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HOW TO MANAGE THE FISCAL COSTS OF NATURAL DISASTERS

Introduction

Natural disasters often entail considerable physical and economic costs, with attendant adverse implications for external and fiscal balances owing to postdisaster relief and recovery efforts (IMF 2003; Rasmussen 2004; Barro 2006; Raddatz 2007; Hochrainer 2009; Noy 2009; Acevedo 2014; Banholzer, Kossin, and Donner 2014; Cabezon and others 2015; IMF 2016a; Marto, Papageorgiou, and Klyuev 2017; Berlemann and Wenzel 2018).[1] The increasing frequency and severity of natural hazards and extreme weather events have raised the economic costs associated with these events. Between 1950 and 2015, 40 countries were hit by natural disasters that caused damage in excess of 10 percent of GDP (Figure 1). Among small island states, 1 in 10 natural disasters involves economic damage costing more than 30 percent of GDP (IMF 2016b).[2] Although the probability of being hit by a natural disaster does not differ systematically between advanced and developing economies (Sawada and Takasaki 2017), low-income countries tend to suffer disproportionately large and lasting damage relative to their economic sizes and populations (Rentschler 2013).

This how-to note focuses on the management of the fiscal costs associated with natural disaster risks. Unlike other types of fiscal risks (for example, unexpected macroeconomic changes or materialization of contingent liabilities), a natural disaster presents a unique challenge to fiscal risk management and budget processes because of its exogenous nature and potentially overwhelming scale. This note discusses how governments can build fiscal resilience against natural hazards and strengthen fiscal management after a disaster, including through budgeting frameworks and other fiscal policies. The note aims to answer three central questions: How large should fiscal buffers be? How should fiscal buffers be built up? How should fiscal buffers be used efficiently and transparently once a natural disaster has struck? These three questions directly relate to fiscal policy, fiscal risk management, and the budget process—all core areas of IMF expertise. To address them, the note focuses on fiscal strategies for financing recovery efforts and considers approaches to mitigate disaster impact. The note also provides guidance on how to conduct regular risk analyses of natural disasters' potential fiscal consequences and outlines best practices for defining and accounting for the contingent liabilities associated with natural disasters in budgeting frameworks. Finally, the note touches on approaches for risk reduction, disaster risk financing strategies, and risk transfer mechanisms, such as various insurance instruments.

One central concern is how large the fiscal buffers against such contingencies should be. Natural disasters can worsen a government's fiscal position—directly and indirectly—by eroding the revenue base and increasing expenditures. They often undermine economic growth and set back development objectives, such as poverty reduction, especially in developing and low-income countries with significant infrastructure gaps and institutional constraints. Building resilience against catastrophic events may lower these fiscal risks.

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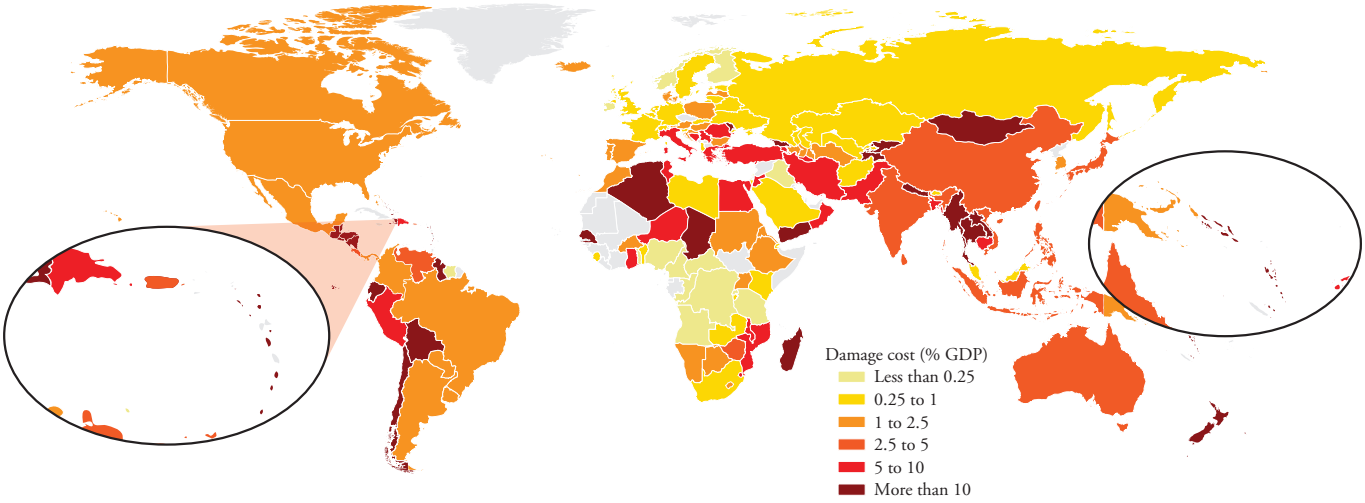
[1]Natural disasters may be geophysical (earthquakes, volcanic activity); meteorological (extreme temperatures, storms); hydrological (floods, wave action); climatological (drought, wildfire); or biological (epidemics, insect infestation) events.

[2]Natural disaster data were taken from the Emergency Events Database (EM-DAT), which is maintained by the Centre for Research on the Epidemiology of Disasters at the Catholic University of Louvain. The EM-DAT is the most comprehensive source on natural disasters; it provides detailed information, beginning in 1950, on the dates, locations, types of disasters, human losses, and economic costs associated with more than 13,000 natural disasters in 168 countries. In the decade and a half following the year 2000, natural disasters caused over $2 trillion in economic damages worldwide.

Figure 1. Natural Disasters: Maximum Damage
(Maximum annual impact, 1950–2015, in percent of GDP)



Source: Emergency Events Database.

From a budgetary perspective, disaster-related fiscal risks represent implicit contingent liabilities. When a natural disaster occurs, contingent liabilities become actual costs associated with humanitarian and economic relief operations in the short term and support for recovery and reconstruction efforts in the medium and long terms.

A public financial management (PFM) strategy can help guide the process of building necessary fiscal buffers. Budgetary provisioning should be the main instrument for managing the fiscal impacts of probable or possible small- and medium-scale natural disasters. Establishing contingencies or building up dedicated funds can help build fiscal buffers to cover future fiscal costs. For large-scale natural disasters, risk transfer options should be developed, as modest budgetary provisioning would provide limited room for expenditure maneuvering, while high budgetary provisioning may be politically challenging and would come at the expense of other expenditure priorities. Catastrophe bonds and insurance are the most common instruments to transfer portions of these risks to third parties for particular fees or premium costs. Finally, when a natural disaster strikes, using fiscal buffers efficiently and transparently is important to mitigate social and economic consequences and to maintain the integrity of budget processes.

The remainder of this note is organized as follows: Section II discusses how to determine the sizes of adequate fiscal buffers for natural disasters. Section III details PFM strategies for building these buffers. Section IV focuses on how to use fiscal buffers when natural disasters strike. Finally, Section V presents six country case studies.

Determining the Size of Fiscal Buffers

When a natural disaster occurs, government finances are vulnerable on two fronts. First, economic activity may contract in the short term, lowering revenue collection. For a given natural disaster, the revenue impact depends on the extent of economic diversification and the composition of tax revenue, as effects differ across economic sectors and revenue sources (income taxes, consumption taxes, customs duties, and so on). Second, postdisaster relief and reconstruction efforts may increase government expenditure and crowd out other priority spending, with potentially long-lasting effects on human capital accumulation and an economy's potential growth rate (Benson and Clay 2004; Rasmussen 2004; Heipertz and Nickel 2008; Lis and Nickel 2010; Mechler, Mochizuki, and Hochrainer-Stigler 2016; IMF 2016b).

According to some estimates, natural disasters have raised government expenditure by an average of 15 percent and lowered revenue by about 10 percent over the five years following a disaster, leading to a substantial increase in the overall budget deficit (Melecky and Raddatz 2011). The resulting increase in public debt, including disaster-related contingent

liabilities, leads to higher borrowing costs, making recourse to capital markets more expensive, thereby putting an additional burden on public finances and further dampening long-term growth (Klomp 2015).

Identification and Quantification

A comprehensive assessment of a country's fiscal position should include contingent and implicit liabilities arising from natural disasters (Laframboise and Loko 2012; Mechler, Mochizuki, and Hochrainer-Stigler 2016; Gamper and others 2017).[3] Accordingly, any debt sustainability analysis (DSA) should encompass such an assessment, going beyond conventional fiscal analysis, which tends to concentrate on a government's direct and explicit liabilities (Box 1). In a broader context, risk assessments for different types of natural disasters must be integrated into the fiscal policy framework (including into budget design, public investment planning, and debt and asset management). Specifically, governments should regularly integrate probabilistic assessments of the frequency and severity of natural disasters, analyses of potential fiscal costs, and comprehensive financing strategies for postdisaster expenditures into their medium-term fiscal frameworks (MTFFs) and DSAs (IMF 2017a).

By creating adequate fiscal buffers within the budget, a risk-based approach to fiscal management can help determine the necessary extent of self-insurance, as well as the number of resources that should be allocated to preventing and mitigating the impacts of natural disasters. Governments should consider using the following step-by-step approach:

- ***Quantify vulnerabilities:*** Obtaining accurate estimates of potential fiscal costs is necessary to facilitate appropriate postdisaster responses and enable better cost-benefit analyses of various risk mitigation and insurance programs. These estimates could be informed by a country's own history of natural disasters and those of its peers.
- ***Invest in risk reduction:*** The public investment strategy should strengthen infrastructure resilience against disaster risks and incorporate regular diagnostic tests to enhance the efficiency of public investments (Box 2).
- ***Adopt flexibility while preserving credibility:*** Budgets should have the flexibility to ensure timely and effective disaster response. Countries that employ fiscal rules should include well-defined escape clauses in their frameworks. In general, flexibility should include the ability to quickly redeploy expenditures across budget chapters (that is, ministries and large agencies), as well as streamlined processes for preparing and ratifying revised budgets.
- ***Develop contingency financing plans:*** Contingency plans for financing disaster relief and recovery should rely on a mix of self-insurance (contingency reserves and funds); contingent plans for disaster responses using borrowed or grant resources; and risk transfer arrangements using insurance, state-contingent debt instruments (SCDIs), and other capital market options (Box 3).[5]
- ***Build fiscal buffers:*** Depending on the extent of vulnerability, international experience suggests reserving up to 3 percent of spending in order to deal with the fiscal risks associated with natural disasters (Cebotari and others 2009). Unused funds could, within certain limits, be transferred at the end of the budget year to a notional fiscal buffer (that is, a natural disaster fund [see Section III]) for use during a future disaster.

Guiding Principles for the Size of Fiscal Buffers

Adequate fiscal buffers are critical to disaster contingency planning, but adequacy depends on country-specific circumstances. This note provides guidance on the high-level considerations that determine the appropriate size of the fiscal buffer rather than suggesting actual cost estimates. These considerations include the projected probabilities of natural disasters for a given country as well as the following elements:

- ***Expected fiscal costs:*** Historical information on the fiscal costs of natural disasters, combined with scientific assessments, can be used to estimate future fiscal expenses associated with natural disasters.

[3]A central government's explicit contingent liabilities, which arise from natural disasters, may include the costs of repairing the infrastructures of subnational governments or state-owned enterprises. Implicit contingent liabilities may include the financial support granted to households for rebuilding homes, even in cases in which the government has no legal obligation to provide such support.

[5]Clarke and Dercon (2016) provide multiple examples of flawed disaster responses resulting from inadequate contingency planning, problems in coordinating responses across multiple partners (local and national governments, disaster relief agencies, foreign governments, and so on), and lack of access to necessary financing.

Box 1. Modeling the Economic and Fiscal Risks of Natural Disasters

According to the Emergency Events Database, during the period 1950–2015, about 80 natural disasters across 40 countries caused economic damage in excess of 10 percent of GDP. These estimates include costs borne by both the government and the private sector. Estimated cost varies with the type of natural disaster and the country's level of economic and institutional development; therefore, governments should develop analytical toolkits (including a parametric approach) for estimating the disaster-related damages public finances suffer under various country-specific scenarios.

Disaster damage covers both the destruction of physical assets and projected economic losses during the period of recovery from the event.[4] The latter refers to forgone production and income as a result of damages to infrastructure and other economic assets. These projected losses are based on a gap analysis relative to predisaster potential growth, implying that the projected period of forgone production and income may last several years before full recovery is achieved. A variety of methodologies and tools can be used to estimate the macrofiscal impacts of natural disasters:

- Following an approach originally developed by the United Nations Economic Commission for Latin America and the Caribbean, the World Bank integrates the Damage and Loss Assessment into the Post-Disaster Needs Assessment (PDNA) tool to estimate disaster-related damages and losses at the sector level and to identify aggregated impact. However, although the PDNA is coordinated across various international and national institutions, it is a postdisaster exercise and does not necessarily provide guidance for disaster preparedness and fiscal planning.
- Guerson (2016) uses Monte Carlo simulations to assess the appropriate sizes of government savings funds to insure against natural disasters among Eastern Caribbean Currency Union countries.
- The Pacific Catastrophe Risk Assessment and Financing Initiative applies probabilistic disaster risk modeling and assessment tools to estimate the economic and fiscal losses caused by natural disasters. It provides Pacific island countries with insurance and technical assistance in natural disaster management.
- The Catastrophe Simulation model, developed by the International Institute for Applied Systems Analysis, is a risk-based economic framework designed and used to conduct a stochastic analysis of a natural disaster's impact.

Natural disaster damage estimates should be updated periodically with the latest available data to reevaluate the financial vulnerabilities and appropriateness of financing instruments, mitigate the fiscal costs of natural disasters, and undertake necessary public investment projects for disaster risk reduction. Probabilistic risk modeling exercises are also critical for the insurance sector and the effectiveness of its postcrisis response.

[4]This definition of natural disaster damage does not account for the often significant cost associated with injury or loss of human life.

Expected fiscal costs, including disaster-related contingent liabilities, should include both direct and indirect costs. Direct costs include immediate damages to public physical assets that must be rebuilt, while indirect costs include tax revenue losses caused by forgone economic activities (Box 1).

- ***Ability to borrow in case of emergency:*** The need for fiscal buffers is higher when, in the event of an emergency, the extent of the country's ability to borrow quickly at affordable rates is lower. Borrowing capacity depends on the current stock of public debt and the ability to tap international credit markets. The speed with which borrowing can be mobilized thus depends on the prospective funding source, as well as a country's track record in debt management.
- ***Opportunity costs of building up buffers:*** The opportunity costs of creating fiscal buffers can be significant, especially when fiscal space is scarce, as building buffers will imply forgoing other high-return expenditures geared toward developing the economy and increasing its long-term growth rate. Resolving this trade-off will depend on the relative magnitude of the opportunity costs in relation to the benefits provided by the buffers.
- ***Funding needs for various phases after a disaster:*** The government's initial funding needs for postdisaster emergency response tend to be relatively small

Box 2. Approaches to Risk Reduction

Despite the high rates of return on investment, studies point to underinvestment in risk reduction. Healy and Mulhotra (2009), for example, estimate that one dollar of investment in disaster preparedness in the United States yields a damage reduction of about $15. In addition to information campaigns for increasing preparedness, early-warning systems and contingency planning should be developed to lay out risk reduction steps and encourage private sector investment in risk reduction. Ex-ante fiscal policies can reduce losses from natural disasters by promoting mitigation and risk reduction. However, public spending on risk reduction must be consistent with fiscal space, debt sustainability, and macroeconomic absorptive capacity. This assessment depends, in part, on the projected economic returns generated by risk reduction programs. In designing fiscal risk reduction and prevention strategies, governments should take the following elements into consideration:

- ***Infrastructure programs:*** A stronger infrastructure could offer better protection against disasters. Examples include more effective seawalls along urban coastlines to protect against hurricanes and tsunamis; maintenance or reinforcement of bridges to improve their resistance to floods, earthquakes, and hurricanes; and investment in earthquake- and flood-resilient construction.
- ***Access to information:*** Accurate, adequate information about risks can influence decisions relating to the locations and construction of commercial and residential properties. For example, risk maps outlining flood zones, areas at risk from coastal erosion, and landslide areas can provide valuable information to property investors and policymakers.
- ***Property rights and regulations:*** Land use and zoning rules can reduce a property's exposure to disasters (for example, by limiting building in flood plains), and building codes should require properties to be strong enough to withstand disasters of prespecified magnitudes.
- ***Fiscal incentives:*** Targeted subsidies can strengthen resilience by encouraging the retrofitting of existing properties, supporting drought-resilient crops, protecting and expanding forest coverage, and preserving scarce water resources.

Risk reduction should focus on potential failure points, as building complete resilience would be prohibitively expensive for many countries. A sectoral analysis can help identify such failure points and resource requirements, and can prescribe their prioritization. The IMF's Public Investment Management Assessment (PIMA) provides a comprehensive diagnostic of a country's public investment practices. The PIMA exercise covers the three key stages of the public investment cycle: (1) investment planning, which includes fiscal rules, the management of public-private partnerships, and regulations; (2) investment allocation, which involves selecting projects and examining the budgeting process (comprehensiveness and whether allocations are made on a multiyear basis); and (3) investment implementation, which includes considering investment protection, transparency of execution, availability of funding, and monitoring of public assets. Countries should incorporate risk reduction elements into their frameworks to identify the weaknesses related to natural disaster risk management across the various stages of public investment management.

compared with long-term recovery and reconstruction costs (Ghesquiere and Mahul 2010). However, it is crucial that the government has unfettered access to liquidity to quickly meet the need for humanitarian relief. The focus of the second phase is recovery from the disaster, including restoring basic infrastructure and systems. The final phase comprises the long-term reconstruction that tends to encompass the greatest share of postdisaster government spending.

Building Fiscal Buffers Through Budgets

Natural disaster risks should be systematically incorporated into the budget process with a medium-term perspective to make funds available for investing in risk mitigation and analyzing natural disaster risks in the context of a fiscal risk statement (FRS). In addition, budgets should have built-in buffers to respond flexibly to the fiscal costs of natural disasters (IMF 2008). Two budgetary instruments are commonly used to build fiscal buffers for the potential costs of natural disasters:

Box 3. Risk Transfer Mechanisms

Governments can transfer some of their natural disaster risks through traditional insurance, parametric insurance, and state-contingent debt instruments (SCDIs). Since risk transfer instruments are costly, however, this strategy is most appropriate for remote events or in cases in which access to financing may be disrupted. In choosing among various disaster risk finance instruments, an ex-ante strategy is necessary to adequately cover postdisaster relief, recovery, and reconstruction needs (World Bank 2014a; Hofman and Brukoff 2006; Clarke and others 2017).

Traditional insurance remains one of the best ways to minimize the fiscal costs of natural disasters. As the distribution of losses features remote but very large losses, primary insurers may choose to transfer considerable portions of their catastrophe exposures to reinsurers. In contrast to traditional insurance, parametric insurance payouts are based on predetermined triggers such as hurricane wind speed, rainfall levels, or ground acceleration from earthquakes. The key advantages of parametric insurance are low transaction costs, swift payouts, and standardized contracts. The main disadvantage is the basis risk: model parameters are only loosely related to losses (for example, wind speed fails to fully capture a storm's destructive power).

By imbedding the insurance component within a financing instrument, an SCDI can alleviate pressures on sovereign indebtedness and financing needs should a disaster occur (IMF 2017b). One type of SCDI is a catastrophe (CAT) bond, which offers an institutional investor a high coupon but provides for bond principal forgiveness in the event of a disaster. This frees the issuer's resources so they can be used to cover postdisaster management. Principal forgiveness depends on a parametric trigger that is similar to the trigger used in parametric insurance. This facilitates quick action in the event of a disaster, while simultaneously protecting investors from the moral hazards arising from asymmetric information (IMF 2016b).[6] As with parametric insurance, basis risk is a drawback of the CAT bond.

The Caribbean Catastrophe Risk Insurance Facility (CCRIF), Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), and Africa Risk Capacity (ARC) are innovative examples of risk assessments and transfers. These programs build on regional coordination among small Caribbean and Pacific island states and African countries, and provide both risk information and disaster risk-management tools at the regional level, as well as financing when a natural disaster strikes (World Bank 2013). In the case of PCRAFI, country risk profiles have been developed for each of the 15 participants on the basis of geospatial information, allowing for improved catastrophe risk modeling and more accurate estimations of the monetary damages caused by natural disasters. To compensate for lower costs and underdeveloped insurance markets in the region, the disaster risk financing segments of CRRIF, PCRAFI, and ARC pool risks. These regional pools buy insurance on the private market to enhance countries' disaster response capacities.

[6]Governments often have better information about the quality levels of insured objects and the efforts involved in upkeep and risk mitigation than the investors who provide the insurance, for whom many of these factors are unobservable. This type of asymmetric information may result in underinvesting in maintenance and risk mitigation. Insurers, in turn, may try to price these effects in their policies, rendering insurance coverage very expensive and resulting in poor value for money for the government (Akerlof 1970).

contingency reserves and natural disaster funds.[7] A contingency reserve is a pool of resources within the annual budget that can be used to adapt the budget to changing circumstances or emergencies, including natural disasters. A natural disaster fund is a dedicated financing source for handling natural disaster risks; such funds have restrictive rules regarding how resources can be used.

[7]Reducing debt is another way to create fiscal space in preparation for a natural disaster. The trade-offs between reducing debt and building fiscal buffers are outside the scope of this note.

Medium-Term Fiscal Framework

Countries that are more vulnerable to natural disasters should reserve sufficient fiscal space for prevention and mitigation programs, while simultaneously ensuring fiscal sustainability (IMF 2008, 2012, 2016b). From a PFM perspective, the implementation of a robust MTFF requires a top-down approach to budget preparation and approval,[8] comprehensive revenue

[8]A top-down budget process requires a binding decision on budget aggregates prior to the allocation of expenditures within that aggregate, which implies a process of cascading decision making. The level of total expenditure is determined before the distribution

forecasting, and public disclosure of fiscal risks, including those arising from natural disasters.

The FRS—an integral part of the MTFF—is a report composed by the government at the time of budget preparation to inform the legislature and civil society about fiscal risks and how the government plans to address them. In a country prone to large natural disasters, the FRS should include natural disasters as macrocritical risks, and serve as an input to inform budget discussions and preparation. Accordingly, the FRS should contain the following elements:

- ***Identification and disclosure of fiscal risks:*** The IMF's Fiscal Transparency Code identifies 12 potential major risks, including natural disasters.[9] The FRS should describe and quantify the most relevant fiscal risks and discuss their odds. This requires detailing quantifiable and unquantifiable contingent liabilities and labeling them as probable, possible, or remote, which can help guide policymakers and the public toward risk-management priorities. Countries such as Indonesia, New Zealand, and the Philippines have detailed FRSs that cover natural disasters.[10]
- ***Mitigation and management of fiscal risks:*** The FRS should propose fiscal measures to mitigate and manage risks. Risk mitigation steps reduce fiscal exposure; they may include public infrastructure investment, tax incentives to encourage resilience-building behavior, and regulatory intervention. The FRS should also provide guidance for contingency planning and procedures that will enable rapid response in the wake of a natural disaster.

Contingency Reserves in the Budget

Contingency reserves for unforeseen expenditures can cover the costs of moderate but frequent natural disasters. Most countries have annual contingency reserves that provide flexibility to respond quickly in the immediate aftermath of a natural disaster. However, country practices vary regarding the purposes for which these funds can be used and the amount of government oversight or approval required. As shown in Table 1, some contingency reserves specifically list natural disasters among the valid triggers required to access funds.

In establishing contingency reserves, a government should stipulate clear and stringent conditions for the use of such funds to increase transparency and avoid abuse (Tommasi 2016).

- ***Amount:*** The general contingency reserve should be set at a small fraction of total expenditure. This will suffice for immediate liquidity needs after natural disasters. With too large a reserve, a line ministry could try to access the funds to implement a policy that has not been approved by the legislature.
- ***Authorization:*** Various modalities for authorization can be used. In some countries, requests to use contingency funds must be submitted to the legislature for approval; in others, the legislature approves a standing authorization to use the funds, and the executive branch decides when and how the funds are used. While the latter modality may be more efficient in the case of a natural disaster, the ministry of finance should maintain control over contingency funds under stringent access conditions.
- ***Transparency:*** An official declaration or public announcement of disaster should be required before the contingency reserve can be used for disaster response. Afterward, the ministry of finance should disclose expenditures taken from the reserve in budget reports and classify them according to their purposes and economic natures.

Natural Disaster Funds

The purpose of a natural disaster fund is to establish a fiscal buffer to cover the potential cost of a catastrophic event in a timely manner without endangering long-term fiscal sustainability.[11] Such funds are effective in accumulating dedicated reserves during periods that are free of catastrophic events. Natural disaster funds also enjoy considerable flexibility in timing expenditures across budget years. However,

across main policies (or sectors) is decided, and sectoral ceilings are set before the detailed division of expenditure within each sector is discussed and determined. In each step of the budget process, the allocation of expenditures is subject to the constraints set at the previous stage (Ljungman 2009).

[9]The IMF's Fiscal Transparency Code and Fiscal Transparency Evaluations can be found at http://www.imf.org/external/np/fad/trans/index.htm.

[10]For example, the Philippines created a predisaster risk assessment, developed a catastrophe risk insurance facility for local governments, and incentivized local governments to pool calamity funds.

[11]The term "natural disaster fund" is used to refer to various types of funds, including response funds, which provide short-term liquidity in the immediate aftermaths of disasters; recovery funds, which support medium-term recovery; and resilience funds, which finance long-term reconstruction and resilience investment. The discussion in this note focuses on recovery and resilience funds.

Table 1. Contingency Reserves/Appropriations: Selected Country Experiences

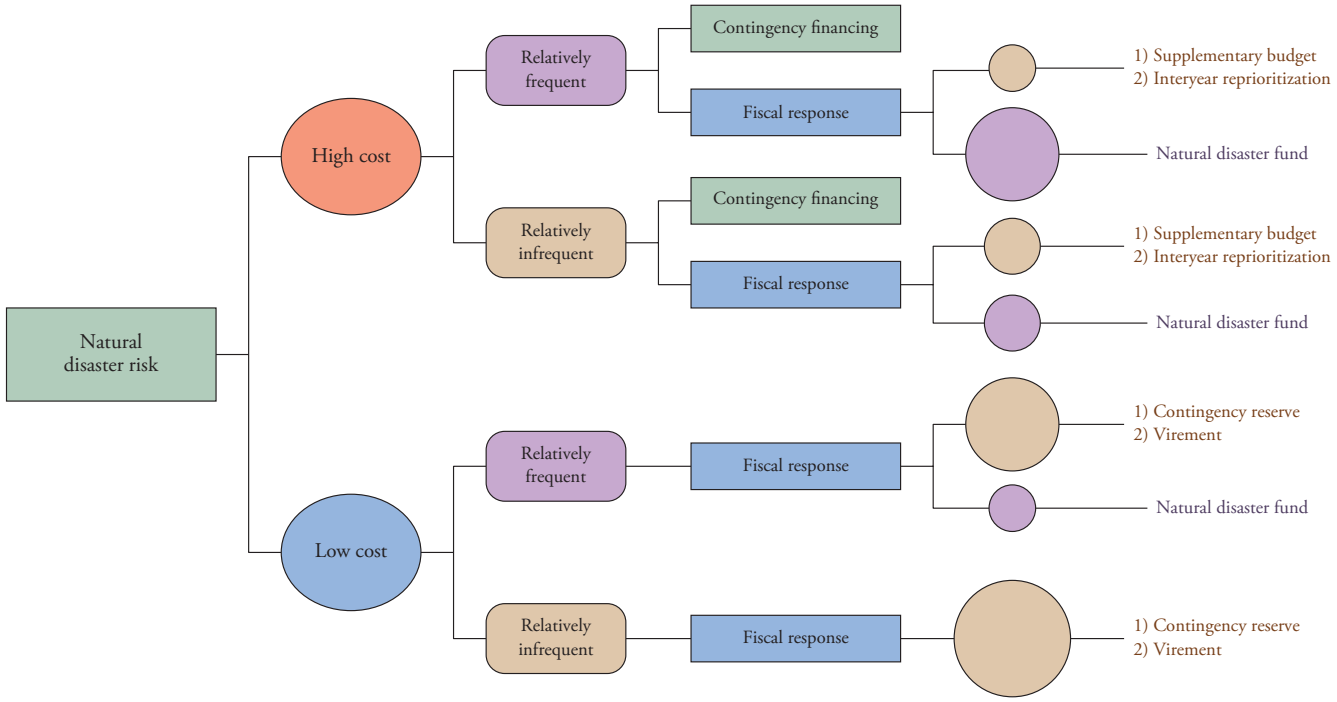
Country	Size/Limit		Purpose of Contingencies	Other Features
Armenia	Maximum 5 percent of total budgeted expenditures.		Additional financing of budgeted outlays; financing of nonbudgeted outlays, including natural disasters; financing of outlays for supporting budget guarantees.	A contingency reserve fund is included in the budget. Proposals for using the reserve fund come from public administration bodies. The government finally authorizes (approves) the use of the funds.
Indonesia	Rp 4 trillion for natural disasters (around 0.2 percent of total expenditure); Rp 24.3 trillion for personnel expenditure; Rp 22.5 trillion for other expenses in 2016.		Natural disasters; allowance for bureaucratic reform and the hiring of new employees; fiscal risks; and others.	The item for natural disaster is social assistance.
Japan	350 billion JPY (0.36 percent of national government expenditure of original 2017 budget).	The reserve allows for unforeseen and unavoidable expenditures, including those incurred by natural disasters.	Depending on the size of the natural disaster (e.g., the 2011 Great East Japan Earthquake), the supplementary budget is also used.	
Philippines	0.8 percent of GDP (4 percent of total expenditure).	Disasters; support for public corporations or foreign-assisted projects; strategic government reforms; pensions; and separation benefits.	Includes several special-purpose funds, such as the Calamity Fund, the Contingent Fund, and the Unprogrammed Fund. Use of contingency reserve can be authorized by the executive branch.	
South Africa	2 percent of central budget expenditure.	General expenses; the reserve allows for unforeseen and unavoidable expenditures (e.g., natural disasters or programs announced in budget but not yet appropriated).	Within the main budget, a contingency reserve is set aside for each of the next three years. During the outer years, the reserve is partly drawn down to fund new priorities.	

Note: Based on the most recent information available as of February 2018.
Source: Country documents.

many of these funds are kept outside the usual budget process and follow different allocation rules. Thus, outlays for these funds do not compete on a level playing field with other priority expenditures. If the financial management and governance procedures of these funds are not carefully designed, natural disaster funds can undermine fiscal discipline and transparency (Allen and Radev 2010). To mitigate these disadvantages, the IMF (2016a) makes the following recommendations for establishing and operating a well-designed framework:

- The fund should be consolidated with budget information to allow for a proper assessment of the overall fiscal situation. At a minimum, the fund balance should appear in financial statements, and drawdowns from the fund should appear in budget execution reports.
- There should be a standing appropriation that allows for spending immediately after certain trigger events, such as an executive declaration of a disaster emergency.
- The fund should generally apply best PFM practices to promote transparency. Specifically, it should have clear rules governing the use of resources, follow normal government accounting standards, prepare and publish audited financial statements, and define its governance rules. However, procurement rules for disaster response should be adjusted to allow for immediate access to the resources.
- Drawdowns should be authorized only above a minimum level of fiscal cost, as use of the fund should be limited to responding to disasters with large fiscal impacts. Budget contingencies should cover smaller expenditure needs.
- The size of the fund should be based on a calibration of the fiscal impact of natural disasters. The fund needs to cover only some of the expected medium- to long-term fiscal costs, as additional longer-term financing can be arranged after the disaster has struck. In addition, too much cash accumulated in a fund might tempt policymakers to use it for other purposes.

Figure 2. Guide for Dealing with the Fiscal Cost of Natural Disasters



Source: IMF staff.
Note: The size of the bubbles in the rightmost column represents the relative importance of the listed instrument(s).

- The fund's financial investment strategy should aim to maintain a relatively high degree of liquidity, given the potential urgency of disaster relief expenditure. In some cases, the fund might best invest in liquid foreign assets because of the risk of postdisaster stress in domestic financial markets. Postdisaster repatriation of offshore investments would also strengthen the balance of payments at a time of economic weakness. Only a small portion of the fund should be kept as a domestic bank deposit. Since these deposits are likely to be withdrawn during times of economic distress, large withdrawals could put additional strain on the domestic banking system precisely when the system is already facing heightened stress.

Using Fiscal Buffers Transparently

While flexibility in managing the fiscal risks associated with natural disasters should be maintained during budget implementation, this should not be at the expense of transparency. Postdisaster uses of natural disaster funds, budget reallocations, and the triggering of fiscal rules' escape clauses must follow robust, transparent processes.

Postdisaster Budget Execution

Two important characteristics of postdisaster budget execution are speed and flexibility. After a natural disaster occurs, the immediate priority is providing affected populations with emergency first aid and relief supplies (World Bank 2014b). Special dispensations or accelerated processes can be applied to quickly disburse available funds, including the fiscal buffer created through contingency reserves and natural disaster funds.

Budget reallocation is often necessary to meet new and urgent requirements. In the immediate aftermath of a disaster, relief and reconstruction efforts may take priority over other developmental and recurring expenditures. Budget reallocation allows for the redeployment of spending and for combining existing investment projects into an overall postdisaster recovery plan (Laframboise and Loko 2012). There are generally three modalities of budget reallocation: (1) a

virement, (2) a supplementary budget, or (3) reprioritization of expenditures among budgets (Figure 2).

- ***Virement:*** A virement is a transfer of budgetary resources between budget items within appropriations; it does not require legislative authorization. Virements do not affect the total levels of budgeted expenditures and should not fundamentally alter the composition of expenditures appropriated by the legislature (Saxena and Yläoutinen 2016). This mechanism can be used along with a contingency reserve to support immediate humanitarian and relief expenditure.
- ***Supplementary budget:*** A supplementary budget changes the annual budget limit or fundamentally alters the appropriated allocations; it requires legislative approval. The supplementary budget should be used for large natural disasters to support recovery and reconstruction when virements and contingency reserves cannot meet these needs.
- ***Reprioritization of expenditure among budgets:*** The reprioritization of budgets is part of the regular formulation of the next year's budget. After a large natural disaster, policy priorities may change in significant ways, especially with the inflow of additional financial resources from such sources as multilateral institutions, bilateral donors, and nongovernment organizations. Thus, building on a detailed postdisaster needs assessment, the government should realign long-term investment plans and reprioritize the following year's budget.

While budget reallocation should be conducted in a timely manner to avoid impeding disaster recovery, fiscal transparency should not be compromised. Virements should be disclosed to the legislature in a timely and comprehensible manner. The executive should regularly summarize the net impact of all virements on the overall budget allocation if such virements are frequent and extensive. Likewise, the supplementary budget should be subject to the same scrutiny as the annual budget, and the approved supplementary budget should be published with a summary of the key changes (IMF 2007).

Flexibility in Fiscal Rules

Fiscal rules serve as a credible medium-term anchor for fiscal policy, but the architecture of a rule-based fiscal framework should provide flexibility in policy design and budget execution through predetermined and well-defined escape clauses. In the event of an adverse shock above the prespecified threshold, the escape clause would suspend the numerical fiscal targets to avoid amplifying the macroeconomic impact of a natural disaster. However, escape clauses are not intended as mechanisms for countercyclical stabilization. Ideally, in the event of an exogenous shock, fiscal rules would include specific provisions for adjusting targets and for reinstituting the original rules within a specific time frame during the postdisaster period (IMF 2014).

In the absence of a natural disaster, a fiscal rule would target an underlying fiscal balance that builds buffers and borrowing space. The rule's escape clause should allow for larger fiscal deficits as part of the response to large exogenous and unanticipated shocks, such as natural disasters. Examples include budget law provisions that allow the government to exceed the spending limit—up to a defined amount—in the event of a formally declared natural disaster, as well as provisions in the fiscal responsibility laws that allow the government to break the numerical or procedural targets following a major natural disaster (IMF 2014).

Well-targeted escape clauses have several important features, including clearly specified links to independently verifiable events (often subject to legislative approval) and applicability when the projected fiscal impact exceeds a prespecified threshold. In the case of a large-scale natural disaster, for example, the damage threshold could be set at the median loss (as a share of GDP) incurred by natural disasters over the past quarter century.

A country with fiscal rules also needs to establish automatic correction mechanisms that are triggered when deviations from the rules occur. To this end, the government could prescribe the required adjustment (or other measures of fiscal policy anchored by a rule) in response to a large, unexpected increase in the budget deficit. To deal with the debt accumulation caused by large deviations from the rules, the government should automatically implement corrective measures according to the adjustment path specified in the law. In this context, the flexibility built into an escape clause or a correction mechanism is not an effective substitute for disaster risk management; rather, it is a short-term cushion to prevent unwarranted fiscal adjustment.

Country Case Studies

Dominica: Natural Disaster Fund[12]

After being hit by Tropical Storm Erika in 2015, Dominica was considering establishing a vulnerability risk and resilience fund (VRRF) to cover the fiscal costs of future natural disasters. The IMF provided technical assistance to design the VRRF as a budgetary financing instrument. The IMF recommended that the VRRF provide financing to the budget for specified expenditures as a special fund under PFM legislation. The VRRF was not envisioned as a separate legal entity with the ability to make investments or undertake other expenditures outside the budgetary process.

The IMF recommended that the main sources of funding for the VRRF include Dominica's Citizenship by Investment (CBI) scheme and the national budget, and that it be used to support relief, reconstruction, and resilience expenditures. To achieve these objectives, the VRRF should be managed as series of subfunds with clear outflow rules. In addition, resources allocated for immediate disaster response should be held in highly liquid forms, and these resources should be released to the budget immediately after a disaster has struck, through a cabinet-level decision and on the advice of the national disaster coordinator. The subfund for reconstruction and rehabilitation should provide funding to the public sector investment program for specified projects; this would normally be done within the context of a formal budget cycle. If VRRF resources exceeded a significant level, a resilience subfund should be created to provide financing to the budget for investment in disaster resilience and other related projects. The fund's assets should be held offshore and denominated in US dollars, so that windfall CBI revenues do not cause Dutch disease–like issues in the domestic economy. In addition, repatriating these funds after a disaster would provide support for the balance of payments.

Dominica's efforts to establish a VRRF and build up its assets were interrupted by Hurricane Maria in September 2017, which caused massive damage. Relief, recovery, and reconstruction have taken priority over establishing a VRRF.

Grenada: State-Contingent Debt Instruments[13]

After the deep 2011–12 economic crisis in Grenada, the government restructured its debt by exchanging its old bonds for new SCDIs. The new bond contract includes a hurricane clause that allows the scheduled debt service payments to be changed when an exogenous natural disaster occurs. The clause is designed to provide cash flow relief at a critical moment after a natural disaster, when financing needs are greatest and new sources are scarce. It will enable Grenada to redirect funds intended for debt service to more immediate needs, reducing the natural disaster's economic impact. The clause includes the following key features:

- ***A verifiable trigger event measured by an independent entity:*** Grenada is a member of the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and has purchased insurance against the risks of tropical cyclones, earthquakes, and excess rainfall. The event is triggered on the basis of parametric measures. If the insurance is triggered, as determined by the CCRIF, the hurricane clause in the bond contract is triggered simultaneously.
- ***Changes to the cash flow:*** The clause provides for payment deferral for up to two payment periods, with no nominal principal or interest rate reduction. The deferred interest payment is capitalized and the deferred principal payment is distributed equally on top of the remaining scheduled payments until final maturity.
- ***Maximum number of triggers:*** The contract allows the trigger to be invoked up to three times.

The cash flow relief that may result from the hurricane clause is roughly equivalent to the probable maximum loss from an event that occurs once every 25 years in Grenada. Depending on the timing of the event, a one-off trigger of the hurricane clause could provide cash flow relief of up to 2.6 percent of GDP. This compares with the approximately 1.5 percent of GDP for the probable maximum loss incurred from an event that occurs once every 25 years, and the average annual loss experienced in Grenada (9.87 percent of GDP). If three events are triggered, the total cash flow relief could be as much as 7.4 percent of GDP.

[12]This country case study is based primarily on information in the 2016 IMF Technical Assistance Report *Dominica: Establishing a Vulnerability, Risk and Resilience Fund*.

[13]This country case study is based primarily on information from Asonuma and others (2017).

Mexico: Combined Financing Strategy[14]

Natural disasters represent significant fiscal risks in Mexico. Between 1999 and 2011, the costs of the post-disaster reconstruction of public assets and low-income housing amounted to $1.46 billion. Given these risks, the federal government established an institutional framework for disaster preparedness, mitigation, and management. The framework includes a two-pronged financial risk-management strategy that aims to achieve the following goals:

- ***Retain some of the natural disaster risks:*** An annual budget provision flows into the Natural Disaster Fund (FONDEN) to meet the costs of disaster relief and reconstruction efforts for the most frequent types of disasters. The Federal Budget Law and the Fiscal Responsibility Law stipulate a minimum 0.4 percent of programmable spending each year, in both budgetary allocations and stock, to be channeled into the FONDEN and the Fund for Disaster Prevention (FOPREDEN).
- ***Transfer some of the natural disaster risks:*** Some of the public sector natural disaster risks are transferred to international markets by purchasing reinsurance and issuing catastrophe (CAT) bonds.

Mexico was the first sovereign to issue a parametric CAT bond in 2006 to cover earthquakes in three specific zones. Under the bond's terms, investors receive principal and interest payments unless an event triggers the transfer of principal amounts to the government. Under the original CAT bond, an official state of emergency or disaster declaration had to be issued, and the earthquake (whose epicenter had to lie within one of the three zones) had to register above a specified magnitude. In subsequent bond issuances, the government expanded its coverage by pooling multiple risks across regions.

New Zealand: Natural Disaster Fund[15]

In 1993, in accordance with the Earthquake Commission (EQC) Act, New Zealand established the Natural Disaster Fund (NDF), which replaced the Earthquake and War Damage Fund. The NDF is administered by the EQC, a statutory entity, on an autonomous, arm's length basis.

The NDF is funded through a charge against the premium paid for building insurance by residential homeowners. The premium is fixed in law and bears no relationship to structure-related or geographical risk, or to any other actuarial reality. The NDF provides homeowners with funding in the event of a natural disaster and operates within defined criteria. It provides a layer of insurance for residential structures, land, and contents in the event of an earthquake, landslide, volcanic eruption, hydrothermal event, or tsunami. Homeowners must purchase insurance beyond the caps provided by the NDF for full coverage of their property's value. The fund is underpinned by a legislated government guarantee to compensate for any shortfall if the balance is insufficient to cover damages.

While the NDF is invested mainly in New Zealand's fixed interest securities, the EQC also invests part of the fund in international equities. The goal is to ensure sufficient liquidity in tradable financial assets outside New Zealand that would not be affected by a major natural disaster in the country. If a drawdown on the fund is needed to meet significant claims, international equities can be sold first, thereby eliminating the government's responsibility to provide immediate funding. Another advantage of investing part of the fund in global equities is that the fund can potentially grow faster.

Transparency is achieved through frequent publication of the NDF's comprehensively audited financial statements. Extensive information about the fund is also included in the government's aggregate financial statements, and the NDF is fully incorporated into the central government's balance sheet and income statement. The NDF's statement of investment policies is published, and there is a formal mechanism by which the EQC (and every ministry, executing agency, statutory body, and state-owned enterprise) prepares an annual statement of intent, reporting back on its implementation. In the case of the EQC, the mechanism also addresses NDF management.

Since the introduction of mandatory insurance in 1993, New Zealand has increased its coverage against earthquakes to about 90 percent of all residential buildings (IMF 2016a). Although the two recent Canterbury earthquakes caused considerable damage to the economy (about 10 percent of GDP), the high level of insurance coverage (6 percent of GDP) effectively transferred much of the reconstruction cost onto the

[14]This country case study is based primarily on information provided by the IMF (2016a).

[15]This country case study is based primarily on information provided by the Earthquake Commission (EQC), and can be found at http://www.eqc.govt.nz.

global insurance market through reinsurance (Laframboise and Loko 2012).

Philippines: Natural Disaster Fund[16]

The Philippines faces significant natural disaster risks, both climate-related natural disasters and earthquakes. On average, more than a thousand lives are lost to natural disasters every year in the Philippines, with typhoons accounting for 74 percent of the fatalities and over 60 percent of economic damages. In 2010 the Philippines passed the Disaster Risk Reduction and Management Law, developing a coherent, comprehensive, integrated, and proactive approach across various levels and sectors of the government and among vulnerable communities across the country (World Bank 2012). The previous national and local calamity funds were redistributed into the National Disaster Risk Reduction and Management Fund (NDRRMF) and the Local Disaster Risk Reduction and Management Fund (LDRRMF).

Thirty percent of the amount appropriated for the NDRRMF is allocated to the Quick Response Fund (a standby fund) for immediate relief and recovery following a natural disaster. The specific amount provided by the Ministry of Finance to the NDRRMF and the appropriate recipient agencies and local government units are approved by the president, in accordance with a favorable recommendation from the National Disaster Risk Reduction and Management Council (NDRRMC). The recipient departments, agencies, or units are obligated to follow existing accounting and auditing rules and to submit monthly statements to the NDRRMC on the NDRRMF's use of funds.

The framework prescribes that no less than 5 percent of the estimated revenue from regular sources be set aside for the LDRRMF to support disaster risk-management activities. As with the NDRRM, 30 percent of the LDRRMF's appropriations are allocated to the Quick Response Fund. Unexpended LDRRMF funds can roll over and accrue to a special trust fund solely for supporting disaster risk reduction and management activities within the next five years. If funds remain unused after five years, they revert to the general fund.

[16]This country case study is based on the National Disaster Risk Reduction and Management Council's "National Disaster Risk Reduction and Management Plan, 2011–2028".

Turkey: Mandatory Earthquake Insurance Scheme[17]

With multiple fault lines passing through the country, Turkey is among the nations most exposed to large-scale earthquakes. In the aftermath of the devastating Marmara earthquake in 1999, which resulted in the loss of 15,000 lives and a substantial macroeconomic and fiscal burden, Turkey's private insurance market was unable to provide adequate coverage. The government faced major financial exposure during the postdisaster reconstruction of private residential and commercial properties, leading to the establishment of the Turkish Catastrophe Insurance Program (TCIP) in 2000. Although it is a nonprofit public entity supervised by the undersecretariat of treasury, the TCIP's operational management is subcontracted to private insurance companies. The TCIP is a conventional indemnity-based catastrophe insurance pool, retaining some of the risk within the scheme and reinsuring the balance in the international market. The TCIP functions as a public sector insurance company with the following objectives:

- Provide nationwide compulsory insurance against earthquakes for all dwellings within the scope of the scheme at an affordable premium.
- Ensure risk sharing within the country and transfer a portion of the risk to the international reinsurance market.
- Reduce government fiscal exposure to the impact of earthquakes.
- Encourage risk mitigation and earthquake-resistant construction practices.
- Accumulate long-term resources to cover catastrophic damages.
- Contribute to the development of insurance.

The compulsory TCIP policy is designed as a stand-alone property earthquake policy with a maximum insured amount per policy and a deductible of 2 percent (to reduce administrative costs associated with small claims). The annual premium rate is determined according to construction type (steel or reinforced concrete, masonry, and so on) and location (five seismic zones throughout the country). As a public-private partnership, the TCIP has become the largest insurance program in Turkey, has reduced the government's fiscal exposure to natural disaster risk, and has raised public awareness about risk mitigation.

[17]This country case study is based primarily on information provided by Ghesquiere and Mahul (2010) and TCIP (2015).

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