its SCDs to identify overlaps and gaps.

Global natural hazard data, disaggregated by hazard type, were derived from ThinkHazard! The ThinkHazard! project was initiated by the Global Facility

for Disaster Reduction and Recovery in 2015 and has now been integrated into the World Bank operations portal for core use in project planning. The open-access website enables users to screen areas for the existence of multiple natural hazard types and their hazard levels, derived using a data-selection algorithm from the best available hazard information sources worldwide. The tool allows project teams to obtain guidance on how to manage project risks and any impacts projects may have on hazards locally. More information can be found at https://gfdrr.github.io/thinkhazardmethods. This evaluation used ThinkHazard! data aggregated at the country level to indicate the hazard level each country faces for each hazard type, ranging from high to very low (tables A.4 and A.5). It should be noted that ThinkHazard! determines the hazard level at local administrative units and subsequently aggregates this to the country level using a maximum function. In other words, if a hazard level is high in one local unit, the hazard level of the whole country is designated as high, regardless of hazard levels in other units. This conservative approach implies that there may be considerable variation in the level of hazard faced by countries classified at a given hazard level.

For each hazard type, the evaluation team assessed overlaps and gaps between ThinkHazard! country hazard levels and the World Bank's country engagements (in terms of DRR lending and nonlending and DRR coverage in SCDs). First, the presence or absence of DRR lending and nonlending—both hazard type–specific and general—was derived from the country-level portfolio (see Evaluation Portfolio section earlier in appendix). Second, the team screened SCDs to identify their extent of disaster risk analysis and DRR discussion, both hazard type–specific and general (see table A.6). Third, for each hazard type, the team conducted an overlap and gap analysis through cross-tabulations to assess whether DRR lending and nonlending activities are concentrated in countries with high hazard levels as compared with countries with medium, low, or very low hazard levels (or without available data on hazard level). Finally, the analysis quantified differences in lending, nonlending, and SCD coverage in countries with high hazard levels across country lending statuses and regions.

Table A.4. Earthquake, Flood, Cyclone, Tsunami, Drought, Volcanic Eruption, and Landslide Hazard Levels in ThinkHazard!

Hazard Level	Earthquake	Flood[c]	Cyclone	Tsunami	Drought	Volcanic Eruption	Landslides
High	An earthquake with intensity larger than 0.2 g[a] occurred in ADM2[b] in the past 250 years.	A flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 10 years.	A cyclone with intensity larger than 80 kilometers per hour occurred in ADM2 in the past 50 years.	A tsunami with larger than 2 meters of coastal maximum amplitude occurred in ADM2 in the past 100 years.	A drought with intensity less than 500 cubic meters per capita per year occurred in ADM2 in the past 5 years.	VEI ≥ 5 or occurrence of volcanic eruption in the past 2,000 years	Annual frequency per square kilometer higher than 0.00075
Medium	An earthquake with intensity larger than 0.1 g occurred in ADM2 in the past 500 years.	A flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 50 years.	A cyclone with intensity larger than 80 kilometers per hour occurred in ADM2 in the past 100 years.	A tsunami with larger than 1 meter of coastal maximum amplitude occurred in ADM2 in the past 500 years.	A drought with intensity less than 1,000 cubic meters per capita per year occurred in ADM2 in the past 50 years.	3 ≤ VEI < 5 or occurrence of volcanic eruption in the past 10,000 years	Annual frequency per square kilometer between 0.00032 and 0.00075
Low	An earthquake with intensity larger than 0.1 g occurred in ADM2 in the past 2,500 years.	A flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 100 years.	A cyclone with intensity larger than 80 kilometers per hour occurred in ADM2 in the past 1,000 years.	A tsunami with larger than 0.5 meters of coastal maximum amplitude occurred in ADM2 in the past 2,500 years.	A drought with intensity less than 1,700 cubic meters per capita per year occurred in ADM2 in the past 100 years.	VEI < 3 or occurrence of volcanic eruption in the more ancient time	Annual frequency per square kilometer between 0.00018 and 0.00032

Very low	No earthquake with intensity larger than 0.1 g occurred in ADM2 in the past.	No flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past.	No cyclone with intensity larger than 80 kilometers per hour occurred in ADM2 in the past.	No tsunami with larger than 0.5 meters of coastal maximum amplitude occurred in ADM2 in the past.	No drought with intensity less than 1,700 cubic meters per capita per year occurred in ADM2 in the past.	No disaster ever recorded in the past	Annual frequency per square kilometer lower than 0.00018
No data	No disaster data in ADM2.	No disaster data in ADM2.	No disaster data in ADM2.	No disaster data in ADM2.	No disaster data in ADM2.	No disaster data in ADM2.	No disaster data in ADM2.

Source: ThinkHazard! (https://gfdrr.github.io/thinkhazardmethods).

Note: ADM2 = Administration level 2; VEI = Volcanic Eruption Index.
a. g stands for Earth gravity, measuring how hard the Earth shakes at a given geographic point.
b. ThinkHazard! principally determines hazard level at ADM2 level, which corresponds to a local administrative unit (that is, county, district, or province). The hazard level is then aggregated to country level (ADM0) by taking the maximum hazard level across all ADM2 units it contains.
c. See disaggregated flood levels in ThinkHazard! in table A.5.

Table A.5. River, Urban, and Coastal Flood Hazard Levels in ThinkHazard!

	River Flood	Urban Flood	Coastal Flood
High	A river flood with larger than 0.5 meters of inundation depth occurred in ADM2[a] in the past 10 years.	An urban flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 10 years.	A coastal flood with larger than 2 meters of inundation depth occurred in ADM2 in the past 10 years.
Medium	A river flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 50 years.	An urban flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 50 years.	A coastal flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 50 years.
Low	A river flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 1,000 years.	An urban flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 1,000 years.	A coastal flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past 100 years.
Very low	No river flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past.	No urban flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past.	No coastal flood with larger than 0.5 meters of inundation depth occurred in ADM2 in the past.
No data	No disaster data in ADM2.	No disaster data in ADM2.	No disaster data in ADM2.

Source: ThinkHazard! (https://gfdrr.github.io/thinkhazardmethods).

Note: ADM2 = Administration level 2.
a. ThinkHazard! principally determines hazard level at ADM2 level, which corresponds to a local administrative unit (that is, county, district, or province). The hazard level is then aggregated to country level (ADM0) by taking the maximum hazard level across all ADM2 units it contains.

Table A.6. Systematic Country Diagnostic Disaster Risk Reduction Content Analysis and Ratings Methodology

Indicator	Hazard-Specific (Drought, Volcanic Eruption, Earthquake, Tsunami, Flood, Cyclone, Landslide)	General Disasters
Mention	Is hazard X mentioned in the SCD? 1 = yes 0 = no	Are *disasters*, *hazards*, or *catastrophes* mentioned in the SCD within the scope of the evaluation? 1 = yes 0 = no
Extent of risk analysis	To what extent does the SCD analyze specific risk for hazard X (that is, hazard frequency/intensity and/or disaster exposure/vulnerability/impact)? 2 = quantitative analysis (that is, at least one data point) 1 = only qualitative analysis (that is, no data points) 0 = no analysis	To what extent does the SCD analyze risk for hazards in general (that is, hazard frequency/intensity and/or disaster exposure/vulnerability/impact)? 2 = quantitative analysis for at least one hazard type or for hazards combined (that is, at least one data point) 1 = only qualitative analysis for at least one hazard type or for hazards combined (that is, no data points) 0 = no analysis
Extent of DRR discussion	To what extent does the SCD discuss DRR content applying to hazard X? 2 = at least one country-specific DRR action applying to hazard X 1 = DRR applying to hazard X is mentioned in a generic way (not country specific or no concrete actions) 0 = no DRR elements applying to hazard X mentioned	To what extent does the SCD discuss DRR content for hazards in general? 2 = at least one country-specific DRR action applying to at least one hazard type 1 = DRR applying to at least one hazard type is mentioned in a generic way (not country specific or no concrete actions) 0 = no DRR elements mentioned
SCD coverage	Combined assessment of extent of risk analysis and DRR discussion for hazard X: 1 = if 1 or 2 on risk analysis and 2 on DRR discussion 0 = otherwise	Combined assessment of extent of risk analysis and DRR discussion for hazards in general: 1 = if 1 or 2 on risk analysis and 2 on DRR discussion for at least one hazard type 0 = otherwise

Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; SCD = Systematic Country Diagnostic.

World Bank's Evolving Approach to Disaster Risk Reduction

The evaluation team conducted several analyses to examine the extent to which the World Bank has evolved its approach to DRR over the evaluation period in line with good practices. The evaluation theory of change posits that World Bank engagement on DRR—including its upstream work and the outputs and activities embedded in project design—has evolved over time to adopt specific good practices. The evaluation team identified good practices from the World Bank's biennial progress reports to the Board of Executive Directors, Mainstreaming Disaster Risk Management in World Bank Group Operations (delivered in 2014, 2016, 2018, and 2020, to date). These good practices were (i) the pursuit of integrated approaches, (ii) a focus on predisaster vulnerability reduction, (iii) the mainstreaming of DRR considerations in sectors, and (iv) appropriate use of NBS.

Integrated Approaches Analysis

The World Bank has indicated that it has evolved its approach to DRR at the country level by pursuing more integrated approaches. This evaluation defines "integrated approaches" as the extent to which the World Bank portfolio uses multiple and synergistic pillars of engagement to help client countries reduce disaster risk. It uses the World Bank's classification of major pillars aligned with the Sendai Framework for Disaster Risk Reduction 2015–2030: (i) risk identification; (ii) risk reduction activities, especially resilient infrastructure and assets and resilient reconstruction where relevant; (iii) preparedness activities, especially early-warning systems (EWSs); and (iv) financial protection (see table A.7).

Table A.7. Pillars of Disaster Risk Reduction Support

Pillar	Description
Risk identification	Risk identification by improving access to and use of risk data and analytics: conducting risk assessments and detailed design of risk reduction solutions for various hazards and development and use of new technologies that support disaster risk management, such as collection of high-resolution imagery, use of drone imagery to support better planning and environmental management, and open-source community-based creation of hazard and exposure maps.
Risk reduction, especially resilient infrastructure and assets	Risk reduction by financing investments in resilient infrastructure: improvements in urban infrastructure (particularly stormwater drainage); investments in solid waste management that reduces flood and public health risks; use of nature-based solutions, such as ecosystem restoration and management to mitigate disaster risk; and investments in community infrastructure and services such as water supply and sanitation facilities, roads, and health and education facilities.
Resilient reconstruction	Resilient reconstruction by supporting post-disaster assessments and financing reconstruction programs: supporting governments in understanding post-disaster damages and losses using innovative rapid assessment tools and traditional Post-Disaster Needs Assessments; financing recovery programs, including reconstruction of housing, infrastructure, and the public sector; and building back better through safer school projects and resilience building investments.
Preparedness, especially early-warning systems	Risk preparedness by increasing capacity for disaster response and access to early warning: building capacity and strengthening institutions to properly operate and maintain early-warning systems; upgrading infrastructure to modernize and operate information systems needed to collect data and develop forecasts, particularly for hydrometeorological hazards (flood and drought); and improving service delivery to offer timely and reliable early warnings to users and communities.
Financial protection	Financial protection by offering disaster risk financing solutions to countries from the local to national scale: supporting the establishment of national emergency funds to access financing quickly after a disaster; providing instruments to build comprehensive financial packages (including reserves, risk transfer, and contingent financing instruments) to improve financial resilience to disaster shocks; and helping countries design adaptive social protection systems to protect vulnerable populations.

Source: World Bank 2020, 7–8.

To assess whether the World Bank is indeed pursuing integrated approaches in its client countries, the evaluation team categorized the portfolio in line with the pillars of DRR support. It analyzed the extent to which client countries received World Bank support for four of the major pillars during the evaluation period—that is, risk identification; risk reduction, resilient infrastructure, and resilient reconstruction; EWSs and preparedness; and financial protection. Resilient reconstruction, as a stand-alone pillar, was excluded from the integrated approaches analysis because it is conditional on a disaster's occurrence during the evaluation period, which may not apply to all countries (resilient reconstruction activities were counted toward resilient infrastructure). The analysis counted the number of pillars with support from lending activities in the FY10–20 DRR portfolio. In countries with support for three or four pillars, the World Bank was considered to be pursuing a more integrated approach. In contrast, in countries with support for only one or two pillars, the World Bank was deemed to be less integrated. The evaluation team then assessed trends across client countries to determine where and how the World Bank is more often pursuing integrated approaches.

Predisaster Vulnerability Reduction

Per the stated goals of the World Bank, the evaluation team assessed the share of predisaster projects approved over the evaluation period, as compared with ex post. The evaluation team also went outside of the DRR portfolio to examine the share of all disaster response projects that had DRR elements during the evaluation period. Over time, while the number of ex post response projects may remain constant (disaster response will always be needed, to some extent), the number of these projects that do not include risk reduction elements should go to zero.

Mainstreaming Disaster Risk Reduction in Sectors

Per the stated goals of the World Bank, the evaluation team examined the extent to which DRR objectives and activities were mainstreamed in technical sector projects, meaning projects that are not designed as "core" DRR projects. Such "core DRR projects" are those that mainly focus on DRR aims in their objective and project theory, either pre- or post-disaster.

Nature-Based Solutions

The evaluation team identified and analyzed projects across the portfolio that contained NBS components to mitigate disaster risks. The NBS projects identified by the evaluation team were compared against a list of projects provided by the World Bank's NBS community of practice to ensure a comprehensive list of projects that integrated NBS for DRR purposes. The evaluation team catalogued NBS intervention typologies, noted trends over time, and examined closed projects for results.

Country Case Analysis

The evaluation team used an explanatory case analysis method to explore factors that have facilitated or limited the World Bank's ability to influence client countries to undertake DRR. In line with the Approach Paper's theory of change, this evaluation posits that the World Bank uses actions such as analytical and advisory work, policy dialogue, convening of partners, and different types of investment to help clients understand their disaster risk and to act on priorities through investments and policy reforms.

A case study design was developed to answer the following question (EQ1b, as posed in the Approach Paper): "What has worked in the World Bank's efforts to influence clients to undertake DRR, including in partnership with other stakeholders?" Two types of cases were chosen: high type cases and low type cases. High type cases were those where it was expected that the World Bank had made a strong contribution to countries undertaking DRR, while low type cases were those where it was expected that the World Bank had sought to influence clients to act on DRR (for example, with upstream analytical work) but had struggled to get uptake. The presumption was that studying more extreme cases would make critical factors more obvious. Cases were then selected based on three methods:

- Consultation with World Bank staff: The evaluation team consulted staff, particularly the regional coordinators for disaster risk management, to identify cases that may fit the high or low type criteria.

- Use of portfolio data: The evaluation team used portfolio data to identify countries with a significant presence of World Bank lending and nonlending for DRR (with a presumption that this could be a potential high type case).
- Use of external data: The evaluation team used the United Nations Office for the Coordination of Humanitarian Affairs INFORM index and the Sendai Framework monitoring data as an external proxy for progress on DRR. However, the self-reported nature of these data limited their utility.

Based on this method, case studies were selected and carried out for Armenia, Brazil, Ethiopia, India (focusing on Bihar and Kerala), Morocco, Mozambique, Nepal, Organisation of Eastern Caribbean States (focusing on Grenada and St. Vincent and the Grenadines), the Philippines, and Romania. These countries also provided coverage across the World Bank regions; a mix of income groups; and examples of fragility, conflict, and violence and small island developing states contexts. They also included countries facing all major natural hazards. Planned case studies for Papua New Guinea and Jamaica were dropped.

In implementing the case studies, it became clear that most countries did not fully fit the simple criteria: there were some successes in DRR even in the low type countries and some barriers and challenges even in high type countries. This observation did not undermine the methodology, as the approach was to consider factors across cases, not within high or low types.

Each case study followed a protocol consisting of a document review, key stakeholder identification, semistructured interviews conducted through virtual missions due to coronavirus (COVID-19) limitations, and the completion of a structured case template. Document review included country documents (SCD, Country Partnership Framework), project documents (Project Appraisal Document or program document), and evaluative documents (Implementation Completion and Results Report, Implementation Completion and Results Report Review, Project Performance Assessment Report). Interviews were conducted with World Bank task team leaders, key team members, country directors or country managers, key practice managers, senior leaders in key government agencies with which the World Bank had engaged (for example, finance or planning ministries, disaster agencies, and key line agencies such as water, agriculture, or infrastructure), develop-

ment partners acting on DRR, and civil society experts on DRR when present. The structured case template required case studies to answer questions on the vulnerability of the country to natural hazards, the degree of progress made by the country on DRR over the evaluation period, the contribution of the World Bank to influencing country progress on DRR over the evaluation period, and key factors of success aligned to the evaluation's theory of change: the role of analytics and upstream engagement, country context factors, internal World Bank factors, and entry points for DRR engagements. Case studies were not able to interview the full expected range of clients in some countries, as managing resurgent COVID-19 waves or other disasters occupied the time of disaster-related stakeholders in multiple countries.

Cross-cutting findings were generated through cross-case analysis. High and low type cases were considered jointly: the presumption was that the key factors were similar across both types, with the presence of a success factor leading to DRR or its absence acting as barrier to DRR. The identical template structure used across case studies made it easier to identify when similar findings were generated across cases. A cross-case analysis workshop facilitated this by helping the team identify convergence and divergence across case studies.

Evaluation Question 2 Effectiveness

How effectively has the World Bank supported DRR, and what factors explain this?

The evaluation team assessed three aspects of effectiveness regarding the World Bank's support for DRR. First, the evaluation team conducted a monitoring and evaluation analysis to identify how the World Bank articulates DRR outcomes in its project objectives and theories of change and how it captures those outcomes with indicators. The evaluation team also conducted an analysis of "for whom" DRR outcomes are intended and achieved. Second, the evaluation team generated lessons on factors that support effectiveness for four key activities in the DRR portfolio. Third, the evaluation team conducted a transformational case analysis whereby it identified, and drew lessons from, selected instances where World Bank DRR activities had transformative effects.

Monitoring and Evaluation and Results Analysis

To capture the frequency and level by which the World Bank is articulating and measuring DRR results, the evaluation team created an indicator database. The evaluation team identified 4,036 DRR-relevant indicators for the 9,721 project indicators in the DRR portfolio. The evaluation team analyzed the indicators for DRR content, then coded them into five categories: Category 0—DRR activity not assessed; Category 1—Broad reference to DRR strategy or capacity, but no results measurement; Category 2—DRR outputs; Category 3—Proxy DRR outcome indicators; and Category 4—DRR economic, social, and welfare outcomes. The goal of this exercise was to catalog the level at which DRR results are being articulated and captured and to track this over time.

To assess DRR-related results for key approaches at the portfolio level, the evaluation team first identified the most frequently occurring types of indicators, then used these to assess results reported in completion reports. Although indicators vary in phrasing, many of them capture similar results (for example, length of roads to withstand extreme weather events based on smart standard, length of bridges to withstand extreme weather events based on resilient standard, and so on). The team used R software to fuzzy search the most common indicator groupings. With the n-gram method, the team used R to find the most frequent phrase (from five to seven words long) across all the indicator names. As a result, the software identified indicators within the same group, even when the indicators varied slightly in wording. In the example on roads and bridge length, since both indicators have a phrase of "to withstand extreme weather events," R treated them as the same indicator group. Using this method, the team detected the 20 most frequent indicators from more than 9,500 indicators. To assess results at the project level for key approaches, the evaluation team then analyzed the results reported against these DRR indicators in Implementation Completion and Results Reports.

Targeting and Tracking Disaster Risk Reduction Beneficiaries

The evaluation team conducted an analysis to determine how well the World Bank is targeting and tracking DRR beneficiaries. The analysis was designed

to assess how and how well the World Bank is targeting, addressing, and tracking DRR benefits for beneficiaries. Based on an inductive approach, the evaluation team recorded the groups that were most often referred to in the portfolio review analysis as being vulnerable to disasters: women and girls, children and youth, persons with disabilities, and the elderly. The assessment team then reviewed and compared the set of closed projects (n = 135) with the set of recently approved projects from FY20 (n = 85) to assess (i) how these groups were being identified and how their needs were being addressed over time and (ii) whether disaggregated DRR effects were being tracked. The method draws on the World Bank's Social Inclusion Assessment Tool methodology (see box A.1). On this basis, the team coded each disaster-vulnerable group (see table A.8) and documented supporting evidence to enable analysis.

Box A.1. Use of the World Bank Social Inclusion Assessment Tool Methodology to Inform the Disaster Risk Reduction Beneficiary Coding Protocol

The Social Inclusion Assessment Tool is a four-question methodology to help policy makers and development practitioners assess how social inclusion can be addressed in projects, programs, policies, or analysis. This tool is based on the axiom that asking the right questions is key to finding the right solutions. The four overarching questions are as follows:

1. Identification: Are excluded groups identified? Who is excluded? Are some groups less likely to benefit from a project/program/policy because of their identity?
2. Analysis: Is there ex ante analysis on social inclusion? How and why is the particular group (or groups) excluded? What drives the exclusion?
3. Actions: Are there actions intended to advance social inclusion? Social Inclusion is not always about doing more; it is often about doing things differently. What actions are built into project, program, or policy design?
4. Monitoring: Are there indicators to monitor social inclusion? How would we know if we have made progress? In projects, does the results framework contain indicators on inclusion?

Source: World Bank 2018.

Table A.8. Disaster Risk Reduction Beneficiary Coding Protocol

For FY20 Projects	For Closed Projects
0—Group not mentioned	0—Group not mentioned
1—Group mentioned but no DRR interventions specified	1—Group mentioned but no DRR results specified
2—Group mentioned and targeted through DRR project interventions	2—Group mentioned and qualitative DRR results specified
3—Group mentioned and targeted through DRR project interventions, and results measured in RF	3—Group mentioned, DRR results specified, and results measured in RF
Group mentioned, targeted through project interventions, and/or tracked in RF, but not DRR-related	Group mentioned, targeted through project interventions, and/or tracked in RF, but not DRR-related

Source: Independent Evaluation Group.

Note: DRR = disaster risk reduction; FY = fiscal year; RF = results framework.

When the team analyzed the collected data, they only expected projects to finance interventions and track benefits for specific disaster-vulnerable groups if these groups were cited as vulnerable by the particular project (that is, not all projects were expected to benefit all vulnerable groups; they were only expected to do so where relevant as determined by the project itself).

Key Disaster Risk Reduction Approaches

The evaluation examined the results achieved and factors of effectiveness for four key DRR approaches. The size and variety of the DRR portfolio meant that it was not feasible to assess results and success factors for all approaches. Instead, the evaluation focused on four key approaches that were significant outputs in the theory of the change representing large subsets of the portfolio or that were identified by World Bank management during consultations as being of particular importance for future DRR work. These approaches were (i) resilient infrastructure; (ii) EWSs; (iii) disaster insurance; and (iv) DRR policy lending instruments, especially catastrophe deferred drawdown options. For each approach, the evaluation reviewed project appraisal and evaluation documents (Project Appraisal Document or program document, Implementation Completion and Results Report, Implementation Completion and Results Report Review, Project Performance Assessment

Report) for all closed projects. Of the 214 closed DRR projects with evaluations, there were (i) 60 closed investment projects that supported resilient infrastructure and had disaster-related objectives; (ii) 32 closed investment and policy lending projects that supported community-based approaches; (iii) 35 closed projects that supported an EWS; (iv) 20 closed investment and policy lending projects that supported disaster insurance; and (v) 33 closed development policy loans that supported DRR reforms.

Transformational Case Analysis and Successful Disaster Risk Reduction Results

The evaluation used analysis of successful cases to answer the evaluation question on what has worked to achieve transformative DRR effects in client countries in the most successful cases. The evaluation theory of change identified that projects can achieve transformative results, outcomes, and impacts that go beyond the direct effects of World Bank interventions. Although the original intent was to assess the achievement of transformational results, the team adjusted the approach during the evaluation to recognize that highly successful cases were on a pathway to transformational change rather than being able to demonstrate that transformational change had been achieved. Highly successful results were defined based on the 2016 evaluation by the Independent Evaluation Group (IEG) on transformational engagements (World Bank 2016): an activity is highly successful if it addresses a major developmental challenge (relevance), addresses root causes to support a change in trajectory (depth of change), or causes large-scale impacts at a national level (scale of change). The evaluation team chose to search for highly successful cases in its high type case countries, as identified in the Country Case Analysis section. The team chose this approach because it assumed that highly successful results are most likely in cases where the World Bank has played a major role on DRR over a long period and because limiting the number of different countries engaged was important for feasibly implementing the case study approach. Each success case was scoped at the level of a single result, made up of the combination of World Bank lending, nonlending, and other work that contributed to that result. Case studies were carried out for flood preparedness and mitigation in Bihar, India; disaster-resilient schools in Mozambique; and a flood master plan in

Manila, Philippines. A partial case study was carried out by drawing on prior IEG work for earthquake risk mitigation in Istanbul, Türkiye. A case study on integrated preparedness in the Organisation of Eastern Caribbean States was dropped due to insufficient evidence, and case studies on policy reform in Morocco and resilient buildings in Romania were also dropped.

Each case study followed a protocol including document review, key informant identification, semistructured interviews through virtual missions due to COVID-19 protocols, and completion of a structured case template. Case study authors reviewed documents including project documents and any available evaluative evidence. Interviews were conducted with World Bank staff, including task team leaders and some team members of projects and analytical work that support the result; government officials such as senior staff in relevant ministries; development partners; and country DRR experts. The case study template required authors to describe the highly successful result and validate that it met the criteria, describe World Bank contributions to the result, and identify factors that contributed to the result being achieved, based on categories from IEG's 2016 evaluation on transformational engagements: rigorous diagnostics, adaptation to context, piloting demonstration and replication, working with partners, institutional change, behavioral change, and sustained engagement.

Cross-cutting findings were generated through cross-case analysis. The case study templates were structured to allow findings across case studies to be combined according to the categories. A cross-case analysis workshop facilitated this process.

Throughout this evaluation, IEG consulted with more than 200 World Bank staff, government officials, staff from other donor organizations and multilateral development banks, and representatives of nongovernmental and civil society organizations.

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Appendix B. Country Case Study Summaries

Armenia

Country Characteristics

Armenia is an International Bank for Reconstruction and Development country with a rich and diversified World Bank Group portfolio and is subject to a variety of development constraints. It is one of the most disaster-prone countries in Europe and Central Asia, facing earthquakes, landslides, mudflows, and hydrometeorological hazards. Climate change is accelerating the frequency and intensity of these hazards.

Country Progress on Disaster Risk Reduction

Armenia has made substantial progress on disaster risk reduction (DRR) policy frameworks and capacity building between fiscal year (FY)10 and FY20. However, various gaps remain in implementing DRR, including (i) a large investment gap in public asset resilience, with most assets still being seismically unsafe; (ii) a lack of common risk assessment methodology for certain hazards and incomplete monitoring systems; (iii) insufficient disaster information, capacity, mainstreaming, and decentralization; and (iv) a lack of a comprehensive disaster risk financing strategy.

World Bank Contribution to Disaster Risk Reduction

DRR has consistently been on the World Bank's agenda throughout the evaluation period, largely through advisory services and analytics. The most notable activity is a seismic risk assessment and cost-benefit analysis of seismic strengthening, leading to building code updates and school retrofitting. Stakeholders generally perceive the World Bank as a leading technical and coordinating partner on disaster risk management (DRM) and as the preferred partner for analytics and advisory support. However, the World Bank's

lending role is limited, with the government typically acquiring concessional finance from other development partners.

Explanatory Factors

At the project level, it was difficult for analytical work to convince actors to invest in climate adaptation or DRR measures, as benefits are intangible and difficult to estimate. Direct World Bank interaction with line ministries on DRR could stimulate mainstreaming as the main way forward for DRR investment because the Ministry of Emergency Situations (MES) has insufficient resources and leverage.

Limited fiscal capacity is arguably the most important reason for limited DRR investment in Armenia. The government has been unwilling to expand its World Bank borrowing due to a high debt-to–gross domestic product ratio. Relevant ministries such as the MES lack financial resources to adequately perform and improve their operations. Furthermore, political instability has impeded sustained leadership and staff capacity on DRR. The war with Azerbaijan and the recent coronavirus (COVID-19) pandemic diverted attention and resources away from DRR. Additionally, DRR champions are scarce both in the MES and in line ministries. The MES is often pulled toward disaster response rather than risk reduction.

Regarding internal World Bank factors, staff-specific DRR interests play a critical role in pushing the agenda. Although the Country Management Unit (CMU) generally provided adequate support, its ability to support DRR engagement was limited by country constraints. Enhanced mainstreaming of DRR in World Bank operations is generally perceived as the way forward, based on increased CMU and Global Practice engagement, coordinating champions, and a dedicated core of disaster specialists.

Brazil

Country Characteristics

Brazil is a territorially large and diverse upper-middle-income International Bank for Reconstruction and Development country. The region with the

highest poverty level—the semiarid northeast— historically has been prone to recurrent droughts that have become even more frequent and severe in recent decades due to climate change, leading to rising economic losses. Flooding has also become more common and serious, particularly in large metropolitan and other urban areas in the Southeast and South.

Country Progress on Disaster Risk Reduction

Historically, Brazil's main DRR concern has been droughts in the northeast, but the government is now paying increasing attention to drought-related problems in other parts of Brazil. The national and subnational governments are taking a more proactive approach to drought risk (for example, improving ex ante drought forecasting at various levels and institutionalizing preparedness and mitigation). Starting in the 2000s, the Brazilian federal government (especially state and affected municipal governments) has also been paying more attention to increased flooding and landslides in urban areas after heavy rainfall events and associated inundations and mudslides.

World Bank Contribution to Disaster Risk Reduction

The World Bank has consistently recognized the risk of drought-related water shortages and the need for improved water security in Brazil in its country strategies, and it has provided both nonlending and lending support for drought risk management. Technical assistance supported the establishment of a drought policy framework and the development of a regional drought monitoring network, and this support and a consultative and convening approach contributed to a paradigm shift from the traditional reactive response to a more nuanced and proactive approach emphasizing preparedness and planning. The World Bank's initial flood-related support came mainly through analytical work. The Global Facility for Disaster Reduction and Recovery (GFDRR) supported the federal government in conducting various studies to better understand the economic impact of chronic disasters. Other notable analytical works include financial protection options for addressing disasters, assessment of damages and losses from disasters, improved climate resilience in the road sector, and support for municipal-level flood maps. World Bank lending activities for urban DRR occurred in specific proj-

ects for urban and sectoral development more generally, both at the municipal and state levels.

Explanatory Factors

A key factor behind the success for drought management was the World Bank's choice of partners at the federal and state levels. Although droughts cover parts of nine different regions, the World Bank was able to bring various agencies to collaborate to frame an effective solution by structuring and facilitating a more permanent institutional approach to drought, improving coordination, and developing integrated drought monitoring tools and preparedness plans. At the country level, champions and leadership within Brazil were particularly important for the transformation in drought policy. However, while government awareness of drought risk is high, it is much lower on floods and landslides because these hazards mostly affect specific urban areas or state subregions. As a result, governments in Brazil, especially at the federal level, have been reluctant or unable to borrow from the World Bank for purposes of urban disaster preparedness and management.

Within the World Bank, lending for DRR is constrained by competing priorities and the limited number of lending "slots" during each year and Country Program Evaluation period. This challenge applies especially to individual states and the World Bank's stated preference for lending to the poorer ones in the northeast and Amazônia. The World Bank's contribution to drought risk reduction benefited significantly from the use of skilled local staff, who had the sectoral and institutional knowledge and relationships needed to enhance and sustain the World Bank's influence.

Ethiopia

Country Characteristics

Droughts and floods pose the most significant risk to Ethiopia, particularly in the northern and eastern regions. About 1.5 million people are affected by droughts every year, although this number is substantially higher in dry years. The arid and semiarid climate of lowland regions is particularly prone

to droughts. Flooding poses a threat to lowland, highland, and urban areas, with approximately 250,000 people on average affected by floods each year. Ethiopia also faces localized landslides and, to a lesser extent, risks from earthquakes and volcanoes.

Country Progress on Disaster Risk Reduction

The government has focused on combating recurrent droughts and food insecurity through an integrated approach to drought risk management that includes mitigation activities (such as soil and water conservation), forecasting and early-warning systems, and scalable safety net programs for the most vulnerable. Establishment of the Productive Safety Net Program in 2005 was an important move away from the regular appeals for humanitarian food assistance after severe drought events. Improvements in drought risk management over the past decade have included strengthening the resilience of rural communities and agricultural households by rehabilitating land, strengthening watershed management, and expanding irrigation coverage. However, despite the development of policies and institutions focused on comprehensive DRM, there has been less attention or investment on hazards other than drought, especially managing flood risk through flood prevention and preparedness and natural hazards in urban settings.

World Bank Contribution to Disaster Risk Reduction

World Bank financing, along with the support of 11 development partners, of the Productive Safety Net Program over 15 years has provided the major platform in Ethiopia for the World Bank to engage with the government on drought risk reduction in rural areas. A sustained program focused on agricultural development and livelihood resilience has been an important part of the World Bank's engagement, and strong early engagement on river subbasin management and Integrated Water Resources Management appears to have decreased over the past decade other than as an element of sustainable land management programs. The World Bank's work on DRR in urban settings has been largely limited to analytical and advisory work, as few of the findings have yet to be translated into increased investment. The World Bank's engagement on DRM in Ethiopia has largely occurred through

cross-cutting elements in sector operations. However, direct discussions with the government on broader DRR have increased in recent years, especially after the major 2020 floods.

Explanatory Factors

Substantial and influential analytical and advisory work on drought risk, food insecurity, and (to a lesser extent) water resource management and hazards facing urban areas was carried out over the past decade, often financed through multidonor trust funds. The World Bank focused its technical assistance to the Productive Safety Net Program on the Ministry of Agriculture (responsible since 2007 for the Disaster Risk Management and Food Security Sector), which did not directly inform the approaches used by the National Disaster Risk Management Commission (established in 2015), including for the parallel delivery of humanitarian food assistance.

The annual nature of drought risks in Ethiopia and the sheer scale of the resulting food insecurity have dominated the country's prioritization of drought vulnerability in the various DRM strategies, disaster financing, and investment plans. The World Bank's policy dialogue on disaster risk financing mechanisms has been start and stop, partly because the government has preferred to rely on continued support from development partners for its successful social protection program. Other hazards have not received the same level of attention as drought hazards due to government prioritization of the food security challenge, the fragmentation of responsibility, and the absence of champions.

India—Bihar and Kerala

Country Characteristics

India is highly vulnerable to the impact of climate change and extreme events. It is prone to earthquakes and tsunamis, floods, droughts, cyclones, and landslides. Bihar is India's most flood-prone state, with 76 percent of the total population living under a recurring threat of floods. Kerala has one of the lowest poverty rates and the highest level of human development in

India, but it has pockets of chronic poverty and lags in the development of quality infrastructure, which has made the existing infrastructure more vulnerable to natural hazards and climate change.

State Progress on Disaster Risk Reduction

Severe floods in Bihar in 2004, 2007, and 2008 were landmark events that spurred a change in Bihar's approach to tackling disasters. Community-based DRR programs were put in place, and coordination across government departments was encouraged, along with the establishment of a Flood Management Improvement Support Centre. In Kerala, the devastating floods of 2018 provided an opportunity for the state government to accelerate long-pending policy and institutional reforms that address the drivers of disasters and climate change risks and better prepare the state for future disasters. The Rebuild Kerala Development Programme (2019) constitutes the state government's road map for a green and resilient Kerala.

World Bank Contribution to Disaster Risk Reduction

The World Bank has supported India's major policy shift from reactive post-disaster response to a proactive DRR approach and earned a role as a trusted partner in "building back better" and prioritizing risk reduction. GFDRR provided grant support for projects at both the state and national levels. In Bihar, the World Bank supported two phases of a flood recovery and river basin management operation, including reconstruction of housing, roads, and bridges; structural investment for strengthening river embankments; and the development of a flood management information system to support improved flood forecasting. Sector-focused lending operations, including rural roads improvement and enhancement of rural livelihood, also helped reduce risk and build resilience. In Kerala, the World Bank used a development policy operation (DPO) focused on resilience and DRR as the foundation for a new state partnership in 2019. The World Bank provided technical assistance for analytical work, conducted policy dialogues, and convened development partners in relation to the government's resilience program.

Explanatory Factors

In Bihar, the state government's initial focus on immediate reconstruction and recovery from the 2008 floods made it difficult to gain traction on a risk reduction agenda. However, the World Bank's support for the Post-Disaster Needs Assessment and a subsequent agreement to finance the outstanding restoration and reconstruction efforts helped position the World Bank as a long-term partner and enabled sustained dialogue and engagement that led to risk reduction investments.

In both states, analytical and advisory work ensured that (i) the lending operations drew on regional experience and international best practices in resilient reconstruction and the restoration of services; (ii) policy and institutional dialogue related to future risk reduction was underpinned by rigorous analysis and consultation; and (iii) the models and information systems for flood early-warning systems were developed iteratively as the data sources, state capacity, and methods improved. Experience showed that long-term risk reduction can be politically popular and contribute to electoral success, so long as quick disaster response and effective reconstruction efforts are prioritized. The World Bank worked primarily with the sector and finance departments to ensure a longer-term approach to risk reduction rather than with the state disaster management authorities that were more focused on disaster response and management efforts. The DRM agenda received consistent support from the World Bank CMU, and engagements with both states benefited from the country office nominating staff members to be the coordinators for each state partnership to help maintain relationships and lead strategic dialogue with the state governments.

Morocco

Country Characteristics

Morocco is regularly prone to flooding, with losses estimated at more than $400 million each year. Droughts affect the agricultural sector, with an estimated annual loss of crop yields of approximately $300 million. Earthquakes typically affect the North and the Agadir region toward the southwest. Water

availability is the most important longer-term chronic vulnerability and is exacerbated by climate change.

Country Progress on Disaster Risk Reduction

Morocco has a long history of actions on disaster preparedness. A series of decrees were issued by the government, and various governmental agencies were established to respond to emergency situations. The Green Morocco Plan was developed in 2008 to enhance agriculture's and fisheries' resilience to natural hazards, especially droughts. In 2009, a National Water Strategy was formulated to prioritize resilience to flood damage, encompassing early-warning systems, weather forecasting, and flood risk reduction plans. A catastrophe fund was set up to cover the cost of damage to infrastructure by natural disasters. Most recently, the Ministry of Interior created a dedicated disaster risk management directorate.

World Bank Contribution to Disaster Risk Reduction

In 2008, the World Bank established a policy dialogue with the government on DRR, which led to five years of intense World Bank–led analytical work. In 2013, the report, *Building Morocco's Resilience*, which applied a user-friendly multihazard probabilistic risk assessment model, highlighted the costs of natural disasters to the population and government. The report also suggested a change in Morocco's strategic approach to disasters from an ex post response of damage repair and recovery to an ex ante integrated risk management approach, with a risk management partnership between the government and the World Bank. The government welcomed the report, and the subsequent dialogue with the World Bank generated confidence to pursue a transformative integrated risk management strategy, which resulted in the government and the World Bank agreeing to a Program-for-Results project in 2016 and a development policy loan in 2019.

Explanatory Factors

The analytical work on the costs of disasters stimulated a partnership with the government on DRM, improved government agencies' awareness and understanding of disaster risks, and embedded disaster resilience within

institutional culture because of the rigorous analytics and efforts to build institutional acceptance. However, the World Bank's approach of not financing investments until a strategy was in place meant there was a long delay before project support began to address disaster risk reduction.

The pathbreaking analytical work was made possible by grant financing, sustained commitment from World Bank management, continuity in staff engagement, and a collaborative approach that built mutual trust.

Mozambique

Country Characteristics

Mozambique is one of the poorest and most disaster-vulnerable countries in the world. It is the only country in Africa considered at high risk from three major natural hazards: recurrent floods, cyclones, and drought. The economic impacts of climate change are significant and likely to grow. Mozambique's vulnerability is further heightened by fragility, conflict, and governance challenges. Natural hazards can also be a conflict driver.

Country Progress on Disaster Risk Reduction

Mozambique has a long history of DRR policy framework development in response to recurring disasters since 1999. The government has invested in multiple aspects of DRR, including preparedness, mitigation, and identification. This has included strengthening hydrometeorological services and early-warning systems, deepening disaster financial protection, promoting resilient infrastructure, and building social resilience. The government has also been increasingly able to include resilience in its reconstruction efforts.

World Bank Contribution to Disaster Risk Reduction

The World Bank's support for DRR was initiated with analytical reports that focused on the country's climate change vulnerability and risks and technical assistance projects for capacity building. These laid the groundwork for two climate change DPOs. Severe floods and cyclones in 2015 and 2019 led the World Bank to respond with a series of emergency recovery projects. The

World Bank supported Mozambique's hydrometeorological system and spatial information data improvements across multiple engagements. Analytical works in the transport sector were promoted and piloted by subsequent road projects. Various urban planning and development projects further strengthened climate resilience in cities. The World Bank's support for resilient schools was effectively taken up and supported by donor partners. The World Bank further incorporated disaster-sensitive aspects into its social protection programs.

Explanatory Factors

The World Bank's substantial program of DRR-related advisory services and analytics was comprehensive and well sequenced. Analytical work was used to make a financial and fiscal case for increased DRR investment to the government of Mozambique and to design subsequent DPOs. Technical assistance strengthened the government's capacity to prepare the ground for mainstreaming climate change resilience into key sectors. The DPOs established the sector-specific plans needed for further investments. Targeting advisory services and analytics and upstream work to the Ministry of Finance and the relevant line ministries helped enable subsequent investment.

Mozambique's vulnerability to disasters, especially floods and cyclones, presents a clear rationale for investment in DRR with the government and development partners. DRR engagement has also benefited from having "the right people at the right places" in government. The national disaster agency helped create government champions by giving them experience and exposure to DRR. The broad mandate of the national disaster agency initially hampered effective DRR engagement. However, transferring responsibility for resilience to line ministries helped the agency focus on disaster preparedness and response.

The availability of grant financing from trust funds, especially GFDRR and the Pilot Program for Climate Resilience, was vital to facilitate the World Bank's engagement in DRR. The World Bank's ability to deploy various tools to allow for quick disbursement after a disaster and its willingness to and success in rapidly supporting disaster reconstruction helped build credibility and in-

fluence with government and development partners. Consistent World Bank engagement and strong CMU leadership further supported DRR programs.

Nepal

Country Characteristics

Nepal is a low-income, landlocked country with complex ethnic, geographic, and caste divisions. It is one of the countries that are most vulnerable to adverse natural events and climate change. All of Nepal is exposed to significant earthquake hazards, and much of the country is susceptible to floods and landslides. Political instability and weak public institutions characterized much of the evaluation period.

Country Progress on Disaster Risk Reduction

Nepal significantly developed its policy and institutional framework for DRR between 2010 and 2020. The challenge has been in the implementation of this framework, as the government's focus has been on responding to disasters rather than longer-term risk reduction. Although the 2017 Disaster Risk Reduction and Management Act, establishment of the National Disaster Risk Reduction and Management Authority, and the federalization process provide the framework for DRR in Nepal, there are considerable institutional, coordination, financial, and technical issues at various administrative levels that need to be resolved. Additionally, despite a long history in Nepal of participatory management of forests and other natural resources, there has been insufficient attention to watershed management at scale.

World Bank Contribution to Disaster Risk Reduction

The World Bank engaged in numerous upstream activities in Nepal. The country has been a priority for GFDRR, which has financed a series of technical assistance activities. The World Bank's post-earthquake housing reconstruction project has been an important platform to support the development of DRR capacity and systems and technical advice and financing for resilient reconstruction. Trust funds including the Pilot Program for Climate

Resilience have been used to support DRR-related advice and technical assistance. Ongoing projects that worked through community-driven development helped build community resilience through improved natural resources management and enhancement of livelihood assets. World Bank engagement in the transport sector focused on the use of climate-resilient designs in the primary and secondary road networks. Operational experience and analytical work on the technical challenges and institutional constraints to DRR have been used to inform policy dialogue and a catastrophe deferred drawdown option approved in 2020.

Explanatory Factors

World Bank staff used the analyses from technical assistance projects (for example, on earthquake housing damage characterization, structural integrity assessments of social infrastructure, and institutional capacity of the National Disaster Risk Reduction and Management Authority) to influence the government and advocate for the application of findings through investment operations of the World Bank and other development partners. There has been considerable analytical and advisory work carried out in Nepal, and it is unlikely that additional analytical work would have resulted in a faster adoption of risk reduction and management approaches.

Although awareness of DRR has generally been high in government and civil society, the priority of the government was on disaster response rather than risk reduction, especially after the 2015 Gorkha earthquake. Although the policy, strategy, and institutional framework for disaster risk reduction and management in Nepal developed significantly over the 10-year period, there was insufficient budget, capacity, and political commitment for the government to take up this agenda effectively.

The importance of DRR has been well reflected in the World Bank's diagnostics and partnership frameworks and supported by the CMU. However, greater coordination of the development partners involved in disaster risk reduction and management (beyond the effective coordination on housing reconstruction) could potentially have improved Nepal's progress in adopting proactive risk reduction approaches.

Organisation of Eastern Caribbean States

Country Characteristics

The six World Bank member countries in the Organisation of Eastern Caribbean States (OECS) face inherent economic, governance, and geographical challenges. The OECS countries are among the most vulnerable to climate change and disasters caused by natural hazards, especially hurricanes, which can wipe out the entire annual gross domestic product.

Country Progress on Disaster Risk Reduction

Development policies in OECS countries have always prioritized disasters, given these countries' extreme exposure to natural disasters. The devastation of hurricanes led to strengthened legislation, national disaster risk management plans, and the establishment of permanent disaster agencies. Client awareness on predisaster risk reduction has increased over time, and there has been a corresponding gradual shift in focus from risk response to risk reduction. This shift, however, remains insufficiently prioritized and implemented, resulting in persistent high disaster exposure.

World Bank Contribution to Disaster Risk Reduction

The World Bank has played a substantial role in supporting OECS clients on disaster risk management. Proactive staff efforts to develop a comprehensive DRM program and acquire corresponding funding eventually led to the regional and national Disaster Vulnerability Reduction Projects. These projects have substantially improved awareness on cross-sectoral disaster mainstreaming and spurred the design of integrated approaches to DRM. Nevertheless, their implementation progress and success in reducing vulnerability have been fragmented due to late program delivery, complex designs, high costs, and low capacity.

Explanatory Factors

The World Bank's efforts to build an evidence base on disaster vulnerability and DRR impacts helped convince and enable clients to shift investments

from disaster response to risk reduction. Technical assistance was also directed toward existing practical needs and analytic capacity gaps. However, an overload in disaster analytics and technical assistance in recent years may have overwhelmed client absorptive capacity.

The high level of government awareness on the need for DRM makes OECS clients very receptive to engaging with the World Bank, especially from an investment angle. However, the most important obstacle to successful DRM investment has been thin client capacity, coupled with widespread programmatic and partner fragmentation. In turn, these obstacles led to high transaction costs; administrative overburdening; delays in procurement, disbursement, and implementation; and reduced portfolio performance, especially for complex infrastructure operations. The World Bank has taken several measures to try to address capacity and fragmentation challenges, with only partial success. Other notable obstacles for DRR engagement include tight fiscal space and low political visibility of DRR as compared with post-disaster reconstruction.

Deliberate and creative efforts from World Bank staff to free up funding for DRM around FY08–10, complemented with sharp increases in concessional and grant finance in the years thereafter, have been the most important factors for a profound and expanding World Bank involvement on DRR in OECS. Staff and management creativity, flexibility, prioritization, and commitment were important factors in successfully conceptualizing, financing, and implementing the DRR program. The World Bank's credibility and reputation further contributed to client trust and buy-in. It should be noted, though, that the regional approach envisaged for World Bank engagement proved only partially successful and was toned down in the FY15–19 Regional Partnership Strategy. The development of Disaster Vulnerability Reduction Projects as single large platforms combining a range of DRR activities entailed several trade-offs, such as complex implementation, lack of prioritization, and coordination difficulties. Finally, while there have been some positive examples of effective donor collaboration, in other cases insufficient collaboration has exacerbated fragmentation and aggravated client capacity constraints.

The Philippines

Country Characteristics

The Philippines is highly exposed to natural hazards, which pose a major threat to the country's population and economic growth. The country experienced 2,754 natural hazard events between 2005 and 2015, and 90 percent of damage from disasters in recent years has been from typhoons. The impacts of disasters on people living in poverty are severe. Climate change may have already reduced economic growth and could have large economic impacts in the future.

Country Progress on Disaster Risk Reduction

The Philippines has demonstrated a strong commitment to addressing disaster risks and has reformed the way it deals with disasters, emphasizing DRR. The government has strengthened its governance and legal framework for disasters, emphasizing response-centric interventions along with disaster prevention, preparedness, and mitigation activities. There has been continuous effort to invest in and overcome budget constraints for DRR at the national and local levels through measures such as the Local Disaster Risk Reduction and Management Fund. Yet challenges remain for cities in securing adequate resources for post-disaster operations (including risk transfer options).

World Bank Contribution to Disaster Risk Reduction

The World Bank has an extensive history of DRR engagement. In the aftermath of Ondoy, a devastating tropical storm that hit Metro Manila, the World Bank supported the government through technical assistance grants to prepare a Post-Disaster Needs Assessment, a Flood Management Master Plan for Metro Manila and Surrounding Areas, and design studies for priority investments. The first phase of implementing the master plan is ongoing. The World Bank has actively supported the government's disaster policy reform program since 2009 through a series of lending operations and analytical work, including a series of development policy loans and catastrophe

deferred drawdown options. A major focus area has been support for disaster risk finance. The World Bank has also supported physical resilience building to address seismic risks in Metro Manila.

Explanatory Factors

High-quality data, analytics, and assessments of hazard risk (including predictive risk modeling) have been key to quantifying risk, assessing costs and benefits, communicating potential impacts, generating buy-in, and supporting data-driven prioritization of investments. To illustrate, the World Bank used advanced risk modeling and three-dimensional simulations of flood scenarios in Metro Manila to raise awareness and generate buy-in for the Manila flood management program.

Champions in the government have played a critical role by enabling essential and decisive political support. However, cultivating champions is not easily replicable. High-level, South-South knowledge exchange has been a key catalyst in raising awareness, fostering political buy-in, and ultimately undertaking DRR investments. The presence of many high-capacity technical experts within the country and government was also credited for facilitating an easier, productive engagement. However, while the experience of serious and high-frequency natural hazards such as floods and storms has resulted in a high overall level of awareness of exposure and impacts among the general public and government, for serious yet low-frequency events such as earthquakes, it took much longer to raise awareness and facilitate investment.

A key strength of the World Bank's engagement is that clients view the World Bank as a trusted partner and honest broker in DRR due to its global experience, internal expertise, networks of international experts, and dependability. Patient, sustained, and long-term engagement—often buttressed by an extensive trust-funded technical assistance program—has been key to building the necessary political and technical buy-in for a long-standing DRR program. Cultivating uptake and ownership of the DRR agenda within the Department of Finance has been critical to (i) elevating the dialogue about DRR and enabling DRR policy reform, and (ii) mainstreaming DRR considerations throughout line ministries and relevant government agen-

cies. Key World Bank staff and managers have played a critical role in building trusted relationships, staying the course, and facilitating an extensive DRR engagement in the Philippines. One challenge that World Bank staff pointed to in undertaking DRR globally is that frequent rotation of World Bank staff may hamper DRR progress and staffing of project teams by undermining country knowledge and personal relationships.

Romania

Country Characteristics

Romania is very vulnerable to earthquakes, with more than 75 percent of the population living in areas subject to earthquakes, including Bucharest. Romania is also one of the most flood-prone countries in Europe, with significant damage from floods occurring several times per decade. Droughts have historically affected 48 percent of agricultural land, and estimates suggest a 20 percent chance of severe droughts in the next 10 years. Due to climate change, Romania is already experiencing increased floods and droughts.

Country Progress on Disaster Risk Reduction

Romania has had a long history of organizing recovery from natural hazards. It has had a flood prevention strategy for decades through a network of dams in river basins. The government has established a national-level multihazard risk reduction platform in various agencies to respond to and prepare for disasters, including an emergency agency, a water management agency responsible for flood warnings, and a water ministry that is responsible for implementation of the European Union Floods Directive. Romania has adopted strategies to address potential disasters due to climate change in accordance with its commitments to the European Union. Disaster preparedness was encouraged through citizen engagement, civil organizations, and volunteer organization. In 2008, the government introduced compulsory national indemnity home insurance to cover losses caused by earthquakes, floods, and landslides, but despite it being compulsory (except for households earning incomes below a specified threshold), only about 20 percent of homeowners are currently covered.

World Bank Contribution to Disaster Risk Reduction

The World Bank's first engagement on DRR in Romania with an investment project between 2004 and 2012 was partly unsuccessful. There was then a hiatus in support, as the World Bank was focused on assisting Romania with mitigating the negative effects of the global financial crises and associated economic downturn. The World Bank returned to DRR operations in Romania in 2017 and 2018 with a development policy loan and four investment projects to bolster DRR and emergency readiness. Concurrently, the World Bank is supporting the government to develop a long-term national seismic risk reduction strategy. To improve institutional capacity for emergency preparedness and response, World Bank staff have used the reimbursable advisory services (RAS) to assist the government with formulating a seismic risk reduction strategy, and another RAS on flood risk management plans is planned.

Explanatory Factors

There is high government awareness that an earthquake, which could occur at any time, would threaten years of economic progress. The government's ability to access European Union grants to finance the cost of World Bank RAS has been critical in enabling preparation of a long-term seismic risk reduction strategy and flood management plans that compensate for gaps in civil service capacity. A respected and influential champion for DRR leads the Department for Emergency Situations. Civil society organizations in Romania have been effective in disseminating advice to civil society and to the government on preparedness for seismic disasters.

The World Bank's proactive and productive reengagement on DRR with the government was enabled by the successful completion of stabilization and economic growth programs, as well as due to strong support and prioritization from World Bank management and staff. The World Bank's work and relationship with the finance ministry from other crisis response and broader development work helped it generate trust from the government, which enabled engagement on DRR. The presence of sector specialists in the World Bank's Bucharest office was expanded to help deliver the ambitious DRR agenda, and the CMU has further strengthened its RAS core team.

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1818 H Street NW
Washington, DC 20433