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Natural Disasters: Mitigating Impact, Managing Risks

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Abstract

This paper reviews the literature on the macroeconomic impact of natural disasters and presents the IMF's role in assisting countries coping with natural catastrophes. Focusing on seven country cases, the paper describes the emergency financing, policy support, and technical assistance provided by the Fund to help governments put together a policy response or build a macro framework to lay the foundation for recovery and/or unlock other external financing. The literature and experience suggests there are ways to strengthen policy frameworks to increase resilience to natural disaster shocks, including identifying the risks and probability of natural disasters and integrating them more explicitly into macro frameworks, increasing flexibility within fiscal frameworks, and improving coordination amongst international partners *ex post* and *ex ante*.

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Contents	Page
List of Acronyms	3
Executive Summary	4
I. Introduction	5
II. Macroeconomic Impact of Natural Disasters.....	6
A. Incidence and Trends.....	6
B. Damages, Costs, and Long-Term Welfare Losses.....	7
III. IMF Financing Support.....	10
A. IMF Financing.....	11
B. New IMF Facilities.....	13
IV. IMF Policy Support and Risk Management Options.....	15
A. Post-Catastrophe Policy Advice: Case Studies	15
B. Policies for Strengthening Resilience to Disasters	17
V. Concluding Remarks.....	19
References.....	30
Tables	
1. Case Studies—Disaster Estimates	10
2. Case Studies—IMF Financing.....	12
Figures	
1. Number of Natural Disasters, Worldwide	6
2. Total People Affected by Natural Disasters, Worldwide.....	6
3. Number of Natural Disasters	7
4. Average Number of People Affected as % of Population	7
5. Total Estimated Cost of Natural Disasters Worldwide.....	8
6. IMF Emergency Assistance	12
Boxes	
1. Box 1: IMF Financing Facilities in 2012.....	21
Appendixes	
I. Real GDP Growth and Central Government Fiscal Balance.....	23
II. Case Studies, Policy Response.....	25

LIST OF ACRONYMS

CRED	Collaborating Centre for Research on the Epidemiology of Disasters
CCRIF	Caribbean Catastrophic Risk Insurance Facility
ECF	Extended Credit Facility
EFF	Extended Fund Facility
ENDA	Emergency Natural Disaster Assistance
ESF	Exogenous Shocks Facility
FCL	Flexible Credit Line
IFIs	International Financial Institutions
LICs	Low-Income Countries
ODA	Overseas Development Assistance
PCDR	Post-Catastrophe Debt Relief
PLL	Precautionary and Liquidity Line
PRGT	Poverty Reduction and Growth Trust
PSI	Policy Support Instrument
RAC	Rapid Access Component
RCF	Rapid Credit Facility
RFI	Rapid Financing Instrument
SBA	Stand-By Arrangement
SCF	Standby Credit Facility

EXECUTIVE SUMMARY

The number of people affected by natural disasters around the world is rising. Over the past two years, 700 natural disasters were registered worldwide affecting more than 450 million people. Damages have risen from an estimated US\$20 billion on average per year in the 1990s to about US\$100 billion per year during 2000–10. This upward trend is expected to continue as a result of the rising concentration of people living in areas more exposed to natural disasters, and climate change.

Natural disasters often lead to lower economic growth and a worsening in fiscal and external balances. They can also have a significant impact on poverty and social welfare. Developing countries, and their most vulnerable populations, are especially at risk. While natural disasters cannot be prevented, much can be done to reduce their human and economic costs.

This paper highlights the role of the IMF in the global disaster support system. Drawing on a sample of seven countries, it reviews the financing and policy support provided by the Fund to countries experiencing natural disasters, and explores ways countries can reduce risks and mitigate the impact of disasters.

The IMF plays a small but vital role in disaster recovery, providing emergency financing and policy support to help governments design the right policy response that lays the foundation for economic recovery. Importantly, IMF support often unlocks external assistance from other sources. Recent reforms to IMF lending facilities have increased the accessibility, predictability, and speed of financing. Several of these can be used in response to a wider range of emergencies, including for natural disasters. The Fund could continue considering ways to enhance the availability of suitable financing for disaster-related needs.

Based on the literature and the sample of case studies, the paper draws the following useful lessons on ways to strengthen disaster risk mitigation and response:

- identify risks and integrate them explicitly into macro frameworks to help determine much to self insure and how much to spend on mitigating impact;
- ensure sufficient fiscal space, and flexibility within fiscal frameworks, to help redeploy spending rapidly;
- improve transparency to bring about effective use of disaster assistance and limit contingent liabilities to the state;
- strengthen coordination *ex post* among multilateral institutions, donors, the authorities and civil society organizations, particularly where administrative capacity is limited;
- use reconstruction as an opportunity to accelerate broader growth-enhancing structural reforms; and
- looking further ahead, explore ideas about how to promote insurance coverage, since insurance penetration reduces the real costs of disasters without raising fiscal burdens.

There could also be scope for improved international consultation and donor coordination to develop ways to encourage the use of *ex ante* donor assistance toward risk reduction, which is likely to have a higher return than emergency assistance *ex post*.

I. INTRODUCTION

The occurrence of natural disasters has increased in frequency across the globe over the past 50 years. Estimates of the economic and financial losses from natural disasters have also risen. While the reporting of natural disasters has improved, these upward trends are due primarily to a documented rise in the number and intensity of climactic disasters, and to an increase in the concentration of people and physical assets in areas more exposed to disasters.

Research has found that natural disasters have a significant negative impact on growth and poverty. The impact of disasters on an economy will depend on many factors like the nature of the shock, the size and structure of the economy, population concentration, per capita income, financial depth, governance, and openness. In the short term, disasters typically result in a contraction in economic output and a worsening in external and fiscal balances. The impact is sometimes alleviated by an increase in transfers from abroad.

Natural disasters can also have a significant negative impact over the long term on poverty and social welfare. The poor have limited savings and access to credit, so are not able to supplement their incomes following a crisis. This can drive households into “poverty traps” with negative health and social effects (Hallegatte and Przulski, 2010). Indeed, disasters have been found to have long-lasting consequences on psychological health and cognitive development (Norris, 2005; Santos, 2007).

With the steady advance of urbanization in developing and middle-income countries and expectations of more intense natural catastrophes related to global climate change, the human and economic costs of natural disasters are likely to keep rising. While natural disasters cannot be prevented, the policy response will have an important impact on the speed of recovery. Moreover, the literature suggests that much can also be done *ex ante* to reduce the human suffering and economic costs of the impact of natural disasters. These include relocating communities from disaster-prone areas, enforcing building codes, holding food inventories as buffers against drought, and developing emergency response mechanisms.

The macroeconomic policy response to a major catastrophe involves some combination of reserves drawdown, new financing, and macroeconomic adjustment. Adequate and timely external financing can help address immediate financing gaps and limit the need for contractionary macro policies that aggravate the adverse effects of the shock on the most vulnerable. The IMF has a specialized role in the panoply of external assistance to countries recovering from natural disaster. While absolute amounts of financing from the Fund are relatively low, the Fund can play a key role as first mover and financing catalyst.

Against this backdrop, this paper highlights the role of the IMF in the international community’s disaster support infrastructure. Drawing on a sample of seven countries hit recently by major natural disasters (Haiti, Japan, Kenya, New Zealand, Pakistan, Samoa, and St. Lucia), it reviews elements of the Fund’s existing financing instruments and policy support that help countries mitigate the impact of disasters, and explores ways countries can strengthen their resilience to natural disaster shocks.

II. MACROECONOMIC IMPACT OF NATURAL DISASTERS

A. Incidence and Trends

The main source of data on natural disasters is the Emergency Events Data Base (EM-DAT) maintained by the Collaborating Centre for Research on the Epidemiology of Disasters (CRED). The CRED registers a “disaster” if at least one of the following has occurred: 10 or more fatalities, 100 or more people “affected,” a call for international assistance, or the declaration of a state of emergency. People “affected” by a disaster are defined as those injured, homeless/displaced, or requiring immediate assistance. Disasters are classified as either geophysical (earthquakes), meteorological (storms), hydrological (floods), climatological (droughts), or biological (epidemics).¹

Figure 1

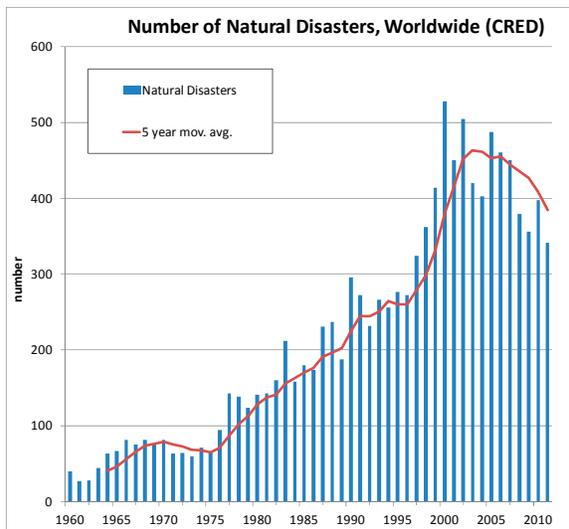
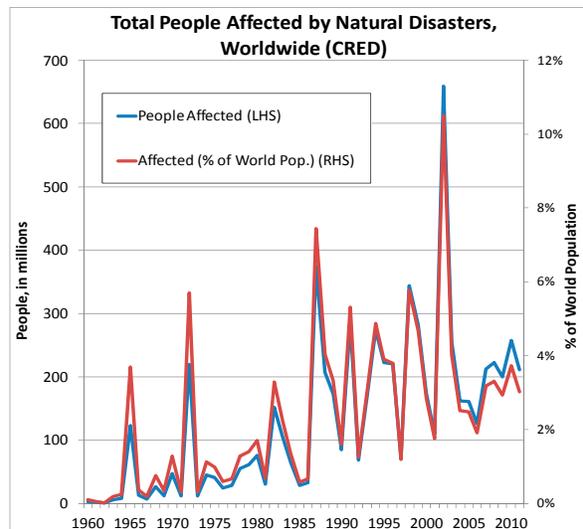


Figure 2



Figures 1 and 2 present estimates of the incidence and people affected from natural disasters worldwide. While the number of events reported has dipped in the last 10 years, the number of people directly and indirectly affected by catastrophes, and their related costs, is rising. From floods in Pakistan, droughts in the Sahel, tornadoes in the U.S. Midwest, hurricanes in the Caribbean, mudslides in Central America, and earthquakes and tsunamis in the Pacific, many countries are faced with the consequences of some form of natural disaster.

The data shows that natural disasters occur more frequently, and affect more people, in developing countries (Figures 3 and 4).² Since the 1960s, about 99 percent (87 percent middle-income, 12 percent low-income) of the world population affected by disasters has lived in developing countries and 97 percent (32 percent low-income, 64 percent middle-income) of all deaths have occurred in developing countries.

¹ Most researchers, including the studies cited in this paper, rely on the CRED database. This comprises over 18,000 mass disasters compiled since 1900.

² Developing countries here are comprised of all low-income countries and middle-income countries as defined by the World Bank classification (<http://data.worldbank.org/about/country-classifications>).

Figure 3

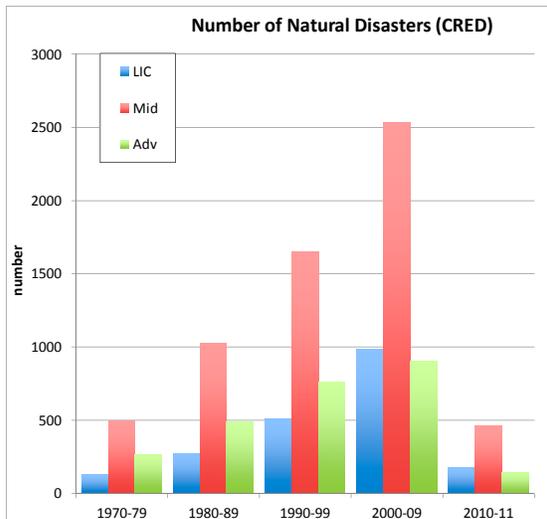
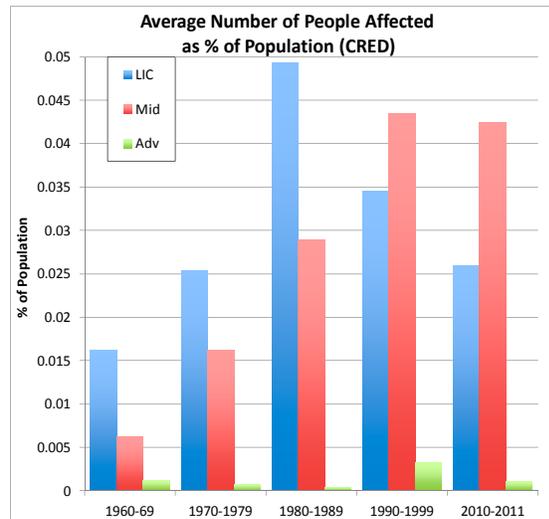


Figure 4



More specifically, Rasmussen (2004) compares the number of events to land area and to population, revealing that small island states have the highest relative frequency of natural disasters. In the Eastern Caribbean, for instance, a large natural disaster inflicting damage equivalent to over 2 percent of GDP can be expected to hit the region every two to three years (IMF, 2004).

B. Damages, Costs, and Long-Term Welfare Losses

Advanced economies are better equipped to absorb the costs of disasters because of recourse to private insurance against risk, higher levels of domestic savings and fiscal revenues, and access to market financing if needed, and they often dedicate more domestic resources to reducing vulnerability *ex ante*, including, for example, enforcing building codes and having a developed emergency response infrastructure in place.

It is well known that low-income countries (LICs), however, are more vulnerable to exogenous shocks, including natural disasters. Poor countries have a larger share of the population living in high-risk areas with weak infrastructure, and they rely more on sectors such as agriculture and tourism that depend directly on the weather (Rasmussen, 2004). Indeed, there is robust evidence that less diversified economies experience larger declines in consumption when earthquakes occur (Ramcharan, 2005b).

There are several methodologies to quantify the cost of disasters, but there is no standard measure to determine a global figure for economic impact.³ Typically, the effects are measured in the literature as direct and indirect. Direct costs arise from the immediate loss of physical and human capital and crops, and the near-term loss of income from the disruption of economic activity in both the private and public sectors. Indirect losses are those not

³ Various cost definitions include direct costs, indirect costs, market and nonmarket (intangible) losses, output losses, and welfare losses (Hallegatte and Przulski, 2010).

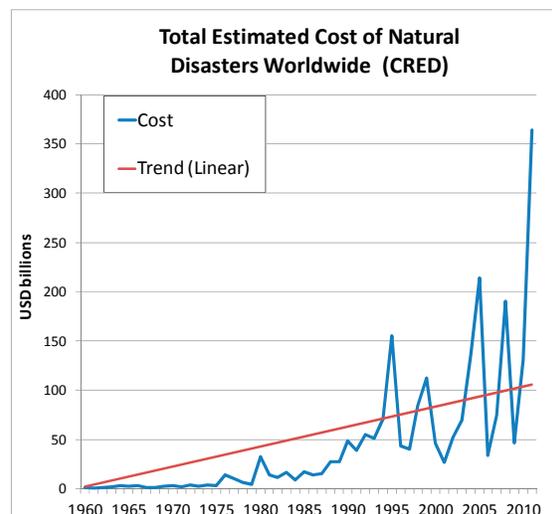
provoked by the disaster itself, but by its consequences. For example, a factory not damaged by an earthquake may suffer “business interruptions” from extensive power outages in the months following. Indirect costs spread throughout the economy over time and affect investment, output, the fiscal and external accounts, debt, and poverty.

Macroeconomic Impact

The dollar value of damage from natural disasters is much larger in advanced economies because the accumulation and concentration of valuable capital, and the potential losses, are much higher than in LICs. However, as a percentage of national output, the damage is usually much larger in developing countries. Middle-income countries are strongly affected by natural disasters in terms of GDP, as their asset bases are rising faster than their ability to absorb the cost of disasters (Ghesquiere and Mahul, 2010). In addition, their sectors are more interconnected than in LICs, yet they lack the systems and emergency coping mechanisms available in advanced economies (Benson et al., 2004). In addition, most small island states are classified as middle-income economies.

The estimated damages from natural disasters over the past 50 years continue to rise, even though the incidence of disasters has declined somewhat in the past decade (Figure 5). The overall findings in the literature show that natural disasters have a significant negative impact on real GDP, though this differs by type of disaster (Hochrainer, 2009). Moderate disasters can in fact have benefits on economic growth rates via the investment boost from reconstruction activities, but severe disasters *never* have positive growth effects (von Peter, von Dahlen, and Saxena, 2012; Fomby, Ikeda, and Loayza, 2009; Loayza et al., 2009).

Figure 5



Major disasters reduce real GDP per capita by about 0.6 percent on average, and this rises to about 1 percent in LICs (Raddatz, 2009; Fomby, Ikeda, and Loayza, 2009). In terms of impact on GDP growth, disasters produce an estimated 0.7 percentage point drop in a country’s growth rate within the first year on average, leading to a cumulative output loss on average of about 1.5 percent over and above the immediate direct losses (von Peter, von Dahlen, and Saxena, 2012). Higher education levels, greater openness, and greater financial sector depth are associated with lower costs from natural disasters.

Among climactic disasters, droughts have the largest average impact, with losses of 1 percent of GDP per capita, and over 2 percent per capita in LICs (Raddatz, 2009; Loayza et al., 2009). In small island states, hurricanes have a larger estimated impact, resulting on average in a 3 percent decline in per capita GDP (Raddatz, 2009). The growth rate the year of the

disaster in the sample countries compared in this study ranged from a contraction of 5.5 percent in Haiti to an expansion of about 1.3 percent in New Zealand.

Major natural disasters usually result in a worsening in the external accounts. As economic activity is disrupted, export earnings decline and imports of food and reconstruction materials push up the import bill, together contributing to a deterioration in the trade balance. The external current account often deteriorates, although this is usually alleviated by higher inflows of official assistance and private remittances. For example, the yen experienced a sharp appreciation immediately after the earthquake on speculation about sizable repatriation flows by insurance companies and households.

Natural disasters can have an important negative impact on the fiscal accounts and public debt, though this depends on how governments respond to the disaster. Typically, fiscal revenues decline as economic activity declines, while at the same time emergency relief and reconstruction lead to a surge in government expenditures. For middle- and upper-income countries, Melecky and Raddatz (2011) find that disasters boost expenditures by about 15 percent and lower revenues by 10 percent, leading to an overall increase in budget deficits by 25 percent compared to initial levels. Whether this affects fiscal sustainability depends on how the recovery costs are financed. They also find that countries with more developed financial systems suffer less in terms of output losses, but fiscal deficits expand more in these countries. Countries with deeper financial systems that also have a high rate of insurance penetration suffer smaller real losses as well, but do not incur expansions in fiscal deficits.

In LICs, the impact is more pronounced, including over time on poverty and social welfare. Divestment of limited physical capital by the poor after disasters—such as the sale of livestock to fund current consumption—can lead to long-term declines in productive capacity. Indirect effects, including higher inflation, also tend to hurt the poor disproportionately because they have limited labor skills and their consumption basket is heavily weighted toward food. Countries whose deficits are financed mostly with grants and have strong donor support are able to adjust more quickly, but in many cases government borrowing and public debt increase relative to GDP. This was the case for most of the countries in our sample.

Case Studies

The seven case studies reviewed in this paper present a cross sample of countries and recent types of natural disasters. Basic information on these cases—Haiti, Japan, Kenya, New Zealand, Pakistan, Samoa, and St. Lucia—is presented in Table 1 and provides a snapshot of the wide range of impact and costs (see also Appendix II).

The magnitude of the destruction on the stock of capital was largest in Haiti and St. Lucia, while the impact on output the year of the disaster was largest in Haiti, which contracted by 5.5 percent. Japan experienced a decline in real GDP growth of 0.7 percent after expanding by over 4 percent the year before. While the direct cost of the tsunami in Japan is estimated at about 4 percent of GDP, the effects were widespread because of electricity shortages in the Kanto region, which accounts for 40 percent of GDP, supply chain disruptions affecting

production nationwide, and a sharp decline in sentiment following the earthquake, which weighed heavily on domestic demand.

Table 1: Case Studies—Disaster Estimates

	Haiti	Japan	Kenya	NZ	Pakistan	Samoa	St. Lucia
Disaster	Earthquake	Earthquake Tsunami	Drought	Earthquake	Floods	Tsunami	Hurricane
Cost US\$ bn	\$8 bn	\$213 bn	\$0.8 bn	\$24 bn	\$10 bn	\$0.08 bn	\$0.43 bn
% GDP	120%	3.6%	1.9%	10%	5%	15%	43%
No. affected	4.3 mn	0.4 mn	4.3 mn	0.3 mn	18 mn	5400	3,000
% pop	43.0%	0.3%	10.6%	6.9%	10.0%	3.0%	1.7%

On the other hand, the sizable cost of the quakes in New Zealand, estimated at about 10 percent of GDP, had less impact on output. Despite the extensive damage to residential and commercial buildings, most of the manufacturing and agriculture sectors were largely unaffected. Real GDP grew by 1½ percent in 2011 as elevated commodity export prices and favorable agricultural conditions also helped offset the adverse impact. Reconstruction is expected to boost investment and aggregate demand in New Zealand over the medium term.

In Samoa and St. Lucia, the two other small island states in the group, the damage from the disasters was relatively high, at 15 percent and 43 percent of GDP, respectively, and activity stagnated in both countries the year of the disaster.

Understanding the scope and nature of loss estimates is important for designing and implementing an effective policy response, mobilizing external financing and assistance, designing strategies for sovereign natural disaster insurance, and tracking insurance coverage and payouts. It is also essential for assessing the desirability of prevention and mitigation measures. As indirect losses are a major component of the total welfare loss emanating from a natural disaster, including them is necessary for disaster risk management design. Two sources of indirect losses usually not included are human capital losses and environmental destruction. Aside from the human tragedy, these are likely to represent sizable losses with long-term damage to economic productivity. For example, the 2010 earthquake in Haiti killed one out of every three civil servants, 1,200 teachers and over 500 health professionals.

III. IMF FINANCING SUPPORT

Natural disasters can place huge cash demands on government treasuries and foreign reserves on short notice. Policymakers must decide whether to finance emergency-related spending and balance of payments shortfalls, or to reduce or divert spending to cover immediate needs, or a combination of both. External financing can reduce the need for policies that lower government spending and aggregate demand and worsen adverse effects from the shock. Aside from urgent humanitarian dimensions, the right mix will depend on many factors, including whether the natural disaster impact is temporary or permanent, the strength of the country's fiscal position and external balance, the exchange rate, and the availability of domestic and external financing.

If the disaster shock is deemed temporary, it makes sense to finance the impact to help maintain the incomes of those hit hardest by the disaster, as well as the very poor who will be hurt by things like shortages and food price hikes. Income support for the very poor after a natural disaster can help avoid permanent welfare losses over time. Research has shown that a contraction in per capita income increases poverty more than an equivalent increase in income decreases poverty (IMF, 2003). This asymmetry suggests that consumption smoothing for the poor after a disaster can produce large welfare gains. If the disaster impact is permanent, the country must eventually adjust to the new normal. But that could take time and it may be difficult to reallocate spending rapidly toward relief and recovery.

Typically the policy response involves some combination of reserves drawdown, new financing, and macroeconomic adjustment. External financing, remittances and overseas development assistance (ODA) flows can help address immediate needs and smooth the recovery process. While earlier research showed no effect, recent empirical work has found that greater aid flows and remittances do help reduce the macroeconomic consequences of disasters (Hochrainer, 2009). The IMF contributes importantly to this, including as a first mover and catalyst for other lenders.

A. IMF Financing

The Fund’s mandate is to make resources available to members to provide them “with opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity.” This gives the Fund a clear shock-financing role to provide temporary balance of payments support in the aftermath of a natural disaster. In addition to financing, the IMF offers policy advice as part of regular economic surveillance, as well as technical assistance.

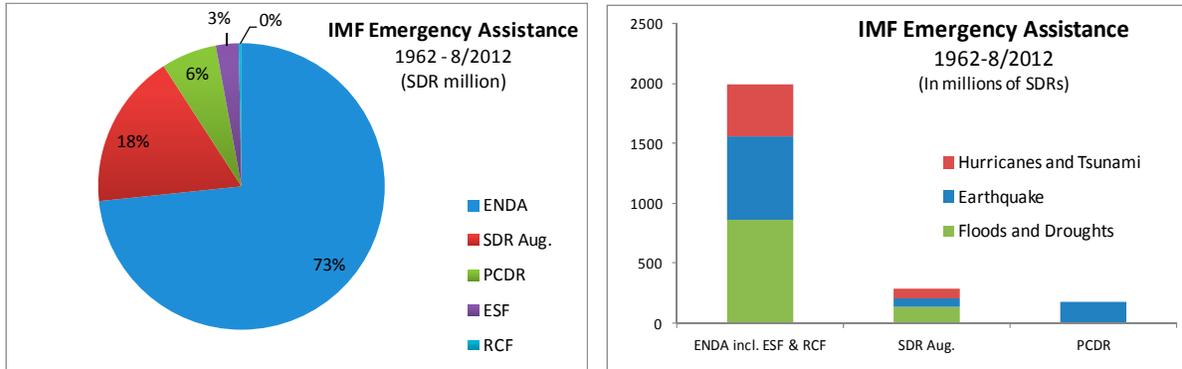
The IMF’s financing instruments continue to evolve over time. Over the past five years, the Fund’s lending toolkit has undergone further significant renovation, moving it toward a set of instruments designed to provide more flexible and country-tailored support. The full list of current facilities is described in Box 1. A number of these can be accessed to meet emergency needs related to natural disasters. The amounts that can be drawn are typically, but not always, based on the country’s quota—its capital subscription to the IMF—and there are concessional facilities designed specifically for LICs.

Most emergency financing related to natural disasters has been extended through a previous facility dedicated to that purpose, but also by augmentations to existing arrangements (Figure 6). Since 1962, when it approved Egypt’s request to cover temporary liquidity needs caused by crop failure, the Fund has provided emergency financial assistance explicitly for purposes related to natural disasters in 42 cases for 27 countries in response to hurricanes (20), droughts and floods (13), earthquakes (7), and tsunamis (2), for a total amount of about \$2.8 billion. As augmentations to existing arrangements, the Fund has provided assistance for disaster relief purposes in 12 cases, mostly for LICs.

At present, emergency financing on nonconcessional terms can be provided to all members under the Rapid Financing Instrument (RFI), the Flexible Credit Line (FCL), and the Precautionary and Liquidity Line (PLL)—pending qualification, or as an augmentation under

a existing Stand-By Arrangement (SBA) or Extended Fund Facility (EFF) (Box 1). All non-concessional facilities are subject to the IMF's market-related interest rate, the rate of charge.

Figure 6



LICs may borrow for emergency financing on concessional terms through the Rapid Credit Facility (RCF), or as an augmentation under the Extended Credit Facility (ECF) or the Standby Credit Facility (SCF). These new facilities for LICs became effective in January 2010 under the Poverty Reduction and Growth Trust (PRGT) when interest rates were reduced to zero until 2013.⁴

The countries reviewed for this paper that received Fund financial assistance did so under the Emergency Natural Disaster Assistance (ENDA) policy, the RCF, and under augmentations to existing ECF and ESF programs (Table 2). The Fund approved an ECF augmentation of US\$102 million to Haiti, which was followed by debt stock relief of US\$268 million under the Post-Catastrophe Debt Relief (PCDR) Trust.⁵ The PCDR allowed the Fund to join international debt relief efforts to free up resources for emergency needs. A new ECF-supported arrangement with Haiti was approved in July 2010.

Table 2: Case Studies—IMF Financing

	Haiti *	Japan	Kenya	NZ	Pakistan	Samoa	St. Lucia
Disaster	Earthquake	Earthquake Tsunami	Drought	Earthquake	Floods	Tsunami	Hurricane
IMF Facility	ECF aug.	...	ECF aug.	...	ENDA	ESF-RAC	RCF+ENDA
\$US mn	\$102.0	...	\$259.0	...	\$450.0	\$8.9	\$8.2
% quota	81%	...	62%	...	28%	50%	35%
% losses	1%	...			5%	11%	2%
* Haiti also received debt relief assistance of \$268 million under the Post Catastrophe Debt Relief							

⁴ Interest rates on concessional facilities are reviewed bi-annually. Loans under the ECF and RCF (but not the SCF or outstanding credit under the ESF and EPCA/ENDA) will charge a zero interest rate until end-2013.

⁵ The PCDR was established in 2010 to provide exceptional debt relief to help lower-income PRGT-eligible members meet exceptional balance of payments needs created by catastrophic disasters, and the subsequent recovery, complementing fresh donor financing and the Fund's concessional financing through the PRGT.

After the devastating floods in Pakistan in 2010, the authorities requested assistance under the ENDA, which provided rapid and flexible financial assistance not linked to any program-based conditionality. The upfront disbursement of \$450 million was directed toward humanitarian needs and to help finance the government without overburdening the domestic financial market or depleting foreign exchange reserves.

In addition to the humanitarian crisis provoked by the drought in Kenya, it led to significant food inflation with adverse impacts on rural households and the urban poor. In December 2011, the IMF augmented the financial assistance it was providing under a three-year ECF reform program from US\$509 million to US\$760 million to help the country maintain an adequate level of foreign reserves.

After the 2009 tsunami, the IMF approved an ESF-RAC (Rapid Access Component) for Samoa, while St. Lucia received IMF financing under the ENDA and RCF following Hurricane Tomas in 2010. The loan to St Lucia complemented other donor financing and the payout received from the Caribbean Catastrophic Risk Insurance Facility (CCRIF) to tackle urgent rebuilding needs.⁶ In all cases, Fund assistance was not large in absolute terms, but was viewed as instrumental in unleashing funding from bilateral donors and other international financial institutions (IFIs).

B. New IMF Facilities

The latest global crisis highlighted the need for a more effective global financial safety net to help countries cope with adverse shocks. A key objective of the recent lending reforms was therefore to develop more effective tools for crisis prevention or mitigation, as a complement to the traditional crisis resolution role of the IMF. Broader recognition of the need for financing for contingencies thus is reflected in the new set of Fund facilities. Are these adequate to respond to potential financing needs generated by natural disasters?

The two headline instruments for emergency financing are the RFI and the RCF. These were introduced to replace and broaden the scope of several earlier emergency assistance facilities. The RFI provides rapid financial assistance with limited conditions to all members facing an urgent balance of payments need, including those arising from natural disasters. The RFI is designed for situations where a full-fledged economic program is either not necessary or not feasible, although the member requesting assistance is required to cooperate with the IMF to make efforts to solve its balance of payments difficulties. The RCF provides rapid financial assistance with limited conditionality to LICs facing an urgent balance of payments need. The RCF streamlines the Fund's emergency assistance for LICs, can be used flexibly in a wide range of circumstances, and is available when a full-fledged program is not necessary

⁶ The CCRIF is a regional insurance scheme involving 16 countries. International Development Association funds paid for 100 percent of the countries' membership fees and premiums for the first two years. Haiti received US\$7.8 million after the January 2010 earthquake, while St. Lucia and St. Vincent and the Grenadines received payouts of US\$3.2 million and US\$1.1 million, respectively, in October 2010.

or feasible. It also provides assistance on more concessional terms compared to the previous ENDA.

In recent years, the Fund has introduced instruments that provide countries with contingent credit lines that can be accessed immediately in case of shocks, including natural disasters: the FCL, PLL, and to some extent the SBA and SCF (available for LICs) on a precautionary basis. The PLL and FCL are for countries with strong fundamentals and policies, and track records of policy implementation. The FCL has no *ex post* conditions, no caps on amounts, and countries can draw on it at any time over its term. Both facilities are based on *ex ante* qualifications and, in the case of the PLL, with conditionality aimed at addressing vulnerabilities identified during the qualification process.

Recent experience suggests that changes to the IMF lending toolkit are headed in the right direction (IMF, 2011a, 2012). The RCF since 2010, and before that the Rapid Access Component of the Exogenous Shocks Facility (ESF), have provided rapid low-access financing in a wide range of emergency situations, with 14 countries having requested support since 2008 and the strongest demand coming from small economies hit by natural disasters (IMF, 2012). Staff also found that countries supported by an IMF program, including through emergency assistance, were able to increase real spending, including social spending, more than non-program countries, and that Fund financing was positively associated with short-term growth and indicators of economic stability (IMF, 2012).

What other financing options are available to countries to minimize the adverse impact of shocks? Other international financial institutions provide an array of instruments to support countries *ex post* and *ex ante*. These include programs by the United Nations and many of its agencies, the World Bank, and all of the regional development banks. Independently, countries can consider market-based financing mechanisms such as catastrophe insurance/reinsurance, catastrophe bonds, securities indexed to disaster-related triggers, deferred repayment loans, derivatives and hedging instruments, and risk pooling to finance insurance against disasters.

Unfortunately, for many developing countries most susceptible to shocks, the cost of these tools can be prohibitive, the technical capacities are lacking, and the related opportunity costs high. Further research and cooperation is needed to improve the availability of financial protection for the state against disasters among developing countries. While the issue is gaining attention and becoming an important element of the disaster risk management framework, particularly at the World Bank, it is generally beyond the role of the IMF. The IMF is expected to provide financial support for countries with balance of payments needs after other financing and macro adjustment is considered. This residual financing role implies that IMF financing mainly be determined *ex post* (IMF, 2011b; Clarke and Mahul, 2011).

That said, the SCF is available on a precautionary basis, the RCF makes it easier to access financing in the event of shock, and the PCDR can provide debt flow and possibly debt stock relief after a natural disaster. Together these products make financing more predictable and accessible for LICs than it was previously, with the advantages of well-defined triggers. Compared to earlier instruments, they also have terms and conditions that are more streamlined and tailored to the borrowers' needs and circumstances.

While the experience so far is positive, further research and time will be needed to examine the empirical impact of these new financing instruments on output and fiscal balances following a catastrophe.⁷ Emergency funds are short term in nature and often complement other Fund assistance, and most of these arrangements require firm engagement by the authorities to solve their balance of payments difficulties. Contingent financing by definition is not tailored to the actual shock and so needs to be carefully designed to avoid moral hazard. In this context, the Fund has done some preliminary work to consider ways to enhance contingent financing under existing instruments, particularly for LICs.⁸

IV. IMF POLICY SUPPORT AND RISK MANAGEMENT OPTIONS

A. Post-Catastrophe Policy Advice: Case Studies

While in many instances, balance of payments difficulties will be transitory, ill-conceived policies can compound problems caused by the disaster. The IMF collaborates with country authorities to provide policy advice and technical assistance on an ongoing basis as part of Article IV surveillance or in the context of a Fund-supported program.⁹ The case studies reviewed for this paper provide a profile of the type of policy engagement that takes place between Fund staff and government officials struggling with the tough decisions in the aftermath of tragedy. Details about each case are presented in Appendix II. A summary of the key issues and lessons is presented below.

Haiti: Despite an extended period of political instability after the 2012 earthquake, the authorities made considerable progress in key areas, particularly revenue collection and administration reforms. The Fund-supported program and comprehensive technical assistance (35 visits as of July 2012) contributed significantly to restoring macro stability. *Reconstruction has also provided an opportunity to make some sectors stronger than they were before the earthquake.* For example, there are now more children in primary school and more paved roads. The biggest challenge to reconstruction, and absorption of the sizeable foreign financial assistance pledged, *is weak capacity and the absence of central coordination.* While less relevant for Fund policy assistance, better coordination and prioritization may have resulted in faster reconstruction.

Kenya: The drought in the Horn of Africa hit Kenya at a time when the economy was already dealing with excess demand and credit growth that had led to high inflation, a

⁷ Empirical research by the authors on the impact of Fund emergency lending in support of natural disasters on economic growth and fiscal balances is forthcoming.

⁸ Refinements could include “relaxing timing restrictions on access under the SCF; giving ECF users the option to forego disbursements when the member’s balance of payments position improves; and making the design of the Policy Support Instrument (PSI) more flexible while preserving its signaling function” (Review of Facilities for Low-Income Countries, PIN No. 12/108; IMF, 2012).

⁹ Under Article IV of the Articles of Agreement, the IMF holds bilateral discussions with members every year and discusses with officials the country’s economic developments and policies. Upon their return to headquarters, the staff prepares a report, which forms the basis for discussion by the Executive Board.

worsening of external balances, and currency depreciation. The ECF program provided funds to alleviate external pressures related to the drought, while also supporting needed adjustment. In addition, the *macro framework explicitly provided room for public investments* in alternative energy, irrigation schemes, market mechanisms for the production and distribution of cereals, and road infrastructure—long-lasting solutions to shield the country from the negative social, economic, and environmental impacts of drought.

Japan: The Fund consulted extensively with the Japanese authorities following the 2011 earthquake. The Fund supported the central bank's decisive action to inject liquidity, launch a loan program for financial institutions, expand asset purchases, and intervene with G-7 partners to stabilize the exchange rate. Japan was also able to mount a decisive fiscal response, though adjustment had to rely mainly on new revenue sources. An obvious lesson from the Japan experience *is that more fiscal space is desirable for crisis mitigation and resolution*. Other countries with less-developed financial sectors and more shallow pools of domestic savings would have had a more difficult time. *The experience also underlines the importance of undertaking growth-enhancing structural reforms*, including raising labor participation among the elderly, women, and youth, pursuing trade liberalization, and promoting small enterprise restructuring.

New Zealand: While the two Canterbury earthquakes caused considerable damage to the economy (10 percent of GDP), the high level of insurance coverage (6 percent of GDP) transferred effectively much of the cost of reconstruction onto the global insurance market. *This, together with New Zealand's low public debt, allowed the government to accommodate earthquake-related spending without cutting other spending*. Given the weakening of the economic outlook after the February 2011 earthquake, Fund staff supported the reduction in the policy rate by 50 basis points and also stressed that monetary policy would need to be tightened if the recovery proceeds as expected.

Pakistan: The devastating 2010 floods added new challenges to an already difficult economic scenario. In the context of growing imbalances (the Fund-supported SBA previously in place had gone off track in June 2010), revenues fell further and higher spending was needed to help affected people and businesses. The IMF responded promptly with emergency funds. Ongoing policy discussions centered on measures to reduce the budget deficit and assure fiscal sustainability, reduce inflation, and protect the external position. *The Fund encouraged the authorities to work with the World Bank to establish an enhanced framework for monitoring donor contributions*.

Samoa: After the 2009 tsunami, Samoa reviewed its development program rapidly and integrated existing investment projects into an overall recovery plan. This helped focus resources on key priorities and garner donor support. The government boosted public spending to pay for a large reconstruction program that included *measures to reduce risks such as resettlement and infrastructure investment*. Despite the large component of grant assistance and remittances, the fiscal deficit increased by over 3 percent of GDP to 7.5 percent within a year and stayed high thereafter, and external public debt rose by over 8 percent of GDP. Fiscal consolidation is now required to bring down the debt level and rebuild policy buffers, though there has been some resistance to such consolidation efforts.

The Central Bank of Samoa extended relief to the private sector by lending directly through the country's development bank. With a slow recovery, *nonperforming loans in the development bank increased*, while the loan quality of some commercial banks also deteriorated. The government assumed bad loans to state enterprises equivalent to 3½ percent of GDP. *The authorities committed to use only concessional assistance to finance tsunami-related reconstruction.*

St. Lucia: Immediate rehabilitation and emergency expenditure after the 2010 hurricane was financed through the reallocation of the investment budget and external financing, including US\$3.2 million from the CCRIF. Fund financing under the ECF and ENDA helped meet immediate foreign exchange needs and played a catalytic role in mobilizing financing from other international financial institutions and donors. *The authorities also committed to use only concessional funding to finance hurricane-related reconstruction.*

These cases offer several useful lessons on the design of the macro policy response:

- As resources are diverted on short notice to emergency spending, reprioritization of development expenditure will be needed. Greater attention to advance planning for disaster contingencies in the budget process could improve outcomes. Fiscal frameworks should provide the space and flexibility to redeploy spending rapidly, and to mesh existing investment projects into an overall recovery plan.
- Efforts are needed to improve coordination between multilateral institutions, bilateral donors, the authorities, and the civil society organizations, particularly in countries where administrative capacities are limited.
- Natural disaster assistance to the private sector should be provided in a way that ensures transparency and minimizes contingent liabilities to the state.
- Reconstruction could provide an opportunity to accelerate growth-enhancing structural reforms. Pre-disaster weaknesses and vulnerabilities could be addressed with reforms that encourage competition and modernization beyond standards existing before the crisis.
- The surge of donor support following a disaster could mask a weakening in competitiveness, particularly in LICs and small island economies. Countries should examine over time whether disasters have contributed to a weakening in competitiveness

B. Policies for Strengthening Resilience to Disasters

Designing a comprehensive policy framework for dealing with natural disasters should involve an assessment of the following core pillars: risk assessment and reduction (retention), self-insurance, and risk transfer (insurance).¹⁰ These involve elements of ex post emergency

¹⁰ See IMF Country Report No. 05/305, August 2005.

response as well as ex ante preparation and mitigation.

Identifying and reducing risk are necessary to lower the impact of disasters once they occur. The first pillar involves identifying risks by studying data on geographic, environmental, and social vulnerabilities, and building these assessments into medium-term development plans. Risk reduction, the second pillar, involves structural and sectoral reforms to lower physical vulnerabilities. Examples include relocating communities from disaster-prone areas, strengthening implementation of building codes, retrofitting existing buildings, or building dams or reservoirs in drought-prone areas. While costly up front, this is the best way to deal with shocks with the largest return over the long term.

The third pillar is self-insurance: building sufficient savings and reserves in good times to draw down in the event of disaster.¹¹ External borrowing and mechanisms like stabilization funds and buffer stocks could also help mitigate the impact of natural disasters.¹² However, particularly in developing countries, self-insurance and other ex ante mitigation mechanisms could be costly and will divert scarce resources from much needed infrastructure and social spending. It is therefore important to evaluate the likely ex post impact and the probability of disasters occurring.

The fourth pillar is risk transfer—insurance—which transfers risk externally to capital markets and investors.¹³ This provides the best channel to reduce the costs of major disasters and provide rapid capital for reconstruction. Recent empirical work shows that countries with deeper insurance penetration have the best outcomes in terms of lower output and welfare losses in both the near and long term (von Peter, von Dahlen, and Saxena, 2012).

Underpinning this framework is an important trade-off: the cost, in present value terms, of coping “after the fact” with major disasters as compared to the costs (including opportunity costs) of allocating resources ex ante towards insurance, self-insurance, and spending to reduce disaster risks. In theory this depends on the relative rates of return; in practice, it is difficult to assess. It may not be clear whether the opportunity costs in low-income countries justify the expected return, particularly considering that post-disaster financial assistance is highly or fully subsidized. The provision of emergency aid to developing countries acts as a strong but rational motivation for under-investing in risk reduction. Haiti, for example, received pledges of US\$9.9 billion after the earthquake, 1½ times the value of nominal pre-quake GDP. Hypothetically, the costs to the country of obtaining equivalent insurance coverage would have been prohibitive.

¹¹ Self-Insurance defined in the literature is the inter-temporal transfer of national resources, and would include domestic borrowing and external savings (external borrowing and possibly remittance flows) (IMF, 2005).

¹² For example, FONDEN is Mexico’s Fund for Natural Disasters. It was established in the 1990s as a mechanism to support the rapid rehabilitation of federal and state infrastructure, low-income housing, and parts of the environment. It consists of two budget accounts, one for reconstruction and one for prevention.

¹³ See also IMF (2011b).

Given the large amounts of international financial assistance provided sometimes to countries after natural catastrophes, there could be scope for strengthening international consultation and donor coordination to develop ways to encourage the allocation *ex ante* of donor assistance toward risk reduction, at least in countries prone to disasters. Over time this could have a higher return than emergency assistance *ex post* (and could save more lives).

The same moral hazard forces act within a country between the public and private sectors, where households expect the state to cover post-disaster needs. For example, in Indonesia, most of the destruction from the 2004 tsunami was of private sector assets and activities of lower-income groups in fishing and farming. Since these groups had no insurance coverage, the government assumed almost all of the recovery costs. Separating public risk from private risk poses difficulties for developing the right disaster risk framework. The inability to calculate public risk, and the assumption that all private sector risks will be assumed by the state, has been an important barrier to the adoption of risk-transfer mechanisms in developing countries (Ghesquiere, Mahul, 2010).

Incorporating all four pillars of a comprehensive policy approach, and taking into consideration the moral hazard factors at play, one can appreciate the considerable challenges to integrating risk management systematically and effectively into macro frameworks. For its part, the Fund has made some contributions toward mainstreaming risk management into macro frameworks. The Fund proposed a framework for the disclosure and management of fiscal risks that helps identify vulnerabilities, elaborate scenarios, and prioritize areas of risk mitigation. These guidelines also lay out the administrative framework needed to manage fiscal risks and provide practical ideas for preparing in advance (IMF, 2008). The Fund proposed ideas on ways to improve sovereign debt structures to make them more resilient to crisis (IMF, 2004). For countries vulnerable to natural disasters, the study discussed instruments that hedge against commodity price shocks and bonds indexed to an economic indicator like GDP. The latter, for example, would provide higher payments when GDP growth is strong and lower payments after a natural disaster. The paper also highlighted some of the practical difficulties that have hindered development of these instruments.

The IMF has also increased its risk assessment practices as part of individual country work and at a broader multilateral level (e.g., Early Warning Exercise). However, these tools do not identify explicit risks related to natural catastrophes. Assessing risks and incorporating statistical probabilities about natural disasters into macro frameworks to reflect their contingent costs could be a valuable contribution to helping governments determine the optimal mix of risk retention (reserves, financing) and risk transfer—at least in regions prone to natural disasters. The World Bank has developed a Natural Disaster Risk Financing Framework for this purpose. It helps countries design a national disaster risk financing strategy based on low, medium or high “risk layers” (Clarke, Mahul, 2011).

V. CONCLUDING REMARKS

This paper reviews the literature on the macroeconomic impact of natural disasters and in that context, presents the Fund’s role in assisting countries coping with the difficult challenges they pose. Focusing on seven country cases, policy advice, and financing modalities, the paper illustrates the supportive role played by the IMF in helping countries

recover from natural disasters. Fund emergency financing, policy support, and technical assistance have helped governments put together a policy response or build a macro framework that laid the foundation for recovery and/or unlocked other external financing. Further research on the effects of IMF financing in support of natural disasters on growth and fiscal balances would help to inform future deliberations on IMF support to members hit by natural disaster shocks.

The literature and recent experience suggests there are ways to strengthen policy frameworks, particularly in developing countries, to increase resilience to natural disasters:

- The design of the macro policy response could give greater attention to: (i) advance planning for disaster contingencies by ensuring sufficient fiscal space and flexibility within fiscal frameworks to redeploy spending rapidly and to mesh existing investment projects into an overall recovery plan; (ii) recommending that disaster assistance to the private sector be provided in a way that ensures transparency and minimizes contingent liabilities to the state; (iii) using reconstruction as an opportunity to accelerate growth-enhancing structural reforms; and (iv) examining whether disasters have contributed to a weakening in competitiveness.
- There is a case for identifying the risks and probability of natural disasters, and integrating them more explicitly into macro frameworks. For developing countries, a rough cost-benefit analysis on the trade-offs between the cost of risk transfer and self-insurance versus an *ex-post*-only approach might be useful to guide governments on how much to self-insure and how much to allocate to capital spending to mitigate the impact.
- Coordination between multilateral institutions, bilateral donors, the authorities and civil society organizations could be improved significantly, particularly in countries where administrative capacities are limited.
- The availability of insurance appears to significantly reduce the real costs of disasters without raising fiscal burdens. This is borne out in the literature and by the experience in our small country sample. IFIs could explore ideas about how to help regions and countries develop insurance markets.
- Since the availability of emergency financing *ex post* acts as insurance of last resort and limits country incentives to mitigate the costs of disasters, there could be scope for improved international consultation and donor coordination to develop ways to encourage the use of *ex ante* donor assistance toward risk reduction, which is likely to have a higher return than emergency assistance *ex post*.
- The Fund should continue reviewing its lending toolkit to ensure the availability of suitable financing in response to natural disasters.¹⁴

¹⁴ See also Review of Facilities for Low Income Countries, IMF (2012)

Box 1: IMF Financing Facilities in 2012

Nonconcessional loans are available to all IMF members facing urgent balance of payments needs. All nonconcessional facilities are subject to the IMF's market-related interest rate, known as the "rate of charge," and large loans (above certain limits) carry a surcharge. The rate of charge is based on the Special Drawing Right (SDR) interest rate, which is revised weekly. Low-income countries (LICs) may borrow on **concessional** terms through certain facilities that became effective in January 2010 under the Poverty Reduction and Growth Trust (PRGT), when interest rates on concessional loans were reduced to zero for one year and subsequently extended until the end of 2013 (2012 for Standby Credit Facility loans). The interest rate is reviewed every two years henceforth. The **maximum amount** that a country can borrow, known as its access limit, varies depending on the type of loan, but is typically a multiple of the country's IMF quota—its capital subscription. Certain facilities (below) have no pre-set cap on access.

1. The **Stand-By Arrangement (SBA)** is designed to address short-term balance of payments problems. Program targets aim to address these problems and disbursements are conditional on achieving targets ('conditionality'). The length of a SBA is typically 1-2 years, and repayment is due within 3¼–5 years of disbursement. SBAs may be provided on a precautionary basis—where countries choose not to draw but retain the option to do so—both within the normal access limits and in cases of exceptional access. The SBA provides for flexibility with respect to phasing disbursements.
2. The **Flexible Credit Line (FCL)** is for countries with very strong fundamentals and policy track records and is useful for both crisis prevention and crisis resolution. FCL arrangements are approved, at the member's request, for countries meeting pre-set qualification criteria. The length of the FCL is 1–2 years and the repayment period is the same as for the SBA. Access is determined on a case-by-case basis, is not subject to the normal access limits, and is available in a single up-front disbursement. FCL disbursements are not conditional on implementation of specific policies. Members may draw on the FCL at the time of approval or treat it as precautionary. Repayment term is the same as under the SBA.
3. The **Precautionary and Liquidity Line (PLL)** replaced the Precautionary Credit Line and can be used for both crisis prevention and crisis resolution purposes by countries with sound fundamentals and policies, and a sound policy track record. PLL-eligible countries may not meet all of the FCL qualification standards, but do not require the large-scale policy adjustments normally associated with SBAs. The PLL combines qualifications with ex post conditions monitored semi-annually. Duration of PLL arrangements can be from six months to two years. Access under the six-month PLL is limited to 250 percent of quota, but can be raised to 500 percent of quota in exceptional circumstances where the balance of payments need is due to exogenous shocks. One to two-year PLL arrangements are subject to an annual access limit of 500 percent of quota and a cumulative limit of 1,000 percent of quota. The repayment term is the same as for the SBA.
4. The **Extended Fund Facility (EFF)** was established in 1974 to help countries address medium- and longer-term balance of payments problems reflecting extensive distortions that require fundamental and sustained economic reforms. Arrangements under the EFF are thus longer than SBAs—normally not exceeding three years at approval but with a maximum duration of up to four years predicated on the existence of a balance of payments need beyond the three-year period, the prolonged nature of the adjustment required to restore macroeconomic stability, and the presence of adequate assurances about the member's ability and willingness to implement sustained structural reforms. Repayment is due within 4½–10 years from the date of disbursement.
5. The **Rapid Financing Instrument (RFI)** was introduced to replace and broaden the scope of earlier emergency assistance policies. The RFI provides rapid financial assistance with limited conditionality to facing an urgent balance of payments need. Access under the RFI is subject to an annual limit of 50 percent of quota and a cumulative limit of 100 percent of quota. RFI loans are subject to the same repayment term as the FCL, PLL and SBA.

For Low Income Countries:

6. The **Extended Credit Facility (ECF)** succeeds the Poverty Reduction and Growth Facility as the Fund's main tool for providing medium-term support to LICs with protracted balance of payments problems. Financing under the ECF carries a zero interest rate, with a grace period of 5½ years, and a final maturity of 10 years.
7. The **Standby Credit Facility (SCF)** provides financial assistance to LICs with short-term balance of payments needs and can be used in a wide range of circumstances, including on a precautionary basis. Financing under the SCF currently carries a zero interest rate, with a grace period of four years, and a final maturity of eight years.

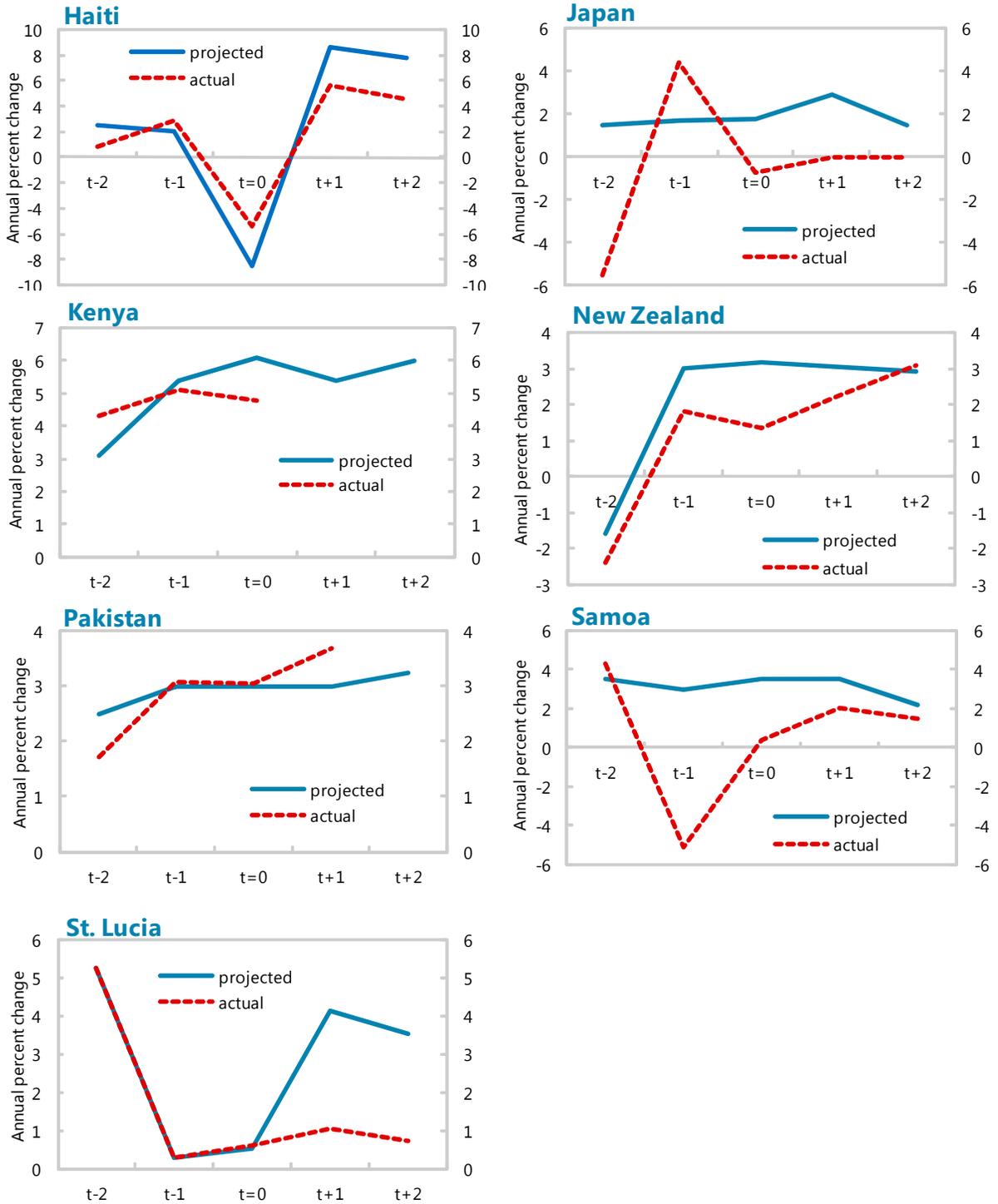
Box 1 (continued)

8. The **Rapid Credit Facility (RCF)** provides rapid financial assistance with limited conditionality to LICs facing an urgent balance of payments need. The RCF streamlines the Fund's emergency assistance for LICs, and can be used flexibly in a wide range of circumstances. Financing under the RCF currently carries a zero interest rate, has a grace period of 5½ years, and a final maturity of 10 years.

The **Policy Support Instrument (PSI)** does not provide direct financing, but provides explicit Fund endorsement of LICs' economic policies. It is a nonlending arrangement that provides policy support and signaling for LICs that have made significant progress in recent years toward economic stability and no longer require IMF financing.

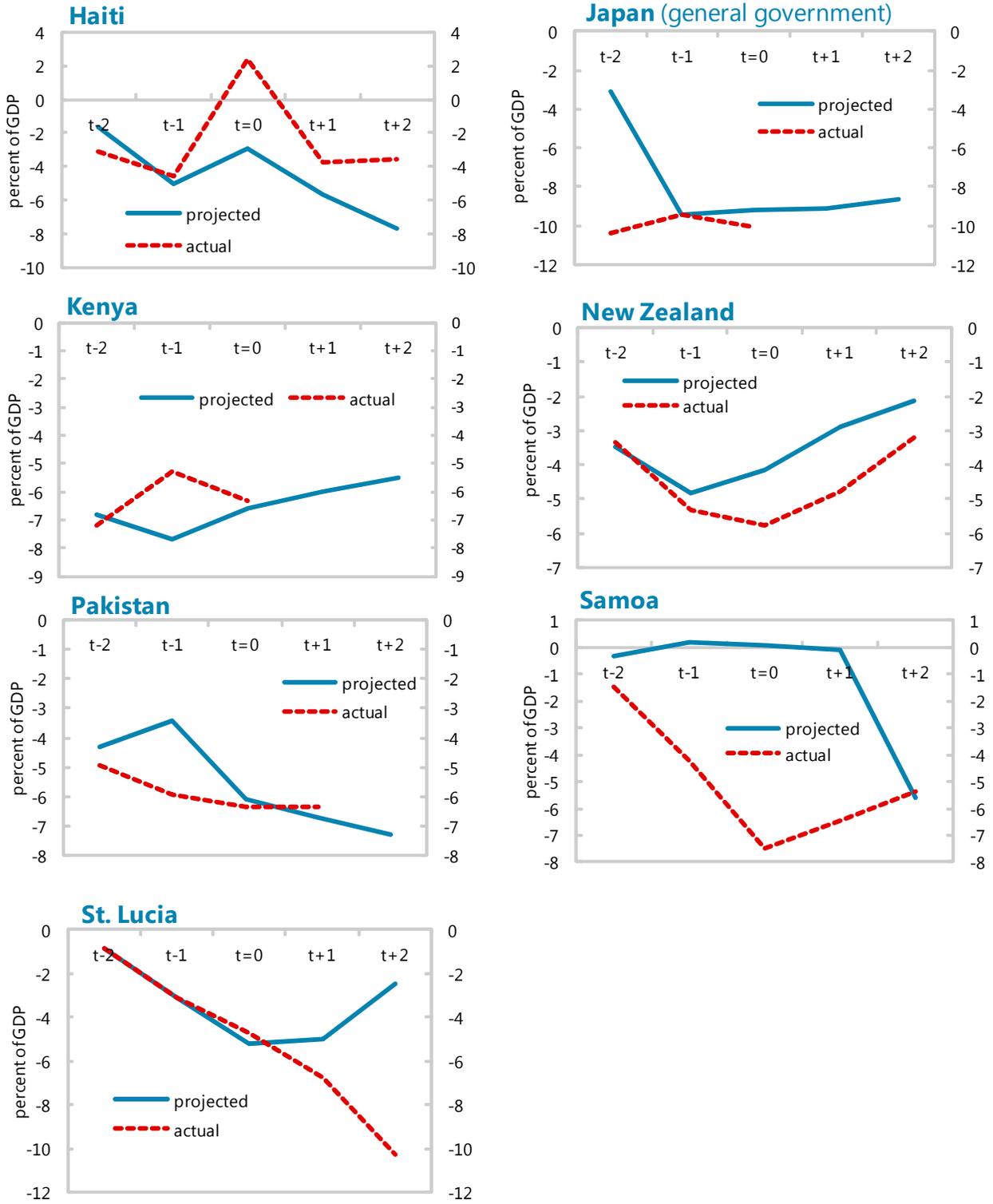
Appendix I

Real GDP Growth



Source: IMF staff estimates
 t=0 is year of natural disaster

Central Government Fiscal Balance



Source: IMF staff estimates
t=0 is year of natural disaster

Appendix II: Case Studies, Policy Response

Haiti (Earthquake, January 2010)

Fund policy advice focused up front on keeping cash moving, ensuring basic functioning of the treasury and payments system, and maintaining financial sector stability. These hands-on efforts were closely coordinated with other donors' interventions. Compared, for example, to the nature of Fund policy advice in other countries, this reflects the depth of the destruction, the challenges relating to basic infrastructure, and the administrative and technical capacity issues in the country. Over time, Fund staff focused energies on building an arrangement, in close consultation with the authorities, that would provide a coherent macroeconomic framework to boost growth and combat poverty in the context of the National Action Plan.

Together with financing, the Fund has since provided comprehensive technical assistance to help the authorities restore basic state functions and undertake much-needed reforms in the fiscal, financial, and monetary areas. By end-July 2012, more than 35 technical assistance visits had been fielded covering tax policy, revenue administration, financial sector development, exchange rate policy, legal, and statistics. While the country has since experienced prolonged political instability, the steady implementation of appropriate policies by senior officials has continued to foster macro stability and deliver on program objectives, particularly in the area of revenue administration reforms. At this time, capacity constraints pose the biggest challenge for the goals of reconstruction and poverty reduction.

Despite a period of political instability, the authorities maintained macro stability and made considerable progress in key areas, particularly revenue collection and administration reforms. Reconstruction has also provided an opportunity to make some sectors stronger than they were before the earthquake. For example, there are now more children in primary school and more paved roads. The biggest challenge to physical reconstruction, and absorption of the sizable amount of foreign financial assistance, is related to weak capacity and the absence of central coordination. There is a need for better coordination and prioritization and human resource development.

Kenya (Drought in the Horn of Africa, fourth quarter of 2011)

The drought in Kenya in 2011 affected over 4 million, consistent with the literature showing that droughts affect the highest share of populations and cause the most adverse impact on welfare in developing countries. The impact on same-year GDP is estimated at about 0.4 percent. Food prices soared and a shift from hydrological to diesel-generated power led to a marked widening of the current account deficit in a context of high inflation and currency depreciation. This undermined the activities of a manufacturing sector that was faced with higher operating costs as well as frequent power disruptions. The domestic price of maize, a staple food crop, increased by more than 150 percent, and about 5 percent of Kenya's livestock population was wiped out. The authorities immediately reallocated spending by about 0.3 percent of GDP to help the most vulnerable.

The ECF-supported program aimed to help restore macro stability, build reserves, and

stabilize the exchange rate, while also recognizing the recurring nature of droughts and the need for long-term solutions. The program focuses on medium-term fiscal consolidation as a means of rebuilding the reserve buffers that would allow fiscal policy to respond proactively should a new drought occur. At the same time, the macroeconomic framework explicitly provides room for public investments to reduce the country's dependence on costly oil for thermal power generation, notably through the inclusion of renewable energy projects under the ceiling for nonconcessional borrowing. Combined with the joint efforts by the Government of Kenya, World Bank, and other development partners to invest in irrigation schemes, enhance market mechanisms for the production and distribution of cereals, and improve road infrastructure for access to drought-prone areas, the IMF's financial support, policy advice, and technical assistance aim to help the government create long-lasting solutions to shield the country from the negative social, economic, and environmental impacts of drought.

Japan (Great East Japan earthquake, March 2011)

Immediately following the Japan earthquake, the monetary authorities took swift and decisive action, conducting coordinated and decisive liquidity injections, launching a loan program for financial institutions affected by the quake, and expanding asset purchases. The Financial Services Agency also contributed, for example, by relaxing conditions for bank recapitalization for regional banks affected by the disaster. Concerted intervention in coordination with the G-7 in mid-March contributed to stabilizing the exchange rate, reduced contagion risks to other asset classes, and mitigated the effects on exports.

The IMF's support focused on policy advice. Fund staff consulted on an ongoing basis with the authorities and supported their response, which was effective at stabilizing financial markets. The Fund also suggested scaling up the use of unconventional measures to ward off deflation risks and support the recovery, recommending that policies protect against risks of a prolonged economic slowdown and higher market volatility given banks' significant holdings of government bonds and equities. In this respect, the Fund felt that the central bank could further increase its purchases of longer-dated public securities and expand its asset purchase program for private assets.

Despite concerns about fiscal sustainability, the authorities managed to implement a decisive fiscal response without adverse market reaction. Through existing funds and a series of supplementary budgets, the government has allocated about 3.8 percent of GDP to reconstruction so far. Key expenses included temporary housing, public works, support for financing of small and medium-sized enterprises, earthquake-related transfers to local governments and individuals, and employment benefits and subsidies. Despite the introduction of a temporary tax for reconstruction spending that increases the corporate tax rate by 10 percent (from 25.5 percent to 28.05 percent), the effective corporate tax rate declined from 41 percent to 38 percent in April 2012 following a reduction in the original corporate tax rate from 30 percent to 25.5 percent. The stimulus had only a modest impact on the debt trajectory, which contributed to keeping Japanese government bond yields stable and the impact on sovereign credit default swaps muted.

Japan was able to mount a decisive fiscal response, despite preliminary concerns about fiscal sustainability. Other countries with less-developed financial sectors and shallow pools of domestic savings may have had a much more difficult time. Thus a key observation from the Japan experience is that fiscal space is a key component of crisis mitigation and resolution. The Fund supported the immediate focus of fiscal policy to revive growth, but to limit bond issuance and strengthen commitment to fiscal reform. The Fund also suggested that reconstruction spending be financed by new tax measures, including through a moderate increase in the consumption tax, and take place within a credible medium-term consolidation strategy. Appropriately, the fiscal stimulus was staged as revised estimates of the size and nature of the damage became available.

New Zealand (Canterbury earthquakes, September 2010 and February 2011)

The two Canterbury earthquakes caused damage to the economy estimated at about 10 percent of GDP, much higher than in many other natural disaster cases. The earthquakes led to a jump in public expenditure by 6 percent of GDP (on an accrual basis) between 2010–11, with about 60 percent funded by the Earthquake Commission, New Zealand’s primary provider of natural disaster insurance to residential property owners.

New Zealand households and firms had extensive property insurance and there is a high level of reinsurance, meaning the majority of privately insured losses will be borne by global insurers rather than New Zealand insurance companies. The total reinsurance payments related to the two earthquakes are estimated at \$NZ 12.5 billion (6 percent of GDP). The proportion of insured loss, likely to be at least 50 percent, is high by the standards of other major earthquake events.

Following the second earthquake, the central bank reduced the policy rate by 50 basis points to limit downside risks and the Reserve Bank worked closely with banks and other companies to ensure the availability of cash in Christchurch. Given the weakening of the economic outlook, Fund staff supported this response, and also recommended a gradual return to neutral policy rates once the recovery proceeds as expected. While the quakes worsened the fiscal deficit significantly in the short term, pushing up the fiscal deficit by 4½ percent of GDP in 2010/11, assets of the government-run Earthquake Commission and its overseas reinsurance helped the recovery efforts without putting a big strain on the government’s fiscal position. Staff agreed with the authorities’ plans to return the fiscal accounts to a small budget surplus by 2014/15, one year ahead of the government’s earlier plan, stressing that this would create fiscal space as a buffer against future shocks and would also relieve pressure on monetary policy and hence the exchange rate, helping rebalance the economy and contain the current account deficit. Moreover, the fairly deep insurance penetration in New Zealand appears to have helped limit the impact of the disaster on growth, consistent with the literature.

Pakistan (Floods, 2010)

The country experienced the worst floods in its history in the summer of 2010. More than 18 million people—about 10 percent of the total population—in half of the districts in

Pakistan were affected. The floods destroyed or damaged nearly 2 million homes and did extensive damage to roads, telecom and energy infrastructure, crops, and livestock.

The authorities requested assistance under the ENDA, which provided rapid and flexible financial assistance not linked to any program-based conditionality. The upfront disbursement of \$450 million was directed toward humanitarian needs and to help finance the government without overburdening the domestic financial market or depleting foreign exchange reserves. The Fund supported the authorities' plan to work with the World Bank to monitor the use of aid flows to ensure accountability and transparency.

Although it is difficult to estimate the exact economic impact of the floods, GDP increased only 3 percent in 2010/11 compared to pre-flood projections of 4.5 percent. Headline inflation also increased by an additional 2 percent and public finances came under pressure, adding to an already expansionary fiscal policy. As the Fund-supported SBA previously in place had gone off track in June 2010, the floods added new challenges. Macro imbalances were exacerbated after the floods as revenues fell further and higher spending was needed to help affected people and businesses.

The IMF responded promptly with emergency funds. Still under the existing SBA at the time, the authorities maintained a close dialogue with the Fund. Discussions centered on measures to reduce the budget deficit and assure fiscal sustainability, reduce inflation, and protect the external position. Reducing the budget deficit would require higher revenue through tax reform to broaden the tax base, including steps to implement reforms in the general sales tax. The Fund also urged efforts to improve the quality of expenditure by increasing the share of spending on health, education, and infrastructure. Two years after the floods and one year after the expiration of the SBA, the challenges still persist. Continued efforts are needed to reduce the budget deficit to take the pressure off monetary policy and create space for more credit to the private sector, and to improve debt management.

Samoa (Tsunami, 2009)

After the 2009 tsunami, the government boosted public spending to pay for a large rehabilitation and reconstruction program, estimated at about 3.5 percent of GDP. The Central Bank of Samoa also extended relief to the private sector by lending directly through the country's development bank. Together with a slowdown in tourism, this resulted in rising nonperforming loans in the development bank and adversely affected the loan quality of some commercial banks.

The fiscal deficit increased rapidly and, while necessary for recovery, led to a rapid accumulation of external debt. In the fiscal year 2009/10 (July/June), the fiscal deficit rose to 7.5 percent of GDP from 4.2 percent in 2008/09 and remained above 6 percent of GDP for several years after. Public external debt climbed from 45.3 percent in 2008/09 to 53.2 percent of GDP in 2011/12. Considerable fiscal consolidation is now required to bring down public debt and rebuild policy buffers, though there has been some resistance to such consolidation efforts.

Other external shocks, including hikes of global food and fuel prices and the global financial

crisis, weakened Samoa's competitiveness. Along with real exchange rate appreciation, the tsunami reinforced the pressure on the country's export industries. As a result, economic recovery has been slow—Samoa's real GDP has not reached its 2007/08 level. On the other hand, a high level of support from development partners has contributed to the maintenance of a comfortable level of foreign reserves despite the real appreciation of the exchange rate. The authorities committed to use only concessional assistance to finance tsunami-related reconstruction.

St. Lucia (Hurricane Tomas, 2010)

Hurricane Tomas, which struck St. Lucia in 2010, caused damages estimated at about 43 percent of GDP. Immediate rehabilitation and emergency expenditure was financed through the reallocation of the investment budget and financing received (US\$3.2 million) from the CCRIF and the Caribbean Development Bank (US\$0.2 million). The Fund provided \$8.2 million under the RCF/ENDA three months later. The purchase helped meet immediate foreign exchange needs and played a catalytic role in mobilizing financing from other international financial institutions and donors. The authorities committed to rein in fiscal deficits in the medium term and implement structural reforms that would improve economic efficiency and foster private sector-led growth.

As a member of the Eastern Caribbean Currency Union, St. Lucia is constrained from using monetary policy and had little fiscal room to address the hurricane's damage. The authorities committed to use only concessional funding to finance hurricane-related reconstruction.

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