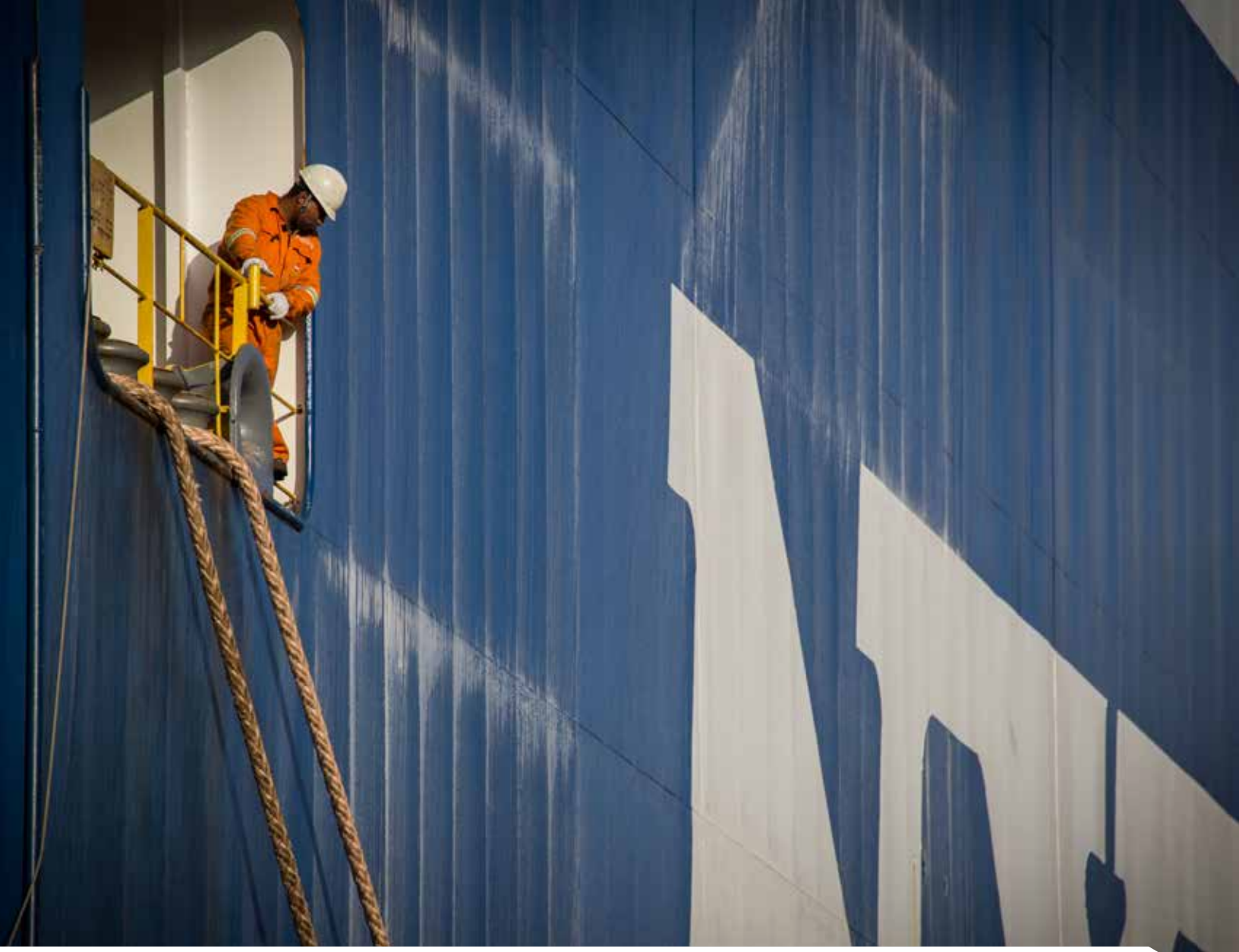

Disaster Recovery Guidance Series

Private Sector Participation in Disaster Recovery and Mitigation

GFDRR
Global Facility for Disaster Reduction and Recovery

THE WORLD BANK
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Cover photo: Dar es Salaam Port, Tanzania. Photo: Rob Beechey/World Bank

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Acronyms

AF	Asset Functionality
ALF	Accumulated Loss of Functionality
APEC	Asia-Pacific Economic Cooperation
BBB	Build Back Better
CSR	Corporate Social Responsibility
CEI	Credit Enhancement Instruments
DANIDA	Danish International Development Assistance
EM-DAT	Emergency Events Database
EPC	Engineering, Procurement and Construction
ICT	Information Communication and Technology
IFC	International Finance Corporation
ILO	International Labour Organization
LoF	Loss of Functionality
MDB	Multilateral Development Bank
NGO	Non-governmental Organization
ODI	Overseas Development Institute
OECD	Organisation for Economic Co-operation and Development
O&M	Operations and Maintenance
PES	Payment-for-ecosystem-services
PPI	Private Participation in Infrastructure
PPP	Public-Private partnership
PSP	Private Sector Participation
SCIRT	Stronger Christchurch Infrastructure Rebuild Team
TCIP	Turkish Catastrophe Insurance Pool
TfR	Time for Recovery
UN	United Nations
UNDRR	United Nations Office for Disaster Risk Reduction
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNHCR	United Nations High Commissioner for Refugees
UPS	United Parcel Service
USAID	United States Agency for International Development

Shiromeda, Gulele Subcity, in Addis Ababa, Ethiopia on. Photo © Dominic Chavez/World Bank.

Acknowledgments

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This Guide is accompanied by a list of resources available on the Global Facility for Disaster Reduction and Recovery's (GFDRR) Recovery Hub website at: http://recoveryhub.gfdrr.org/

I. Introduction

A. Disasters, Disaster Recovery, Mitigation and the Role of the Private Sector

In recent years, the severity and frequency of natural disasters has risen, resulting in increasing human and economic losses (Figure 1). These extreme weather events disproportionally affect low-income countries, with a greater toll and cost of disaster being borne by the poorest populations.[1] It is estimated that beyond asset losses, the average annual loss of well-being from natural disasters is equivalent to US$520 billion.[2] An alarming, related trend concerns the losses imposed by smaller-scale and recurrent local disasters.[3] Such disasters particularly affect households, communities and small and medium enterprises, who bear a high proportion of the losses.[4] It is estimated that in Latin America and the Caribbean, small-scale disasters accounted for over half of human losses caused by climate events between 1990 and 2014.[5]

Disasters also pose a risk to the viability and functioning of existing infrastructure and services. For example, after the Nepal earthquake in 2015, the damages to infrastructure amounted to almost US$472 million[6], and diminished a significant amount of the existing infrastructure.[7] This exacerbated the logistical difficulties associated with the emergency response to the disaster, as well as the recovery from it. Natural disasters also disrupt supply chains, creating negative ripple effects within the economic network. For example, one of the reasons the 2005 Hurricane Katrina in the United States had such a deep impact on Louisiana and New Orleans was because the hurricane disrupted economic systems in such a way that even businesses that did not suffer any damage could no longer function properly because of supply chain and business interruptions. These disruptions made economic production close to impossible, leading to an almost complete collapse of the local economy.[8] Therefore, Hurricane Katrina resulted in a total estimated cost of close to US$149 billion.[9]

Today's greater interconnectivity means that the impact of disasters is not restricted to an area, country or region alone, but it may in fact impact organizations and individuals in other

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1 UNDRR, *Global Assessment Report on Disaster Risk Reduction 2019* (Geneva, Switzerland: United Nations Office for Disaster Risk Reduction (UNDRR), 2019), https://gar.unisdr.org/sites/default/files/reports/2019-05/full_gar_report.pdf.

2 Stephane Hallegatte and others, *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters,* Climate Change and Development Series (Washington, DC, USA: World Bank Group, 2017), https://openknowledge.worldbank.org/handle/10986/25335.

3 Vinod Thomas, *Climate Change and Natural Disasters: Transforming Economies and Policies for a Sustainable Future* (New Brunswick, New Jersey: Transaction Publishers, 2017).

4 United Nations, *Sendai Framework for Disaster Risk Reduction 2015 - 2030,* Third UN World Conference (Sendai, Japan, 2015), http://www.fao.org/resilience/resources/resources-detail/en/c/281348/.

5 Food and Agriculture Organization (FAO), 'Small Disasters, Great Damages | FAO', FAO Regional Office for Latin America and the Caribbean, FAO, 6 March 2017, http://www.fao.org/americas/noticias/ver/en/c/472904/.

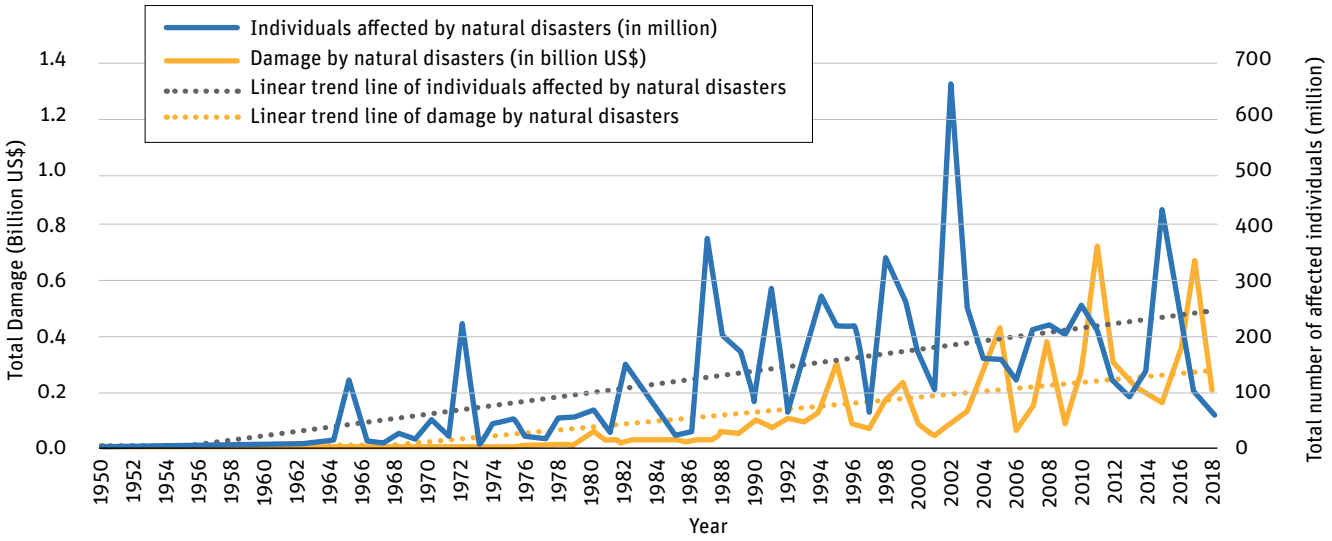
6 This was calculated using the conversion rate of 1 US$~ 111.09 Nepalese Rupee (NPR) (as of April 17, 2019).

7 National Planning Commission, 'Nepal Earthquake 2015: Post Disaster Needs Assessment | Executive Summary' (Kathmandu, Nepal: Government of Nepal, 2015), http://www.worldbank.org/content/dam/Worldbank/document/SAR/nepal-pdna-executive-summary.pdf.

8 Fanny Henriet, Stéphane Hallegatte, and Lionel Tabourier, 'Firm-Network Characteristics and Economic Robustness to Natural Disasters', *Journal of Economic Dynamics and Control* 36, no. 1 (January 2012): 150–67, https://doi.org/10.1016/j.jedc.2011.10.001.

9 Stéphane Hallegatte, 'An Adaptive Regional Input-Output Model and Its Application to the Assessment of the Economic Cost of Katrina', *Risk Analysis* 28, no. 3 (June 2008): 779–99, https://doi.org/10.1111/j.1539-6924.2008.01046.x.

Figure 1: A Rise in the Number and Severity of Natural Disasters



Source: This figure was constructed based on data from the EM-DAT: The Emergency Events Database, Université catholique de Louvain (2019).

Note: The frequency of natural disasters recorded in the Emergency Events Database (EM-DAT) has increased from 2,776 reported natural disasters between 1950-1985 to 11,556 reported natural disasters between 1985-2018 — an over four-fold increase. The rise in the number of disasters accompanied by an increase in their severity has had a concomitant impact on human lives and economic damage. Université catholique de Louvain (UCL)- CRED and Guha-Sapir (2019).

parts of the world as well.[10] Natural disasters by themselves are beyond anyone's control. However, the preparation and response to them can be managed so that the economic and human losses can be minimized or eliminated altogether.[11] Researchers estimate that, on average, US$1 spent on preparedness is worth about US$15 in terms of the future damage it can potentially mitigates.[12] Whereas states have the overall responsibility to drive disaster recovery and mitigation efforts, especially in the aftermath of a disaster, it is often a shared task between the government and relevant stakeholders.[13] Therefore, when a disaster strikes, apart from the government response, a variety of other actors also step in to provide support, including non-profit organizations, aid organizations, international organizations, local communities and individual agents.

The private sector provides post-disaster support, albeit in a less systematic, more ad-hoc manner (Box 1). Strategic and planned partnerships between the government and the private sector for disaster recovery and mitigation remains an area for improvement. In this context, government effectiveness can be strengthened by leveraging existing private sector capacities and core competencies. Indeed, effectively involving the private sector in disaster recovery can open opportunities to increase resilience and reduce pre-disaster risks by building back better (BBB). Private participation in disaster recovery can also allow for faster and more efficient recovery efforts at a time when governments are already overstretched. Therefore, under the right enabling conditions, the private sector can make a very positive contribution toward

[10] Chloe Demrovsky, *Public-Private Partnerships Are Essential to Attaining the nNext Level of Resilience in Japan and the Greater Global Community,* White Paper: Thoughts from the Third UN World Conference on Disaster Risk Reduction (Disaster Recovery Institute International, 2015), https://www.preventionweb.net/files/57531_57531postsendai.pdf.

[11] Demrovsky, 2015.

[12] Andrew Healy and Neil Malhotra, 'Myopic Voters and Natural Disaster Policy', *American Political Science Review* 103, no. 3 (August 2009): 387–406, https://doi.org/10.1017/S0003055409990104.

[13] United Nations, *Sendai Framework for Disaster Risk Reduction 2015 - 2030.*

Box 1: Private Sector Support Following the 2010 Earthquake in Haiti

Following the 2010 earthquake in Haiti, the private sector contributed both monetary and non-monetary donations to the emergency response and long-term recovery efforts. For instance, FedEx provided complimentary flights carrying medicines and aid materials. The pharmaceutical company Teva donated medicines toward relief efforts. Google created a 'person-finder' application to look for missing people and collaborated with the aerial surveillance company, GeoEye, to assess damages and direct aid to the worst affected areas. Simultaneously, the telecommunications company, Digicel, made its communication data available to track the displaced population.

The engineering company, Degenkolb, sent a team to assist with post-earthquake building inspections and collaborated with Build Change (a non-governmental organization [NGO]) to develop and implement a retrofit guideline and training program. The construction company, Caterpillar, collaborated with the Pan American Development Foundation on a drainage canal clean-up project and provided equipment, such as excavators, tractors, and so on, as well as operational expertise and engineers to assist in clearing of debris. The reconstruction of the iron market in Port-au-Prince was financed by Digicel telecommunications and private contractors (John McAslan & Partners), and local craftsmen were hired for the construction work.

Source: Business Civic Leadership Centre (2012); Bailey (2014); Kiss (2011); Smith (2016); John McAslan & Partners (2019)
Note: For more details on these and other examples see Table 2.

disaster recovery and mitigation both in the short- and long-term.

B. About this Guidance Note: Aim, Relevance and Scope

This Guidance Note aims to provide action-oriented guidance to local and national government officials, key decisionmakers and other stakeholders on ways to encourage, enable and facilitate successful private sector participation in post-disaster recovery. The term 'disaster' is limited to natural hazards (excluding those caused by biological phenomena, such as disease epidemics or insect plagues).[14] It does *not* include man-made hazards, such as conflict and complex emergencies.[15]

Regarding private sector participation in disaster recovery and mitigation, there is a knowledge gap about the existing forms of engagement and how they can be better facilitated. Research in this regard is still in its infancy, given a lack of reliable data.[16] While there are numerous examples of private-sector participation in the form of pro-bono, philanthropic and not-for-profit initiatives following a disaster, not much is known about alternative forms of private sector participation in disaster recovery. This Note takes a first step toward filling that knowledge gap by mapping

[14] Université catholique de Louvain (UCL)- CRED and Guha-Sapir, 'EM-DAT: The Emergency Events Database'.
[15] Natural hazards include events that can be geophysical (earthquakes, landslides, tsunamis and volcanic activity), hydrological (avalanches and floods), climatological (extreme temperatures, drought and wildfires) and meteorological (cyclones and storms/wave surges) in nature.
[16] Andrea Binder and Jan Martin Witte, Business E*ngagement in Humanitarian Relief: Key Trends and Policy Implications*, An HPG Background Paper (London: Overseas Development Institute, 2007).

existing private sector participation in disaster recovery and mitigation. As such, this exercise will help to identify sectoral areas and forms of private sector participation where there is potential for greater private involvement.

The Guidance Note also lays out the case for private sector participation in disaster recovery and mitigation by providing case studies and examples. This Note is divided into four sections. The first section introduces the notion of private sector participation in disaster recovery and mitigation; the second section explains the rationale for private sector involvement; the third section discusses and maps the existing forms of private sector participation in disaster recovery and mitigation; and the fourth section highlights common challenges and provides guidance for governments about the key elements for successful private sector participation in disaster recovery efforts. Appended to the end of this Guidance Note are more details regarding the examples cited in the tables.

This Note is based on research drawn from academic as well as practitioner sources. This includes but is not limited to journal articles, books, reports, news articles and briefs prepared by The World Bank, the International Labour Organization (ILO), Asia-Pacific Economic Cooperation (APEC), the International Economic Council, the International Finance Corporation (IFC), the Organisation for Economic Co-operation and Development (OECD), the United Nations Office for Disaster Risk Reduction (UNDRR), the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), RAND, media agencies, as well as corporate social responsibility (CSR) reports of various private companies and business organizations. Information has also been drawn from the World Bank's Private Participation in Infrastructure (PPI) database.

The Note uses a case study approach to draw lessons and develop best practices. Therefore, many of the solutions identified are disaster- and country- specific, thereby implying that generalizations to other contexts may not be appropriate. They would need to be tempered by the local context as every disaster scenario is unique in its cultural, socioeconomic, governmental capacity, institutional bodies and regulatory provisions. The solutions presented here should be taken as examples about what proved to be effective and what may have the potential to deliver similar results in other contexts under the right institutional arrangements. Similarly, what proved to be ineffective also offers lessons of what governments should take into consideration.

C. Key Terms in this Guidance Note

1. Disaster Management Cycle, Disaster Recovery and Mitigation

The disaster management cycle illustrates the different phases by which governments and other entities plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster strikes.[17] Typically, the disaster management cycle is thought to consist of four equally important phases: mitigation, preparedness, response and recovery.[18]

Mitigation entails actions taken to prevent and reduce the causes, impacts, and consequences of disasters. Preparedness includes planning, training and undertaking other activities for events that cannot be mitigated. Mitigation and

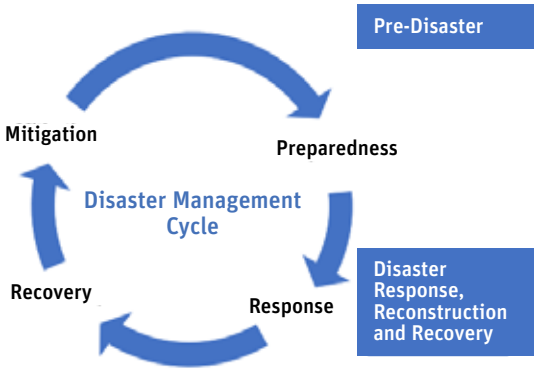
[17] Corina Warfield, 'The Disaster Management Cycle', Disaster Management, accessed 12 April 2019, http://www.gdrc.org/uem/disasters/1-dm_cycle.html.

[18] FEMA, 'Unit 4: Emergency Management in the United States', Emergency Management in the United States, n.d., https://training.fema.gov/emiweb/downloads/is111_unit%204.pdf.

preparedness are generally associated with the pre-disaster period. Disaster response unfolds in the immediate aftermath of a disaster and takes the form of disaster relief operations, as well as other measures to curtail the damage imposed by a disaster. In the recovery phase, which occurs post-disaster, restoration and reconstruction efforts are undertaken concurrently with regular activities.[19]

Figure 2 illustrates these phases. In this regard, it should be noted that the four phases are not mutually exclusive and can be thought of as a broad generalization rather than strictly defined categories. They also do not necessarily occur in isolation or unfold in a linear, cyclical or sequential manner. In fact, they often overlap, with the length of the phase dependent upon the severity of the disaster.[20]

Figure 2: The Disaster Management Cycle



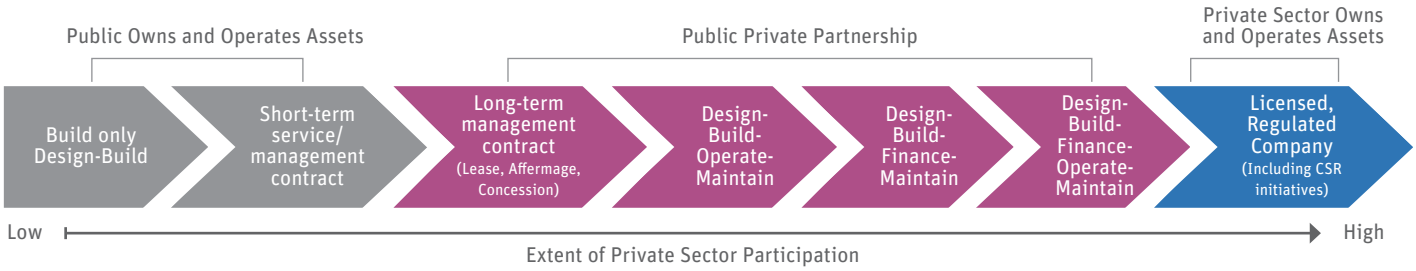
Source: Adapted from FEMA (n.d.) and Thomas (2017).

2. Private Sector Participation (PSP)

For the purposes of this note, private sector activities are defined as "all economic activities that do not involve production by the public sector. This definition includes all for-profit firms regardless of size, activity (goods, services, or financial), or location (urban or rural). It also includes institutions specifically established to serve the private sector such as industry associations".[21] While some authors include NGOs as part of the private sector, this Guidance Note restricts the term 'private sector' to mean entities that are typically driven by a commercial interest such as firms, businesses, corporations, companies and business/industry associations.

The extent of private sector participation in an economy can be described along a continuum ranging from low to high (Figure 3). Here 'low' refers to instances where the public sector uses the private sector as a contractor to build and/or design infrastructure, and/or to manage

Figure 3: Extent of Private Sector Participation



Sources: Adapted from World Bank (2016, 2017).

Note: CSR= corporate social responsibility.

[19] FEMA.

[20] Warfield, 'The Disaster Management Cycle'.

[21] Jacqueline Mazza and others, 'Summit of the Americas: The IDB and Job Creation in the Americas' (Mar del Plata, Argentina: Inter-American Development Bank, 2005), https://publications.iadb.org/publications/english/document/The-IDB-and-Job-Creation-Report-to-the-Summit-of-the-Americas.pdf.

Building a road in Bangladesh. Photo: Scott Wallace/World Bank

services in the short-term or to supply goods. Such contracts apply when the government has the skills and knowledge to know the technical solution it requires (or has pre-determined design standards) but prefers to retain maintenance responsibility over the long term (and has the budget to pay for maintenance).

By contrast, at the other end of the spectrum, private participation is at its highest. Here 'high' refers to instances where the private sector owns and operates an asset, for example, when the private sector operates as an independent, licensed and regulated company. Between these two extremes lies the case of Public-Private Partnerships (PPPs), which constitute a specific way of financing and procuring infrastructure assets and services.

3. Public-Private Partnerships (PPPs)

For the purposes of this Note, a PPP is defined as "a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility and remuneration is linked to performance" (World Bank 2017).

PPPs can be described in terms of the assets involved, the division of functions and the types of payment mechanisms. PPPs may involve the creation of new assets or the upgradation of management for existing ones.[22] The private sector may perform multiple functions depending on the type of asset and service involved. Typical functions include, but are not limited to, design, build (or rehabilitate),

[22] The former is referred to as greenfield projects, whereas the latter are referred to as brownfield Projects.

finance, maintain and operate. The payment mechanism is usually structured in such a way that the net renumeration to the private party is linked to performance. This is done by collecting fees from service users, the government, or a combination of the two.

In the literature about the role of the private sector in disaster recovery and mitigation, the term 'PPP' is used very loosely and is often used to label pro-bono, non-contractual and collaborative relationships between the government and the private party. Even when a contractual agreement exists between the government and the private entity, there may be cases in which such a partnership does not exhibit the defining feature of a PPP, that is, the transference of significant risk and responsibilities to the private party under a long-term contract, as well as performance-based remuneration.[23]

It should also be noted that a PPP is not equivalent to privatization. Privatization involves the permanent transfer of a previously publicly-owned asset to the private sector, an aspect that has currently not been seen, as the research conducted for this Guidance Note reveals.

4. Corporate Social Responsibility (CSR)

The World Bank defines Corporate Social Responsibility (CSR) as "the commitment of businesses to behave ethically and to contribute to sustainable economic development by working with all relevant stakeholders to improve their lives in ways that are good for business, the sustainable development agenda, and society at large".[24] [25] [26]

Private participation as a CSR activity is particularly prominent in disaster recovery. As such, it is included in this Guidance Note. Private firms of all sizes make a wide variety of financial and non-financial contributions in the aftermath of disasters. For instance, in the aftermath of Typhoon Haiyan in the Philippines in 2013, it has been estimated that the private sector contributed as least half of all humanitarian assistance.[27]

5. Loss of Functionality (LoF), Time for Recovery (TfR) and Accumulated Loss of Functionality (ALF)

In the context of infrastructure, 'resilience' describes: (i) an asset's ability to withstand shocks in such a way that minimizes losses in the levels of service provided by the asset (also known as asset functionality); and (ii) the asset's capacity to recover functionality across multiple dimensions following a disaster event.[28]

Loss of functionality (LOF) accounts for the reduced levels of service that the infrastructure

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[23] World Bank and others, 'Chapter 1: What Is a PPP: Defining "Public-Private Partnership"'.

[24] Djordjija Petkoski and Nigel Twose, *Public Policy for Corporate Social Responsibility*, E-Conference, July 7-25, 2003 (World Bank, 2003),

http://web.worldbank.org/archive/website01006/WEB/IMAGES/PUBLICPO.PDF.

[25] The World Bank's definition is one of many. However, according to Kitzmueller and Shimshactwo (2012), two defining features of CSR tend to cut across the various definitions. First, CSR is manifested in observable and measurable output or behavior. Second, this behavior exceeds the standards enforced by law or exceeds levels set by obligatory regulations. In some countries, a certain level of CSR activity is mandated by law (for example, in India). However, the emphasis here is on the nature of CSR activities. including those that businesses are not legally obligated to undertake, or those that exceed levels that they are bound to perform.

[26] Markus Kitzmueller and Jay Shimshack, 'Economic Perspectives on Corporate Social Responsibility', *Journal of Economic Literature* 50, no. 1 (March 2012): 51–84, https://doi.org/10.1257/jel.50.1.51.

[27] Steven A. Zyck and Randolph Kent, 'Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector – Final Report' (Humanitarian Policy Group, Overseas Development Institute, July 2014), https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9078.pdf.

[28] Darwin Marcelo, Schuyler House, and Aditi Raina, 'Incorporating Resilience in Infrastructure Prioritization: Application to the Road Transport Sector', Policy Research Working Paper (Washington, D.C.: World Bank, 2018), http://documents.worldbank.org/curated/en/985731536844603721/Incorporating-Resilience-in-Infrastructure-Prioritization-Application-to-the-Road-Transport-Sector.

generally produces due to disaster events. LOF is a function of both the impact of natural disasters and the structural measures taken during the design and construction of the infrastructure to resist or absorb the external forces imposed by natural disasters.[29]

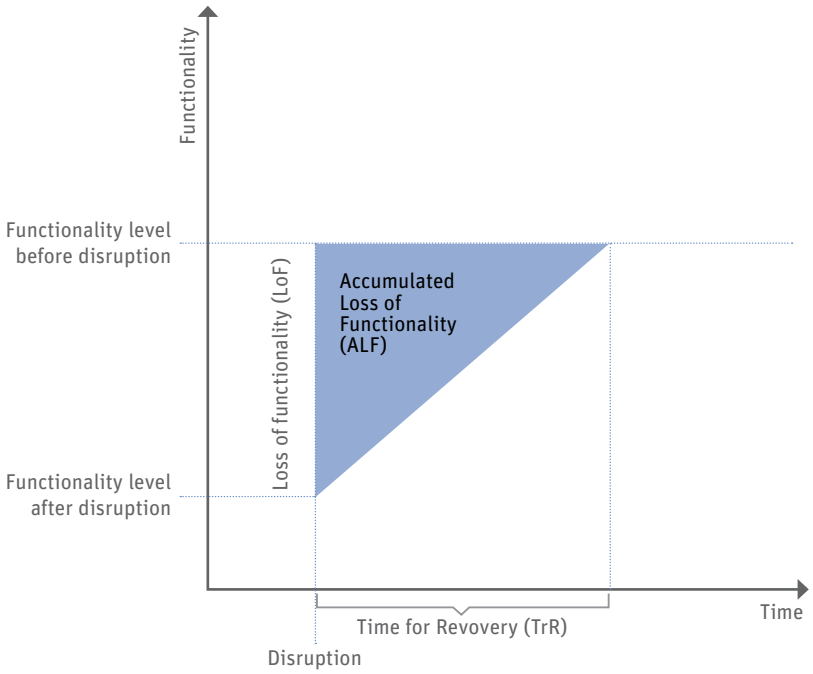
Recoverability refers to the ability of an asset to recover its functionality quickly. Recoverability is associated not only with physical factors, but also with social, organizational, resource-related, and managerial factors. *Time for Recovery* (TfR) is defined as the time that it takes an infrastructure asset that has been hit by a disaster to return to a near-total or pre-disaster level of performance.[30]

Taken together (Figure 4), the *Accumulated Loss of Functionality* (ALF) measures the total functionality loss suffered by the asset until it can be returned to the pre-disaster levels of service. This is represented by the shaded triangle in Figure 4.

6. Build Back Better (BBB)

According to UNISDR (2017), Build Back Better (BBB) is defined as the "*use of the recovery, rehabilitation and reconstruction phase after a disaster to increase resilience and integrate disaster risk reduction measures into the restoration of physical infrastructure and societal systems, including livelihoods, economies and the environment*". If implemented properly, BBB has the potential to increase the asset functionality of a reconstructed work to a level which exceeds the pre-disaster level. Additionally, by building back better, the recovery time in future disasters can be significantly reduced.

Figure 4: Asset Functionality and Post-disaster Recovery (for an infrastructure asset over time)



Source: Marcelo and others (2018).

[29] Marcelo and others (2018).
[30] Marcelo and others (2018).

Haiti - A debris management program has finally cleaned Haiti's street of tons of rubble left from the 2010 earthquake. The program has given needed jobs to those recycling the debris for future infrastructure projects. Photo: Romel Simon/World Bank

II. Rationale for Private Sector Participation in Disaster Recovery: Emergency Response and Long-term Recovery

In general, the private sector has been a supplier of goods and services for the government and aid agencies in the aftermath of a disaster. This has included construction companies deploying assets and staff during and after disasters; consumer goods companies providing in-kind materials (for example, hygiene products, soaps, water purification tablets, and so on); and even small firms and businesses distributing food, water, clothing and other goods to affected people.[31] Increasingly, the private sector is also being recognized as a driver of innovation and a strategic partner in disaster recovery. For instance, IKEA's solar-powered shelters, that have been deployed following disasters, last six times longer than typical emergency tents (Box 2).[32] [33]

The private sector has played a role as a strategic partner in telecommunications, insurance (including catastrophe bonds) and logistics where its resources and expertise have enabled more effective disaster recovery and mitigation than if only public sector resources were utilized (Boxes 3, 4 and 5).

Box 2: IKEA's Solar-powered Better Shelter

Developed by the not-for-profit Ikea Foundation with the United Nations High Commissioner for Refugees (UNHCR), IKEA's solar-powered Better Shelter lasts six times longer than a typical emergency tent. Not only is the 188 square foot emergency shelter easy to assemble, it can be built in just about four hours. It can sleep five people comfortably and is twice the size of a regulation refugee tent. The shelter also comes with solar-powered roofing. This eliminates the need for candles or kerosene lamps, which can pose a fire danger. In addition, the interiors are kept cool during hot weather because the roof deflects solar heat gain by 70 percent. These shelters were used in Nepal following the 2015 earthquake and in Senegal in 2018 following severe coastal erosion. Based on feedback, Ikea is working on a re-design to make the shelters fire-resistant.

Sources: Alfred (2017); Better Shelter (2019); Inhabitant (2003); Wainwright (2017).

[31] See Annex 1—Table 2.

[32] Inhabitat, '8 Innovative Emergency Shelters for When Disaster Strikes', inhabitat, 17 November 2013, https://inhabitat.com/8-innovative-emergency-shelter-designs-for-when-disaster-hits/.

[33] Oliver Wainwright, 'Why Ikea's Flatpack Refugee Shelter Won Design of the Year', *The Guardian*, 27 January 2017, sec. Art and design, https://www.theguardian.com/artanddesign/2017/jan/27/why-ikea-flatpack-refugee-shelter-won-design-of-the-year.

Box 3: Some Examples of Private Sector Involvement in the Emergency Response to Disasters

United Parcel Service (UPS), Walmart and FedEx helped in coordinating humanitarian logistics (through the delivery and supply of aid and relief materials) in the aftermath of the earthquake in Haiti in 2010 and following Hurricane Katrina in the United States in 2005. Similarly, IBM and Microsoft contributed to recovery efforts through the use of their information and communication technology (ICT) tools and data to manage and plan emergency operations during the earthquake and Tsunami in Japan in 2011. Following the earthquake in Haiti in 2010, Google worked with an aerial surveillance company, GeoEye, to make damage assessments and help target aid to the most impacted areas.

Source: See Table 2.

Box 4: Earthquake Insurance for Disaster Mitigation in Turkey

In the aftermath of the 1999 Marmara earthquake, the Turkish Catastrophe Insurance Pool (TCIP) commenced operations in 2000. The TCIP is a PPP insurance entity that provides catastrophe risk insurance for Turkish homeowners. The TCIP has no public employees, and all its business operations are managed by the private insurance industry. The government's role is restricted to providing contingent liquidity support in excess of the TCIP's claims-paying capacity.

The goals of the TCIP are to provide earthquake insurance coverage at affordable, but actuarially sound, rates; limit the government's financial exposure to natural disasters; build long-term reserves to finance future earthquake losses; and encourage risk reduction and disaster mitigation practices in residential construction. Since the TCIP began operations, insurance penetration for catastrophic coverage has increased by more than three times.

Source: Gurenko and others (2006).

Compared to governments and multilateral aid agencies, the private sector often possesses capabilities that enable it to move faster and more effectively in facilitating emergency responses to disasters.[34] The private sector can also reduce the likelihood of disruption caused by disasters by using innovative technologies, research and data to build back better. Leveraging on private sector strengths, governments can increase asset functionality to higher levels than would be possible by government participation alone.

Compared to governments and multilateral aid agencies, private sector participation (PSP) functions under a different set of accountability, motivation and incentive structures. These differences govern how it manages, designs, constructs, operates, maintains and delivers

[34] Luis Ballesteros, Michael Useem, and Tyler Wry, 'Masters of Disasters? An Empirical Analysis of How Societies Benefit from Corporate Disaster Aid', *Academy of Management Journal* 60, no. 5 (October 2017): 1682–1708, https://doi.org/10.5465/amj.2015.0765.

Box 5: Mexico Leverages Private Sector Financing for its Natural Disaster Contingency Fund

Innovative financing arrangements in Mexico have been initiated under its Natural Disaster Fund (FONDEN) to leverage private sector financing to manage risk. In 2006, Mexico became the first government to issue a parametric catastrophe bond when FONDEN launched a US$160 million catastrophe bond to transfer Mexico's earthquake risk to the international capital markets. Despite being costly, such financial schemes are able to disburse funds more rapidly than would be possible with public funds alone. Moreover, by predefining payment rules for post-disaster support, potential political and economic constraints can be avoided.

Sources: Cardenas and others (2007); Clark and others (2017); and Hallegatte and others (2017).

infrastructure and services. Under the right enabling conditions and a properly structured and procured contract, it can lead to a better provision of assets and services (that is, higher asset functionality) than if the same set of tasks was to be performed by the public sector. For instance, PPPs, a form of private participation, can deliver quality, reliable, and cost-efficient infrastructure in post-disaster situations (See Box 25 on Haiti Telecommunications). By harnessing private sector expertise and efficiency, as well as its ability to mobilize capital faster, PPPs can improve the speed, quality and affordability of services. They can also introduce innovations that respond better to the needs of the people.

The private sector can assist in the immediate aftermath of a disaster, enabling the community to recover faster through a shortening of the time for recovery — even from an infrastructure resilience perspective.[35] In addition, the private sector can reduce the accumulated loss of functionality (described in the previous section) by BBB. Indeed, by improving pre-disaster construction standards, the reconstructed infrastructure assets may be able to better resist and/or recover more quickly from a future natural disaster.

In summary, there are two main reasons for private sector participation in disaster recovery and mitigation. These are the 'immediacy' with which the private sector is able to undertake operations after a disaster (emergency response) and the resources at its disposal that enable it to successfully build greater resilience for the future ('long-term recovery') (see Table 1).

[35] As presented in Marcelo, House and Raina (2018).

Table 1: Comparative Advantage of Private Sector Participation in Disaster Recovery and Mitigation

Emergency Response	Long-Term Recovery
In the aftermath of a disaster, the private sector can mobilize resources faster than the public sector, especially at a time when government resources may already be stretched. For instance, the private sector can help transport and distribute goods and services more quickly than the government.	The private sector plays a key role in building back better, whether as a service contractor or by being instrumental in developing resilient systems through its expertise, financial resources and technological know-how.
The private sector can play a key role in providing skills and filling financing gaps in the short and medium term.	In the medium and long term, engagement with the local private sector can also contribute to the development of the capabilities of local contractors and construction workers.
The private sector can help in providing improved quality of services.	Certain types of private sector involvement can contribute toward generating commercial value from public-sector assets.
The private sector may possess greater competencies in the deployment of newer technologies and in the gathering of data to enable faster disaster recovery.	The private sector's competencies with ICT tools can aid in building disaster resilient systems for the future.
In the aftermath of a disaster, experts from the private sector can help undertake rapid assessments and provide guidance on how to do things better.	Private sector involvement in disaster recovery is also likely to nudge businesses to take measures to increase their own resilience, as well as decrease the risks they face. This is especially relevant for small and medium enterprises that are often the most vulnerable in disasters.
Government access to private sector resources, capabilities and logistic networks, when organized properly, can allow governments to concentrate on their own priorities and avoid inefficiencies and/or duplication.	Successful PPPs between the public and the private sector in disaster recovery can help contribute to greater cooperation and collaboration in the future in other spheres and sectors.

Sources: Abou-Bakr (2013); Bajracharya and Hastings (2015); Liu and others (2013); United Nations (2015); World Bank (2007).

From the private sector point of view, the rationale for involvement in disaster recovery may stem from a variety of reasons. A firm may feel a moral-, religious- or country-related obligation. It may be in the interest of the firm to accelerate recovery and restore its supply chain. It may also be to build brand reputation or to induce brand loyalty by providing services to clients during crises.[36] In addition, it may even be to boost staff morale, retention and job satisfaction.[37] The case for private sector participation is even stronger in countries where a significant proportion of the critical infrastructure is owned and operated by the private sector, such as in the United States. Indeed, in the US, it is estimated to be at 85 percent, thereby making it a critical stakeholder.[38] In certain sectors, such as insurance, the private sector may have a commercial interest in supporting investments

[36] Ami J Abou-bakr, *Managing Disasters Through Public-Private Partnerships (Public Management and Change Series)* (Georgetown University., 2013), http://liverpool.idm.oclc.org/login?url=https://www.jstor.org/stable/10.2307/j.ctt4cg8rg.

[37] Zyck and Kent, 'Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector – Final Report'.

[38] Abou-bakr, *Managing Disasters Through Public-Private Partnerships (Public Management and Change Series).*

Accra, Ghana on October 11, 2015. Photo © Dominic Chavez/World Bank

in building long-term resilience so as to reduce losses over time.[39]

Regardless of the motivation, the potential positive impacts resulting from private sector engagement are evident. Research using aid and source data on every major natural disaster from 2003 to 2013 has found corporate disaster aid to not only be more socially beneficial, but also more efficient and effective than aid from traditional providers.[40]

Certain types of private sector participation, such as through PPPs, can be harder to undertake in the aftermath of a disaster when time is of the essence (Figure 5). Also, small projects may not possess the required economies of scale to be structured as PPPs. Therefore, involving the private sector in a systematic and effective way requires pre-planning and strategic thinking to produce the highest social benefits.

[39] OECD, ed., *Financial Management of Flood Risk* (Paris: OECD Publishing, 2016), https://doi.org/10.1787/9789264257689-en.
[40] Ballesteros, Useem, and Wry, 'Masters of Disasters?'

III. Current Trends in Private Sector Participation for Disaster Recovery

As noted, private sector participation can take many forms. It depends on the formality of the commitment with the government, accountability for results, and responsibility for risk management. Of course, it also depends on investment, financing and payment mechanisms. Therefore, private sector participation, may be low or high in a given intervention (Figure 2).

Table 2 provides a mapping of private sector engagements in disaster recovery by the form of engagement, as well as by the goal, that is, whether it fulfills immediate response needs or works toward long-term recovery.[41] This mapping exercise reveals two key aspects, as follows:

1. The primary mode of private participation in disaster recovery is through short-term service, management or supply contracts and corporate social responsibility.

In the case of service/management contracts, the private sector is primarily engaged as a contractor for the construction, repair or management of services or infrastructure by the government, community, donor aid or other organization. Typically, service and management contracts are short-term arrangements with a duration less than 5 years.[42] The government retains ownership of and responsibility for service provision, but finances private providers to offer support services.[43] The private sector may also act as a supplier providing material for reconstruction purposes to the government or other organizations.

Service contracts are one of the most expeditious ways of involving the private sector and engaging their expertise in the recovery processes. This usually requires the government opening a competitive tendering process, through which it identifies the most appropriate private partner, working together to deliver infrastructure and/or services in a post-disaster situation. Such an engagement requires far less government capacity to implement as opposed to a PPP — although the responsibility for financing, and the risks associated with it, remain with the public party.

The other dominant mode of participation by the private sector in the post-disaster phase is through its response and recovery actions undertaken under the aegis of CSR. This could be in the form of not-for profit or philanthropic initiatives. This may involve donating funds, goods or services, either directly or indirectly through the government, local civil society organization or international aid agency. The key business sectors that engage directly are logistics, transport, consumer goods and services, water and sanitation, banking, agribusiness, and engineering and construction.[44]

Although pro-bono contributions by firms in the form of funds, aid materials and technical

[41] Further details on these examples are included in the Endnotes for Table 2.

[42] APMG International, *The APMG Public-Private Partnership (PPP) Certification Guide* (World Bank Publications, 2016), https://ppp-certification.com/sites/www.ppp-certification.com/files/documents/Chapter-1-PPP-Introduction-and-Overview.pdf.

[43] APMG International; World Bank and others, *Public-Private Partnerships Reference Guide.*

[44] Joanne Burke and Lilianne Fan, *Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector - Indonesia Case Study* (Humanitarian Policy Group, Overseas Development Institute, 2014), https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8826.pdf.

expertise to support post-disaster events have been taking place for a long time, it is in the last few years that these initiatives have really accelerated.[45] In 2000, for example, fewer than a third of the world's 3000 largest companies donated anything to disaster relief. However, by 2015 the share had surpassed 90 percent, with the average donation having increased ten-fold.[46] In fact, since the 2004 Indian Ocean tsunami, many alliances have been created between international NGOs and private firms.[47] However, such initiatives are often short-term, ad-hoc and independently based. Therefore, they often lack impact assessments, which inhibits lesson learning and best practice adoption over the long term.[48]

The sector is also characterized by limited integration of disaster-focused CSR activities in the core planning and organizational structures of the public and private sector.[49] For instance, the 2010-11 Queensland flood disaster in Australia served as a catalyst for relatively ad-hoc public-private engagement during the response and recovery period.[50] However, there were no state guidelines in place to offer specific guidance regarding the development of strategic or responsive public-private engagement arrangements in disaster recovery.[51] This suggests that there is room for private sector involvement in disaster recovery to be channeled into a more organized and effective form.

In addition to the two modes (service contracts and CSR), the private sector in disaster recovery has some limited involvement in the form of PPPs and independent business operations. Regarding the latter, business firms may provide necessary or desired services with or without a formal arrangement with government agencies.

2. CSR and service contracts are used for emergency disaster response, whereas PPPs tend to help build resilience in terms of disaster mitigation.

Regarding the post-disaster period, the timeliness of response critically affects the well-being of people. As such, it is often more efficient to use the private sector's existing skills and expertise to deploy immediate relief rather than responding through traditional public procurement. The private sector can respond quickly and effectively, mobilizing staff and resources. Indeed, the effectiveness of the emergency response is related to both the volume and speed with which it arrives — and the degree to which it can address areas of critical need.52 Moreover, disaster recovery is significantly affected by the restoration of critical infrastructure, such as transport and communications, as well as by the speedy delivery of essential items such as food, medicine and water.[53] [54] These are areas in

[45] Zyck and Kent, 'Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector – Final Report'.

[46] Luis Ballesteros, 'Markets as Clubs: A Study of the Role of Economic Reliance in Corporate Provision of Collective Goods', *The Wharton School Research Series* 1 (2015): 56.

[47] Zyck and Kent, 'Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector – Final Report'.

[48] Binder and Witte, *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications.*

[49] Binder and Witte.

[50] Bajracharya and Hastings, 'Public-Private Partnership in Emergency and Disaster Management: Examples from the Queensland Floods 2010-2011'.

[51] Bajracharya and Hastings.

[52] Susan L Cutter and others, 'Social Vulnerability to Climate Variability Hazards: A Review of the Literature', *Final Report to Oxfam America* 5 (2009): 1–44.

[53] Jamison M. Day and others, 'Humanitarian and Disaster Relief Supply Chains: A Matter of Life and Death', *Journal of Supply Chain Management* 48, no. 2 (April 2012): 21–36, https://doi.org/10.1111/j.1745-493X.2012.03267.x.

[54] Jamison M Day, Iris Junglas, and Leiser Silva, 'Information Flow Impediments in Disaster Relief Supply Chains', *Journal of the Association for Information Systems* 10, no. 8 (2009): 1.

which the private sector may already possess a comparative advantage.

Corporations that have an active economic presence in a disaster-affected nation are uniquely well-suited for quick deployment of resources.[55] Private sector participation tends to fulfill the emergency response motive predominantly when it takes the form of CSR initiatives, or when it is engaged as a contractor by other public-sector and disaster management organizations. Since the private sector does not have to deal with the typically slow contractual processes that governments have, it is often able to mobilize resources faster.

To further improve the effectiveness of the emergency response provided by the private sector, governments should conduct the recovery operations through a coordinated system or through short-term performance-based service contracts that appropriately identify and target the beneficiaries who are most in need of relief. Failing to do so contributes to the risk of coordination failures and can exacerbate accountability issues (see Boxes 6, 7 and 8). In the case of independent CSR programs, as they are operated under the discretion of the private firm, they often do not form part of a strategic response to a disaster. Although these activities would be beneficial, they would not necessarily be efficient and effective in terms of the overall impact of the disaster. Therefore, given that it is now recognized that there is a role for the private sector to play in disaster recovery,[56] [57] [58] [59] it is vital for the government to build its own capacity as a facilitator and coordinator. In doing so, the government can identify where the strengths of the different actors lie in disaster response and how to deploy them in a more judicious manner.

PPPs are a special case of private participation. They require detailed preparation, planning and complex negotiations. Thus, they may not be the most suitable for emergency response (see table 1) as they tend to correspond to long-term contracts. They must be for a project or set of projects of a significant amount to justify the time and financial costs involved in preparing them (Figure 5).[60]

This may explain why PPPs are more common in the post-disaster reconstruction phase, that is, at a point when the government can capitalize on the efficiency and innovation of the private sector to support disaster mitigation by building back better. In the absence of the urgency to respond to the immediate needs of the people, the government will be in a better position to assess whether a PPP is the best form of procurement and provides value for money. As such, it can dedicate the time required for preparing, deploying all the actors (deal teams, sponsors, multilateral development banks, financiers, and so on) and negotiating the terms and conditions of the contract.

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[55] Ballesteros, Useem, and Wry, 'Masters of Disasters?'

[56] Nathan E. Busch and Austen D. Givens, 'Achieving Resilience in Disaster Management: The Role of Public-Private Partnerships', Journal of Strategic Security 6, no. 2 (2013): 1–19.

[57] Burke and Fan, *Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector - Indonesia Case Study.*

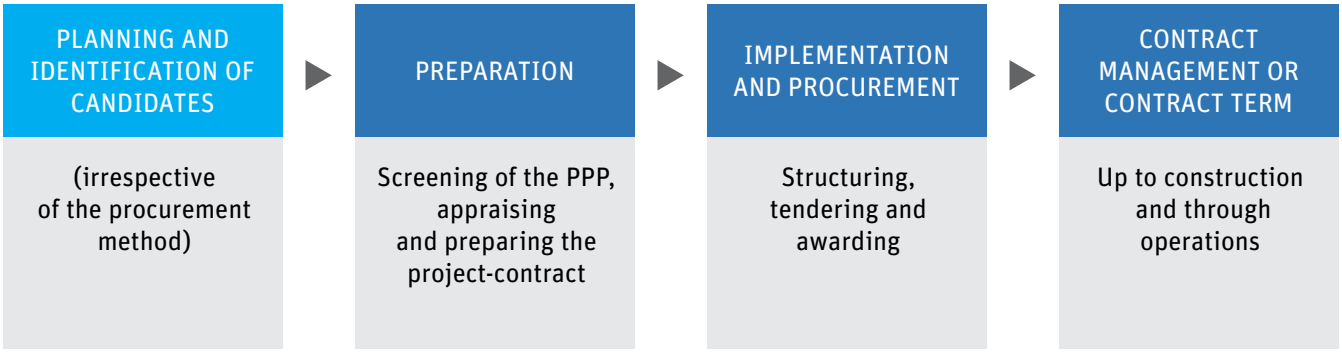
[58] UNISDR, *Private Sector Activities in Disaster Risk Reduction: Good Practices and Lessons Learned* (Bonn: UN, 2008), https://www.unisdr.org/files/7519_PPPgoodpractices.pdf.

[59] Anita Chandra, Shaela Moen, and Clarissa Sellers, *What Role Does the Private Sector Have in Supporting Disaster Recovery, and What Challenges Does It Face in Doing So?* (RAND Corporation, 2016), https://doi.org/10.7249/PE187.

[60] APMG International, 'Chapter 1: Public-Private Partnership - Introduction and Overview'.

Azerbaijan road network. Photo: Allison Kwesell/ World Bank

Figure 5: PPP Process: General Stages and Time Frames



Source: APMG International (2016)

Note: The PPP cycle can be complex and time consuming. It includes three main phases – preparation, implementation and procurement, and managing/ operations. In the United Kingdom, it can take between one to three years to reach contract signing before a project begins construction and operations.[61] In Russia it is estimated to take between nine months to 2.5 years.[62] One of the more extreme cases is that of the Poland A1 Toll Motorway Project where the first tender was made public in 1995, but the PPP contract for the development of the motorway was signed nine years later in 2004.[63]

[61] Nathan Associates, *Public-Private Partnerships: A Basic Introduction for Non-Specialists: Topic Guide.* (UK: EPS PEAKS, 2017), https://www.gov.uk/dfid-research-outputs/public-private-partnerships-a-basic-introduction-for-non-specialists-topic-guide.

[62] William Dachs, 'PPP Policy Framework for St. Petersburg: PPP Project Cycle' (22 May 2008), http://siteresources.worldbank.org/INTECAREGTOPTRANSPORT/Resources/Session2&3PolicyFramework,ProjectCycleInception.ppt.

[63] Marian W Moszoro, 'Public-Private Partnerships in Toll Motorways in Poland: A Comparison of Financing, Exploitation and Fiscal Risks', *Nowy Sacz Academic Review,* no. 3 (2007), http://jemi.edu.pl/uploadedFiles/file/all-issues/vol3/NSAR_Vol3_2007_Article3.pdf.

IV. Key Lessons and Guidelines for Public Sector Participation in Disaster Recovery and Mitigation

A. Key Challenges

1. Coordinating among Multiple Actors during a Crisis

In the event of a disaster, weak links and collaboration networks between technical experts, policymakers, governmental agencies and the private sector tend to completely break down. This frequently leads to a duplication of efforts and contributes to inefficiencies and delays in the post-disaster response and recovery operations (Boxes 6 and 7).

Even in the case of disaster mitigation activities, the involvement of the private sector may be subject to obtaining clearances and permissions from various government agencies and offices. Thus, a lack of intra-governmental coordination may lead to delays in private sector participation, whether as a contractor, independent operator or as a (public-private) partner.

Box 6: Widespread Coordination Challenges in Response to the 2004 Indian Ocean Tsunami in Indonesia

According to a report by the International Federation of the Red Cross and Red Crescent Societies (IFRC), a failure to coordinate between local, governmental, non-governmental, international and private agencies contributed to the lack of information sharing, duplication of work and wasted resources. While some communities were overwhelmed with the emergency response, others were completely neglected. Competing rivalries within the government gave mixed signals to the private sector and non-governmental and international organizations. This hampered disaster response and recovery operations. A United Nations (UN) Officer summarized it as follows: "Depending on how you look at it, you can say this has been the best-funded emergency in the world — or the most expensive humanitarian response in history".

Source: Lloyd Jones (2006).

Box 7: Procedural and Institutional Complexity of Private Sector Participation during the Jordan Refugee Crisis

An Overseas Development Institute (ODI) report notes some of the negative experiences faced by businesses in Jordan as they attempted to contribute to humanitarian work in the wake of the refugee crisis. One company representative spoke about being passed around several offices of the same organization after offering a relatively straightforward in-kind contribution. Another firm spoke of being approached by three different international agencies in a short period of time to establish the arrangements for strikingly similar, but unrelated, initiatives, which each agency was attempting to pursue. Another business spoke about the long delay in hearing back from an organization after having offered technical support on a project.

Source: Zyck and Armstrong (2014).

Box 8: Private Sector Views regarding Government Procedural Challenges during Post-disaster Work

Following the 1989 Loma Prieta earthquake in San Francisco, a manager of the firm that was contracted by the Santa Cruz County to provide repair and reconstruction services summed up the challenge to government as follows: "Governments should focus on and formalize the process they want to have in place when disaster strikes, rather than trying to reinvent or tweak or get around or ignore normal procedures when you're trying to move as quickly as possible to help your community." Indeed, in most parts of the world, the lack of a regulatory framework remains even after the disaster.

Source: National Research Council (1994).

2. Lack of Enabling Legal and Regulatory Frameworks Governing PSP in Disaster Recovery

One of the biggest challenges for private sector participation in disaster recovery and mitigation is the lack of a clear legal and regulatory framework.[64] Emergency management policies and guidelines in most countries provide no specific direction regarding the involvement of the private sector. Where guidelines do exist, the emphasis is on broad procurement-related protocols (for example, regarding emergency supplies) or general community building.[65] This leads to lower private sector participation in disaster recovery (Box 8), but it can also further exacerbate coordination failures.

3. Accountability and Institutional Challenges

One critical factor in the post-disaster phase concerns the rapid assessment and implementation of response and recovery activities to minimize the recovery time and the accumulated loss of functionality. Hence, post-disaster time pressures become especially high,[66] thereby limiting private sector involvement in ways that would entail more paperwork, for example, with PPPs (See Figure 5). As a result, private sector engagement in disaster recovery often takes the form of short-term initiatives. Such initiatives do not encourage impact assessment or investment in building trust among the involved parties.[67] This further hampers the future development of successful public–private partnerships.[68] [69]

The accountability issues that are endemic to any economic activity can be particularly salient in a post-disaster context when systems

[64] ADPC, ESCAP, and R3eady, *Resilient Business for Resilient Nations and Communities.*

[65] Bajracharya and Hastings, 'Public-Private Partnership in Emergency and Disaster Management: Examples from the Queensland Floods 2010-2011'.

[66] Thomas, *Climate Change and Natural Disasters.*

[67] *Burke and Fan, Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector - Indonesia Case Study.*

[68] National Research Council of the National Academies, *Building Community Disaster Resilience through Private-Public Collaboration* (National Academies Press, 2011).

[69] Justine Chen and others, 'Public-Private Partnerships for the Development of Disaster Resilient Communities: Public-Private Partnerships for Resilient Communities', *Journal of Contingencies and Crisis Management* 21, no. 3 (September 2013): 130–43, https://doi.org/10.1111/1468-5973.12021.

Box 9: Accountability Concerns regarding Private Contractors in Haiti

Following the 2010 earthquake in Haiti, numerous private contractors were engaged in various aspects of the recovery and humanitarian work. The top private contractor among these was Chemonics International, which received close to US$150 million in funding between 2010-2012. However, there was little evaluation of the private contractors operating in Haiti. A 2011 audit by USAID's Inspector General found inadequate results vis-a-vis Chemonics International's cash-for-work projects, as well as a lack of oversight. In addition, no financial review of their implementing partners had been conducted.

Sources: CEPR (2011); Ramachandran and Walz (2015)

and processes are in disarray.[70] The lack of private sector oversight in such a situation can make it difficult to track the funds flowing to contractors and sub-contractors.[71] For instance, a study on corruption and disasters in the United States found a positive correlation between corruption rates and the number of disaster events and related losses. The study also argued that large inflows of relief funding and lucrative post-disaster construction contracts bred opportunities for corruption.[72]

The lack of systematic research regarding the impact of PSP (whether on a commercial or non-commercial basis) on accountability and transparency in disaster recovery remains a challenge. There are no publicly-available reports on what the private sector is doing (especially in the case of short-term service contracts) and whether their efforts have been successful.[73] The difficulty of obtaining information from businesses with respect to financial flows under ordinary circumstances raises concerns about transparency and accountability under extenuating circumstances, such as when a disaster strikes (see Box 9).[74] The lack of proper information-sharing channels can also contribute to transparency concerns.[75] [76] Closely connected to this is the institutional challenge that is posed by weak governance and corruption.

Corrupt practices, especially in hazard prone areas, increases the vulnerability and exposure of people and assets.[77] One study estimated that 83 percent of all deaths from building collapses in earthquakes between 1980-2010 occurred in countries regarded as exceptionally corrupt.[78] This is because corruption often corrodes compliance to building codes, standards and regulations that would have helped reduce/mitigate disaster risk.[79] Therefore, strengthening the quality of governance is critical to improving accountability and making PSP in disaster recovery and mitigation more effective.

[70] Busch and Givens, 'Achieving Resilience in Disaster Management: The Role of Public-Private Partnerships'.
[71] Ramachandran and Walz, 'Haiti: Where Has All the Money Gone?'
[72] Peter T. Leeson and Russell S. Sobel, 'Weathering Corruption', *The Journal of Law and Economics* 51, no. 4 (November 2008): 667–81, https://doi.org/10.1086/590129.
[73] Ramachandran and Walz, 'Haiti: Where Has All the Money Gone?'
[74] Binder and Witte, *Business Engagement in Humanitarian Relief: Key Trends and Policy Implications.*
[75] National Research Council of the National Academies, *Building Community Disaster Resilience through Private-Public Collaboration.*
[76] Chen and others, 'Public-Private Partnerships for the Development of Disaster Resilient Communities'.
[77] James Lewis, 'Corruption: The Hidden Perpetrator of under-Development and Vulnerability to Natural Hazards and Disasters: The Pat Reid Lecture 2010', *Jàmbá: Journal of Disaster Risk Studies* 3, no. 2 (2011): 464–75.
[78] Nicholas Ambraseys and Roger Bilham, 'Corruption Kills', *Nature* 469 (12 January 2011): 153–55, https://doi.org/10.1038/469153a.
[79] UNISDR, *Making Development Sustainable.*

4. Limited Role of PPPs

As noted, PPPs are challenging to execute during an emergency response, especially if they have not been established during the pre-disaster period. This is primarily because establishing an appropriate PPP requires time for project preparation, as well as for complex negotiations among multiple parties. In addition, it can be challenging to build the economic case for a PPP in a context where people are already facing a loss of income and property and government resources are stretched thin. In such a scenario, neither a government-pay nor a user-pay PPP may be feasible.

However, there remains scope for using PPPs in the long-term recovery process, capitalizing on their expertise, innovative capacity and resource efficiency in building more resilient infrastructure. Once the immediate needs have been met, governments can then work on assessing what interventions are needed for recovery, in particular, where the private sector is best placed to deliver, and what type of financing mechanism is best suited to the task. Not all projects are amenable to PPPs. Therefore, careful selection and evaluation of value-for-money is required to determine whether the costs of a PPP procurement are worthwhile for the government.

B. Guidelines for Governments

The guidelines in this section have been categorized into three areas. However, these classifications are not mutually exclusive, and some of the recommendations could pertain to one or more categories.

Table 3: Summary of Guidelines for Governments

Guidelines	
1. Policy, Planning and Implementation	i. Establish processes and agreements prior to a disaster. ii. Formally include the private sector in government disaster preparedness planning. iii. Facilitate cooperation within the private sector and humanitarian/international aid agencies. iv. Identify business cases for private sector involvement in disaster recovery and mitigation. v. Create incentives for private sector participation in disaster recovery to BBB and increase resilience. vi. Build information systems to facilitate PSP engagement and multi-stakeholder coordination for the entire recovery process. vii. Document learning from disaster recovery experiences. viii. Ensure that reconstruction efforts involve building back better.
2. Institutional Recovery Arrangements	i. Provide an enabling legal and regulatory environment for the quick and efficient use of private sector resources and expertise. ii. Appropriately assign responsibilities between the central and local governmental authorities depending on the context. iii. Foster higher levels of trust with the private sector by establishing working relationships before a disaster.
3. Financing Recovery Options	i. Engage with international agencies to explore the use of credit enhancement instruments to encourage PSP. ii. Identify financial transaction options most suited for the context. iii. Structure PPPs to be mutually beneficial.

1. Policy Planning and Implementation

- *Establish processes and agreements prior to a disaster*

One of the most effective strategies for ensuring disaster recovery and mitigation remains investment in preparation— that is, having plans and tools in place to efficiently respond and start the recovery process as quickly as possible.[80] Rather than engaging in ad-hoc arrangements or signing contracts in a rush with the private sector when a disaster occurs, the government could establish processes and initiate contracts prior to a disaster. This would prevent bureaucratic delays and improve accountability when a disaster strikes. This could be done on a priority basis for different sectors and regions. The sectoral prioritization could be done after assessing the strengths and capabilities of the private sector by sector, identifying those sectors where the private sector possesses a distinct advantage as compared to the public sector, or where its presence can complement existing public sector activities. For certain activities it may help to identify and pre-qualify those contractors who can aid in debris removal or other recovery activities.

Using existing information regarding vulnerability and resilience, the most vulnerable and least resilient regions could be prioritized over others in establishing these pre-disaster contracts. Such contracts do not necessarily need to be in the domain of PPPs but can also include contracts signed between governmental bodies and with the private sector for financing or service agreements. For instance, Japan's high exposure to natural disasters, its experience in dealing with them, and its institutional capacity developed over time have led to the initiation

Box 10: Establishing Processes Before a Disaster Strikes

In Japan if a disaster affects a public works facility owned by a local government, the local government can obtain public support and subsidies from the central government to raise money for recovery costs. Japanese regulations clearly set out defrayment rates for various kinds of facilities/infrastructure, such as roads, harbors, schools, and medical facilities. These policies positively impact financial viability and bankability, thereby resulting in greater private participation.

Source: World Bank (2017).

Box 11: Case Study of Kokusai Kogyo in Japan

Kokusai Kogyo is one of several Japanese companies bound to the government by a contract entitled *saigai kyotei*, that is, a service agreement that is activated by the government in the event of a disaster. The company collects and sells geo-spatial information including aerial imagery of Japan's terrain. Following the March 2011 earthquake in Japan, Kokusai Kogyo surveyors undertook aerial imaging, which was then combined with property tax records, to determine the extent of damage to residential homes in the tsunami-affected areas. The company also helped issue disaster loss certificates in the wake of the disaster as the respective government offices had been washed away and were effectively dysfunctional.

Source: Salim (2012).

[80] Business Civic Leadership Centre, *The Role of Business in Disaster Response.*

of several such arrangements. Boxes 10, 11, 18 and 22 detail how Japan has successfully achieved this. Other countries may differ in their individual levels of vulnerability and institutional capacity. However, the Japanese case offers valuable insights on how disaster recovery and mitigation can be improved by having in place pre-disaster contracts.

- *Formally include the private sector in government disaster preparedness planning*

Local governments can involve the private sector, including both large and small companies, in the design of their disaster preparedness and response plans. This would provide the government with insights into private sector resources, capabilities, as well as the needs and requirements in the event of a disaster. It would also generate a sense of ownership among the private sector, contributing to building trust and paving the way for future collaboration in the most suitable form given the contextual factors. In addition, the government would be able to start discussing the impact of private initiatives, harnessing the lessons learned and engaging in better planning for disaster mitigation and recovery.

Often emergency plans set guidelines on a narrow range of processes, such as procurement of emergency supplies.[81] Involving the private sector can help determine how to formalize guidelines on private participation in such emergency and recovery plans (See Box 12). One way to do this may be putting together a panel of private companies involved in disaster response and use their advice on how to ensure the private sector interests are considered and other relevant aspects.

The private sector's expertise can also be harnessed upon by involving it in establishing standards related to disaster resilient construction (Box 13).

Box 12: Steps for Disaster Preparedness Planning with the Private Sector and other Stakeholders

1. Conduct a risk assessment to identify potential hazards and vulnerabilities.
2. Determine the impact of these potential hazards.
3. Create a plan for operating under duress.
4. Practice implementing the plan through a system involving testing and exercising.
5. Conduct a post-exercise debrief to ascertain what has been learned and how future responses can be improved.

Source: Demrovsky (2015).

Box 13: The Building Standards Committee in Fiji

Private firms in Fiji oversee the preparation of the National Building Code, which establishes the minimum standards to reduce disaster-related losses and set hurricane insurance premiums. Homes that are upgraded are inspected by an engineer and issued a certificate. This certificate is necessary for obtaining cyclone insurance and undertaking mortgages.

Source: World Economic Forum (2008).

- *Facilitate cooperation within the private sector and humanitarian/international aid agencies*

After a disaster, the capacity of smaller and local businesses to contribute to disaster recovery may not match the skillset and resources of bigger businesses and international organizations. By encouraging synergies

[81] Bajracharya and Hastings, 'Public-Private Partnership in Emergency and Disaster Management: Examples from the Queensland Floods 2010-2011'.

An instructor and trainees at the Savar EPZ training center in Dhaka. Photo: © Dominic Chavez/World Bank

between local and smaller businesses with larger businesses and organizations, the capacity of the local private sector can improve. This is especially true in the construction sector, where small construction companies may often not be aware of disaster resilient construction strategies. Building their capabilities would contribute to future resilience efforts when big corporations and international organizations have moved on after a disaster. Engaging in reconstruction activities that are focused on disaster resilience and BBB is also likely to nudge the smaller, medium and local enterprises to increase their own resilience to natural disasters. This could, in turn, have a positive, cascading effect on the local economy and global supply chains (Box 14).

The government can encourage bigger businesses and international organizations to collaborate with local and small businesses in the form of training in processes and activities, as well as through involvement in actual disaster recovery efforts. Large businesses can also actively identify small businesses in their supply chains and include them in their disaster recovery plans. (Box 15).[82]

[82] Demrovsky, *Public-Private Partnerships Are Essential to Attaining the next Level of Resilience in Japan and the Greater Global Community.*

Box 14: Small and Medium Enterprise Engagement in Bangkok, Thailand following the 2011 Floods

The United Nations Office for Disaster Risk Reduction (UNDRR) Global Assessment Reports documented the systemic impacts of the 2011 Bangkok floods on manufacturing supply chains in southeast and east Asia. Flooding in and around Bangkok disrupted manufacturing through a loss of electricity supply and flood damage. This blocked the supply chain, affecting countries such as Japan which relied on many essential components that were made in Bangkok. Most of the suppliers in Thailand that had been disrupted were small and medium enterprises that lacked resilience to natural disasters. Few of these enterprises had any kind of contingency plan, insurance coverage or alternative premises to relocate sensitive equipment, stocks or plants. Consequently, many enterprises that did not have access to recovery loans or capital never re-opened after the disaster.

Source: UNDRR (2019).

Box 15: Facilitating SME Involvement in Local Procurement and Participation in Haiti

In the aftermath of the 2010 earthquake in Haiti, Building Markets (formerly the Peace Dividend Trust), a Canadian organization, established the Peace Dividend Marketplace-Haiti project (PDM-H). The project sought to facilitate local procurement and promote access to procurement processes for a wider range of businesses. The specific goal of the project was to reduce barriers to local procurement and increase participation by local SMEs in recovery efforts. The project created a Tender Distribution Service, which collected and shared tenders with registered local businesses and provided training on business standards, procurement and contracting requirements. It is estimated that these services enabled local SMEs to win 1,332 contracts valued at US$28.7 million.

Source: Bailey (2014).

- *Identify the business case for private sector involvement in disaster recovery and mitigation*

The private sector is more likely to be involved in disaster recovery and mitigation if it can perceive and obtain tangible benefits from its involvement.[83] Therefore, building a business case for the engagement of private firms in the disaster recovery process is perhaps the most strategic way to build a sustainable partnership and leverage private sector strengths in a time of crisis (Box 16).

The government can achieve this on a selective basis by creating general dossiers on the kind of private sector participation it is interested in inviting and the forms this would take. These dossiers should highlight the advantages that would accrue to the private sector through their participation. The government could use the insights generated from involving the private sector in the planning process to craft such dossiers (See also the guideline: Include the private sector formally in government disaster preparedness planning).

[83] UNISDR, *Private Sector Activities in Disaster Risk Reduction: Good Practices and Lessons Learned.*

Box 16: The Case of Clean Team Toilets in Ghana: A Commercially Viable and Cost-effective Solution

The 'Clean Team' partnership, comprised of the private company Unilever and design firms IDEO and WSUP, developed a commercially viable and cost-effective household toilet system in Ghana. The service was developed on a commercial basis wherein households paid a fixed amount per month, which was less than what they would have paid for public lavatories. In return, users received a package of services that included twice-weekly emptying of the toilet, handling of the waste and eventual replacement of the toilets.

From a business point of view, the initiative proved to be financially sustainable, and potentially feasible for all but the poorest of households. It also helped Unilever to expand its presence in Africa. In addition, it provided technologies and a business model that could be replicated in refugee camps.

Sources: Carpenter and Day (2012); Zyck and Kent (2014).

- *Create economic incentives for PSP in disaster recovery, BBB and increasing resilience*

Another way to incentivize private sector participation is by offering monetary and other economic incentives (see Box 17). Examples of monetary incentives include subsidies, concessions, and loans and grants that can be allocated to the private sector.[84] When the private sector is involved as a service provider (whether as a service provider or partner), the rewards/penalties system can incentivize BBB and the development of cost-effective solutions to strengthen disaster resilience.[85]

- *Build information systems to facilitate PSP and multi-stakeholder coordination for the entire recovery process*

Good information systems can contribute to disaster response and immediate recovery. For example, the disaster information system that followed Hurricane Stan in Guatemala in 2005 contributed to deploying logistical support in the immediate post-disaster response operations. Similarly, utilizing the information system after the earthquake in Pakistan (2005) helped to provide information about basic needs in disaster areas, thereby improving the response coverage.[86]

Box 17: Payment-for-ecosystem-services (PES) to Promote Nature-based Solutions for Disaster Resilience in Brazil

Water users in Brazil pay a fee to the local water company, which is then used by local water-shed committees for water maintenance and reforestation. Such payment-for-ecosystem-services (PES) schemes can be implemented to incentivize the private sector to become involved in promoting nature-based solutions to strengthen resilience to disasters.

Source: Browder and others (2019).

[84] ADPC, ESCAP, and R3eady, *Resilient Business for Resilient Nations and Communities.*

[85] Martín Rodríguez Pardina and Julieta Schiro, *Taking Stock of Economic Regulation of Power Utilities in the Developing World: A Literature Review,* Policy Research Working Papers (The World Bank, 2018), https://doi.org/10.1596/1813-9450-8461.

[86] Samia Amin and Markus Goldstein, eds., *Data Against Disasters: Establishing Effective Systems for Relief, Recovery, and Reconstruction* (The World Bank, 2008), https://doi.org/10.1596/978-0-8213-7452-8.

Information systems are crucial for platforms listing services from private sector companies, including the disaster recovery operations and capabilities they possess (Box 18). These can help in the process to efficiently matching needs after a disaster. Information systems can also incorporate a help desk/matching service for private sector donations and goods following a disaster.[87]

Box 18: Post-disaster Activity Database in Japan

Under the system of *saigai kyotei* (a service agreement activated by the government in the event of a disaster), the government of Japan appointed the Association of Precise Survey and Applied Technology, a national business association of survey companies, to make a short list of companies that could conduct aerial post-disaster damage assessments in the immediate aftermath of a disaster. They developed detailed guidelines including information to prepare the association members on how to respond to a disaster. This included how single-page forms can be completed by hand during emergencies, and how information can be delivered between parties.[88]

Source: Salim (2012).

During the disaster recovery and mitigation stage, information systems could be utilized to facilitate the hiring, bidding, contracting and tendering processes. This would help to increase accountability and transparency, thereby building trust. Information systems could also be used for disseminating information customized to private sector-related to topics such as disaster risks, preparedness, and disaster risk management. In addition, such systems could operate in an interactive, concise, attractive and accessible manner (Box 19).[89]

Box 19: Open Data on Disaster Risks and Management in Japan

Japanese municipalities produce hazard maps for potential natural disasters, such as earthquakes, tsunamis, floods, volcanic eruptions, landslides and storm surges. Regional disaster risk management plans and hazard maps are freely available to the public as open data. Such information helps reduce uncertainty and risk factors for the private sector, particularly for insurance companies as they attempt to facilitate effective disaster risk assessment.

Source: World Bank (2017).

- *Document learning from disaster recovery experiences*

To learn from the PSP lessons in previous disasters, the government could create a resource center that pools together information regarding best practices, risk analysis and mapping of private sector initiatives in the country. In future, such a resource center could define a modality for accreditation and impact assessment of disaster recovery initiatives to identify gaps and strategies for further improvements.[90]

[87] Burke and Fan, *Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector - Indonesia Case Study.*

[88] Salim, 'Private Sector's Key Emergency Role in Japan'.

[89] Burke and Fan, *Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector - Indonesia Case Study.*

[90] UNICEF, ASSOCHAM, and All India Disaster Mitigation Institute, *Integration of Disaster Risk Reduction and Corporate Social Responsibility,* Policy Brief for Asian Regional Plan, 2016, https://www.preventionweb.net/files/51041_51033policybriefdrrandcsr.pdf.

As part of this endeavor, the government can encourage companies to consider including disaster-resiliency metrics in their CSR reporting or as part of their sustainability efforts. This would not only help pioneer best practices, but it could also contribute to standard setting and accountability.[91]

- *Ensure that reconstruction efforts involve building back better*

Research on the voting behavior of counties in the US shows that voters tend to reward disaster relief spending, but not disaster preparedness spending. This inconsistency can distort the government's incentives toward investing in disaster mitigation and preparedness even though spending on disaster preparedness can be more efficient than disaster relief.[92] In this context, investing in maintenance of existing infrastructure is also important as it helps boost resilience, reduces losses from natural disasters and bolsters recovery efforts. A World Bank report estimates that better road maintenance could reduce losses from floods and other natural disasters by as much as 18 percent in Tonga and 12 percent in Belize.[93] Further, inadequate infrastructure and weak logistic chains can also contribute to the risk that a hazard will turn into a disaster.[94]

Against this backdrop, it has been suggested that disasters have the ability to realign citizen priorities in favor of disaster preparedness and mitigation.[95] For example, in the aftermath of Hurricane Katrina in late 2006, 30 percent of New Orleans residents considered repair of the levees, pumps and floodwalls to be one of the top two priorities in reconstruction efforts.[96] By mid-2008, only 2 percent of New Orleans residents ranked hurricane protection and rebuilding of levees and floodwalls as among their top reconstruction concerns.[97] This implies that when a disaster is still in the minds of citizens and legislators, the implementation of disaster mitigation measures that would otherwise have been considered unpopular can be undertaken. For instance, it may be easier to enforce stricter building codes for reconstruction and disaster mitigation efforts (Box 20).

Box 20: Using Disasters as a Catalyst for Changes in Disaster Mitigation Efforts

Following the 2009 Victorian 'Black Saturday' bushfires in Australia, the Victorian Government introduced updated Building Standards AS3959-2009 for bushfire-prone areas to facilitate the rebuilding process. The Standards increased the construction requirements for residential buildings to ensure better fire protection. The new Australian Standard now applies to the whole State.

Source: Yan Chang and others (2010)

[91] World Economic Forum, *Building Resilience to Natural Disasters: A Framework for Private Sector Engagement.*
[92] Healy and Malhotra, 'Myopic Voters and Natural Disaster Policy'.
[93] World Bank, *Climate and Disaster Resilient Transport in Small Island Developing States: A Call for Action* (Washington, D.C: World Bank, 2017), https://openknowledge.worldbank.org/handle/10986/28798.
[94] UNU-EHS, 'World Risk Report 2016', Focus: Logistics and Infrastructure (Bündnis Entwicklung Hilft (Alliance Development Works) and United Nations University – Institute for Environment and Human Security (UNU-EHS), 2016), http://collections.unu.edu/eserv/UNU:5763/WorldRiskReport2016_small_meta.pdf.
[95] Healy and Malhotra, 'Myopic Voters and Natural Disaster Policy'.
[96] Kaiser Family Foundation, *Giving Voice to the People of New Orleans: The Kaiser Post-Katrina Baseline Survey* (Menlo Park, CA: Henry J. Kaiser Family Foundation., 2007), https://www.kff.org/medicaid/poll-finding/report-giving-voice-to-the-people-of/.
[97] Kaiser Family Foundation, *Report: New Orleans Three Years After the Storm: The Second Kaiser Post-Katrina Survey, 2008* (Menlo Park, CA: Henry J. Kaiser Family Foundation, 2008), https://www.kff.org/other/poll-finding/report-new-orleans-three-years-after-the/.

While ensuring that reconstruction efforts build back better, when possible, the government should also try to tap locally-procured goods and services. This would to stimulate the local economy. If the local private sector capacity is not sufficiently developed, then the government can encourage bigger private corporations and international organizations to collaborate with local companies, so that the latter can learn by doing (See the guideline: *Facilitate cooperation within the private sector and humanitarian/ international aid agencies*).

2. Institutional Recovery Arrangements

- *Provide an enabling legal and regulatory environment for the quick and efficient use of private sector resources and expertise*

Providing a legal and regulatory framework is essential to enabling private participation, including accounting for any disruptions that may ensue.

This would involve establishing a set of laws and regulations that would come into play in the event of a disaster, thereby enabling a quick response by the private sector. This measure would apply in the domain of operational, informational and financial regulations. For instance, regulations that allow essential personnel to return to work in the initial stages of recovery can enable the private sector to execute their recovery plans and restore business operations to serve the community. During Hurricane Irene in 2011 in the US, states either had no procedures or had different procedures and regulations regarding reopening businesses, which made it difficult for the private sector to plan and execute their recovery plans and resume business operations.[98] Similarly, information-sharing laws and regulations could allow businesses to share data with the government that would aid in the emergency response. Following disasters, companies such as Google and IBM have shared data with the public and the government for immediate response and long-term recovery efforts as part of their CSR or not-for-profit initiatives (see Table 2).

On a similar note, if regulations for reconstruction work (in the form of building codes and safety requirements) are clearly articulated and freely available, the quantity and quality of participation by the private sector (whether as a contractor or as an independent operator) may be boosted. For infrastructure projects, clear and accessible technical guidelines are imperative for building back better.[99] Such guidelines constitute the basic minimum standard to be met. The government should, however, encourage the private sector to perform above and beyond the minimum mandated standards (see Box 21).

In addition to technical guidelines, a regulatory framework can also factor in the risks posed by natural disasters, especially in vulnerable areas (Box 22).

[98] Business Civic Leadership Centre, *The Role of Business in Disaster Response.*
[99] FEMA, 'Unit 4: Emergency Management in the United States'.

Box 21: The SCIRT Collaborative-competitive Model for Reconstruction

The Stronger Christchurch Infrastructure Rebuild Team (SCIRT) Alliance Model was developed following the 2010-11 Christchurch earthquakes in New Zealand. The model includes both competition and collaboration to drive improved performance. SCIRT was based on an alliance between national and local governments and five private civil engineering contractors. The alliance was established to manage the US$2 billion reconstruction of Christchurch's badly damaged infrastructure, which included roads, water and other facilities. Strong drivers/incentives were created for competition and collaboration in the reconstruction work.

For each project, the difference between the target cost (budget) and actual cost was added to a common "gain share/ pain share" pot, a share of which was paid to (or paid by) the contractor at the end of the program according to the amount of work done. This encouraged collaboration among contractors as they all needed to perform well to ensure a "gain" rather than a "pain" result. All contractors began with an equal allocated amount of work, but over the course of the program each contractor's share of future work varied based on their performance. Those companies that performed better were allocated more work, thereby encouraging competition among them to perform better.

Source: SCIRT (2016).

Box 22: Government Factoring in Natural Disaster Risk

In Japan, the Kansai International Airport, operates on basis of the PPP concession model. The concession model sells management rights to a private entity, regardless of whether new construction work is planned. In the case of the Kansai International Airport project, the contract allows the concessionaire (the private party) to be exempt from contractual obligations to the extent and time period necessary, if obligations become difficult to perform due to force majeure circumstances. This is important given how prone Japan is to natural hazards, as well as the general vulnerability of its airports built offshore, such as the Kansai International Airport.

The Kansai international airport (left) under normal operations and the airport after its' runways were submerged under seawater after Typhoon Jebi triggered high waves and storm surges on September 4, 2018 (right).

Sources: Japan Times (2018); Mainichi (2018); World Bank (2017).

Box 23: Multi-government Approach following the Earthquake Wenchuan in Sichuan, China

After the 2008 earthquake in Sichuan, China, the national government took legislative action to establish a multi-governmental management framework for recovery. The national government, working jointly with the county and local municipal authorities, followed a common approach to reduce the resource constraints posed by a shortage of building material and labor. They achieved this by stimulating and promoting the use of resources nation-wide and locally. This took the form of providing legal support to various departments and government agencies. Overall the approach helped to tailor the response to reconstruction requirements, especially for the most vulnerable communities, in the short-term.

Source: Chang (2012).

Box 24: Prioritizing Road Networks in Mozambique

Given Mozambique's finite budget and the need to prioritize interventions that would maintain the reliability of the road network under extreme circumstances as well as reap the highest agricultural benefits, the government of Mozambique and the World Bank Africa Team helped create a tool to identify the districts where transport investments could yield the highest benefits in the central provinces of Zambezia and Nampula. The tool uses data related to current and future exposure to flood risk, and combines this with criteria for agriculture, fishery, poverty and network criticality.

Source: Espinet and Rozenberg (2018).

- *Appropriately assign responsibilities between the central and local governmental authorities given the specific context*

Following disasters, the balance between central and local governmental responses needs to be maintained. Although a centralized response can reduce coordination failures and duplication of efforts, it can also contribute to bottlenecks and delays. The latter is likely to happen if there is a lack of pre-event planning and preparedness, as well as a lack of flexible and proactive engagement with the private sector. Therefore, it is important to coordinate and direct private sector involvement in a way that the central government response complements action by local authorities (Box 23).

Although disasters cannot be perfectly predicted, geographical and climatic knowledge can help identify which regions are more vulnerable than others (Box 24).[100] This knowledge can, in turn, help incorporate preparedness by involving local agencies in the planning and needs assessments stage, including but not limited to identifying potential private sector partners and especially vulnerable communities and areas.

[100] FEMA, 'Unit 4: Emergency Management in the United States'.

- *Foster higher levels of trust with the private sector by establishing working relationships before a disaster*

Effective collaboration between the private and public sectors in the aftermath of a disaster requires establishing institutional trust beforehand.[101] It is essential that the private sector trusts government procedures and policies, and vice-versa. Studies have shown that low trust environments reduce the private investment rate.[102] This is also borne out through qualitative accounts, indicating that low trust can have a detrimental impact on long-term recovery and growth. Beyond being mutually beneficial, trust is an important element of long-term viability.[103]

One way to build trust is through collaborative efforts between the public and private sectors —well before a disaster. For example, the private sector could be involved in disaster preparedness planning (see the guideline from the previous sub-section: *Formally include the private sector formally in government disaster preparedness planning*). Collaborative planning between the government and private sector provides a strong foundation for working through the disaster management cycle, specifically by moving from the emergency response to long-term recovery following a disaster.[104]

3. Financing Recovery Options

- *Engage with international agencies to adopt credit enhancement instruments to encourage PSP*

There is lack of consistency in the financing of critical infrastructure.[105] However, Credit Enhancement Instruments (CEI) can be an option in cases where governments and the private sector are unwilling to fully bear disaster recovery risks or finance a disaster mitigation-related project. CEIs are financial instruments that transfer a certain type of project risk from the project to creditworthy third parties who are better placed to mitigate them. These third parties include development finance institutions, multilateral development banks (MDBs), infrastructure banks, commercial banks, insurance companies and export credit agencies, that is, institutions that have the capabilities to bear such project risks. Examples of CEI include political risk guarantees, credit risk guarantees, as well as construction and currency risk mitigation instruments. These CEIs not only help to secure revenue streams, but also help to build confidence in a project's bankability — especially in contexts with a limited existing legacy of PSP.[106] In the case of a disaster, these CEIs would need to be mobilized quickly. As such, it would be advisable to design them in advance to facilitate the process (See the guideline: *Establish processes and agreements prior to a disaster*).

MDBs can support improvements in the policy environment for private sector investments, as well as help governments structure investments that may be attractive to the private sector. They can also provide data so that private players can better understand the risk profile of potential investments. In addition, MDBs can provide technical assistance to establish contractual, procurement and implementation arrangements, thereby improving transparency and avoiding failure (Box 25).

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[101] ADPC, ESCAP, and R3eady, *Resilient Business for Resilient Nations and Communities.*

[102] Paul J. Zak and Stephen Knack, 'Trust and Growth', The Economic Journal 111, no. 470 (1 March 2001): 295–321, https://doi.org/10.1111/1468-0297.00609.

[103] Abou-bakr, *Managing Disasters Through Public-Private Partnerships (Public Management and Change Series).*

[104] PwC, *Rebuilding for Resilience: Fortifying Infrastructure to Withstand Disaster,* 2013, https://www.pwc.com/gx/en/psrc/publications/assets/pwc-rebuilding-for-resilience-fortifying-infrastructure-to-withstand-disaster.pdf.

[105] PwC.

[106] Oshani Perera, David Uzsoki, and Laurin Wuennenberg, Credit Enhancement for Sustainable Infrastructure (IISD, 2018), https://www.iisd.org/library/credit-enhancement-sustainable-infrastructure.

Box 25: Haiti Telecommunications

After the 2010 earthquake in Haiti, the IFC structured a PPP between Haitian fixed-line operator, Teleco, and the Vietnamese telecommunications company, Viettel. This resulted in Viettel investing nearly US$100 million in Teleco. The PPP is expected to catalyze future foreign direct investments, as well as new PPPs in other sectors such as power, transportation, and water.

IFC served as the advisor to the Central Bank of Haiti in structuring and implementing the international bidding process for the telecommunications PPP. It worked closely with Haiti's Council for the Modernization of State-Owned Enterprises, which acted as the project's implementation agency to ensure the highest standards of transparency and fairness. IFC also coordinated with the World Bank, which was conducting a reform project to improve the regulatory environment for telecommunications operators in the country.

Source: IFC (2010).

- *Identify financial transaction options most suited to the context*

During and after disasters, if a certain type of financial transaction option poses a binding constraint to recovery operations, then governments should be prepared to adopt alternative options. For instance, in Kenya after the 2011 drought, it was noted that the lack of cash rather than operational or technical issues with the private sector hampered recovery efforts that were spearheaded by aid organizations. This was overcome by using mobile banking platforms provided by telecommunications operators, such as M-PESA. Thus, they were able to undertake electronic cash transfers for disaster recovery.[107] Similarly, after the 2010 earthquake in Haiti, aid agencies worked with mobile network operators to provide cash transfers via mobile money to help the community recovery from the disaster.[108]

- *Structure PPPs to be mutually beneficial*

Although PPPs have many advantages in offering specialized expertise and risk-transfer mechanisms for disaster recovery and mitigation, they may not be suitable to all situations. Therefore, they need to be structured in a way that is mutually beneficial for both the public and private sectors.[109] There are two critical aspects to consider. First, the PPP must be properly prepared and well-structured to provide value for money to the government. Second, the PPP must be implemented in line with the country's specific context.

Part of this process may involve making a convincing and credible case to the private sector to engage in the first place (see the guideline from the previous sub-section: *Identify the business case for private sector involvement in disaster recovery and mitigation*). In this context, it may be necessary to work with a third party if key personnel on both sides are not accustomed to such contracts (see the guideline: *Engage with international agencies to explore the use of credit enhancement instruments to encourage PSP*). It may also be useful to begin with a specific project rather than to immediately attempt broad-based

[107] Drummond and Crawford, *Humanitarian Crises, Emergency Preparedness and Response: The Role of Business and the Private Sector - Kenya Case Study.*

[2] Bailey, Humanitarian Crises, *Emergency Preparedness and Response: The Role of Business and the Private Sector - a Strategy and Options Analysis of Haiti.*

[109] PwC, *Rebuilding for Resilience: Fortifying Infrastructure to Withstand Disaster.*

Box 26: Potential for Further PSP in Disaster Recovery and Mitigation

Apart from CSR, some sectors naturally lend themselves to greater private sector participation in disasters, such as the information, technology and data-driven sectors. As much of this technology is in the hands of the private sector, they remain best-placed to be engaged in providing such services. For instance, in 2009, Telstra was chosen as the private sector partner following a selective tender process to develop a national emergency alert system with US$15.6 million funding from the Australian Government, under the leadership of the Victorian Government (through the Office of Emergency Services). The national emergency alert system would be available to all states and territories, excluding Western Australia (as Western Australia has its own system). The use of Telstra technology in developing the system would allow emergency alerts to be broadcast via landlines and text messages.

Private sector participation could be encouraged in food systems for storage and distribution, especially for low-income and lower-middle income countries recovering from a disaster. There is also room for increasing private sector participation in pharmaceuticals and health, given the strong link between natural disasters and epidemics. Early-warning diagnostic systems and medical preparedness could be provided by these sectors.

Refugee camps present another opportunity for greater involvement by the private sector (See Box 16 on Ghana's Clean Team Toilets). According to the Danish International Development Assistance (DANIDA), in 2010 close to 5,000 businesses, ranging from small traders to large shops, were operating in the Dadaab camp in Kenya with a turnover of almost US$25 million annually.

Sources: APEC (2010); DANIDA (2010); Thomas (2017); World Economic Forum (2008).

cooperation across a range of sectors.[110] This would allow for sufficient time to identify and learn from the process and incorporate this learning into future projects (see the guideline from the previous sub-section: *Document learning from disaster recovery experiences*).

Private financing immediately after a disaster is unlikely to be cost effective, as the private risk perception would make the financing very expensive without some form of a guarantee. Therefore, it may be better to start with a short-term engagement, or at least a market testing after 3 or 5 years, to avoid locking in costs based on these high levels of perceived risk. This could be achieved by splitting the engineering, procurement and construction (EPC) functions from the operations and maintenance (O&M) component. This could include the option of keeping the EPC funded entirely through government budget or through aid, and then issuing a competitive bidding tender for the O&M contract to the private sector.

Finally, as noted in the Challenges section, not all projects are amenable to PPPs. Therefore, careful selection is required to evaluate the suitability of a PPP to a given situation as opposed to garnering private sector participation in other ways.

[110] Demrovsky, *Public-Private Partnerships Are Essential to Attaining the next Level of Resilience in Japan and the Greater Global Community.*

Annex 1

Table 2: Selected Examples and Forms of Existing Private Sector Participation in Disaster Recovery and Mitigation

Initiative Goal	Short-Term Service Contracts	PPPs	Private Business Operations	CSR / Non-profit Initiatives
Emergency Response	i. Following Hurricane Harvey in the US in 2017, AshBritt was engaged to collect and manage debris in 14 jurisdictions in Texas.[113] ii. Following the earthquake in Haiti in 2010, Chemonics was awarded a contract for activities like rubble removal.[114] [a]		i. Proteus On-Demand is a company that provides a range of emergency services, such as emergency kitchens, mobile facilities and camps.[115] [b]	i. After the 2010 Haiti earthquake, FedEx provided complimentary flights with medicines and aid materials.[116] [c] Digicel made communications data available to help track the displaced population.[117] [d] Google also created a 'person-finder' application to look for missing people.[118] [e] Google and aerial surveillance company, GeoEye, also collaborated to assess damage and steer aid to the worst affected areas.[119] [f] ii. In response to the 2011 drought in Kenya, Safaricom, Yu and Airtel, provided mobile banking platforms on a pro-bono basis for the emergency response.[120] [g] Kenya Commercial Bank and other audit companies offer pro-bono financial and auditing services.[121] Cargill donated 10,000 metric tons (~22 million pounds) of rice to support the World Food Program (WFP) (USA) efforts in Kenya.[122] [h] iii. Microsoft's Disaster Response Program provided technological support and services to restore citizen and partner operations. Based on needs, this can take the form of cloud computing, low bandwidth applications, scaling communications between the government and citizens, and so on.[123] [i] Microsoft provided US$15 million worth of software to humanitarian aid organizations operating in the Horn of Africa following the 2011 drought.[124] [j] iv. Shell provided monetary support to the Texas Forest Service to support the local fire department following the wildfires in 2011.[125] [k] v. Walmart and FedEx provided logistical support to affected areas following Hurricane Katrina in the US.[126] [l] vi. Following the 2010 Queensland flood disaster in Australia, large retailers provided logistical support.[127] [m] vii. Siemens donated potable water filtration units following Cyclone Nargis in Myanmar (2007), Cyclone Sidr in Bangladesh (2008) and the Sichuan earthquake in China (2008).[128] [n] viii. Google's public alerts on Google Maps provided emergency alerts. Their landing pages provided emergency numbers and resources for first responders in the event of a disaster.[129] [o] Following the March 2011 earthquake in Japan, Google provided real-time information mapping of the disaster.[130] [p] ix. IBM sponsored workshops for frontline health workers and air providers to provide psychological support following the flash floods in Pakistan in 2010.[131] [q] x. Following the 2015 earthquake in Nepal, IBM worked with the Nepalese government to improve and analyze missing persons data and track the distribution of aid material.[132] [r]

Initiative Goal	Short-Term Service Contracts	PPPs	Private Business Operations	CSR / Non-profit Initiatives
Emergency Response (cont.)				xi. Following the floods in India and Nepal after the breach of the river Kosi in 2008, BASF Stiftung extended support to provide water and sanitation services to affected communities.[133] [s] xii. Tokyo Gas created disaster management camps and conducted disaster drills for school children to teach them the relevant disaster-related knowledge and skills.[134] [t] xiii. Office Depot retail stores in the US provided online information about disaster preparedness resources and contributed to the sponsorship of the US Business Civic Leadership Center's national disaster help desk for businesses.[135] [u] xiv. UPS worked with the Red Cross to train its logisticians as first responders to disasters in key locations in the US. UPS is funding a pilot with the Red Cross to develop a commodity tracking technology to aid in a disaster response.[136] [v]
Long-Term Recovery	i. After the Christchurch earthquakes in 2011, New Zealand used a Stronger Christchurch Infrastructure Rebuild Team (SCIRT) joint competitive model for reconstruction.[137] [w] ii. Samoa's Government engaged two New Zealand-based consultancies to develop a national disaster management plan and strategy.[138] [x] iii. Local builders engaged in reconstruction efforts in Indonesia following the 2004 Indian Ocean Tsunami[139] [y] iv. Reconstruction of the Wolong Panda Base and Hubei after the Sichuan earthquake in 2008 involved local construction companies.[140] v. After Haiti's earthquake in 2010, John McAslan & Partners and local craftsmen were hired to reconstruct the iron market in Port-au-Prince.[141] [z]	i. Multiple PPPs in Japan were related to Sendai city's reconstruction activities.[142] [aa] ii. Earthquake insurance in Turkey took the form of a PPP.[ab] iii. Following the 2010 earthquake in Haiti, Viettel signed a PPP with the Central Bank of Haiti to modernize Teleco, the state-owned telecommunications enterprise.[143] [ac]	i. The Shiga Bank (Japan) provided disaster risk reduction-related services to their corporate clients.[144] ii. Mission Risques Naturels (MRN) is an association created by French insurance companies. MRN engaged in risk knowledge management and disaster prevention.[145] [ad] iii. Private flood insurance was offered by companies in the US.[146] [ae]	i. Private investors from the local community signed a contract with the City of New Orleans following Hurricane Katrina to rebuild long-term resilience and economic health.[147] [af] ii. Following the 2010 earthquake in Haiti, Google provided an ICT platform and cloud storage to the Haitian Ministry of Agriculture to safeguard official operations against future disasters.[148] [ag] iii. After the 2004 Indian Ocean Tsunami in Indonesia, the Bali Hotels Association along with the Indonesian Ministry of Tourism developed and disseminated a 'Tsunami Ready Toolkit' to help hotels prepare for future disasters.[149] [ah] iv. The Corporate Network for Disaster Response (CNDR) engaged in disaster risk reduction interventions (comprised of hazard assessment, information dissemination and contingency planning at the community level) in Dingalan, Aurora in the Philippines following mudslides and typhoons of 2004.[150] [ai] v. The Asahi Glass Company in Japan led information campaigns on global warming adaptation and disaster reduction countermeasures. They also donated disaster resistant glass to evacuation centers and schools.[151] [aj] vi. TATA steel organized disaster management training programs for their employees, contract workers and masons in the community in India.[152] [153] [ak] vii. Following the 2010 earthquake in Haiti, Digicel telecommunications funded the reconstruction of the iron market.[154] [al]

Initiative Goal	Short-Term Service Contracts	PPPs	Private Business Operations	CSR / Non-profit Initiatives
Both	i. The Brisbane City Council in Australia contracted the post-flood clean up to the private sector after being hit by floods in 2010 and 2011.[155] [am] i. Telstra is engaged by the Australian Government to develop a national emergency alert system.[156]	i. Following the 2011 Great East Japan Earthquake, the Astronomical Observatory Project in Sendai City, Japan took the form of a PPP.[157]	i. Private builders are engaged by citizens for housing reconstruction after the Victorian Bushfire in Australia (2009)[158] ii. Ceres Environmental is a construction company specialized in disaster recovery operations both for emergency response and long-term recovery.[159] [an] iii. PADCO (Planning and Development Collaborative International) is a development consulting firm specialized in humanitarian response, recovery and mitigation to disasters.[160] [ao] iv. Belfor is a disaster restoration company that provides disaster response, as well as disaster mitigative construction services.[161] v. In Cabanatuan, Philippines, SM Prime designed a disaster-resilient mall capable to withstand flooding. By allowing its basement to serve as a catchment, it helps to reduce flooding in the community. During typhoon Lando in 2015. the mall served as refuge to over 400 people.[162] [ap]	i. Following the 2013 floods in Jakarta, Indonesia, Telkomsel restored disrupted telecommunication networks, supported evacuations and provided food and non-food items. It also provided free telecommunications services for several weeks after the disaster.[163] [aq] ii. Following the Hurricanes Maria and Irma in the Atlantic in 2017, IBM undertook a damage assessment in public schools in Puerto Rico and provided consulting services to the Puerto Rico Department of Education to develop a resiliency strategy.[164] [ar] iii. Following Hurricane Harvey in the US in 2017, IBM provided response and recovery workshops for small businesses in Texas and offered cloud hosting to them. IBM helped develop a power grid resilience monitoring system and a blockchain prototype to improve disbursement of recovery funds.[165] [as] iv. After the 2011 earthquake in Japan, IBM provided data and computing services to Hiroshima University and other non-governmental organizations to aid them in their emergency response. IBM also provided expert advice and technical data to the cities of Sendai and Ishinomaki for their long-term recovery efforts.[166] [at] v. After Haiti's earthquake in 2010, Degenkolb's assisted with building inspections and collaborated with Build Change (NGO) to develop and implement a guideline and training program.[167] [au] vi. Following the 2010 earthquake in Haiti, Caterpillar donated more than US$800,000 to the Red Cross. It collaborated with the Pan American Development Foundation (PADF) on a drainage canal clean-up project and contributed US$1 million as part of a joint relief investment in recovery. Caterpillar provided equipment such as excavators, tractors, and so on. Also, their operational expertise and engineers helped to assist in the debris clear up.[168] [av] vii. After the Philippines' tropical storm Ketsana in 2009, BASF Stiftung helped in the construction of permanent shelters for affected families [169] [aw]

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Endnotes for Annex 1—Table 2

[a] Following the 2010 earthquake in Haiti many American private companies were awarded US government contracts to assist in recovery and humanitarian operations. Chemonics and DAI received a total of $125 million from USAID for activities like rubble removal and cash for work.

[b] Proteus is an emergency services company that provides operating camps and a range of other services that can aid emergency response. The services provided by Proteus include emergency mobile kitchens, shelters, as well as satellite and software packages.

[c] Following the 2010 earthquake in Haiti, FedEx provided 13 complimentary charter flights full of medicines and aid supplies, including one for the International Federation of Red Cross and Red Crescent Societies (IFRC) to the affected areas in Haiti. FedEx also worked with other organizations like Heart to Heart International (HHI) to help deliver medicine and equipment to the disaster hit areas of Haiti.

[d] Following the 2010 earthquake in Haiti, data from Digicel's mobile phone towers was made available to a non-profit initiative in order to track the displaced population. This helped identify where displaced people were congregating and improved coverage of the emergency response.

[e] Following the 2010 earthquake in Haiti, Google's crisis response team formally organized information about the disaster using geographic, satellite and aerial imagery. The Person Finder application to help individuals search for missing friends and family was also developed. This application is now an open-source project with an open application programming interface.

[f] Following the 2010 earthquake in Haiti, Google worked with GeoEye, an aerial surveillance company, to take aerial pictures of the affected areas. The photos were then used to assess the damage and direct aid to the most severely impacted areas.

[g] Following the 2011 drought in Kenya, donors and international organizations used private sector platforms for cash transfers. These included Safaricom (M-PESA), Orange (Orange Money), and other mobile network operators in Kenya (Yu and Airtel), who offered their platforms on a pro-bono basis.

[h] Following the 2011 drought in Sub-Saharan Africa, Cargill donated 10,000 metric tons (more than 22 million pounds) of rice to the World Food Program (WFP), USA to support their work in Kenya. Cargill sourced the rice and managed the ocean transportation and logistics to deliver and donate the grain in Mombasa.

[i] Microsoft's disaster response program involves engagement with technology and response partners, as well as government agencies, to deploy targeted technologies following a disaster. It helps coordinate the delivery of expert IT services to support consumers and partners restore business operations. Its targeted offerings include cloud computing; provision of data to enhance response planning and mobilization; low band-width applications; and technologies to strengthen governmental and community communications.

[j] Following the drought in the Horn of Africa in 2011, Microsoft worked with NetHope (a non-profit organization) to provide more than US$15 million worth of software to aid and other organizations on the ground. The software was used to improve coordination and disaster relief operations.

[k] After the wildfires in Texas in 2011, Shell donated US$160,000 to the Texas Forest Service to support local fire departments. At the same time, Shell also encouraged their wholesalers to provide support to emergency crews and local residents.

[l] After Hurricane Katrina in 2005, FedEx contributed to disaster recovery by helping the first responders in New Orleans establish a communications channel. Walmart was also among the first responders on the scene and helped provide critical supplies to evacuees.

[m] After the floods in 2010-11 in Queensland and Brisbane, Australia, large retailers provided and modified logistical support in the form of warehouse services and freight and distribution to ensure the supply of essential items in the disaster area.

[n] In the wake of natural disasters, Siemens, in collaboration with Sky Juice Foundation, has supplied multiple potable water filtration units called 'Sky Hydrants' to several disaster impacted areas, including but not limited to countries affected by the Indian Ocean Tsunami in 2004. Siemens also provided assistance to Myanmar (following cyclone Nargis in 2007), Bangladesh (following Cyclone Sidr in 2008) and China (following the Sichuan earthquake in 2008).

[o] Google has launched a Google Public Alert on Google Maps that provides emergency alerts as needed. Other Google tools such as their landing pages provide important information relevant to a disaster, such as emergency numbers, resources for first responders, and crisis maps.

[p] Following the 2011 earthquake and Tsunami in Japan, the Google office worked around the clock to provide real-time information about road-closings, power outages, as well as general disaster-related information.

[q] Following the 2010 flash floods in Pakistan, IBM sponsored intensive workshops for aid providers and frontline workers to provide psychological support for their own healing and recovery.

[r] Following the 2015 earthquake in Nepal, IBM collaborated with the Nepalese government to help track missing people and the distribution of relief material. IBM also helped to establish an integrated response and relief reporting process. IBM's CSR report notes that 13,000 Nepalese families were supported with emergency food, hygiene, healthcare and housing.

[s] Following the floods in India and Nepal in 2008, UN-Habitat received financial support from BASF Stiftung to extend support to provide sustainable and safe access to water and sanitation services to the affected communities in the two countries.

[t] Tokyo Gas Company has developed its physical and organizational infrastructure to prepare for earthquakes. In addition, it has worked with other governmental and

non-governmental agencies to conduct disaster camps and workshops for school children and families. As such, they will be better equipped with the necessary skills-set and knowledge in the event of a natural disaster.

[u] Office Depot retail stores in the United States reaches out to small businesses through the Foundation's continuing sponsorship of BCLC's National Disaster Help Desk for Business. Office Depot helps spread information about disaster preparedness, adapted particularly to the requirements of small businesses. It achieves this by hosting relevant information and resources on its website.

[v] UPS is working with the Red Cross to train its logisticians as first responders to disasters and place them in locations such as New Orleans, Texas and Florida, as part of a Logistics Action Team (LAT). UPS is also funding a pilot in collaboration with the Red Cross to help develop a commodity tracking (technological) system that can help in the logistics of warehousing, inventory management and prepositioning of supplies in advance of the hurricane season.

[w] See Box 21.

[x] Under a World Bank-funded initiative, the Government of Samoa commissioned New Zealand-based consultancies, namely BECA International Consultants (BECA) and Kestrel Group, to help in the development of a national level framework (legislation and national plan) for disaster management and institutional strengthening of the National Disaster Management Office. The framework also entailed engagement with private sector agencies in disaster risk management.

[y] In Indonesia, following the 2004 Indian Ocean Tsunami, the main builder for tsunami housing reconstruction was contracted out to local construction companies. However, masonry requirements without adequate technical training could not be fulfilled by the local construction contractors. As a result, many houses had to be demolished and rebuilt or retrofitted.

[z] Following the 2010 earthquake in Haiti, the restoration of Port-au-Prince's historic Iron Market was financed by the telecommunications company, Digicel. The services of the United Kingdom firm, John McAslan + Partners, were engaged for the reconstruction work, which also included local artisans. In addition to restoring historic details, as and when possible, the building was also engineered to meet current seismic requirements.

[aa] Sendai City PPPs were mostly projects of the build-operate-transfer (BOT) form. These transferred ownership of the assets to the private sector with an elaboration of the definition of the force majeure definition (to be agreed upon risk sharing). Other examples of PPPs in Japan include the Aichi toll road, the Sendai airport and the Minamisoma park.

[ab] See Box 4.

[ac] Following the earthquake in Haiti, the Central Bank of Haiti (Banque de la République d'Haïti or BRH) signed an agreement with Viettel, Vietnam's largest mobile telephone operator. The PPP is expected to modernize Teleco (the state-owned fixed telephony enterprise) to help modernize its infrastructure, increase the company's financial and technical capacities and provide new services to its customers. Viettel, one of three bidders, was awarded the international tender. Viettel will initially invest US$59 million, and over the next four years an additional US$40 million. IFC served as advisor to BRH, providing advice on structuring and implementing the bidding process, working closely with the implementing agency (Haiti's Council for the Modernization of State-Owned Enterprises) so as to ensure transparency and fairness.

[ad] Mission Risques Naturels (MRN) was created in 2000 by French insurance companies in the aftermath of losses caused by storms Lothar and Martin, as well as large floods during the preceding decade. MRN develops general interest services for the market as a whole and generates disaster management and prevention knowledge for insurance companies.

[ae] According to estimates, 20 groups and unaffiliated organizations in the US offered private flood insurance in 2016, and 30 offered it in 2017. In 2017, the total premium that was written in this regard was approximately US$623.5 million.

[af] In the aftermath of the 2005 Hurricane Katrina, New Orleans experienced a deep decline in employment and population. With a view to reviving the local economy, the New Orleans Business Alliance (NOLABA) was created as an agreement between the city of New Orleans and private investors from the local community. NOLABA functions as a non-profit with a focus on supporting the city's economic strategy through workforce development, equity, branding, international investment, and so on.

[ag] After the earthquake in 2010 in Haiti, the World Bank and the Ministry of Agriculture, Natural Resources and Rural Development (Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural, or MARNDR) redesigned the ICT system of MARNDR. The new system was based on Google's cloud technology, making use of Google Apps, which was provided by Google free of cost. The system allows agricultural knowledge to be protected, shared and used even in the event of a disaster. Therefore, the technology has helped to make the agricultural innovation and extension system more effective and resilient.

[ah] After the 2004 Indian Ocean Tsunami, the Indonesian Ministry of Culture and Tourism (BUDPAR) and the Bali Hotels Association (BHA) developed a 'Tsunami Ready Toolkit' to help hotels prepare for future disasters. The toolkit comprises of a collection of fact sheets and background information papers on subjects such as evacuation, information sources, department close-down procedures, best practice examples, warning signs, and so on.

[ai] The Corporate Network for Disaster Response (CNDR) is a network of business groups, associations, corporations and corporate foundations in the Philippines whose aim is to institutionalize disaster management efforts of the business community. Following mudslides and typhoons in 2004, CNDR in conjunction with CARE and the European Commission sought to build disaster resilience and preparedness. As such, it undertook a hazard assessment, contingency planning and information dissemination campaign in the Municipality of Dingalan, Aurora Province.

[aj] Following the earthquake in Niigata Prefecture, Japan in 2004, the 'Glass Power Campaign' was initiated by Asahi Glass Company. The campaign raised public awareness about the properties of laminated glass and its role in creating disaster resilience. The campaign also involved the donation of such glass by the company to preferred donation sites, as voted for by the public on their website.

[ak] Undertaken under the aegis of CSR, Tata Steel in collaboration with the National Disaster Management Authority of India has organized training in disaster management and response for its staff. They have also trained masons in the community and their own contractors in the construction of disaster-resilient structures.

[al] See endnote z.

[am] Following the 2010-11 floods in Brisbane and Queensland, Australia, the Brisbane City Council used social media to actively solicit contract plant and machine operators for the post-disaster clean-up.

[an] The services company, Ceres Environmental, offers debris removal, deconstruction, seismic stabilization, construction of levees and flood control systems, among other services.

[ao] PADCO is a development consulting firm and an operating company of AECOM, which is a consortium of major engineering and architectural companies. In addition to disaster recovery and mitigation, PADCO works on issues related to conflict resolution, urban services, sustainable development and governance. PADCO's specialization in disasters includes natural, man-made and complex disasters.

[ap] SM Prime (Shopping mall company) designed the SM Cabanatuan Mall to allow overflowing creek flood water into the mall's lower ground basement parking as a temporary flood catchment. This helped reduce the flooding for the community. During Typhoon Land in 2015, the Mall served as a safe refuge for over 400 stranded customers, who were provided with food, water and basic medical assistance.

[aq] Telkomsel's disaster preparedness unit called the Telkomsel Recovery Emergency Response Activity (TERRA) was formulated as a CSR initiative. Following the 2013 floods in Jakarta, Indonesia, TERRA restored disrupted telecommunications networks, provided food and non-food items to affected communities, supported evacuations, and provided free telecommunications services for several weeks in the aftermath of the disaster.

[ar] In the aftermath of Hurricane Maria and Irma in 2017, IBM undertook a damage assessment of IT and communications capabilities in Puerto Rico's 1,130 public schools for the Puerto Rico Department of Education (PRDE). IBM also partnered with the Bechtel Corporation to provide PRDE with resiliency consulting in order to mitigate the impact of future disasters.

[as] In partnership with the U.S. Chamber of Commerce Foundation, IBM organized recovery and resiliency planning workshops for small businesses impacted by Hurricane Harvey in Texas. This involved expert reviews of disaster plans developed by workshop attendees, as well as an offer of cloud hosting. Following a design thinking session, IBM developed a blockchain prototype illustrating innovative best practices for resource tracking. It demonstrated how recovery payments can be efficiently and securely tracked. In collaboration with Texas A&M University, IBM is also developing a power grid resilience monitoring system that would help demonstrate and assess the health of and threats to a utility in the event of a disaster.

[at] In the aftermath of the 2011 earthquake in Japan, IBM opened its computer servers and data centers to Hiroshima University to allow it to fortify its website to provide important information on radiation exposure. IBM used its data center to host the IBM smart cloud for social business software to facilitate better communications and coordination between non-governmental organizations. IBM also hosted the Sahana software on its cloud for the Yamagata and Iwate prefectures to help track refugees. It was supported by another application created by IBM that captures data on shelters. In Sendai and Ishinomaki cities, through the Smarter Cities Challenge grants, IBM provided access to top experts. It surveyed stakeholders and combined this with technical data to help build disaster resilience in these cities.

[au] Following the 2010 earthquake in Haiti, Degenkolb's team assisted with post-disaster building inspections and helped develop appropriate seismic standards. Degenkolb collaborated with a non-profit, Build Change, to act as peer reviewer. It also developed and implemented a comprehensive retrofit guideline and training program.

[av] Following the 2010 earthquake in Haiti, Caterpillar made donations to the Red Cross (over US$800,000) for its emergency response. It also contributed US$1 million to the joint relief investment fund for reconstruction. In addition, it provided equipment such as excavators, loaders, tractors, and specialty tool attachments to assist with the massive clean-up efforts. Caterpillar provided the expertise of their engineers and operators for training the Haitian people in the use of Caterpillar's equipment. Caterpillar also participated in a drainage clean-up project with the Pan American Development Foundation (PADF).

[aw] The BASF Stiftung, working in collaboration with UN-Habitat and the BDO Foundation of the Philippines, contributed to the construction of permanent shelters for 31 families affected by the Typhoon Ketsana that struck the Philippines in 2009.

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The Global Facility for Disaster Reduction and Recovery (GFDRR) is a global partnership that helps developing countries better understand and reduce their vulnerabilities to natural hazards and adapt to climate change. Working with over 400 local, national, regional, and international partners, GFDRR provides grant financing, technical assistance, training and knowledge sharing activities to mainstream disaster and climate risk management in policies and strategies. Managed by the World Bank, GFDRR is supported by 34 countries and 9 international organizations.

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