Recovery and Reconstruction Planning In the Aftermath of Typhoon Haiyan (Yolanda)

Summary of Knowledge Briefs

WORLD BANK GROUP

GFDRR
Global Facility for Disaster Reduction and Recovery

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Acronyms

ADB	Asian Development Bank
AGDI	Agency Geospatial Data Infrastructure
BAPPENAS	National Planning Agency (Indonesia)
BRR	Reconstruction Agency (Indonesia)
BSP	Bangko Sentral ng Pilipinas
CCT	Conditional cash transfer
CDD	Community-driven development
CSCAND	Collective Strengthening on Community Awareness on Natural Disasters
DBM	Department of Budget and Management
DEM	Digital elevation model
DepEd	Department of Education
DOH	Department of Health
DOST	Department of Science and Technology
DPWH	Department of Public Works and Highways
DSWD	Department of Social Welfare and Development
DRM	Disaster risk management
DRRM Act	Philippine Disaster Risk Reduction and Management Act
EAP	East Asia and Pacific
EDC	Electronic data capture
ERRA	Earthquake Reconstruction and Recovery Agency (Pakistan)
EU	European Union
FOREC	Fund for Reconstruction and Social Development of the Coffee Region (Colombia)
GDP	Gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic information systems
GoP	Government of the Philippines
HOT	Humanitarian OpenStreetMap Team
IT	Information technology
IFC	International Finance Corporation

JICA	Japan International Cooperation Agency
JTWC	Joint Typhoon Warning Center
LGU	Local government unit
MGB	Mines and Geosciences Bureau
MMDA	Metropolitan Manila Development Authority
MMEIRS	Metro Manila Earthquake Impact Reduction Study
NAMRIA	National Mapping and Resource Information Authority
NBCP	National Building Code of the Philippines
NDMA	National Disaster Management Authority (Pakistan)
NDRRMC	National Disaster Risk Reduction and Management Council
NEDA	National Economic and Development Authority
NGO	Nongovernmental organization
NOAH	Nationwide Operational Assessment of Hazards Project
NSCP	National Structural Code of the Philippines
OpenDRI	Open Data for Resilience Initiative
OSM	OpenStreetMap
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PDNA	Post-disaster needs assessment
PERRA	Provincial Earthquake Reconstruction and Rehabilitation Authority (Pakistan)
PHIVOLCS	Philippine Institute of Volcanology and Seismology
RAY	Reconstruction Assistance on Yolanda
SERRA	State Earthquake Reconstruction and Rehabilitation Authority (Pakistan)
UAV	Unmanned aerial vehicle
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

Acknowledgements

This report was prepared by the World Bank Disaster Risk Management East Asia and the Pacific Team, based on contributions of the World Bank Group staff and consultants involved with providing technical assistance to the government of the Philippines (GoP) in the aftermath of Typhoon Haiyan (local name Yolanda).

Technical assistance was provided under guidance of Abhas K. Jha and Ousmane Dione, and was led by Jolanta Kryspin-Watson. The extended team included Vincent M. Abrigo, Agnes Albert-Loth, Anissa Amador Tria, Christopher C. Ancheta, Leonora Aquino Gonzales, Joselito R. Armovit, Jorge Avalos, Abigail C. Baca, Geraldine Visitacion Bacani, Melba D. Baltasar, Leonardo Jr. Batugal Paat, Henrike Brecht, Caryn Bredenkamp, Anne Brockmeyer, Jaeeun Chung, John R. Crowley, Victor Dato, Vivien Deparday, Lynnette Dela Cruz Perez, Marianna Alfa Fernando-Pacua, Carolina V. Figueroa-Geron, Victoria Florian S. Lazaro, Chisako Fukuda, Claudia Gabarain, Maria Teresita Galauran Lacerna, Edkarl M. Galing, Mildred Gonsalvez, Rashmin Gunasekera, Xuemei Guo, Mary Kathryn Hollifield, Amelia Johnston, Kai-Alexander Kaiser, Chiyo Kanda, Matthew James Keir Stephens, Justine Espina Letargo, Paula Maria Leynes Felipe, David Llorico Llorito, Charles Lor, Maria Loreto Padua, Phyllis Danielle Malek, Wael Mansour, Stephanie Anne M. Margallo Paul A. Mariano, Eduardo Martinez-Miranda, Kristine May S. J. Ante, Gia Mendoza, Deepak K. Mishra, Nadine Mortola, Nataliya Mylenko, Ariel Mauricio Nunez Gomez, Reinaluz Ona, Christopher T. Pablo, Gerardo F. Parco, Ayaz Parvez, William Paterson, Priscilla Mary Phelps, Aleksandra Posarac, Maria Theresa G. Quinones, Hanif Anilmohamed Rahemtulla, Liana Zanarisoa Razafindrazay, Raja Rehan Arshad, Demilour Reyes Ignacio, Geralyn Ani Rigor, Roberto Antonio F. Rosadia, Aileen Theresa Ruiz, Hoon Sahib Soh, Hamzah Saif, Keiko Saito, Artessa Saldivar-Sali, Hans Shrader, Ferdinand Sia, Alanna Leigh Simpson, George Soraya, Zuzana Stanton-Geddes, Joop Stoutjesdijk, Maria Consuelo Sy, Karl Kendrick Tiu Chua, Marinela Cecilia Tolenti Pascua, Mari Anne DL. Trillana, Rogier J. E. Van Den Brink, Conrad Antonius Vasquez De Jesus, Rashiel Velarde, Noel Verdote, Catherine G. Vidar, Maya Gabriela Q. Villaluz, Felizardo K. Virtucio, Makiko Watanabe, Sayaka Yabuki, Diana Ya-Wai Chung, Yan F. Zhang, and Maribelle S. Zonaga. Technical editing of the report was done by Zuzana Stanton-Geddes.

During the provision of technical assistance, the World Bank team worked closely with the National Economic and Development Authority (NEDA) and the Department of Public Works and Highways (DPWH) and consulted with various other departments and agencies in the Philippines, including the Department of Budget and Management (DBM), the Department of Education (DepEd), the Department of Health (DOH), the Department of Science and Technology (DOST), the Mines and Geosciences Bureau (MGB), the Metropolitan Manila Development Authority (MMDA), the National Mapping and Resource Information Authority (NAMRIA), the National Disaster Risk Reduction and Management Council (NDRRMC), the Philippine Atmospheric, Geophysical and Astronomical

Services Administration (PAGASA), and the Philippine Institute of Volcanology and Seismology (PHIVOLCS), as well as local government units (LGUs).

The team would like to thank all the partners that have cooperated with the World Bank and the International Finance Corporation (IFC) team to provide technical support in the various sectors where each organization is actively engaged in the Philippines, including the Asian Development Bank (ADB), the United Nations Development Programme (UNDP) and other United Nations agencies, the European Union (EU), the United States Agency for International Development (USAID), the Japan International Cooperation Agency (JICA), and the Australian government, among others.

The field assessment of structural damage and impacts of Typhoon Haiyan and the magnitude 7.2 Bohol earthquake was conducted together with JICA and PHIVOLCS, whose recommendations were presented jointly to the DPWH. The field assessment was conducted with the financial support of the Global Facility for Disaster Reduction and Recovery (GFDRR).[1]

[1] See DPWH and World Bank (2014).

Together with the GFDRR's Open Data for Resilience Initiative (OpenDRI), the Bank collaborated with the OpenStreetMap (OSM) global network of volunteer mappers through the international nongovernmental organization (NGO) Humanitarian OpenStreetMap Team (HOT). The Bank–GFDRR team coordinated with the American Red Cross on the development of a data-sharing platform, www.yolandadata.org, with in-kind resources and technical expertise provided by the U.S. Army Corps of Engineers and the U.S. State Department. The GeoNode-based platform facilitated access to results of remote sensing damage assessment and other critical datasets. GFDRR also contributed to the recommendations on recovery and reconstruction institutions and on monitoring and oversight mechanisms.

Preface

Bringing the Best of the Bank: Supporting the Philippine Government with Knowledge in a Time of Crisis

On November 6, 2013, the World Bank team followed intently reports of the Joint Typhoon Warning Center (JTWC) in Pearl Harbor as it estimated that Typhoon Haiyan had attained Category 5–equivalent "super typhoon" status. The JTWC's unofficial 315 kilometer per hour (195 mile per hour) estimate of one-minute sustained winds would make Haiyan the most powerful storm ever recorded to strike land. Compounding fears was the magnitude 7.2 earthquake that struck the same region on October 15, 2013—just three weeks earlier—centered in the island of Bohol in Central Visayas. By November 9, Haiyan had exited the Philippines, leaving in its wake a path of destruction that affected 14 million people and displaced 4 million in the Visayas region. As of December 2013, 5,982 people were dead, 27,022 injured, and some 1,779 reported missing, making Haiyan the deadliest storm ever to have hit the Philippines. Over 1.1 million houses were damaged or completely destroyed (GoP 2013).

The Bank teams mobilized quickly to gather reconstruction and recovery specialists with experience of major disasters in Haiti, Indonesia, Pakistan, Sri Lanka, Turkey, and elsewhere. One lesson learned from years of supporting disaster recovery is that reconstruction begins on day one, and important decisions made by governments in the early hours have an impact on the success or failure of long-term reconstruction efforts.

On the evening of November 11, the World Bank team was in contact with the government of the Philippines and ready to support its early requests for technical assistance in developing a reconstruction and recovery plan. In the week immediately following the typhoon, in response to requests from the National Economic Development Authority (NEDA) and the Department of Public Works and Highways (DPWH), the team mobilized a group of ten specialists[2] to provide "just-in-time" advisory services to the government. These included not only members of the East Asia and Pacific (EAP) Disaster Risk Management team, but also staff from the Global Facility for Disaster Reduction and Recovery (GFDRR) and the Indonesia Country Office and specialists from California, Japan, and New Zealand.

By November 17, nine days after Haiyan made landfall, these specialists were on flights to join specialists from the Bank's Manila office sectors.[3] The team outlined critical decision points and actions and provided specific technical guidance in various sectors, based on lessons learned from other large-scale disasters. The mission worked almost nonstop for two weeks with NEDA to develop guiding principles for the government's Reconstruction Assistance on Yolanda (RAY) plan,

2 These specialists shared expertise in shelter and housing reconstruction and recovery, resilient reconstruction of roads, buildings, and other infrastructure, remote damage assessment, and disaster risk management.

3 Sectors include roads and bridges, irrigation, water supply and sanitation, housing and settlements, livelihoods, agriculture, private sector development, education, and health.

determining priorities for reconstruction and good practices for designing, costing, and financing recovery programs. The government developed RAY in an unprecedented five weeks after Haiyan made landfall, and the timely preparation could become a standard for future disaster events.

The team also discussed institutional arrangements, oversight, and monitoring systems for transparent, efficient, and effective reconstruction. Bank staff were embedded in the Department of Public Works and Highways (DPWH) Yolanda Command Center to share best practices in information management, remote damage assessment, resilient reconstruction of public buildings and infrastructure, housing and shelter, and roads and bridges, and reconstruction monitoring and evaluation.

To complement global experience with on-the-ground assessments, a small field team was deployed to Bantayan Island, which sustained the highest levels of damage in the entire Haiyan-affected area (over 90 percent of the damage in all three of its municipalities). The field assessment was conducted jointly with the Japan International Cooperation Agency (JICA) and the Philippine Institute of Volcanology and Seismology (PHIVOLCS). Remote sensing and geographic information systems (GIS) specialists on the Bank team contributed to the initial macroeconomic impact estimates by extracting sector exposure data from catastrophe risk modeling carried out as part of ongoing technical assistance to the Department of Finance.

In one of the country's worst times of crisis, the government of the Philippines turned to the World Bank as its trusted partner. It relied on the Bank to provide the best global knowledge and experience to solve a problem almost too massive and difficult to imagine. Since the RAY plan was shared with development partners on December 18, 2013, the Bank has continued to provide support to the Philippine government as early recovery efforts make the transition to reconstruction. New challenges have emerged, and the Bank team works hand in hand with counterparts across sectors to respond to them every day, along with partners including the Asian Development Bank (ADB), JICA, and many others.

Every disaster teaches us lessons. More than anything else, Haiyan has taught us that the human spirit—the Filipino spirit—is not easily broken. The residents of Bantayan Island, Tacloban, and other affected communities in the Visayas took the lead in clearing their streets of the wreckage from the worst disaster they have ever lived through. They took wood, bamboo, and anything else they could find to begin rebuilding their homes and rebuilding their lives. They welcomed us into their communities, and their smiles will stay with us for years to come. And we will stay with them, committed to supporting their efforts to recover, no matter how long it takes.

Motoo Konishi
Country Director, Philippines
East Asia and Pacific Region

Global Lessons for Rebuilding Communities after Haiyan

The World Bank Group and the international community have gained enormous experience with disasters worldwide, and lessons have emerged that may be useful for the Philippines as it tackles the challenges of recovery and reconstruction following Typhoon Haiyan.[4]

[4] This summary is based on an editorial by van Trotsenburg (2013).

First, a long-term commitment is needed. These communities have been devastated, and although the cameras and global attention are still focused here, soon they will drift away. We really have to commit ourselves to stand by the people for as long as it takes to rebuild their lives, their homes, and their communities.

Second, a comprehensive recovery and reconstruction plan is key to providing effective support. The government of the Philippines has been working hard to develop such a plan, incorporating global best practices. The World Bank is working closely with the GoP and other development partners in support of this process and implementation of the plan.

Third, the approach should be inclusive. Reconstruction is best done with very close involvement of local communities, civil society groups, and the private sector. The government will clearly take the lead in steering the reconstruction effort, but for investment and the creation of much-needed jobs and livelihoods, we will need the Philippine private sector as well as communities to be actively involved.

The fourth lesson is that effective coordination and monitoring are needed. An internal monitoring effort to prioritize and direct investments will be important not only at the central government level but at the local level. In this context, investment capabilities will need to be built up to manage the hundreds of millions of dollars of assistance. This will require not only coordination but also monitoring of the public and the private sectors so people can easily track the progress being made. Such a monitoring system would also enhance transparency and accountability, reassuring the affected communities that they will be the ultimate beneficiaries.

Fifth, new investments will be needed to help strengthen disaster risk reduction and preparedness. Given the increasing frequency of extreme weather events in the Philippines, new investments should provide more resilience to future mega disasters. As with all countries—more can be done. Experience shows that investments in mitigation can save lives. For example, Bangladesh has in the past decades improved its early warning systems and build new cyclone shelters—the benefits of which have been demonstrated in lower casualty rates.

The World Bank can be an active supporter of an inclusive approach. The institution has valuable experience with the Philippines in community-driven development, which holds promise that communities can guide or determine the main features of the recovery effort rather than be told what to do by outsiders who are not familiar with the realities they face. The Bank can also provide financial support consistent with the government's reconstruction plan.

Finally, the Bank has been, is, and will continue to be a long-term partner of the Philippines, and we will work together with the government, private sector, and communities to help rebuild the future of the affected Filipinos.

Axel van Trotsenburg
Regional Vice President
East Asia and Pacific Region

Super Typhoon Haiyan

8,000 casualties

Affected some **12.2 million** people (in **2.6 million families**)

US$12.9 billion estimated losses

1,192,091 houses were reported damaged

of which **593,785** incurred more than **50 percent** damage

...an additional **2.3 million people** now live **below the poverty line**

Photo: © Tigeryan | Thinkstock.com

Background

Super Typhoon Haiyan (local name Yolanda) is considered one of the strongest typhoons ever recorded, with Category 5–equivalent winds and five- to six-meter storm surges at landfall. The typhoon caused over 8,000 casualties, affected some 12.2 million people (in 2.6 million families), and brought damages and losses to the country estimated at PhP571.1 billion (US$12.9 billion).[5] A total of 1,192,091 houses were reported damaged, of which 593,785 were said to have incurred more than 50 percent damage (GoP 2013). The poor were disproportionately affected, and an additional 2.3 million people (nearly half a million households) now live below the poverty line, representing an increase in the poverty rate from 41.2 percent to approximately 55.7 percent in the areas worst affected (GoP 2013).

[5] Amounts are from the GoP (2013). BangkoSentral exchange rate of US$1 = PhP44.135, as of December 12, 2013.

Three weeks before Typhoon Haiyan, the Visayan Islands (Visayas) in the Central Philippines were struck by a magnitude 7.2 earthquake with its epicenter in Sagbayan, Bohol. The National Disaster Risk Reduction and Management Council (NDRRMC) reported 222 deaths, PhP2.26 billion in damaged infrastructure and public buildings, and 73,002 damaged or destroyed houses (DPWH and World Bank 2014). The earthquake also caused significant damage or collapse to many historic buildings and heritage sites.

Immediately after Typhoon Yolanda, the World Bank provided advisory services to the government of the Philippines (GoP) on principles and policies for reconstruction and specific technical guidance in various sectors based on international post-disaster experience (World Bank 2013). The Bank assisted the National Economic and Development Authority (NEDA) in the development of the Reconstruction Assistance on Yolanda (RAY) plan, which was prepared in an unprecedented five weeks after Yolanda made landfall. RAY is the government's strategic plan to guide the recovery and reconstruction of the economy, lives, and livelihoods of people and communities to a higher level of disaster resilience.

The World Bank also deployed a team of experts to survey the structural damage to housing and other buildings in the Visayas and to support the Philippine government's long-term recovery and reconstruction efforts. The team surveyed Bohol Island, northern Cebu Island, and Bantayan Island from November 30 to December 3, 2013 (DPWH and World Bank 2014a).

Along with the technical assistance, the World Bank provided the GoP with a recovery loan amounting to US$500 million, helping the government to address the human and economic impacts of Typhoon Haiyan through budget support and to bridge the financing gap caused by unbudgeted expenditures and revenue loss due to the disaster and disaster response. Additional support for resilient recovery has been provided through the Philippines National Community Driven Development Program (World Bank n.d.). Launched in June 2014, the program is the second phase of a successful community-driven development (CDD) program implemented by the Department of Social Welfare and Development (DSWD), which the Bank has supported since 2003. Following Yolanda, the program, expanded to a total of US$479 million, was redesigned to be one of the national government's mechanisms for post-disaster recovery and rehabilitation, covering 554 municipalities affected by the typhoon. Recovery assistance has also been provided through existing World Bank–supported projects in the urban, water, and transportation sectors.

Summary

This report summarizes the "just-in-time" advice provided by the World Bank to the government of the Philippines (GoP) immediately after Typhoon Haiyan. The Bank helped the National Economic and Development Authority (NEDA) develop the Reconstruction Assistance on Yolanda (RAY) plan, providing recommendations and sharing international good practice on key aspects of recovery and reconstruction, including institutional arrangements for recovery implementation, use of remote damage assessment, resilient recovery, and reconstruction of housing, buildings, roads, and other infrastructure.

The report is divided into six chapters:

1. Rapid Damage Assessments: Using Remote Sensing Technologies and Risk Information to Help Determine Preliminary Reconstruction Needs
2. Buildings and Infrastructure: Good Practices for Resilient Reconstruction
3. Housing: Lessons Learned from Large-Scale Housing Reconstruction Programs
4. Building Back Better: Restoring Key Sectors, Local Economy, and Livelihoods
5. Roads and Bridges: Enabling Operational Continuity of Lifelines for Evacuation and Post-Disaster Response
6. Institutional Structures: Good Practices and Options for Effective Planning and Implementation of Reconstruction and Recovery

International experience shared through the engagement includes lessons learned from community-driven reconstruction in Indonesia and Pakistan; shelter and housing recovery in Haiti; emergency reconstruction in Turkey; resilient infrastructure and hurricane contingency planning in Florida; resilient reconstruction of buildings in California, Haiti, Japan, and Turkey; remote damage assessment in Pakistan; and resilient road and highway management in East Asia and New Zealand.

The collection of recommendations and global lessons learned was presented to NEDA and the Department of Public Works and Highways (DPWH). The recommendations highlight the importance of taking into account multiple hazards in the Philippines (that is, earthquakes, volcanic eruptions, and landslides, in addition to typhoons) in the recovery and reconstruction process, to bring communities, buildings, and infrastructure to higher multihazard resilience standards. Some of the key messages include the following.

Reconstruction policy and plans should explicitly mandate standards for safe and resilient buildings and infrastructure and for risk-informed land use planning. Recovery and reconstruction plans should take into consideration the need to build resilience to the wide range of natural hazards—geological as well as weather related—to which the Philippines is exposed. Information about hazards and risk should be openly shared, in combination with training and capacity building to enable its proper use in risk reduction measures.

Construction quality control, enforcement, and training are essential for rebuilding infrastructure that is resilient. A priority should be to develop and oversee during reconstruction mechanisms to ensure construction quality and enforcement of the National Structural Code of the Philippines (NSCP) from 2010. Experience from Turkey (after the 1999 Marmara earthquake) and other countries has shown that, on average, an effective inspection program adds just 1 to 2 percent to overall project costs.

The best housing recovery approach is to identify the desired outcome and give households a choice of means and support to speed up normal housing processes. Experience from large-scale disasters around the world, including the 2004 Aceh tsunami and the 2005 Pakistan earthquake, has shown that the in situ household self-recovery and community-driven reconstruction model is highly effective and can cost some 40 percent less than contractor-built housing. This model is also faster to implement, has a significant economic multiplier effect, and leads to changes in behavior and attitudes and increased resilience, as long as proper training and oversight are provided. Even for low-income families, most housing is acquired through the market in normal times, and the goal of recovery should be to get that market working again. Community-based housing reconstruction can expedite the whole recovery process.

For schools, hospitals, emergency evacuation shelters, and municipal buildings, reconstruction and repair are opportunities to implement cost-effective resilience measures and a strong quality control and enforcement mechanism. Particular attention should be paid to developing strategies for operational continuity of critical infrastructure during disasters. Roads and bridges serve as lifelines for evacuation and access for post-disaster response, and designs should be sufficiently resilient to ensure key routes remain operational and secondary routes can be quickly restored. Roads and bridges should be assigned strategic classifications based on how critical they are for access.

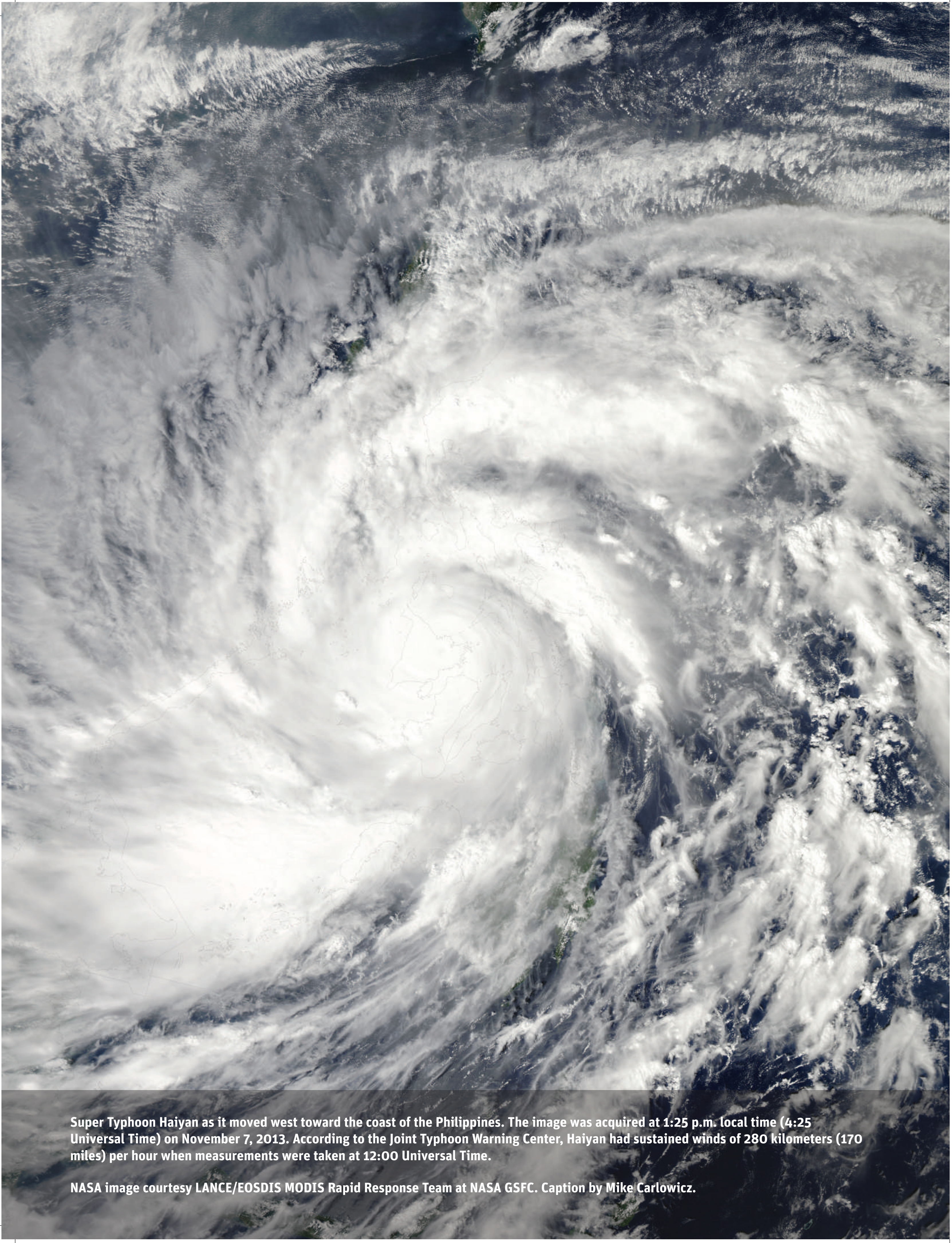
As part of the advisory services, the World Bank, together with representatives from the Humanitarian OpenStreetMap Team (HOT) and the Philippines-based OpenStreetMap (OSM) team, supported collaboration across GoP agencies on the use of remote sensing and open data during and beyond disaster emergencies. This involved the Department of Budget and Management (DBM), the Nationwide Operational Assessment of Hazards Project (NOAH), led by the Department of Science and Technology (DOST), the Department of Education (DepEd), and the Department of Public Works and Highways (DPWH), as well as nongovernmental actors in the housing sector.

The coordinated effort focused on developing www.yolandadata.org, a data-sharing website with more than sixty data layers shared by at least eight different organizations, both international and Philippines-based. Created to assist the Philippines with reconstruction efforts, the GeoNode-based platform facilitated access to results from remote sensing damage assessment and other critical datasets. The assistance in part involved communicating the availability of remote sensing data products to agencies in need, including, for example, post-disaster satellite imagery released by Digital Globe and building-level damage assessments conducted by HOT, the American Red Cross, and other partners. Such innovative approaches can contribute to standard damage and needs assessments.

World Bank technical assistance contributed directly to the development of the Reconstruction Assistance on Yolanda (RAY) plan. The plan was developed by the GoP and presented to the public five weeks after Typhoon Haiyan made landfall—an unprecedented compression of the time after a disaster of this scale. The team's technical support is reflected in the document's core principles to "build back better" and safer and in close partnership with the affected communities:

> Reconstruction Assistance on Yolanda (RAY) is the Government's strategic plan to…restore the economic and social conditions of these areas at the very least to their pre-typhoon levels and to a higher level of disaster resilience. RAY will be implemented according to a set of core principles based on lessons from previous disasters in the Philippines and other countries. The magnitude of the disaster and the large scope of recovery and reconstruction call for institutional arrangements that combine strong central coordination and oversight with flexible implementation at the local level…to ensure that the response is tailored to local conditions and promotes community participation, ownership, and sustainability.
>
> Government systems will be used for implementation, and will identify ways to manage governance risks and ensure transparency and accountability; and develop a robust monitoring and evaluation system to track and assess performance.
>
> The wide geographical scale and large number of affected households warrants implementation approaches that emphasize self-recovery and community participation… that correspond to varied needs and choices of affected populations. (GoP 2013)

While full recovery from a disaster of this scale will take years to conclude, the importance of the planning that guides the implementation cannot be overstated. The "just-in-time" advisory and knowledge briefs documented in this report provided important contributions to the GoP's process of post-Haiyan recovery and reconstruction planning. The collection of international best practices represents a multisectoral approach, both to addressing urgent short-term needs and taking medium- and long-term actions to increase the disaster and climate resilience of the country and its communities.



Super Typhoon Haiyan as it moved west toward the coast of the Philippines. The image was acquired at 1:25 p.m. local time (4:25 Universal Time) on November 7, 2013. According to the Joint Typhoon Warning Center, Haiyan had sustained winds of 280 kilometers (170 miles) per hour when measurements were taken at 12:00 Universal Time.

NASA image courtesy LANCE/EOSDIS MODIS Rapid Response Team at NASA GSFC. Caption by Mike Carlowicz.

Chapter 1

Rapid Damage Assessments: Using Remote Sensing Technologies and Risk Information to Support Identification of Preliminary Reconstruction Needs

This chapter gives an overview of the benefits of using remote sensing to support planning for recovery and reconstruction, focusing on selected aspects that include baseline data, accessing of remote sensing imagery, validation, damage reporting, and geotagging, and the use of multihazard maps. The chapter also shares insights on using open data and participatory mapping to support early recovery and reconstruction efforts.[1]

How Remote Assessment Can Benefit Recovery and Reconstruction Efforts

Remote damage assessment using innovative technologies can overcome some of the challenges associated with field-based assessments of large-scale disaster impacts across a wide area. Remote damage assessments rely on satellite or aerial images, crowdsourced mapping, and baseline data sources to estimate disaster impacts rapidly. This type of assessment is not intended to replace post-disaster needs assessments (PDNAs) that rely on field observations and discussions with stakeholders in the affected areas. Instead, the data produced provide quick estimates of damage to key sectors which can be used in the early stages of disaster recovery and later as an independent source of validation for any estimates that come out of field-based assessments. In parallel to conducting damage assessments, expanding the available multihazard risk information is critical to ensuring resilient reconstruction is possible. In sum, remote damage assessments in large-scale disasters offer the following benefits:

- **Estimating disaster impacts without interfering with humanitarian response efforts.** The outputs of remote assessments should focus on making initial estimates of damages to determine the needs for reconstruction and recovery and inform early resource mobilization efforts.

- **Complementing and extending data collected during the humanitarian relief phase.** Such data collection includes the rapidly expanding crowdsourced baseline information being created by, for instance, the OpenStreetMap community.

- **Helping to estimate the degree of damage in affected areas.** Results of remote assessments can be used to differentiate among municipalities or areas that have experienced different degrees of damage. An example would be a percentage-based assessment of impact—for instance, classifying buildings or areas as having high damage (75–100 percent) or low damage (0–10 percent). This information can be combined with the existing baseline data to refine iteratively the assessment of damage and gain an understanding of the spatial distribution of the damage.

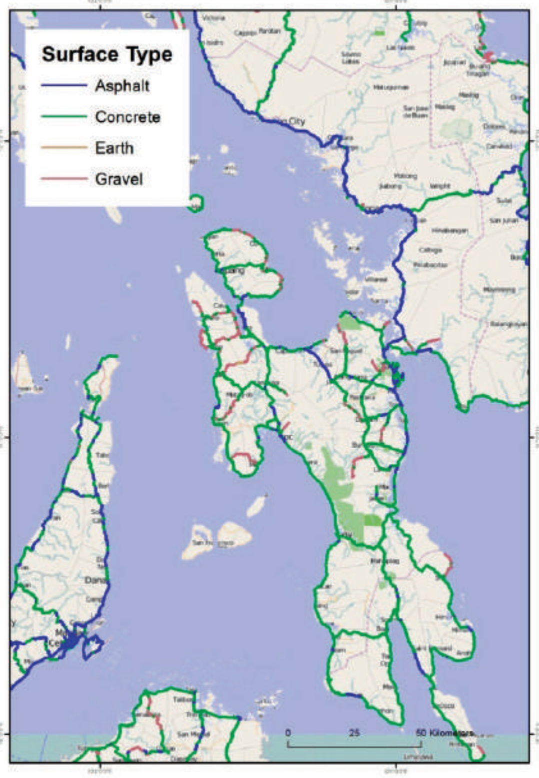
New technologies should be used with caution, however. While many new technologies enable remote damage assessment, the government needs to consider whether they are truly appropriate for the identified objective and if corresponding capacity exists for managing the large amount of data and processing them into meaningful information for decision making.

Baseline Data Collection

After a disaster, it is useful for government agencies to have access to post-event imagery for early validation of damage reports from the field and preliminary assessment of damage in more remote areas. This process is easier if relevant sectoral agencies already maintain a geographic information systems (GIS) database of their own physical assets for regular operations and asset management. In many countries, however, geospatial baseline data are very limited. After Haiyan, baseline datasets from national government agencies in the Philippines—containing information on the location of infrastructure such as schools, hospitals, roads, and bridges—were made available for the impact assessment. For example, DPWH maintains a GIS database on the primary national road network (see Figure 1.1). After Haiyan, these geospatial datasets were used to estimate the impact from the disaster on roads, although the lack of data on local road networks limited the assessment. Similarly, baseline data were needed for both major and local ports in the affected area to develop a full view of the condition of the transportation network.

Figure 1.1 National Road Network Maintained by the Department of Public Works and Highways, Overlaid on OpenStreetMap

Sources: DPWH and OpenStreetMap.



Output baseline data have many uses within government workflow in addition to their application in post-disaster situations, when they are urgently needed to allocate resources effectively for response and assessment of recovery needs. As collection of these data is a time-consuming activity, it is recommended that these spatial baseline datasets be prepared during nonemergency times.

When addressing their needs for local information, a number of countries have benefited from baseline data collected and shared by crowdsourcing initiatives, including OpenStreetMap (OSM), a global network of volunteers that is creating a "map" of the world. Data extracted and shared by the OSM community by tracing satellite and aerial images are freely available and can be exported by users in various formats and for different purposes.

In the Philippines, the Humanitarian OpenStreetMap Team (HOT) activated over 1,500 volunteers after Typhoon Haiyan to create geographical data that could be freely used by the Philippine government, donors, and partner organizations to support all phases of disaster recovery. Working square by square to add information to the map of the typhoon-affected areas, this online community made over 3 million edits, digitizing tens of thousands of individual buildings and identifying land use, roads, and structures damaged by the storm. Figure 1.2 shows the maps for Tacloban City before and after the volunteers' activities. Philippines-based OSM mappers made significant contributions as well, through, for example, multiple "mapathon" events; one was hosted by the University of the Philippines Diliman Geodetic Engineering Department in Manila on November 15, 2013. Figure 1.3 shows the results of the building-level damage assessment by the HOT volunteers for Tacloban, overlaid on the OpenStreetMap basemap.

In recent years, the World Bank/Global Facility for Disaster Reduction and Recovery (GFDRR) has supported such participatory mapping in Bangladesh, Colombia, Haiti, Indonesia, Nepal, the Philippines, and Sri Lanka through the Open Data for Resilience Initiative (OpenDRI). In the case of Haiti, for example, hundreds of volunteers worked together to produce the most accurate and up-to-date basemap of Port-au-Prince and surrounding areas ever created. This map played a critical role in response and reconstruction efforts. Currently, OSM is being used as part of OpenDRI projects in a number of countries to facilitate community-based mapping, create information on critical assets and infrastructure, and ensure that as broad as possible a section of society is involved in the process of risk identification activities.

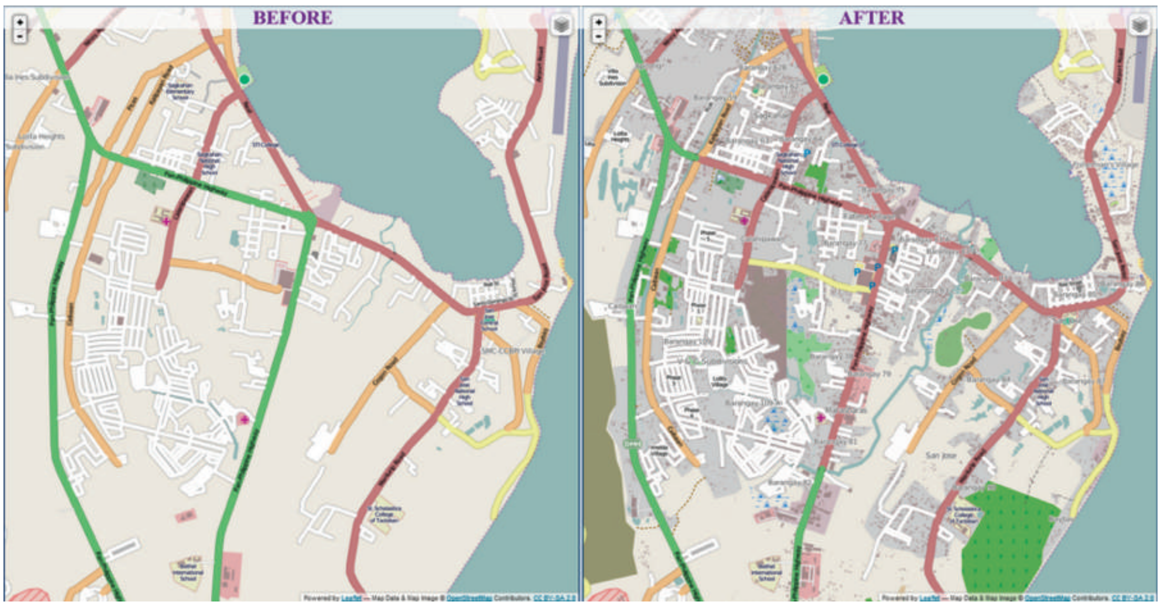


Figure 1.2
OpenStreetMap Basemaps for Tacloban City, Before and After Volunteer Efforts

Source: OpenStreetMap.

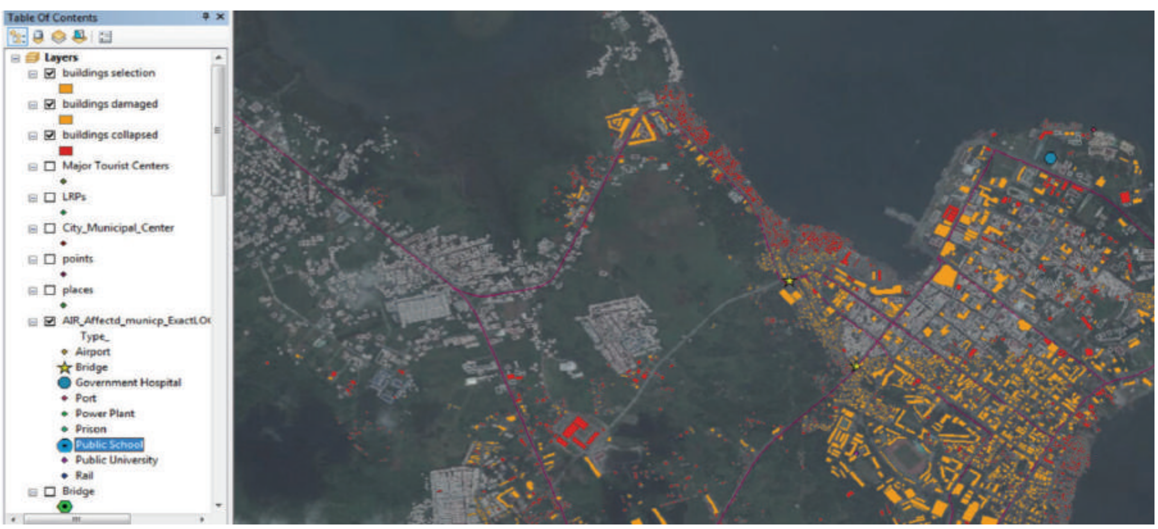


Figure 1.3
Sample Remote Damage Assessment in Tacloban

Sources: American Red Cross and OpenStreetMap.

Note: Red marks collapsed buildings, yellow marks damaged buildings.

Validation, Damage Reporting, and Geotagging

After major disasters, many space agencies and private companies provide pre- and post-disaster satellite imagery for noncommercial use. Before data are used, a validation process is recommended, including ortho-rectification of the maps for positional accuracy.[2] Often, images contain cloud cover, which may make it difficult to generate a complete road network view from these images alone. A recommended first step is to assess the usability of the images, particularly those with cloud cover, and consider alternative sources to assess damage in these areas where necessary. While the resolution of the images is often sufficient for preliminary assessment of damage, options for acquiring aerial images or the use of unmanned aerial vehicles (UAVs) in high-priority areas can be explored if more detailed information is needed.

Figure 1.4 shows an example of aerial imagery collected by UAV after the typhoon. This imagery was openly available for use by the OSM community. In the Philippines, post-Haiyan imagery was provided by U.S.-based Digital Globe;[3] its extent is shown in Figure 1.5. The images were available free of charge for thirty days at fifty-centimeter resolution, which is roughly equivalent to the resolution of images viewable in standard Google Earth.

Figure 1.4 Post-Disaster Aerial Imagery Extents for Tacloban City

Source: Corephil Data Services.

When damage extends over a wide area and post-processing needs for images are high, prioritized selection of sites for possible aerial surveys is recommended. Beyond the use of remote sensing for damage assessment, digital elevation models (DEMs), derived from IFSAR or LiDAR data,[4] can be useful. In the case of the Philippines, the DEM developed by the Department of Science and Technology (DOST) could, for example, be processed to derive baseline data for local roads. If the resolution is high enough, the DEM can also be used to assess the condition of the road surfaces. In addition, DEM is a multipurpose dataset that can be used for flood modeling, landslide modeling, three-dimensional building extraction, and land use planning, among other applications.

Automating and digitizing field reporting protocols before a disaster hits is important if GIS analysis is to contribute to damage reporting, validation, and generation of mapping outputs post-disaster. Geotagging—that is, adding spatial coordinate data to a digital photo or video—can support the analysis of damaged assets based on their exact locations. After Haiyan, DPWH's Bureau of Maintenance and field teams submitted paper-based field reports that did not contain GIS coordinate data. These were entered into a newly launched project monitoring system, from which the GIS team extracted the data, including the names of the roads, and mapped them, using the baseline data for national roads. Results for local roads could not be mapped due to the lack of baseline data.

The work of the Yolanda Command Center team would be significantly enhanced by streamlining workflow to enable GIS analysis to contribute to the monitoring and validation of damage reports and to facilitate the generation of mapping outputs, which would lead to faster, more effective recovery. Currently, the GIS and reporting specialists have access to needed information technology (IT) tools, but their efforts are limited by the lack of GIS coordinates in the damage reports.

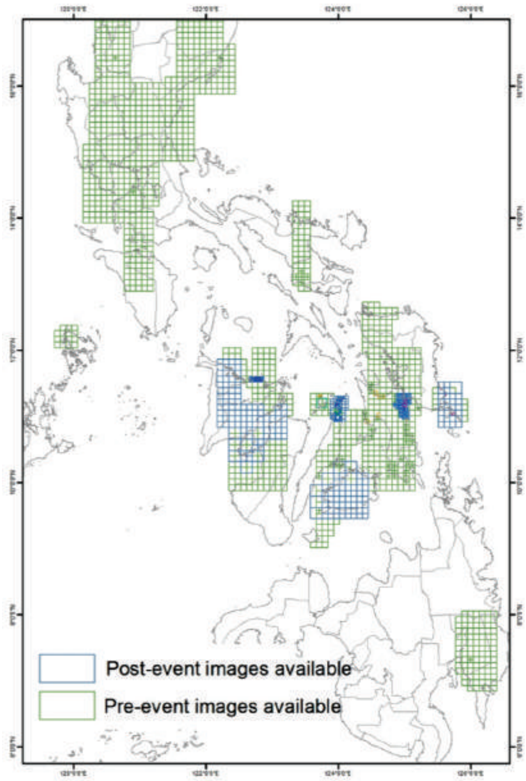


Figure 1.5
Available High-Resolution Satellite Images from Digital Globe for Post-Haiyan Response

Source: GFDRR analysis based on http://www.digitalglobe.com/super-typhoon-haiyan.

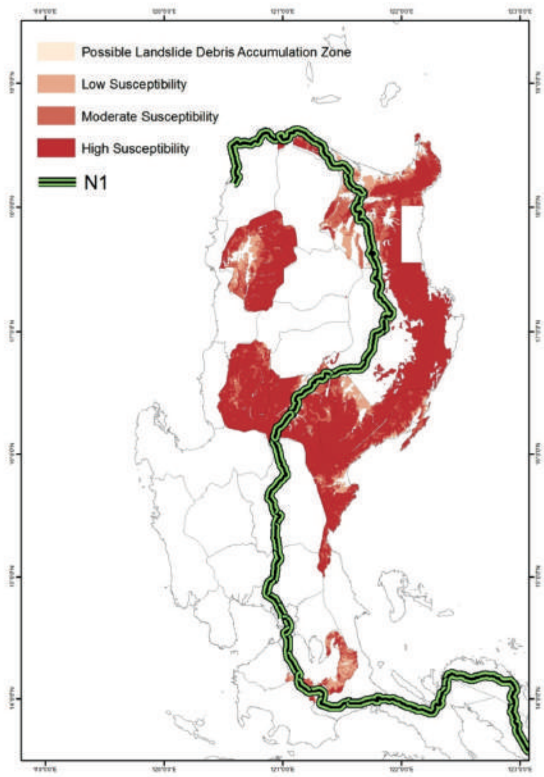
Multihazard Maps and Medium- to Long-term Information Management

Hazard and risk assessment outputs produce detailed risk information for typhoons, flooding, earthquakes, and other hazards, providing valuable information and expertise in the weeks and months after a disaster and during medium- and long-term resilient reconstruction and recovery. Subnational hazard mapping efforts, conducted by local universities and agencies, are helpful to the work of lead recovery agencies. Further hazard and risk mapping can be initiated based on these local-level assessments, datasets, and knowledge to meet the specific needs of reconstruction planning.

After Haiyan, the DPWH Planning Services GIS specialists collected available multihazard maps developed by the Mines and Geosciences Bureau, downloading thousands of maps in jpg format from the MGB site. The GIS team manually digitized the data for use in planning but found them limited in extent and resolution. The Greater Metro Manila Risk Assessment Project, led by NDRRMC and the Collective Strengthening on Community Awareness on Natural Disasters (CSCAND) agencies, produced detailed risk information for typhoons, flooding, and earthquakes, alongside the ongoing efforts of the Nationwide Operational Assessment of Hazards (NOAH) Project. Likewise, various subnational hazard mapping efforts were conducted by local universities, including landslide mapping carried out by University of the Philippines Los Baños for the Leyte Province, to provide useful information (see Figure 1.6).

The conditions after a major disaster pose many challenges to oversight agencies, but they also offer opportunities to advance technical and policy changes that have long-term benefits. For many countries, these include expanding capacity for GIS tools and the preparation and sharing of data and information across the various agencies. Furthermore, improving project monitoring systems for reconstruction can be mainstreamed into the core systems beyond the scope of recovery operations. In the Philippines, various initiatives are underway with respect to GIS and general data analytics to support the core services of DPWH. DPWH will work with the National Mapping and Resource Information Authority (NAMRIA) and the Department of Budget and Management (DBM) on the Agency Geospatial Data Infrastructure (AGDI). DPWH also plans to consolidate analytical services, such as under the “Right of Way” programs. Improving the human and technical GIS capabilities

Figure 1.6
Landslide Hazard Map of the N1 Road Network with Project READY Output



Source: DPWH Road Network with Project Ready Landslide Hazard Data.

Note: See Project Ready website at http://www.preventionweb.net/files/3289_READYProject.pdf.

within DPWH and other leading agencies can support future recovery efforts and contribute to efficient recovery planning, implementation, and monitoring.

Endnotes

1 This chapter draws on contributions from Abigail C. Baca, John R. Crowley, Vivien Deparday, Ariel Mauricio Nunez Gomez, Rashmin Gunasekera, Liana Razafindrazay, Keiko Saito, and Alanna Leigh Simpson. The needs and recommendations have been identified for the Philippines Department of Public Works and Highways (DPWH) and teams from the Yolanda Command Center, Planning Services, Bureau of Maintenance, Bureau of Design, and Information Management Service.

2 Ortho-rectification is the processing of an aerial photograph to geometrically correct it so that the scale of the photograph is uniform and, as on a map, can be measured.

3 See http://www.digitalglobe.com/super-typhoon-haiyan.

4 IfSAR (Interferometric Synthetic Aperture Radar) and LiDAR (Light Detection and Ranging) are data sources that allow the generation of DEMs—three-dimensional representations of the earth's surface essential to some applications, such as flood or landslide modeling, forestry, and urban analysis. Both require intensive post-processing of data. In general terms, LiDAR has a higher spatial resolution than IfSAR.

Chapter 2

Public Buildings and Infrastructure: Good Practice for Resilient Reconstruction

This chapter focuses on principles of reconstructing public buildings and infrastructure, summarizing good practice and offering recommendations for the medium and long terms for the areas affected by Typhoon Haiyan.[1] Further details of the structural damage assessment and design recommendations can be found in the Field Investigation Report on the Impact of the Bohol Earthquake and Typhoon Yolanda on Buildings (DPWH and World Bank 2014a) and in the Guidelines for Earthquake and Wind Strengthening and Reconstruction of Public and Cultural Heritage Buildings: Findings from the Bohol Earthquake and Typhoon Yolanda Assessment (DPWH and World Bank 2014b).

Key Principles for Reconstruction of Public Buildings and Infrastructure

Reconstruction of public buildings and infrastructure in storm surge zones needs to be carefully reviewed. For critical structures, such as ospitals and emergency evacuation shelters, new construction or reconstruction in high-hazard zones is not recommended (although certain structural mitigation measures can be put into place if this is unavoidable—for example, minimum elevation levels for critical functions). Multistory essential buildings and schools can be specifically designed as tsunami and storm surge evacuation structures. At the same time, public education regarding storm surge risks is needed, and evacuation routes should be planned for communities.

For all new construction and reconstruction, site-specific hazards, such as flood and storm surge, tsunami, and soil failure, such as landslide, liquefaction, settlement, and lateral spreading, need to be considered. If soil reinforcement and slope stability measures are not implemented, detailed (and practiced) preparedness plans can mitigate the risk to the facilities and communities exposed to these hazards.

A detailed understanding of exposure to multiple hazards is necessary for risk-informed land use planning on the community scale. In the communities surrounding Mount Merapi in Indonesia, for example, detailed hazard maps have been used to inform zoning and land use restrictions to protect lives and property from future volcano impacts. The high resolution maps indicate which areas are safe for reconstruction of dwellings and which should be used for agriculture and livestock only. A similar principle can be applied in neighborhood replanning and reconstruction to minimize the impact of multiple hazards on fisheries and livelihoods in affected communities.

Quality control is executed by participation of both national and local agencies. For public buildings, such as schools, hospitals, and emergency evacuation shelters, quality control of new construction or repair is essential. It is a vital tool not only for providing safe and resilient construction but for building capacity in contractors, engineers, and public agencies. The existence of a broader capacity-building system is important for successful implementation of a reconstruction program. Standards of practice should be established by the publication of guidelines and the presence of a continuing education system.

Key Considerations for Reconstruction

The Bohol earthquake and Typhoon Haiyan caused substantial devastation in the northern Cebu and Bantayan Islands. In the Visayan Islands (Visayas), most damaged structures were made out of concrete, stone, and brick masonry; they included heritage churches, schools, city administration buildings, non-engineered one-story block houses, and engineered two-story concrete houses (DPWH and World Bank 2014a). Observed damage was the result of inadequate earthquake and wind resistance in stone churches—typically unreinforced masonry—and schools, public buildings, and houses—typically nonductile concrete and masonry (for details, see Box 2.1 Damage Observed in the Visayas from the Bohol Earthquake and Typhoon Haiyan).

Box 2.1 Damage Observed in the Visayas from the Bohol Earthquake and Typhoon Haiyan

Many of the structural failures observed in the Bohol earthquake and Typhoon Yolanda were the result of poor design details and construction that did not follow the design and material specifications.

Most of the observed damage was due to the use of light-gauge (too thin) sheet metal or wood for roofing, inadequate attachment of the sheet metal roofing to the roof framing of the building, and poor hold-down attachments anchoring the roof framing (joists, beams, trusses, and so forth) to building walls and columns. Inadequate protection of openings led to damaged windows and doors, which breached the building envelopes and exposed the structures to higher wind forces and the building interiors to rain and water damage.

Concrete frames and masonry infill walls experienced generally minor to no damage unless they were inadequately reinforced, like many non-engineered houses of this variety. Non-engineered wood houses with light-gauge sheet metal roofs typically broke apart and blew away. Roofs on engineered buildings also experienced significant damage.

Better-attached and heavier- (at least twenty-six-) gauge sheet metal roofing performed well, as did structures of all-concrete construction. New government buildings in Bohol collapsed even though they were designed to meet the provisions of the current national building code, because code-specified seismic reinforcement (for example, horizontal ties around vertical column rebars) was missing, or weak concrete composed of sea sand and round aggregate was used.

Source: DPWH and World Bank 2014a.

According to the *Field Investigation Report on the Impact of the Bohol Earthquake and Typhoon Yolanda on Buildings* (DPWH and World Bank 2014a), the damage would have been minimal if the structures had been designed and constructed (or retrofitted) in line with the existing Philippine structural design code (NSCP 2010). Reconstruction can be a major opportunity to improve the structural resilience of these buildings if certain principles are followed, including those described below.

Rebuild with wind- and earthquake-resistant features. Such features may include, for example, roof framing ties and foundation anchorage, glazing protection, improvements to roofing and other attachments (such as gutters, flashing, and so forth), and reduced eaves/roof overhangs and other projections to reduce the surface area that allows wind to lift off roofs. Most of the highest wind design levels in the world are set at approximately 250 kilometers per hour, and buildings designed (and properly constructed) to withstand that speed have met the Life Safety criterion (see below). Concrete buildings have generally performed at higher levels than Life Safety, at 250 kilometer per hour design wind speed. Mass housing of the concrete construction type, particularly precast concrete (such as flat slabs and double-Ts), needs to be designed to the appropriate seismic standards, properly constructed, and carefully inspected so the structures do not become collapse hazards in large earthquakes. Field observations from the 2011 Great East Japan Earthquake and Tsunami, for example, showed that modern, multistory concrete structures (usually schools) had adequate capacity against tsunami forces, and they were used for shelter (teachers and students in each had been trained to proceed to the top floor, which had food, water, blankets, and other essential provisions for disasters).

Improve resilience of utility distribution lines. Utility distribution lines along national highway easements are vulnerable to collapse in typhoon winds. For new highways, the addition of underground conduits for utility lines should be considered. For existing alignments, horizontal directional drilling of underground conduit ducts can be a lower-cost option (in place of expensive trenching) for critical segments that must remain clear of debris. Other lower-cost options include moving utility lines farther away from road surfaces, as downed power lines on roads are common in wind storms. The lowest cost solution is planning and preparedness. Governments (national and local) should plan for disaster scenarios to clear debris as quickly as possible.

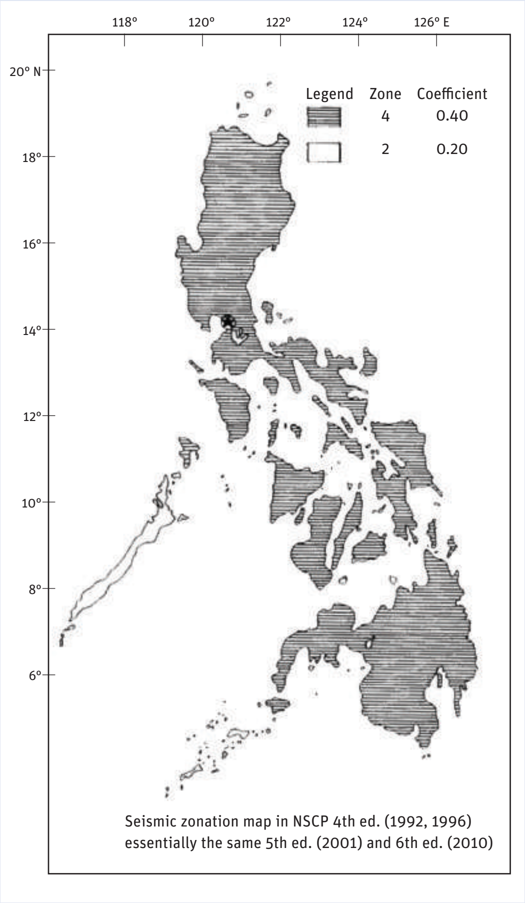
Update the National Structural Code of the Philippines (NSCP). For most structural codes worldwide, the intended performance level for a majority of structures is "Life Safety," which means a structure will not collapse under the code-specified design event. Life Safety does not imply continuous operation or immediate occupancy, which are both higher performance criteria that are typically applied to essential facilities, such as hospitals, emergency operations centers, mission-critical structures, and so on. Current NSCP provisions for wind speeds of 250 kilometers per hour should provide the Life Safety level of protection for most building structures in a Category 5–equivalent typhoon, as well as an earthquake of up to magnitude 8. In magnitude 8-plus earthquakes in Mexico (1985), China (2008), Chile (2010), and Japan (2011), among other countries, wood and concrete structures properly designed to provisions of the 1997 Uniform Building Code (upon which the NSCP 2010 is based) did not collapse and were only minimally damaged. Box 2.2 gives an overview of the structural design codes in the Philippines, as well as providing maps of, respectively, the code levels adopted in the Philippines and the path of Super Typhoon Haiyan.

Box 2.2 Structural Design Codes in the Philippines

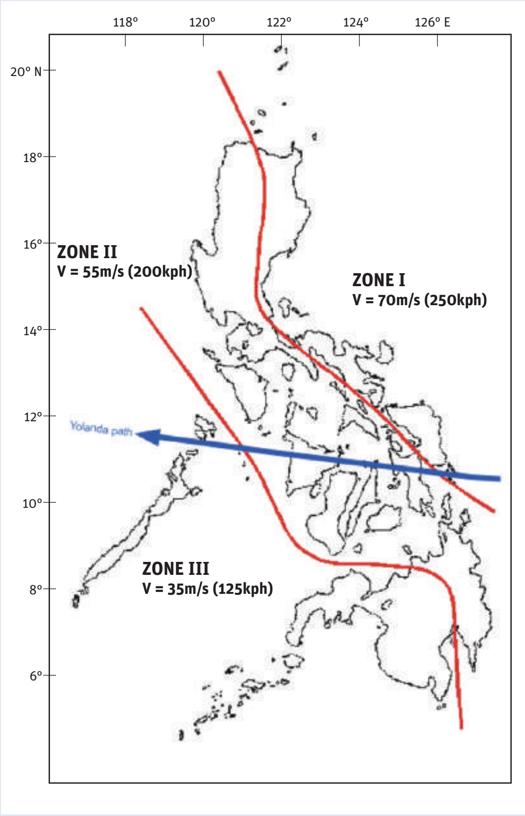
The National Structural Code of the Philippines (NSCP) is the reference standard of the National Building Code of the Philippines (NBCP), based on the 1997 Uniform Building Code. The NSCP divides the country into two seismic zones (zone 2 and zone 4; see the map on the left, below). Most of the Philippines, including the areas affected by Typhoon Haiyan, is in seismic zone 4, for which the NSCP expects the highest seismic ground motion.

With regard to design wind speeds, the NSCP divides the country into three zones (1, 2, and 3; see the right-hand map). For zone 1, the design wind speed is 250 kilometers per hour, for zone 2 it is 200 kilometers per hour, and for zone 3 it is 150 kilometers per hour. The Visayas are typically in wind zones 1 and 2 (with design wind speeds of 250 and 200 kilometers per hour, respectively). Most of the Haiyan-affected population is in zone 2 (200 kilometers per hour). Structures designed and constructed to the provisions of the NSCP should perform as intended at Category 5–equivalent wind speeds and in a major earthquake (even up to a magnitude 8 event). It is recommended that the zone 2 design wind speed be increased to 250 kilometers per hour, since the land mass of the Philippines is not large enough to cause wind speeds to degrade as typhoons travel from east to west.

NSCP Earthquake Zone Map



The Path of Super Typhoon Haiyan



Source: Based on DPWH and World Bank 2014a.

Improve construction quality control and enforcement. Many structural failures observed in post-disaster situations (that is, following earthquakes and typhoons) are due to construction not following the design and material specifications. Among many examples are public buildings, including new government buildings, that collapsed even though they were designed to meet recent code provisions. A medium- to long-term priority for the country is to develop better mechanisms for ensuring construction quality and enforcement of national building and structural codes. International experience has shown that, on average, an effective permitting and inspection program adds just 1 to 2 percent to overall project costs.

Develop capacity in contractors for non-engineered construction. A significant amount of low-income housing is the product of non-engineered construction based on local practices (DPWH and World Bank 2014a). Capacity needs to be built among contractors and carpenters to add wind-resistant hardware and reinforcement to tie key structural components together, which will significantly strengthen houses to withstand typhoons. Adding typhoon ties to key roofing elements, for example, does not require complex engineering and is inexpensive. Local government capacity for quality control also needs to be assessed and strengthened.

Develop guidelines for reconstruction and inspection of public buildings. Technical guidelines, an inspection process, and a continuing education system should be developed at the national level. Standard plans and guidelines are essential for massive implementation of repair, strengthening, and reconstruction. They have to be based on a strong understanding of the types of damage observed in the building stock, however.

Clearly define roles of national and local governments for quality control. Local government staff, including city and municipal engineers and building officials, should be empowered and trained to use technical guidelines and inspection procedures to implement quality control, while the national government should monitor the quality control mechanisms at the local government level.

Building Back Better: Recommendations for Public Buildings

Public infrastructure plays an important role during disasters, often serving, for example, as emergency shelters and providing emergency care. A list of guiding principles for reconstruction is presented below. Table 2.1 summarizes priority actions for the short, medium, and long terms to achieve resilience of public infrastructure.

Carefully evaluate reconstruction in disaster-prone zones. Site hazards must be carefully evaluated in all reconstruction and new construction. Important hazards include flood and storm surge, tsunami, landslide, liquefaction, settlement, and lateral spreading, and preparedness plans should be developed for them. For essential structures, such as hospitals and shelters, reconstruction or new construction in high-hazard zones is not recommended.

Increase wind design standards. Public buildings (such as schools, hospitals, police and fire stations, municipal buildings, community centers, and markets) are engineered structures designed to follow professionally established design codes. If built and constructed according to the NSCP, the current earthquake provisions, and the proposed 250 kilometer per hour typhoon standards, most should resist major earthquakes and typhoons without collapse:

Table 2.1 Recommended Priority Actions for Reconstruction of Public Infrastructure

Time frame	Recommended actions
Short term	▼ Give citizens and national and local government agencies access to robust hazard and risk information produced by technical agencies and universities, such as PHIVOLCS, PAGASA, MGB, NAMRIA, and DOST's NOAH Project. This information will enable both the public and private sectors to ensure new construction and reconstruction can be planned and designed for multihazard resilience. Government agencies should provide access to the latest hazard map data in digital GIS format for easy access via the internet. This could be facilitated through, for example, the Philippine Geoportal initiative. ▼ Mandate a design wind speed of 250 kilometers per hour for all reconstruction projects, and make formal revisions to NSCP in parallel. ▼ Repair damaged schools, hospitals, and other public structures. For critical public structures, consider rebuilding outside of storm surge zones. Some multistory public buildings in storm surge and tsunami zones can be engineered and rebuilt as evacuation structures. Install wind-resistant features to protect the building envelope. ▼ Train local government engineers, carpenters, and contractors in typhoon-, wind-, and earthquake-resistant reconstruction. Training could cover roof framing ties and foundation anchorage, glazing protection, improvements to roofing and other attachments (such as gutters and flashing), and reduction of eaves, roof overhangs, parapets, and other projections from the building structure that basically act as large sails to attract more wind forces and are often points where damage is initiated. Removing them reduces wind loads on a building structure and makes the building more resilient. ▼ Conduct a public information and education campaign on the hazards of rebuilding in storm surge zones. ▼ Develop a typhoon preparedness plan and procedures for each school, particularly if it is a designated disaster shelter. Preparedness plans also need to be developed for critical health facilities and hospitals assigned as emergency response units. ▼ Encourage citizens' personal disaster preparedness using existing models, such as MMDA's Earthquake Preparedness Plan.
Medium term	▼ Develop and provide open access to multihazard micro-zonation maps (covering hazards including earthquake, storm surge, tsunami, flood, landslide, liquefaction, lateral spreading, and so forth) and distribute in digital GIS format to government agencies, local governments, and citizens. ▼ Develop and implement a nationwide inspection system to improve construction quality. A formal plan-checking and construction inspection system should be required for all public and private buildings. The cost of such a system is typically paid for by the building owner. Good models can be found in Japan, New Zealand, and the United States (specifically California). ▼ Train national and local government inspectors in good construction practices and important structural and nonstructural elements that minimize earthquake and typhoon damage. ▼ Establish quality control standards through the publication of guidelines and a continuing education/training system for municipal building officials.
Long term	▼ Evaluate older churches, schools, hospitals, and other important public buildings for earthquake and typhoon vulnerability. ▼ Identify public assets (such as buildings, utilities, roads, and bridges) that are vulnerable to natural hazards, and develop preparedness plans for them. Planning should be required for both national and local government agencies for typhoons, earthquakes, and floods. ▼ Evaluate schools designated as evacuation shelters and designated emergency response hospitals for wind and earthquake resistance. ▼ Initiate a phased seismic upgrading strengthening program for bridges, other schools and hospitals, and other public buildings.

Source: World Bank staff, with inputs from DPWH and World Bank (2014a).

- **For reinforced concrete masonry structures with concrete roofs**, most of the damage is expected to be nonstructural in nature—consisting of damaged roofing, siding, and other building envelope materials, water intrusion, and content damage. If the reinforced concrete masonry building has a wood-framed roof, roof damage may occur if the frame is not adequately tied to the concrete masonry walls.
- **For wood frame buildings**, significant structural and nonstructural damage is expected in coastal locations and moderate damage in inland locations. Gymnasiums are large open structures that can be significantly damaged if not properly designed and constructed.
- **For essential structures** (typically hospitals, fire stations, and emergency evacuation centers), higher design force levels are needed (for example, an importance factor of 1.5, or 50 percent higher design force, is required in the NSCP for earthquake forces), and equipment must be anchored to improve resilience and allow post-event operability.

Combine structural and nonstructural measures. Reconstruction should incorporate wind-resistant features such as roof framing ties and foundation anchorage, glazing protection, improvements to roofing and other attachments (such as gutters), and reduction of projections such as eaves. Together with structural measures, preparedness plans and public awareness campaigns are needed to inform the population about existing risks and evacuation routes planned for vulnerable communities. Citizens' personal disaster preparedness should also be encouraged, using existing Philippine models such as the Metropolitan Manila Development Authority (MMDA) Oplan Metro Yakal (Earthquake Preparedness Plan).

Endnote

1 This chapter benefited from contributions by Christopher C. Ancheta, Tom Chan, Jolanta Kryspin-Watson, Kit Miyamoto, and Artessa Saldivar-Sali.

Gawad Kalinga ("give care") volunteers help build brightly painted colorful homes in sustainable communities for poorest of the poor and displaced families after typhoon Yolanda. Photo: Danilo Victoriano

Chapter 3

Housing: Lessons Learned from Large-Scale Housing Reconstruction Programs

This chapter focuses on selected issues that are relevant when devising a housing recovery program, including determining the scope of the program and the roles of the stakeholders involved and tackling key implementation issues, such as the establishment of an overall disaster risk reduction policy for housing reconstruction, linkages between reconstruction and transitional housing, communication with the affected population, quality control systems, arrangements to encourage family resource mobilization, and monitoring and auditing systems.[1]

How to Approach Housing Recovery

Best practices for large-scale housing reconstruction programs encourage household self-recovery rather than providing "turnkey" (ready-to-move-in) solutions and focus on getting the normal housing system and construction materials markets working again. People are resourceful and know how to acquire and improve housing. Providing support that encourages self-recovery should be a pillar of the housing recovery strategy. Even for low-income families, most housing is provided in normal times through markets (for houses, materials, rentals, and so forth). The goal of housing recovery should be to jumpstart the housing market, provide support to households, and identify options for speeding up the normal housing process; it is not to create new, unfamiliar processes—such as large-scale social housing or construction programs—if that is not how households normally acquire housing.

Through post–Typhoon Haiyan reconstruction, a post-disaster housing recovery and reconstruction methodology could be developed that can be mobilized in future disasters and incrementally upgrade the national housing stock with safer housing, especially for low-income people. The overall goal of efforts in housing recovery and reconstruction is to establish an equitable, timely, cost-effective housing recovery program that can reach scale, reduce risks, restore family dignity, and support household self-recovery. In line with these objectives, timelines and priorities for large-scale housing projects fall into the following phases:

- **Immediate**: Provision of temporary shelter grants to households; development of government-sponsored bunkhouses; design of community-based reconstruction, repair, and relocation programs; and establishment of a monitoring system
- **One year:** Launch of a community-based reconstruction, repair, and relocation program and establishment of a multi-donor trust fund and a remittance facility

- **Two years:** Full implementation of the community-based reconstruction, repair, and recovery program

Determining the Scope of a Housing Recovery Program

When determining the scope of a housing recovery program, the government needs to consider different options, including the scale of temporary and permanent housing, risk reduction efforts, and neighborhood redevelopment and upgrading, as well as relocation of landless populations or populations living in high-risk areas. Moving communities from newly established no-build zones can pose considerable challenges of finding appropriate locations—a common problem after major floods and sea surges. Table 3.1 provides a summary of key considerations for the different options.

Table 3.1 Options and Considerations When Determining the Scope of a Housing Recovery Program

Options	Considerations
Temporary housing/shelters, with most in situ and a limited number of new sites	High rates of relatively secure/formal land occupation mean most sheltering can be in situ.
Permanent housing through repair and reconstruction, with most in situ and a limited number of new sites	High rates of secure/formal land occupation mean most reconstruction will be in situ. Those given temporary shelter need a permanent solution; to avoid multiple moves, shelter sites should be chosen carefully (and, where possible, be in situ) and be convertible to permanent sites.
Risk reduction for housing sites and neighborhoods by means of safe designs for construction, repair guidelines, capacity building, and disaster mitigation works	The high number of non-engineered houses in the most damaged zones demonstrates the importance of new housing designs.
Neighborhood replanning, rehabilitation for existing neighborhoods, or **upgrading** at new sites	Cost of rehabilitating existing neighborhoods is generally much lower than new site development.
Relocation of landless or high-risk households	Relocation should be minimized; social and economic impact should be carefully evaluated and mitigated. Beneficiaries of funding earmarked for relocation should be given options (including self-relocation) for reaching the same end (safer housing). Other interventions to improve land tenure security in reconstruction may be warranted.

Source: World Bank staff.

Collecting data can facilitate the planning and management of the housing recovery program. A housing survey, for example, provides a sample of destroyed and damaged housing. It is used to develop a set of housing prototypes (based on the typology of damage) and prepare repair guidelines. A standard household survey will collect the following information:

- Location of family and housing
- Housing condition
- Tenure status and security
- Family characteristics, including family size and sources of income

- Basic family economic data (such as source of income, access to and use of banking services, access to savings or remittances, and so on)

- Participation in cash transfer programs

International experience from large-scale housing reconstruction programs suggests the most effective approach is community-driven or owner-driven reconstruction (see Box 3.1, Box 2.2, and Box 3.3), which can help expedite the whole recovery process. This approach is equivalent to the community-driven development (CDD) model followed in many East Asian countries, including the Philippines. Experience shows community-driven and homeowner-driven housing reconstruction to be 40 percent less expensive per housing unit than contractor-built housing. In the 2010 Philippines housing census, more than 95 percent of households in the Typhoon Haiyan–affected region reported owning or renting their land or occupying it with the consent of the landowner, which means most households should be able to reconstruct on the land they already occupy.

Box 3.1 Housing Recovery after the 2006 Yogyakarta Earthquake in Indonesia

- **Impact:** Earthquake 6.3 M; 350,000 houses destroyed and damaged
- **Program overview:** The objective was reconstruction and rehabilitation of 350,000 seismically safe houses and settlement restoration for the 500 most affected villages; total cost of the program was US$500 million; completed in two years.
- **Program principles:**
  - Community-driven housing and settlement reconstruction
  - Quality assurance through use of technical facilitators, spot checks and technical audits, and conditional grants
  - Preparation of community settlement plans, which incorporated disaster risk reduction
  - Establishment of strong support system to ensure transparency and accountability of the program, including robust complaint handling
- **Program elements:**
  - Establishment by presidential decree of a powerful coordinating body for reconstruction, located in Jogjakarta
  - Detailed community self-survey, supported by facilitators, on level of damage (good, damaged, destroyed) and need for temporary shelters, verified through public announcements and independent audits
  - Conditional grant (US$1,500 to $2,000 per group) for housing groups of ten households each to support a $36m^2$ seismic structure (foundation, columns, and roof); each housing group assigned a single bank account and held accountable for the use of the funds in accordance with the conditions of the grant
  - Architectural and civil engineering support for the communities that had specific design requests in addition to the housing prototypes
  - Technical assistance to community for preparation of community settlement plan incorporating disaster risk reduction measures
  - Conditional grant to village (up to US$100,000) for settlement restoration, including infrastructure and disaster risk reduction

Source: World Bank staff.

Box 3.2 1999 Colombia Earthquake in Coffee-Growing Region (Armenia)

- **Impact:** More than 130,000 houses affected; 550,000 people homeless; 16,700 households in need of relocation; 649 schools and 52 health centers destroyed
- **Program overview:** One of first major assisted community-based reconstruction programs, involving twenty-eight municipalities in five departments, with total reconstruction cost of US$750 million, of which 40 percent was borrowed from international organizations
- **Key principle:** A highly decentralized system
  - Twenty-eight universities, cooperatives, civic groups, and professional associations selected by the government to manage the program in thirty-two operational areas
  - Popular housing organizations called upon by grassroots community groups to organize families and help them understand and compare available housing options and complete necessary forms
- **Program elements:**
  - Popular housing organizations enforced administrative practices, ensured participation of affected population, ran procurement processes for construction projects, and implemented environmental safeguards.
  - Beneficiaries selected house designs through public exhibitions known as "mobile windows."
  - NGOs acted as zonal managers, working with affected communities, local governments, and civil society to identify and set priorities for reconstruction and develop and implement area plans.
  - The government supervised the project and created the Fund for Reconstruction and Social Development of the Coffee Region (FOREC). Only 120 government officials were permanently assigned to the program, and three years later, the government dissolved FOREC, declaring its mission completed.

Source: World Bank staff.

Box 3.3 Pakistan Rural Housing Reconstruction Program after the 2005 Earthquake

- **Impact:** 73,000 people killed; 2.8 million left homeless
- **Program overview:** Total cost of over US$1.5 billion, of which US$210 million was provided by the World Bank. The program oversaw construction of approximately 460,000 seismically safe houses and restorations.
- **Program principles**
  - Ensure owner-driven housing reconstruction
  - Assist and inspect reconstruction and restoration
  - Ensure seismic safety
  - Ensure uniform principles and assistance packages across all funding sources
  - Ensure judicious use of grants; reduce conflicts and grievances; avoid socioeconomic distortions and disparities
- **Program elements**
  - Dedicated reconstruction agency, the Earthquake Reconstruction and Recovery Agency (ERRA)
  - Detailed damage assessment and beneficiary eligibility verification survey
  - Conditional grant and bank accounts
  - Seismic-resistant structural design solutions
  - Training and capacity building
  - Assistance, inspection, and certification
  - Public information campaigns
  - Facilitation of access to building materials
  - Defined role for NGOs in implementation (community mobilization)
  - Reporting, monitoring, and evaluation and grievance redress mechanisms

Source: Based on https://www.gfdrr.org/ruralhousingreconstruction.

A housing recovery program must address several considerations simultaneously, including those described below.

Purposes of assistance. Separate grants should be provided to households for temporary lodging or shelter construction and for safe, permanent housing reconstruction and repair. If housing only needs to be repaired, a temporary shelter subsidy may not be necessary. Infrastructure grants to communities should be principally for projects that reduce risk (such as those involving drainage, retaining walls, evacuation routes, and so on).

Amount of assistance to be provided. Assistance should be sufficient to allow construction of either a safe building structure (foundation, columns, and roof) or a small, safe house (costing US$2,500 to $3,500). Recipients should be encouraged to supplement assistance with their own savings (for example, from earnings or remittances). Repair assistance generally comprises 40 to 50 percent of the reconstruction grant.

Form of assistance. Unconditional cash grants are recommended for temporary shelter and conditional grants for housing repair and reconstruction. Housing grants should be accompanied by technical assistance and training for families and builders. Vouchers and material donations are only recommended when markets are not functioning efficiently, and only until they begin to do so. The provision of turnkey houses should be strongly discouraged, whether by government or donors, except in specific situations, such as rehousing of vulnerable families. Even then, these houses should be modest and cost no more than the amount of the housing reconstruction grant, to avoid social pressures and corruption.

Eligibility and form of assistance. Households with destroyed housing should receive conditional reconstruction grants. Households with damaged housing should receive smaller grants for repairs. The repair grant may need to be adjusted to the level of damage (with no more than two distinct levels of damage, for ease of implementation). Neighborhoods should also receive grants to carry out small infrastructure projects. Households located in high-risk sites should not be automatically relocated to new, preselected sites but should be provided with a grant that can be used for a range of options, including site mitigation and self-relocation.

Community-driven reconstruction requires setting up and managing a multi-tiered system of training, facilitation, and monitoring. National government, local government, the private sector, academia, the nongovernmental sector, village groups, networks, and households all have important roles, the elements of which are set out in Table 3.2.

Table 3.2 Proposed Roles of Stakeholders Involved in a Community-Based Housing Recovery Program

Agency /Entity	Functions
National government	▼ Establish a steering committee of various key shelter agencies as part of overall policy direction and coordination. ▼ Decide on a single lead agency for the overall preparation, implementation, supervision, and monitoring of reconstruction, and define roles for collaborating agencies. ▼ Approve policies for assistance and technical standards, and issue technical and operational guidelines for the program. ▼ Select national and regional management consultants, and recruit facilitators.
Local government	▼ Appoint a local government project manager for payment verification, local program management, land use planning, and resettlement.
Local-level NGOs	▼ Conduct a beneficiary survey with the community, ensure integrity of implementation, facilitate meetings on community needs, and implement small-scale community infrastructure projects (supported by facilitators).
Private sector	▼ Supply materials, transport goods, and contractors to households, provide consultants and contractors for complex small-scale infrastructure projects, conduct area mapping, and provide banking services.
National and regional consultants	▼ Assist the implementing agency (the national government) with implementation and oversight of the overall program, and ensure the program's quality, effectiveness, efficiency, and timely completion. ▼ Support establishment of an effective monitoring and complaint-handling system.
Facilitator teams (which include technical, financial, and social facilitators)	▼ Help community and households build capacity in housing and village reconstruction, ensure high-quality house construction that meets resilience standards, oversee bookkeeping, facilitate disputes, and maintain two-way flow of information with the community.
Civil society organizations	▼ Assist with community planning and capacity building, train facilitators, and facilitate reconstruction for vulnerable households (in the context of the overall program).
Housing groups (of approximately ten households each)	▼ Manage bank account for ten houses, maintain transparent bookkeeping, and ensure implementation integrity by each member.
Academia	▼ Design and carry out facilitator training, assist with development of housing prototypes, and provide architecture and engineering students and faculty as technical resources to local government units (LGUs).

Source: World Bank staff.

Critical Implementation Issues

Agencies in charge of housing programs have to be mindful of a number of implementation aspects, discussed below.

Establishing disaster risk reduction policy for housing reconstruction. Decisions concerning which risks need to be managed in recovery and what is an acceptable level of risk affect the design of the housing program, the nature of housing and site improvements, and decisions regarding relocation. Where new standards are imposed, enforcement measures must be developed. Not all risks are disaster related; the risk hierarchy of households should be considered. For instance, losing one's livelihood as the result of relocation may concern the household more than the next typhoon does. Establishing feasible, improved building and repair standards provides the basis for training households and contractors and contributes to long-term sustainability. Prototype designs and a housing damage survey provide the parameters for training.

Coordination of reconstruction with provision of emergency and transitional or temporary shelter. As sheltering decisions will affect reconstruction costs and progress, temporary and permanent solutions need to be viewed as a whole. Transitional shelter on a household's own land is best practice, since it causes minimal disruption and facilitates permanent reconstruction. The Haiyan-affected zones have relatively large plots, so this approach should be feasible. Shelter standards should be flexible and reflect cost, duration of use, and safety considerations. In many cases, temporary housing takes as long to construct as permanent housing, and it later tends to become permanent, even if it is of low quality.

Communication with the affected population. Communication with the affected households is critical because it provides information that allows them to make decisions about self-recovery. Lack of communication contributes to dependency. A communications program should provide ongoing, two-way communication between affected households and all involved institutions.

Embedding of quality control in the program. Quality control should be embedded in all phases and at all levels of the community-based recovery and reconstruction program. At the outset, the government implementing agency could work with relevant agencies to establish technical standards and guidelines for new construction and rehabilitation of housing. For new construction, prototype designs can be developed that incorporate these standards. Repair standards can be developed to respond to the typology of local housing and the damage sustained. National, municipal, and *barangay*-level consultant teams can provide training at different levels to ensure standards are understood and capacity exists to adhere to them. Housing and infrastructure facilitators can accompany the housing groups and communities throughout the construction period. To enforce the application of the housing technical standards, housing grant payments can be made in three tranches, whose release is contingent upon compliance with the standards. In addition, at various stages of program implementation, technical audits and spot checks should be conducted to assess the construction quality.

Encouraging family resource mobilization. Housing subsidies should be designed as seed to encourage resource mobilization for housing by the households themselves. Remittances in 2013 reached a level of US$25,351 million, compared to US$23,352 million in 2012 and US$21,922 million in 2011.[1] This increase reflects international aid and family resource mobilization post-Haiyan and represents a flow of funds that could be facilitated by banks. Incentives in the form of matching grants or other measures could be offered by government to encourage use of the funds for housing and village reconstruction.

Monitoring and audit. Monitoring of financial flows and physical progress is essential at program, locality, and household levels. Monitoring results should be provided to the public, especially the affected population, to keep people informed of progress. Both financial audits and social auditing (by watchdogs or beneficiaries) add credibility to the overall program. Reporting continuously and candidly to the public and educating the press about progress and the use of funds provide insurance against inaccurate charges, which are almost inevitable during reconstruction.

Endnote

1 Data from Bangko Sentral ng Pilipinas, http://www.bsp.gov.ph/statistics/keystat/ofw.htm. Major sources of cash remittances in 2013 were Canada, Japan, Saudi Arabia, Singapore, the United Arab Emirates, the United Kingdom, and the United States. Cash remittances support local economic activity, accounting for 8.4 percent of the Philippine gross domestic product (GDP) in 2013.

2. This chapter benefited from contributions by George Soraya, Priscilla Mary Phelps, and Yan F. Zhang.

Chapter 4

Building Back Better: Restoring Key Sectors, Local Economy, and Livelihoods

This chapter focuses on key sectors that were affected by Typhoon Haiyan, including agriculture, irrigation, water, sanitation, health, and education and summarizes recommendations made for their resilient recovery and reconstruction. It also looks at how to facilitate revitalization of the local economy and the livelihoods of vulnerable populations.[1]

Revising Key Economic Sectors

The quick recovery of agriculture and irrigation, as well as water and sanitation, is vital to communities' ability to restore their livelihoods. Restoring health and education services and reconstructing structures are likewise important to avoid further shocks to the communities and disruption of development gains. To address medium- and long-term challenges across all these sectors, disaster and climate resilience should be integrated into reconstruction efforts in the form of higher standards with respective training and inspection, location of new buildings outside hazardous areas where necessary, and/or adequate retrofitting of existing structures to mitigate risk. Restoring operations of private businesses is fundamental to sustainable recovery and job generation. This requires a long-term commitment and close collaboration between government and the private sector, and it usually comes after immediate relief and reconstruction have restored key basic services.

Agriculture and Irrigation

The agriculture sector was severely affected by Typhoon Haiyan. The total developed service area in the regions affected by the typhoon was about 575,700 hectares of land. In most of these regions, irrigated agriculture is an important source of livelihood. Approximately 550,000 families directly depend on irrigation schemes, with rice being the common crop across the country. Irrigation is critical to agricultural production, especially during the dry season. Almost all irrigation water is derived from rivers with direct abstraction and conveyance, while its distribution depends largely on open canals. During the reconstruction and recovery process, immediate restoration of rural livelihoods is a priority, and affected irrigation systems must become operational as soon as possible to avoid future loss of production. This can be facilitated through the measures discussed below.

Prioritization. Reconstruction spending can be prioritized based on scheme investigations and surveys for the worst affected regions. De-silting of canals and the repair of critical structures, such as abstraction and canal diversion structures, can be prioritized so the needed water can be conveyed and distributed to the farmers' fields.

Use of implementation mechanisms. Contractors can be mobilized to repair the larger structures and de-silt the canals. As a form of income support to affected communities, irrigation associations could carry out the de-silting of secondary and tertiary canals with hired laborers under a cash-for-work scheme.

Climate proofing of key irrigation infrastructure. To avoid recurring damage from future extreme weather events, climate proofing of key irrigation infrastructure should be implemented. This may include strengthening key hydraulic structures (including river abstraction works) to withstand future floods and improve the drainage and silt retention capacity around and within irrigation systems (to avoid siltation of canals and fields).

Water and Sanitation

Impacts on water and sanitation systems can include power loss and damage to power equipment (such as power lines and generators), pump houses and offices, storage tanks (reservoirs), and transmission and distribution piping and service connections. Although water treatment facilities can be resilient to wind and precipitation, their operation may be disrupted by power loss due to flooding and lack of backup generators. Pump houses and poorly designed and constructed buildings, such as offices and operations buildings, may experience damage from wind, debris, and water intrusion. Transmission and distribution systems (including pump stations, tanks, and aboveground and buried piping) are usually resilient unless damaged by storm surges, landslides, washouts, and falling debris. In the event of earthquakes, transmission and distribution systems are vulnerable to shaking, ground failure (such as liquefaction, lateral spreading, and landslides), and tsunamis.

Recovery and rehabilitation may take longer in some areas than others due to redevelopment and new land use patterns that may require hydraulic flow redesign and rehabilitation. The delayed restoration of water supply services and the lack of sanitation facilities in the affected areas are threats to people's health and the environment, and they adversely affect the economy of the affected city or municipality. To enable quick restoration of facilities, the following actions are recommended.

Prioritize and build back better. Resumption of water operations in areas severely damaged by disasters should be prioritized to avoid further loss of production from nonfunctioning irrigation infrastructure. Damaged transmission and distribution systems should, however, be reconstructed to higher standards to protect contents of facilities and equipment (especially electrical) from future water intrusion and flood damage. Repair and reconstruction of water district buildings should follow the resilience guidelines for public buildings, especially the wind standards, when feasible.

Financing. Debt relief policies should be triggered to allow restructuring of financial debts and provide incentives to local water utilities to reconstruct and recover as soon as possible. The GoP could provide concessional funds to service providers to fast track the restoration of access to improved water supply and sanitation.

*Emergency preparedness. I*nvestments should be made in emergency response logistics (for example, for provision of mobile treatment plants, water tankers, mobile gensets, and portalets), which are extremely necessary for continued water supply and sanitation operations. Power is essential to operate water treatment facilities, and generators should be anchored to prevent damage during earthquakes. Emergency generators should be provided to water utilities to continue operations (such as running pumps and filters) following an earthquake or other disaster. Contingency and disaster recovery plans for water districts should be developed in parallel.

Risk reduction. Earthquake and typhoon assessments of undamaged and repaired structures, equipment, tanks, and piping should be conducted to identify vulnerabilities and develop mitigation plans, which may include selective retrofits of important components to keep water systems operational and/or post-event response measures to ensure continuity of operations.

Private sector participation in reconstruction, recovery, and rehabilitation. Local governments could encourage the private sector to mobilize expertise and resources in reconstruction and rehabilitation. To attract private sector financing, small water utilities should be consolidated to increase financial viability and sustainability.

Health Services

In the short term, essential health services need to be provided, including medical, surgical, and mental health consultations, immunization, restoration of the referral system, establishment of temporary health facilities and services, repair or rehabilitation of damaged health facilities, delivery of maternity tents and containers for hospital delivery rooms, and mobile health teams. In addition, nutrition services for families need to be restored, with the provision of supplies for therapeutic feeding, micronutrient supplements, and equipment. Before Typhoon Haiyan, the Visayas region already had high rates of malnutrition and the second highest rate of child mortality in the Philippines. Many Visayas households do not have access to safe water and sanitary toilet facilities. The damage wrought by Haiyan disrupted supply chains for medicines and equipment and displaced health care workers, rendering the delivery of essential health care services (such as immunization, safe delivery, and regular curative care) almost impossible.

Prioritization and planning. The Department of Health (DOH), together with LGUs, should undertake mapping of the service delivery network in the affected areas. A recovery and reconstruction plan for different types of health facilities (covering services, supplies, and manpower) should be developed according to the facilities' exposure to multiple hazards. DOH should put into place a more robust monitoring system, not only to serve the needs of the reconstruction phase, but to become a backbone of the program monitoring and reporting system it shares with the LGUs.

Building back better. Reconstruction and recovery provide an opportunity for DOH to develop plans with LGUs for improving and building stronger service delivery networks. Reconstruction should begin before the relief phase ends. Damaged hospitals and clinics outside of storm surge zones should be repaired, while major structures in those zones should be considered for relocation to higher ground or provided with elevated "safe haven" areas. New hospitals should be built to higher design wind speeds than the ones they replace (from the current 200 kilometers per hour in some zones of the country to a uniform 250 kilometers per hour), with the inclusion of wind-resistant features such as roof framing ties and foundation anchorage, glazing protection, and improvements to roofing and other attachments (such as gutters and flashing). In the long term, hospital structures should be evaluated for wind and earthquake resistance and upgraded if found deficient. The GoP could develop and implement an inspection system to improve construction quality and train inspectors on principles of resilience, the cost of which could be covered by permit and inspection fees.

Implementation and financing parameters. DOH may also consider expanding its public–private partnerships for smaller health facilities, since reestablishment of the service delivery network almost simultaneously in all affected municipalities is urgently needed.

Education

During a post-disaster situation, restoring the education sector and getting children back into the classroom is vital. The Haiyan-affected areas included a high concentration of public elementary and secondary schools. In the most significantly affected regions—Western, Central, and Eastern Visayas—approximately 5,000 schools and 2.2 million children were directly affected. The reconstruction of schools involves a number of important policy decisions. Table 4.1 lists recommended post-disaster reconstruction and recovery priorities in the education sector.

Table 4.1 Recommended Actions for Recovery and Reconstruction in the Education Sector

Time frame	Recommended actions
Short-term priorities for recovery...	▼ Provision of temporary or alternative learning spaces (makeshift classrooms) for affected and displaced children ▼ Use of alternative modes of teaching and learning ▼ Mobilization of volunteer or mobile teachers from nonaffected regions ▼ Provision of early childhood care and development learning packages ▼ Provision of psychosocial services and counseling to affected students and teachers
...and reconstruction	▼ Cleaning of damaged schools and community learning centers ▼ Repairing of damaged schools outside the storm surge area and building of replacement schools (outside the surge zones) to higher wind speeds
Medium-term priorities for recovery...	▼ Replacement of damaged and destroyed teaching materials ▼ Expansion of alternative delivery modes (for example, open high school, modified in-school, off-school approach, and so on) and of learning system through increase in volunteer or mobile teachers ▼ Train teachers and school administrators on psychosocial care and counseling
...and reconstruction	▼ Development of typhoon preparedness plans and procedures, prioritizing structures designated as disaster shelters
Long-term priorities for recovery...	▼ Training of teachers, school administrators, students, and parents in disaster preparedness ▼ Replacement of destroyed furniture and equipment.
...and reconstruction	▼ Reconstruction, repair, or retrofitting of damaged public learning facilities • Evaluation of school structures and building envelopes for wind and earthquake resistance, prioritizing schools that are designated as evacuation shelters and upgrading vulnerable facilities if found to be deficient • Development and implementation of an inspection system to improve construction quality ▼ Training of municipal building officials and contractors in resilient construction practices

Source: World Bank staff.

For the above actions, national and local government resources should continue to be supplemented by support from private sector groups, corporate foundations, industry and business, and bilateral and multilateral donors. Aside from classroom construction, these partners can assist with the provision of continuous education during and after typhoon and other disaster situations; extension of psychosocial services and counseling to students and teachers; and provision of a safe and secure learning environment that promotes the protection and well-being of learners.

Reviving the Economy after a Disaster

Experience from other countries suggests two key challenges for businesses reviving economic activity after a disaster are replacing assets and obtaining operating capital. Businesses are often unable to gain access to financing because they lack collateral or have temporarily lost their ability to generate income. Government response usually includes stimulating financial institutions to restructure existing loans and provide additional financing, possibly by providing credit guarantees. Governments can, for example, provide regulatory relief for banks operating in the affected areas, which in the Philippines was done by the Philippine Central Bank (Bangko Sentral ng Pilipinas, or BSP).

Estimates from the Labor Force Survey suggest most of the 4.5 million employed persons in the Visayas are employed informally. Service sector employment dominates, providing jobs to 43 percent of the population and contributing 54 percent to the local GDP. Among workers in industry and the service sector (60 percent of those employed), over 95 percent work for micro or small enterprises. A particular challenge in the affected areas is that only a small portion of businesses had formal access to finance prior to the crisis. To revive the business sector, areas of support may include those below.

Loan restructuring, refinancing, and guarantees. The sufficiency of the existing refinancing mechanisms, especially for supporting rural banks in the affected areas, needs to be assessed. Given the lack of collateral and generally high levels of liquidity in the country's financial system, a guarantee instrument could play a role in stimulating lending in the affected areas by private institutions to ensure financing flows to micro, small, and medium-sized businesses.

Financing through cooperatives and microfinance institutions. Since most micro, small, and medium-sized businesses in the affected areas did not have access to bank financing before Typhoon Haiyan, this is a critical area of support. Availability of refinancing mechanisms for microfinance providers needs to be assessed. Support should be targeted to these businesses, building on the existing programs operating at the local government level. Experience shows a sectoral approach with a focus on supply chains is the most effective.

Addressing Poverty and Social Impacts

Households in the affected areas inhabit rural communities, and their average per capita income is about 10 percent lower than the national average. Income from wages from both agricultural and nonagricultural activities comprises 45 percent of their income; about a quarter comes from entrepreneurial farm and off-farm activities; and about a third comes from other sources, including domestic and foreign remittances. This composition of household income in areas where many already hovered just above the poverty line suggests the destruction of livelihood caused by the typhoon has pushed hundreds of thousands of highly vulnerable households into immediate income poverty. An additional 2.3 million people (nearly half a million households) are now estimated to live below the poverty line, representing an increase in the poverty rate from 41.2 percent to approximately 55.7 percent in the worst affected areas (GoP 2013). For those who have lost houses and/or productive assets, the impact might be long term, and poverty could become deep and chronic. The following are the key potential negative social consequences, as observed in other, similar disaster situations:

- **Worsening of health and nutrition status.** Disasters put food consumption at significant risk and also increase health risks.

- **Disrupted education and loss of human capital.** Some families may decide to remove their children, particularly the older ones, from school. This coping strategy has a long-term negative impact on children's future earning capacity and contributes to the intergenerational transmission of poverty.

- **Shift in livelihood/employment.** Since the majority of affected households are engaged in agricultural activities that can take some time to recover, most look for alternative sources of income. It is important to provide cash and/or training for work programs, skills training, and capital and other business development support services for alternative forms of income-generating activities.

- **Out migration.** The employment opportunities in host urban areas are burdened by out migration, which also creates other social problems, such as increase in informal settlers. Prolonged stays with relatives and friends may put a financial strain on the host households.

- **Increased child labor and other forms of exploitative labor.** The acquiescence of some affected households to exploitative work arrangements, such as child labor or underpaid employment, is not unlikely, particularly among those who have lost the major income earner of the family. If the rest of the family members have neither labor skills nor work experience, they would be forced by circumstances to accept any form of income-generating activities.

- **Increased debt burden.** Many disaster-affected households have no access to lending or credit services. If not provided with public emergency income cash support, compensation for lost assets, cash support for housing reconstruction, and so on, many might be forced to borrow from private money lenders at predatory interest rates, risking the loss of land or other property and ultimately facing destitution. The need to rebuild or repair the house, replace furniture and household goods, and replenish clothing, among other expenses, puts additional pressure on households' resources.

- **Increased risk of violence.** Traumatic experiences and weakened public safety might contribute to an increase in sexual abuse and domestic violence, particularly toward children, women, and other vulnerable groups.

- **Deterioration of mental health.** The capacity of victims to recover their livelihoods and income would also depend on how well they cope with or manage, not just the physical trauma, but the psychosocial trauma of the disaster.

Actions to mitigate or manage these risks can include the following.

Provide emergency income support in cash. Cash support can be offered to mitigate the immediate impoverishing impact of the disaster and bridge the time until households resume farming and other economic activities. Most countries affected by disasters have used this type of program (see Box 4.1). Often delivered as a one-time payment to all affected households, the support normally compensates for a three-month estimated income loss, or some percentage of it, incurred by affected households. Experience shows almost all money is used for food, clothes, house repairs, and debt repayment. The success of the program is greatly enhanced when efforts are made to stabilize the supply of basic goods so that inflated prices (in case of shortages) do not decrease beneficiaries' purchasing power.

Box 4.1 Lessons Learned from Aceh, Indonesia, after 2004 Tsunami

- Start with cash for work to clear debris, and begin shelter reconstruction as a priority.
- Once reconstruction needs have been estimated, determine how many jobs will be created in construction and assess availability of labor in the local market. To meet demand in Aceh, some labor was brought in from other parts of Indonesia; in other cases, people were trained to gain the skills required so the jobs could go to local people. Importing labor will be necessary in some cases, but it does create social jealousy.
- Rebuild community service facilities in the agriculture/fisheries sector.
- Provide grants and compensation for asset replacement.
- Provide access to credit and technical assistance to restore businesses. Governments or NGOs can set up business advisory centers for this purpose.
- Set up training and job counseling and referral for those seeking employment, particularly in construction.
- Different strategies will be needed for urban and rural livelihoods. Donors in particular tend to focus on rural areas, but people in the city should not be forgotten.
- Shift quickly from recovery livelihood programs (cash for work) to restoration of original livelihoods.
- Involving communities in identifying needs and solutions is crucial. The human infrastructure (comprising networks, facilitators, and so on) available for community-driven development can be mobilized for this purpose. Combined with surveys of employers and market analysis, it can be used to prepare a rapid livelihood needs assessment.
- A joint government–donor livelihood recovery working group should be established with a clear lead from the government side and a joint convener from the development community.

Source: World Bank staff.

Suspend conditionality on the conditional cash transfer (CCT) programs in affected areas. Local government bodies, parental leaders, and other stakeholders should monitor the health and education services recovery to ensure conditionality is reactivated as soon as services resume. CCT benefits should be delivered to affected households irrespective of their current residence (some might have temporarily left the disaster area). This provision could be of limited duration (for example, six months).

Develop cash-for-work and public works programs. Many people affected by disaster are neither farmers nor self-employed individuals in need of employment. Cash-for-work programs have been a good option to provide work, albeit temporary, for these people, including clearing debris and building temporary shelters. The global practice is to pay participants an hourly wage that is slightly (5 to 10 percent) below the applicable minimum wage, although the International Labor Organization recommends paying 100 percent of the minimum. As reconstruction picks up, some of the work could be done in the form of public works, which would provide cash for work to disaster-affected unemployed individuals and may also used as an opportunity to train participants in construction-specific jobs, with construction companies involved in reconstruction obliged to employ unskilled workers from the disaster-affected communities. The cash-for-work program can be cross linked with the other cash transfer programs described above. It can be self-selected on a volunteer basis and target certain groups of individuals or households.

Provide grants for productive assets restoration. Grants schemes are used by many disaster-affected countries to compensate for losses and help households restart their livelihood activities as soon as possible. An important precondition for such a program is the availability of assets in the local markets.

Provide long-term support. A longer-term cash income support program for poor or extremely poor households can be sustained for up to one year. Such a program is sometimes conditioned upon at least one household member's taking part in the public works program. Governments should also focus on developing social protection mechanisms and programs that would be triggered automatically in a disaster situation and on improving mechanisms for monitoring and evaluation.

Endnote

1 This chapter benefited from contributions by Christopher C. Ancheta, Jorge Avalos, Melba D. Baltasar, Leonardo Jr. Batugal Paat, Caryn Bredenkamp, Victor Dato, Lynnette Dela Cruz Perez, Marianna Alfa Fernando-Pacua, Carolina V. Figueroa-Geron, Edkarl M. Galing, Amelia Johnston, Victoria Florian S. Lazaro, Paula Maria Leynes Felipe, Maria Loreto Padua, Paul A. Mariano, Eduardo Martinez-Miranda, Phyllis Nadine Mortola, Nataliya Mylenko, Gerardo F. Parco, Aleksandra Posarac, Maria Theresa G. Quinones, Roberto Antonio F. Rosadia, Aileen Theresa Ruiz, Artessa Saldivar-Sali, Ferdinand Sia, Matthew J. K. Stephens, Joop Stoutjesdijk, Karl Kendrick Tiu Chua, Rogier J. E. Van Den Brink, Conrad Antonius Vasquez De Jesus, Rashiel Velarde, Noel Verdote, Catherine G. Vidar, Maya Gabriela Q. Villaluz, Felizardo K. Virtucio, Makiko Watanabe, Yan F. Zhang, and Maribelle S. Zonaga.

Chapter 5

Roads and Bridges: Enabling Operational Continuity of Lifelines for Evacuation and Post-disaster Response

This chapter focuses on maintaining continuity of the operational lifelines during evacuation and post-disaster response. It discusses assessment of the vulnerability of the roads and bridges network and options for strengthening the resilience of road infrastructure through improvements in asset management, as well as in design standards and planning.[1]

Why Focus on Roads and Bridges?

Roads and bridges, which serve as lifelines for evacuation and provide access for post-disaster response, should be sufficiently resilient in design and condition to remain open and operational along key routes and quickly restorable to a passable state along other important routes. Reliable management information on road and bridge assets needs to be immediately available in the event of a disaster and readily usable as a consistent reference during the full cycle from pre-disaster through ultimate reconstruction. As organizational resources (such as staff, facilities, and communications) may be disabled by a disaster, a response plan for damage assessment, restoration, and recovery needs to include prompt, efficient, and accountable deployment of external resources. Key areas of focus include the following:

- **Assigning strategic classification to road and bridge assets.** Classification of assets should be based on the criticality of functions during emergencies and recovery.
- **Enhancing resilience of strategic routes.** The planning and design standards for assets should reflect location-specific natural hazard risks and the assets' strategic classifications.
- **Improving emergency and recovery via multiyear maintenance contracts.** Multiyear contracting arrangements, which include emergency management in addition to maintenance and rehabilitation of roads and bridges on a performance-specified basis, should be developed and tested in hazard-prone areas as a means for improving the efficiency and reliability of emergency response and recovery.
- **Enhancing information management systems.** Information management systems could include spatial geocoding and image data that interface readily with the government's GIS system and data infrastructure. A national geospatial database should extend to cover local assets.

Assessing the Vulnerability of the Network

The Philippines's road network comprises national roads managed by DPWH and local roads supervised by LGUs. The road network is the main means of transporting people and goods in the country. Part of the national roads network, the primary arterial roads connect important centers for the purpose of regional development as well as during emergencies. Totaling about 172,000 kilometers nationally, the local road network comprises *barangay* (village) or farm-to-market roads (69 percent), provincial roads (18 percent), city roads (8 percent), and municipal roads (5 percent). The Haiyan-affected area includes 6,728 kilometers of national primary roads, or 42 percent of the total 16,056 kilometers. The national secondary roads in the affected area comprise 5,583 kilometers (36 percent) of the national total of 15,541 km. The affected area includes 3,357 bridges, or 42 percent of the national total. Local roads in the affected area total about 65,000 kilometers.

Through vulnerability assessments, road sections in high-hazard areas can be identified and upgraded, when feasible, or entirely reconstructed. If funds for retrofitting are not available, preparedness plans should be developed for possible failure of these sections, including alternative routing options. The following are hazards that should be identified for road sections vulnerable to storm surge (induced by typhoons and precipitation), landslides, washouts, flooding, and earthquake-induced soil failures, such as liquefaction, lateral spreading, compaction, and landslides. For earthquakes, the structural integrity of bridges needs to be specifically assessed.

- **Typhoons.** Unless damaged by storm surge or precipitation-induced earth movement or washouts, typhoon impacts to roads are usually limited to debris and downed utility poles and lines. These damages block roads, however, and delay rescue operations by a few days. For Typhoon Haiyan, the government had road and bridge clearing equipment ready by day two, and road clearing commenced on day three, after operators arrived. By day four, 96 percent of the roads were passable. This was a commendable performance for a Category 5–equivalent storm, as compared to a week or more the clearing took for other major storms, such as Hurricane Katrina in the United States in 2005.

- **Earthquakes.** Earthquake impacts on roads (including landslides, other forms of slope failure, and subsidence, liquefaction, rupture, and displacement) can be more severe than those from typhoons and tend to depend on geotechnical conditions. The impacts on bridges are also dependent on structural features and include approach failure, abutment and pier damage, and superstructure damage or collapse. To reduce these risks, an earthquake analysis of vulnerable bridges should be conducted and retrofits implemented for those assets found to be at high risk.

The incidence of damage (that is, the percentage of assets affected) is important, but related statistics indicating the passability and percentage affected of road routes (which may have multiple sections and involve both road and bridge damage) will be valuable, both for planning repair and publicizing access information. Damage costs are compared to asset replacement costs and to annual budget appropriations to provide comparative measures of financial impact.

Estimates of the damage and restoration costs of local roads and bridges are needed, as local transportation infrastructure is likely to represent a higher percentage within the annual road-related budgets of the affected local governments. This has to do with the fact that lighter structures are likely to be more vulnerable to geotechnical and water hazards. Given that asset inventory information is less reliable at the local government level, relevant national government agencies could play a supporting technical role in validating damage estimates against GIS information on the local road network, damage distribution, and appropriate unit costs.

Improving the Resilience of Road Infrastructure through Asset Management

The government of the Philippines could take a number of steps during the recovery and reconstruction process for roads and bridges that reflect good practice. These are discussed below.

Provide reliable asset information management. In the event of a disaster, asset information needs to be available immediately and readily usable as a consistent reference during the full cycle from preparedness through reconstruction. Local organizational resources (including staff, facilities, and communications) may be disabled by a disaster, and a response plan at the agency level for restoration, early recovery, and damage assessment needs to include prompt, efficient, and accountable deployment of both national and external resources.

Incorporate emergency management into contracts. While the Philippine government performed well in implementing recovery operations by rapidly deploying staff, equipment, and fuel supplies from unaffected regions following Typhoon Haiyan, the incorporation of emergency response for road and bridge repairs into multiyear or long-term, performance-based contracts can help countries provide relief and early recovery more efficiently. Successful examples are the multiyear road management contracts found in Australia and New Zealand and the performance-specified road maintenance and rehabilitation contracts (CREMA) used in Latin America.

Relocate utilities or put them underground. The government is requiring that utility poles be located outside the road right of way, as and when budget permits, to avoid creating debris and obstruction in storms, as well as to enhance road safety. In "lifeline" road sections, such as main arterial roads, for which access is critical, the provision of underground ducting for power and telecommunications utilities is good practice in high-risk zones.

Enhance information management systems. In the Philippines, DPWH could progressively enhance its database to include field data collection, with electronic data capture, spatial geocoding and image data linked to the GoP's GIS system and, if applicable, to the geospatial data infrastructure framework.

Improving the Resilience of Road Infrastructure through Design Standards and Planning

Currently, planning and design procedures in the Philippines address resilience indirectly through the standards adopted for design return period of hazards, such as flood level. An explicit treatment of resilience could include the actions summarized below.

Classify strategic assets. Road and bridge assets should be classified strategically based on the criticality of functions for evacuation, delivery of relief supplies, and access in an emergency. An ongoing study led by the GoP has defined categories of "critical" (those assets that need to stay operational), "essential" (those that must be repairable), and "others" (those that must avoid collapse) for national bridges; a similar system could be applied to road routes.

Add geohazard risks and zoning to planning and design processes. Adding hazard risk (for earthquakes, landslides, liquefaction, and other hazards) as a layer of geospatial information available to the planning and design processes can support decisions on realignment of roads or on explicit design measures to reduce the impacts of identified hazards. At the planning stage, the information would guide the budgeting for and the selection and prioritization of projects, and, in the design stage, it would guide preliminary testing and the selection of structural type.

Raise the design standards in terms of the return periods for weather-related natural hazards. An ongoing government review of design standards needs to take into account the impact of climate change in raising the frequency and severity of natural hazards.

Prioritize quality over cost. The use of higher design standards for enhancing resilience may increase construction costs of a new asset by 20 to 40 percent in the critical sections. The added cost, which will depend greatly on the type of treatment selected, may be considered a requisite of the higher strategic resilience standard. An economic evaluation of the added cost should be based on an annualized budget with zero discount rate rather than on the basis of an independent investment.

A summary of the recommendations in this chapter is presented in Table 5.1.

Table 5.1 Recommended Actions for Enhancing the Resilience of Roads and Bridges

Time frame	Recommended actions
Immediate	▼ *Use remote-sensing data to augment damage assessment.* Support government agencies with access and methodology for interpreting damage assessments from satellite and LIDAR images for local government infrastructure (roads, public buildings, other) and housing. ▼ *Promote rapid deployment of electronic image capture for data validation, detailed assessment, and project tracking on as-needed basis.* Equip and train a central government agency team to respond to on-demand requests for support on detailed, limited-area surveys by directing and deploying available local providers using geotagged imaging technology to produce the following: • Geotagged digital photographs • Ground-level geo- and time-tagged video imaging with field commentary (via an existing Android phone application from the Department of Tourism) • Low-altitude aerial imaging with high resolution using unmanned aerial vehicle (UAV) technology. ▼ *Plan for upgrading GIS functionality in national government agencies to support disaster response as well as core functions.* Upgrade functionality of existing GIS in relevant line agencies (such as DPWH), in accordance with guidance issued by the agency in charge of spatial data infrastructure in the country.

Table 5.1 Continued

Time frame	Recommended actions
Short term	▼ *Classify road routes based on their disaster-related strategic importance.* Define and agree with the national government on classification of disaster-related strategic importance of road routes, and apply to national road and provincial road networks nationwide. ▼ *Populate GIS database with available hazard risk information and enable future enhancement.* Import hazard zone information from PHIVOLCS, PAGASA, DOST Project NOAH, and other sources to support design for resilience of national infrastructure (roads, flood control, and drainage) and local government infrastructure (roads and buildings); prepare medium-term action plan for detailed ground assessment and upgrading of hazard information to support design-level parameters. ▼ *Plan for developing electronic data capture (EDC) capability in relevant line agencies (such as DPWH).* Evaluate options and plan for roll-out of appropriate image-based and time-stamped geotagged electronic data collection technology and methodologies to support disaster response and damage assessment, as well as the core business process of asset management and project monitoring. ▼ *Enhance delivery of civil works and participation of private sector in disaster response and recovery.* Prepare contract models for civil works, which include emergency response and recovery operations, with reference to available international good practice, including alliance contracts and long-term, performance-based contracts.
Medium term	▼ *Implement resilience-based approach in planning, design, and construction of public works.* Upgrade and authorize planning criteria, design codes, and construction specifications to address resilience to site-specific hazards and disaster-related strategies for roads, buildings, and flood or drainage assets, and implement the resilience-based approach in the design and construction of civil works and critical public assets and facilities. ▼ *Implement a program to build EDC capability in the relevant line agencies.* Purchase equipment, train personnel, and deploy EDC capability for disaster response and damage assessment, as well as core business processes, in accordance with the roll-out plan. ▼ *Implement contract models that include private sector provision of emergency and recovery works.* On a pilot basis and in accordance with the national government's program delivery policy, implement long-term, performance-based contracts and an alliance-based contract program that includes emergency and recovery works.

Source: World Bank staff.

Endnote

1 This chapter benefited from contributions by William Paterson, Abigail Baca, Christopher Ancheta and Victor Dato.

The devastation caused by typhoon Haiyan left many without shelter and food but not without hope. A small village in Tacloban, Leyte fights through the rubbles and works hand-in-hand in rebuilding their community. Photo: Robert John Cabagnot - Philippines

Chapter 6

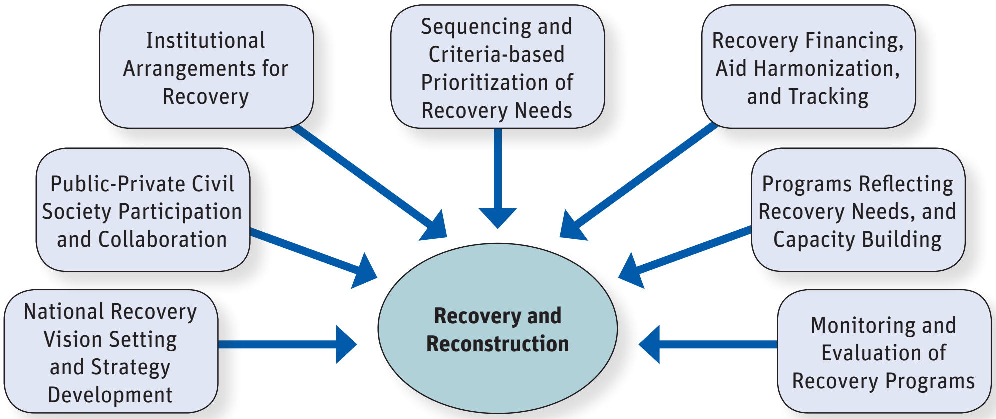
Institutional Structures: Good Practices and Options for Effective Planning for Reconstruction and Recovery

This chapter focuses on three specific considerations: deciding among different models of institutional arrangements; understanding the roles of a recovery and reconstruction agency vis-à-vis a national planning agency; and ensuring overall guidance and oversight. The chapter includes lessons learned from large-scale recovery and reconstruction programs in Indonesia, Pakistan, Turkey, and other countries.[1]

Why Focus on Institutional Arrangements?

A large disaster requires a multifaceted recovery and reconstruction strategy on a scale that many governments have never faced. Disasters the size of Typhoon Haiyan emphasize the importance of having an integrated recovery and reconstruction plan that addresses all key elements of recovery: (1) institutional frameworks; 2) policy and planning; 3) recovery finance; and 4) management and monitoring. Figure 6.1 illustrates the various aspects of a strong and coherent reconstruction plan. Determining the most appropriate institutional arrangements is crucial to the overall success of a recovery program.

Figure 6.1 Aspects of a Coherent Reconstruction Plan



Source: World Bank/GFDRR staff.

In 1941, the Philippines established the Civilian Emergency Administration to formulate and execute policies and plans to protect the population in emergencies. Since then, the institutional and disaster management systems have undergone many changes, most significantly in 2010, with the introduction of the Philippine Disaster Risk Reduction and Management (DRRM) Act. The act marked a shift toward a proactive, comprehensive, and integrated approach to disaster risk management (DRM) that promotes the involvement of all sectors and all stakeholders at all levels, especially the local community.

Overall policy and coordination are provided through the National Disaster Risk Reduction and Management Council (NDRRMC). Its thirty-nine members come from national government agencies, local governments, NGOs, and the private sector, and it is complemented by regional and local councils (see Figure 6.2).[2] NDRRMC is chaired by the Secretary of the Department of National Defense and supported by a Vice Chairperson for Disaster Preparedness (Secretary of the Department of Interior and Local Government), Vice Chairperson for Disaster Response (Secretary of Department of Social Welfare and Development), Vice Chairperson for Disaster Prevention and Mitigation (Secretary of the Department of Science and Technology), and Vice Chairperson for Disaster Rehabilitation and Recovery (Director General of the National Economic Development Authority). Working with communities, local government units (LGUs) are involved in disaster preparedness, prevention, mitigation, and response. Line agencies focus on disaster prevention and recovery for specific sectors. DRRM has seventy-nine provincial offices, as well as over 1,487 city and municipal offices. (Figure 6.3 depicts the Philippines's regions and provinces.)

Options for Implementation Arrangements

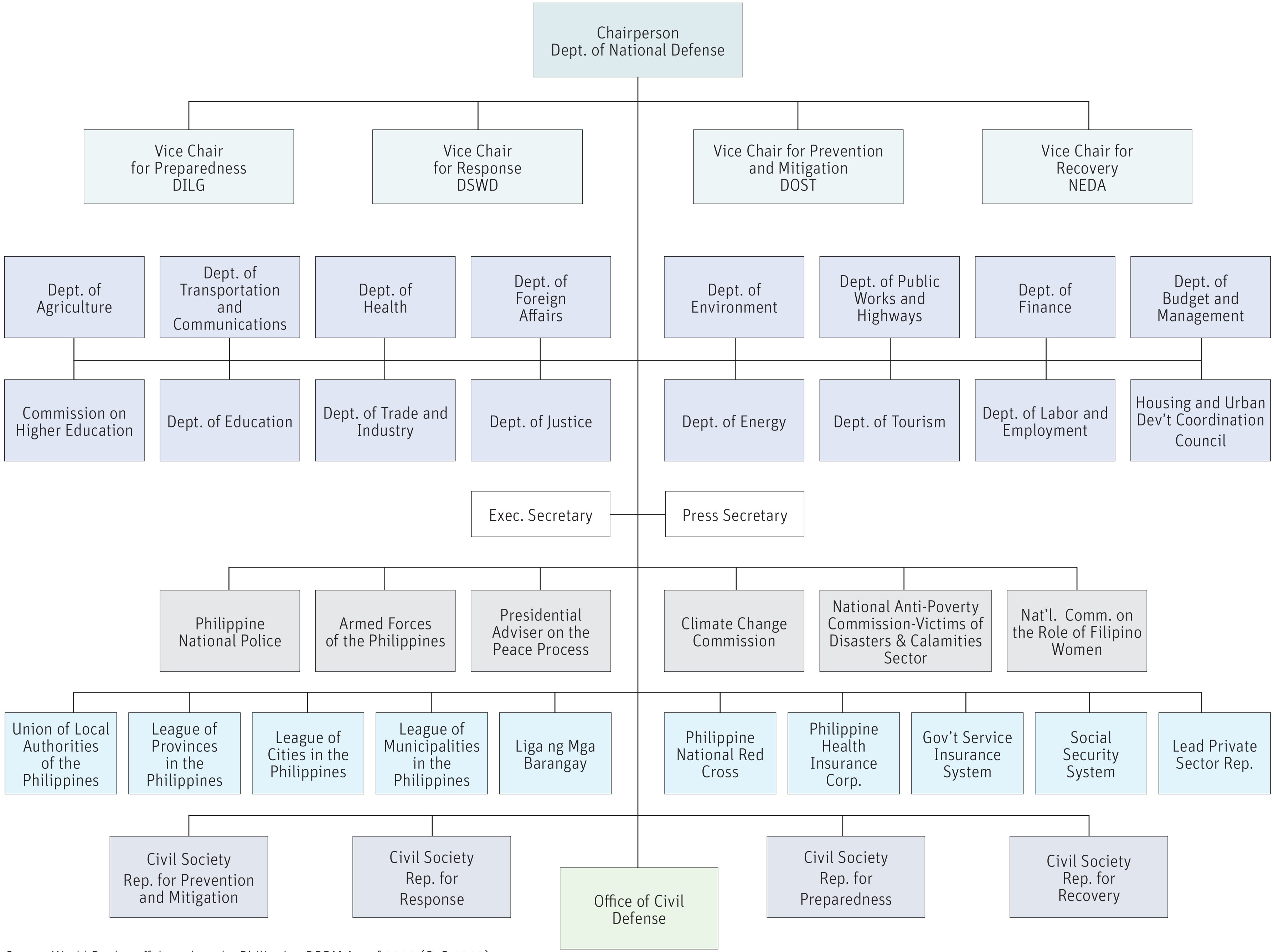
Global post-disaster reconstruction experience suggests a number of options for implementation arrangements, depending on the characteristics of the disaster, current governance structure, and prior experiences and the overarching coordination, monitoring, and control frameworks operating among oversight and line agencies. A summary of the main advantages and disadvantages of the specific options is provided in Table 6.1.

Option 1: Create a new institution for reconstruction and recovery management. A single lead implementation agency envisions, strategizes, plans, implements, and controls the overall multisectoral reconstruction program. The lead agency needs to be equipped with implementation capacity and authority matching the level of assigned responsibilities. In this model, the agency should also have a direct reporting relationship with a high authority in the country. Similar to option 3 below, the agency could be established with a sunset clause, with the institution ceasing to exist upon the achievement of clear, predefined goals. Alternatively—provided the agency proves to be highly effective—its capacity can be retained, but the organization is absorbed and mainstreamed by an authority responsible for overall disaster risk management in the country.

Option 2: Strengthen and coordinate existing line agencies to be the reconstruction leaders, sector by sector. In option 2, individual line agencies work independently to manage recovery in their particular sectors and also supervise and implement projects. Their work usually begins with joint preparation of a master plan, blueprint, or action plan for the recovery, in which their respective roles and activities in support of the reconstruction are identified. Even in this model, the need is strong for a high authority in the country to coordinate and oversee the recovery works.

Option 3: Establish a hybrid arrangement by creating a temporary reconstruction and recovery agency. In this option, a designated agency provides oversight and a single point of coordination

Figure 6.2 Organizational Chart of NDRRMC



Source: World Bank staff, based on the Philippine DRRM Act of 2010 (GoP 2010).

Table 6.1 Advantages and Disadvantages of Different Options for Institutional Arrangements

Options for institutional arrangements	Advantages	Disadvantages
Option 1: Reconstruction and recovery agency model	▼ Accelerates coordination and implementation of recovery ▼ Features can be replicated from existing models of good practice ▼ Draws on resources beyond the civil service pool ▼ Focuses on tasks specific to reconstruction, such as land acquisition and development of reconstruction policy	▼ Potential for rivalry with existing agencies ▼ Can take more time and resources to establish ▼ Requires strong central government for support and authority ▼ Does not strengthen existing government bodies
Option 2: Line agency model	▼ Strengthens existing government structure and capacities ▼ Does not create additional competition for resources and power ▼ Facilitates transition from reconstruction to longer-term development	▼ Line agencies will be drawn away from their routine work ▼ Requires third-party implementation ▼ Will not address reconstruction-specific activities, such as coordination of off-budget funds, continuous communication with stakeholders on reconstruction progress, or upholding of transparency and accountability
Option 3: Hybrid model	▼ Has a light structure and can be dissolved after reconstruction ▼ Provides additional capacity to line agencies whose capacities and resources will be under immense pressure ▼ Provides a single point of responsibility for managing reconstruction. ▼ Can focus on tasks specific to reconstruction, such as land acquisition, development of reconstruction policy, and aid tracking	▼ Light structure may not be sufficient to deal with the enormity of the task. ▼ May lack the political weight necessary to coordinate other line agencies or reconstruction actors

Source: World Bank/GFDRR staff.

for national and international stakeholders, along with additional capacity to implement and expedite delivery of reconstruction deliverables and targets. Option 3, which was used in Indonesia after the 2004 Indian Ocean tsunami and in Pakistan following the 2005 earthquake, is desirable when existing government agencies are unlikely to be able to coordinate and implement rapidly an enormous number of additional projects while sustaining routine public services. The temporary agency could have a sunset clause and cease to exist upon the achievement of clear, predefined targets. Alternatively, in countries with frequent catastrophic events, the temporary agency, with all its recovery and reconstruction experience, could be retained but be absorbed by an authority responsible for overall disaster risk management. Experience shows that hybrid arrangements can perform or facilitate a number of functions important to sustainable recovery, including the following:

- **Ensuring adequate planning and implementation capacities**. While national-level planning and land use agencies may have adequate institutional capacities to develop and implement reconstruction plans and projects to some extent, subnational institutions may not. The government should consider structuring a comprehensive, long-term program to strengthen planning and reconstruction capacities at district- and local-level institutions in affected areas as part of the overall reconstruction plan.

- **Ensuring land supply.** Accurate and timely information is necessary for land parcels to be made quickly and readily available for reconstruction and redevelopment. After the 2004 tsunami in Aceh, Indonesia, land mapping and parcel information gathering was quickly undertaken at the village level with support from the National Land Agency. A major program was also undertaken after the 1999 earthquake in Marmara, Turkey, to update and upgrade cadastral information in affected areas.

- Incorporation of disaster risk management into urban and rural planning. Following the 1999 Marmara earthquake in Turkey, local-level decision makers were targeted by a national training program on urban development processes and risk management through urban planning and building regulation. A special emphasis was placed on the creation of hazard maps and their incorporation into special project zone plans.

- **Land readjustment and urban redevelopment.** After the 1995 Kobe earthquake in Japan, the country's government initiated a top-down, government-led reconstruction planning and implementation process that employed policy instruments to ensure recovery and reconstruction took place in a sustainable, well-planned manner and was delivered within acceptable time frames. Immediately after the disaster, the national government announced a two-month moratorium on reconstruction, which may have enabled more thorough planning and policy development to take place. Hyogo prefecture and Kobe city adopted complementary restoration plans in this period. These recovery programs included land readjustment projects, urban redevelopment projects, and projects for residential areas.

- **Active community engagement.** After the Kobe earthquake, the Japanese government actively engaged affected communities and stakeholders by forming community development councils with significant influence on the outputs and outcomes of the urban community planning process throughout reconstruction. Similarly, community engagement was sought in Tamil Nadu, India, and Aceh, Indonesia.

- **Relaxing of planning standards based on local conditions**. In China, after the 2008 Wenchuan earthquake, the Ministry of Lands and Natural Resources announced major exceptions to policy on land management to streamline and hasten post-disaster land use and town-planning reconstruction.

The Roles of Economic Planning Agencies and Reconstruction Agencies

Another important choice governments face when establishing institutional arrangements is how to distribute the responsibilities of the national planning agency and a reconstruction agency. As highlighted above, having a dedicated recovery agency can greatly advance post-disaster recovery and reconstruction. Since medium-term recovery can offer a chance to align reconstruction priorities with overall national development objectives, however, the involvement of the national planning agency in reconstruction is essential. Table 6.2 summarizes the main advantages and disadvantages of models led by a recovery and reconstruction agency as opposed to a national planning agency. Table 6.3 provides an overview of the various responsibilities of planning and reconstruction agencies across the different stages of reconstruction.

Table 6.2 Advantages and Disadvantages of Models Led by Recovery and Reconstruction Agencies versus National Economic Planning Agencies

	Advantages	Disadvantages
Reconstruction and recovery agency–led model	▼ Mechanisms to implement reconstruction ▼ Mandate to implement reconstruction ▼ Capacity to address the scope and magnitude of work required ▼ Does not have a "business as usual" approach	▼ Lacks complete knowledge of long-term development goals
Economic planning agency–led model	▼ Knowledge of planning objectives ▼ Knowledge of approval procedures for planning initiatives ▼ Coordination mechanisms to assist with reconstruction	▼ Institutional inertia can prevent reconstruction from being done with urgency. ▼ May lack implementation capacity and institutional mechanisms to address reconstruction needs appropriately

Source: World Bank/GFDRR staff.

Table 6.3 Responsibilities of Recovery and Reconstruction and Planning Agencies during Reconstruction

Recovery stage and key outputs		Responsibilities
Recovery vision	Setting an overall recovery vision that balances, and provides optimal tradeoffs between, public sector and private needs to create a common recovery vision that includes the views and needs of communities, government agencies, and the reconstruction agency	**Economic planning agency**: Lead role in coordinating across sectors and aligning recovery vision with long-term development objectives **Reconstruction and recovery agency**: Advisory and facilitation role in coordinating with partners and sharing of good practice
Policy setting	Developing and instituting a central framework for creating a set of policies and guiding principles that outline the main goals of recovery and set forth the broad parameters of the reconstruction effort	**Economic planning agency:** Key role in developing and recommending an enabling policy framework to implement the vision and in revising existing policies or drafting new ones for legislation
Prioritization and financial planning	Conducting criteria-based inter- and intrasectoral prioritization to create a comprehensive prioritization plan to guide sequencing of planned and future recovery programs and projects, both within and across sectors	**Economic planning agency**: Key role in leading intersectoral prioritization, sequencing needs, and securing corresponding financial allocations, and in matching supply and demand, tracking aid, and developing a multiyear recovery financing plan **Reconstruction and recovery agency**: Secondary role in providing impact-proportionate criteria and data on damage and needs for intrasectoral prioritization
Central strategy and results framework	Setting standards and benchmarks through a strategic results framework to guide detailed sector recovery strategies to create a central recovery program and institutional arrangements for central oversight and coordination of monitoring and evaluation, budget planning, resource management, staffing, and strategic initiatives	**Economic planning agency:** Advisory role in ensuring synergies and transition between recovery and regular development agenda **Reconstruction and recovery agency:** Key role in establishing central programmatic framework and institutional arrangements for integrated recovery
Project and program design	Designing and implementing of projects and capacity building to support the design of projects and programs for livelihoods restoration, agricultural recovery, and the reconstruction of houses, hospitals, schools, and other physical and energy infrastructure	**Economic planning agency:** Approving authority role for larger projects that are beyond the threshold of the recovery agency **Reconstruction and recovery agency**: Key role in setting technical standards, any specialized procurement rules, and approval/clearance of line departments' project proposals

Source: World Bank/GFDRR staff.

After the 2005 earthquake, Pakistan's Earthquake Reconstruction and Recovery Agency (ERRA) coordinated reconstruction and incorporated long-term development objectives into the recovery efforts through the appointment of the deputy chairperson of the National Planning Commission to the ERRA council (ERRA's apex body). To ensure reconstruction was consistent with economic planning in the affected areas, the ERRA council also included the ministers of the key line agencies and the prime ministers of the affected areas. The approach proved successful in smoothly implementing reconstruction activities that were aligned with planning objectives. However, it is important to note that success hinged on political backing at the highest levels allowing the ERRA, as a new institution, to mobilize resources.

Pakistan's contrasting experience with the 2010 floods offers an example of the challenges associated with planning agency–led approaches. In this instance, the country's National Planning Commission authored the National Flood Reconstruction Plan. However, the planning commission shared the reconstruction mandate with the National Disaster Management Authority (NDMA), as well as a variety of line agencies, which complicated decision making. The planning commission lacked capacity to appropriately manage the scope and magnitude of the reconstruction efforts and was missing functioning institutional mechanisms to enable rapid procurement and emergency budget approvals, which can prove critical in reconstruction. These two models for recovery planning, implemented in the same country after events that were only five years apart, highlight the importance of having a standing institutional protocol rather than ad hoc arrangements for recovery after every disaster.

Indonesia's successful reconstruction experience following the 2004 tsunami provides a strong example of good practice. The national planning agency (BAPPENAS) was involved in reconstruction planning from the very start and led the country's damage and needs assessment. As reconstruction activities began, the country followed an institutional setup very similar to that used in Pakistan's post-earthquake reconstruction.

Institutional Guidance and Oversight

Because of the speed and quantity of disbursement of funds, the risks to transparency and accountability in recovery and reconstruction programs are especially high. Ways exist to insulate programs from these risks, however, or at least to mitigate the risks significantly. Mechanisms focusing on transparency, accountability, and participation can provide a temporary solution while the government enacts formal mechanisms.

It is advisable to develop a public grievance or complaint-handling mechanism with its own embedded monitoring and evaluation system. Participatory and demand-driven mechanisms to redress grievances are essential to the legitimacy and perceived success of reconstruction programs and are vital tools in ensuring accountability. Monitoring of such mechanisms must include the tracking of complaints and follow-up solutions and should also provide real-time feedback and feed-forward loops.

In addition, the beneficiary community can play a vital role in increasing accountability. A tool that can be used for this purpose is the social audit. After an implementation process is completed, a social audit can be conducted to evaluate its success in achieving medium- and long-term objectives. Ideally, communities should be involved at the planning stages to better assess their needs. However, this can take a lot of time and may cause competition between partners and communities.

A case study analysis of six countries, including Indonesia and Pakistan, found that oversight and coordination were the central functions of all of the reconstruction institutions developed (whether as agencies, centers, or government committees). Central and federal governments had the strongest representation in these institutions, with varying degrees of representation for local government and international donors.

Indonesia's Reconstruction Agency (BRR) has two oversight boards, one advisory and one supervisory, both appointed by the president. The advisory board oversees reconstruction planning and is composed of seventeen ministers and representatives of regional governments, religious institutions, and civil society. The supervisory board oversees implementation and is composed of nine technical advisers and community and donor organization representatives. In Aceh and Nias, the various local and international NGOs provided oversight and coordination of reconstruction by creating community-driven development working groups under the leadership of local and provincial governments.

In Pakistan, reconstruction was led and overseen solely by the federal reconstruction agency, ERRA. There were, however, NGOs and private sector entities acting as implementing partners. Implementation carried out by NGOs was overseen by a program manager who was an employee of ERRA. The divisions of policy planning and approval (the responsibility of the ERRA council) and programmatic planning and implementation (the responsibility of the ERRA board) were replicated at the local levels. At the provincial and state levels, the provincial steering committee was coupled with the Provincial Earthquake Reconstruction and Rehabilitation Authority (PERRA), and the state steering committee was coupled with the State Earthquake Reconstruction and Rehabilitation Authority (SERRA). Similarly, at the district level, reconstruction advisory committees provided work-plan oversight to district reconstruction units with designed programmatic interventions.

Endnotes

1 This chapter benefited from contributions by Jaeeun Chung, Jolanta Kryspin-Watson, Ayaz Parvez, Raja Rehan Arshad, Hamzah Saif, Artessa Saldivar-Sali, Zuzana Stanton-Geddes, and Catherine G. Vidar.

2 For details on the roles and responsibilities of the different levels of councils, see the Philippine DRRM Act of 2010 (GoP 2010).

Figure 6.3 Map of the Philippines with Administrative Regions

Source: The World Bank/IBRD 33466R4.

Students from the newly-repaired Bislig Elementary School, Tanauan City in Leyte province, Philippines on July 13, 2014.
Photo: World Bank

Conclusion

The recommendations offered in this report highlight the need for the Philippines to take into account multiple hazards (earthquakes, volcanic eruptions, and landslides, as well as typhoons) in the recovery and reconstruction process, to bring communities, buildings, and infrastructure to higher multihazard resilience standards. Some of the key messages include the following.

Reconstruction policy and plans should explicitly mandate standards for safe and resilient buildings and infrastructure and for risk-informed land use planning. Recovery and reconstruction plans should take into consideration the need to build resilience to the wide range of natural hazards—geological as well as weather related—to which the Philippines is exposed. Information about hazards and risk should be openly shared in combination with training and capacity building to enable its proper use in risk reduction measures.

Construction quality control, enforcement, and training are essential for rebuilding infrastructure that is resilient. The wind and earthquake provisions mandated by the current National Structural Code of the Philippines (2010) are to ensure the "Life Safety" level of protection for most building structures up to a Category 5–equivalent typhoon and a magnitude 8.0 earthquake. A priority should be to develop and oversee during reconstruction mechanisms for the assurance of construction quality and enforcement of the NSCP. Experience from Turkey (after the 1999 Marmara earthquake) and other countries has shown that, on average, an effective inspection program adds just 1 to 2 percent to overall project costs.

The best housing recovery approach is to identify the desired outcome and give households a choice of means and support that will speed up normal housing processes—not to create new, unfamiliar processes. The GoP is well positioned to support a choice of safe recovery paths, which include the owner-driven self-recovery model as well as the government-driven new construction programs. The government is responsible for ensuring quality, assessing results, and channeling resources. Experience from large-scale disasters around the world, including the 2004 Aceh tsunami and the 2005 Pakistan earthquake, has shown that the in situ household self-recovery and community-driven reconstruction model is highly effective and costs some 40 percent less than contractor-built housing. This model is also faster to implement, has a significant economic multiplier effect, and leads to change in behavior and attitudes and increased resilience, as long as proper training and oversight are provided. Even for low-income families, most housing is acquired through the market in normal times, and the goal of recovery should be to get that market working again. If the housing reconstruction is supported by a variety of agencies and NGOs, these organizations should work in accordance with standards and practices established by the government and report results to the governmental entity responsible for reconstruction monitoring and outcome tracking.

For schools, hospitals, emergency evacuation shelters, and municipal buildings, reconstruction and repair are opportunities to implement cost-effective resilience measures and a strong quality control and enforcement mechanism. Particular attention should be paid to developing strategies for operational continuity of critical infrastructure, such as hospitals and schools designated as emergency shelters, during disasters. Roads and bridges serve as lifelines for evacuation and provide access for post-disaster response, and designs should be sufficiently resilient to ensure key routes remain operational and secondary routes can be quickly restored. Roads and bridges should be assigned strategic classifications based on how critical they are for access.

While full recovery from a disaster of this scale will take years to conclude, the importance of the planning that guides the implementation cannot be overstated. The advisory services documented in this report provided important contributions to the GoP's process of post-Haiyan recovery and reconstruction planning. The collection of international best practices represents a multisectoral approach, both to addressing urgent short-term needs and taking medium- and long-term actions to increase the disaster and climate resilience of the country and its communities.

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