Center for Excellence in Disaster Management & Humanitarian Assistance

ADVANCES IN CIVIL-MILITARY COORDINATION IN CATASTROPHES

How the Philippines Turned Lessons Learned from Super Typhoon Haiyan (Yolanda) Into Best Practices for Disaster Preparedness and Response

About the cover photo: HENANE, Republic of the Philippines (Nov. 16, 2013) Naval Aircrewman (Tactical Helicopter) 2nd Class Jason Rimando, from Torrance, Calif., left, passes water containers to Filipino civilians in support of Operation Damayan. The George Washington Strike Group supports the 3rd Marine Expeditionary Brigade to assist the Philippine government in response to the aftermath of the Super Typhoon Haiyan in the Republic of the Philippines. (U.S. Navy photo by Mass Communication Specialist 3rd Class Paolo Bayas/Released) 131116-N-TE278-755

"*Category 5 typhoon [Ruby/Hagupit] triggered one of the largest peace time evacuations in Philippine history.*"

-Denis McClean, spokesperson for The United Nations Office for Disaster Risk Reduction (UNISDR) on the 1.4 million people who evacuated during Super Typhoon Hagupit

Advances in Civil-Military Coordination in Catastrophes: How the Philippines Turned Lessons Learned from Super Typhoon Haiyan (Yolanda) Into Best Practices for Disaster Preparedness and Response

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Executive Summary

How does a nation respond to crises when contingency plans fail? What predisposes a country for success in overcoming catastrophic events? This study looks at practical ways to improve a nation's ability to manage crises beyond traditional solutions. It draws upon organizational behavior studies to understand how lessons learned are turned into best practices as exemplified in the 2013 and 2014 super typhoon[1] experiences of the Philippines.

Given the constantly changing nature of disaster risks in the context of climate change,[2] strategists have begun looking at a wide range of approaches in managing disasters across various sectors.[3] Vulnerable countries have begun to integrate disaster risk management policies and practices into their overall civilian governance framework to enhance unity of effort at the local, national, and international level[4]. This study emphasizes the importance of structuring collaborative relationships to strengthen Asia-Pacific national and transnational crisis management capabilities.[5]

Three best practices emerging out of the recent Philippine experience are:

> **Best Practice 1: A commonly understood "end-to end warning system" prepares a nation for crises.**

> **Best Practice 2: Bilateral commitment executed multilaterally on the ground through the Multinational Coordination Center (MNCC) promotes optimal civilian use of foreign defense assets.**

> **Best Practice 3: When closely coordinated with the government, the private sector multiplies a nation's surge capacity to meet the life-saving needs of the affected population.**

All three practices resulted in the convergence of concepts, practices and policies across different governmental departments, foreign militaries, and industrial sectors. Rather than establishing new departments, adaptive surge capacities emerged out of synchronizing and mainstreaming existing national and local capabilities in the public and private sectors. The importance of structuring collaborative relationships typically occurs as a collateral benefit of disaster management training. This study suggests that crises management capacities could be significantly enhanced through investments in enduring interagency and multisectoral connections.

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[1] The term "Super Typhoon" is used according to the definition established by the Joint Typhoon Warning Center (JTWC) as well as its prevalent use in the Philippines relative to other countries where it is simply called a "typhoon." The threshold for a "super typhoon" is higher in the JTWC system where winds need to be 130 knots or greater. In the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) system, the government agency responsible for the nation's weather forecasting, flood control, astronomical observations, and time service, the winds need to be only 220 kph which is about 119 knots.

[2] The Philippines, one of the top 10 countries most vulnerable to climate change, acutely suffers from this variability in climatic conditions. Super Typhoon Haiyan occurred very late in the typhoon season. In addition to the timing, the landfall and path of the storms are also changing from the norm. Mindanao, the southern island of the Philippines, typically does not experience extreme weather such as tropical cyclones, but Super Typhoon Bopha (Pablo) hit the island in 2012. It was a super typhoon that formed at the lowest latitude ever to make landfall in the world. Since typhoons typically form at higher latitudes, Mindanao located at the lower latitude, was completely unprepared.

[3] https://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf
[4] Ibid.
[5] http://www.nber.org/chapters/c0036

Rationale and Purpose of the Study

Previous studies looked at general lessons learned from the US Department of Defense's (DOD) major humanitarian assistance and disaster relief (HADR) operations in Asia.[6] Building upon the 2013 RAND study on the United States Government (USG) HADR operations in Burma, Indonesia, Pakistan and Japan,[7] this publication focuses on the recent super typhoon experiences of the Philippines and its civil-military coordination challenges and successes[8].

This article also further expands on the lessons learned and best practices identified in the 2015 USPACOM study published in the Joint Forces Quarterly (JFQ) 80 titled, "One Year Later: An Inside Look into USPACOM Response to Super Typhoon Haiyan (Yolanda)."

While the two earlier publications largely focused on the assisting states, this study looks at coordination from the perspective of the affected state with the intent to encourage the sharing of best practices among national disaster management offices in the Asia-Pacific.

Much work still lies ahead on ways to synchronize civil-military planning processes to advance a common operational planning framework[9]. Contingency plans are particularly effective when the future is sufficiently predictable to facilitate a plan.[10] However, in crisis situations where by definition, they could not be anticipated,[11] plans alone are not sufficient. Coordinated multi-stakeholder framework plays a critical role.[12]

This applied research study offers insights on how to enhance surge capacity for large-scale events from the perspective of civil-military coordination.

Organization and Approach of the Study

To understand the evolution of lessons learned into best practices after Super Typhoon Haiyan in 2013, this study looks at civil-military coordination in the Philippines a year later when faced with Super Typhoon Hagupit. Major findings follow a three-part format:[13]

(1) "What Happened in Super Typhoon Haiyan" provides a qualitative baseline;

(2) "Lessons Learned" describes innovative solutions to improve HADR operations based on the established qualitative baseline during the one year period between the two super typhoons;

(3) "Best Practices in Super Typhoon Hagupit" lays out the current benchmark conceived and/or implemented after Super Typhoon Haiyan which may continue to evolve as improvements are discovered and implemented.[14]

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[6] http://www.rand.org/content/dam/rand/pubs/research_reports/RR100/RR146/RAND_RR146.pdf

[7] http://www.rand.org/content/dam/rand/pubs/research_reports/RR100/RR146/RAND_RR146.pdf

[8] http://www.ndcp.edu.ph/for%20NDCP%20website/DE%20CASTRO_21st%20Century%20Philippine%20Civil-Military%20

[9] Relations%20Why%20Partnership%20Instead%20of%20Subordination.pdf; https://www.questia.com/library/journal/1P3-1189751281/anatomy-of-a-successful-coin-operation-oef-philippines; http://www.tandfonline.com/doi/abs/10.1080/12264431.2011.10805184#.VhPqb8luiEI; http://www.ajol.info/index.php/smsajms/article/view/70504
In the Workshop Report of the "Integrated Civil-Military Regional Response Planning For Large-Scale International Disaster Relief" held in Bangkok, Thailand on 16-17 October 2014, four elements were identified to build a common operational framework in Civil Military coordination: (1) Disaster Preparedness, (2) Disaster Response, (3) Setting Standards, (4) Building a Regional Partnership. https://www.worldhumanitariansummit.org/bitcache/1f7f7352d268e7d18173512d9e28be6a4f2dff10?vid=518319&disposition=inline&op=view

[10] http://www.nber.org/chapters/c0036.pdf

[11] Crises defined by the Philippine National Security Manual 2012 are events that are "impossible to plan for, and anticipate," and where contingency measures are not sufficient to prevent their occurrences. http://www.ndrrmc.gov.ph/attachments/article/41/NDRRM_Plan_2011-2028.pdf

[12] https://www.worldhumanitariansummit.org/bitcache/1f7f7352d268e7d18173512d9e28be6a4f2dff10?vid=518319&disposition=inline&op=view

[13] Case studies within a case study. https://srmo.sagepub.com/view/encyc-of-case-study-research/n357.xml; The case selection for this investigation is interconnected with its case analysis as commonly practiced where random sampling is not a viable approach.

[14] The "best practice" definition is based on quality management systems widely used in the Philippines.

While this study's research approach is exploratory and qualitative, the selection of the authors is purposeful.[14] Contributors consist of decision-makers and responders who could provide a detailed first-hand account of their experiences in the two super typhoons. The data collection follows various methods: archival research, informal discussions, open-ended interviews, and direct first-person unstructured observations.[15]

To maintain consistency and validity of key concepts, this study adopts disaster management terminologies and frameworks from the Philippines. Specifically, the Republic Act 10121 known as the Philippine Disaster Risk Reduction and Management Act of 2010 provides the definition of terms, organizational framework, and general principles employed in this study.[17]

"Pacific Ring of Fire." Historically, an annual average of 20 tropical cyclones enter the Philippine territorial waters and approximately a third make landfall. Consistently rated in the top 10 countries most affected by extreme weather events over the last decade, the Philippines ranked second place in 2012 right behind Haiti.[21]

Two crises preceded Super Typhoon Haiyan. On September 9, 2013, an unanticipated armed conflict between the Philippine government and the Moro National Liberation Front resulted in a 20-day siege of the predominantly Christian Zamboanga City affecting over 118,000 people (64,600 remain displaced).[23] After the Zamboanga crisis, a 7.2 magnitude earthquake hit Bohol on October 15, 2013 displacing over 350,000 people (FIGURE 1).[24]

Introduction

"Category 5 typhoon [Ruby/Hagupit] triggered one of the largest peace time evacuations in Philippine history."

-Denis McClean, spokesperson for The United Nations Office for Disaster Risk Reduction (UNISDR) on the 1.4 million people who evacuated during Super Typhoon Hagupit[19]

The Philippines lies in the typhoon belt within the active volcanic region[20] known as the

FIGURE 1. Zamboanga City[25] and Bohol[26]

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[15] http://blogs.bu.edu/jgerring/files/2013/06/CaseSelection.pdf; Authors of the study provides first-hand accounts on what went wrong and what worked well during the two super typhoons.

[16] http://euroac.ffri.hr/wp-content/uploads/2010/06/Eisenhardt_1989_Building-Theories-from-Case.pdf

[17] http://www.gov.ph/2010/05/27/republic-act-no-10121/

[18] http://www.un.org/apps/news/story.asp?NewsID=49525#.VgBuu8IuiEI

[19] Salazar, Lorraine Carlos (2015). Institute of Asian Studies. Typhoon Yolanda: The Politics of Disaster Response and Management, Volume 2015, pp. 297.

[20] The Philippines currently has 23 active volcanoes.

[21] Joint Typhoon Warning Center. Appendix B: Characteristics of Tropical Cyclones Affecting the Philippine Islands (Shoemaker 1991); Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). (January 2009). "Member Report to the ESCAP/WMO Typhoon Committee, 41st Session"; Pama, Alexander, "Confronting Disasters: Paradigm Shifts," The 13th Jaime V. Ongpin Annual Memorial Lecture on Public Service in Business and Government, Ateneo de Manila University,

[22] November 5, 2014.

[23] http://germanwatch.org/en/download/8551.pdf

[24] http://www.unocha.org/cap/appeals/philippines-revision-zamboanga-action-plan-2014-october-2013-august-2014

[25] http://www.wpro.who.int/philippines/areas/emergencies_disasters/updates/OCHA_Bohol_Earthquake_SitRep_ No3_18Oct2013.pdf?ua=1

[26] http://tourism-philippines.com/zamboanga-city/

https://en.wikipedia.org/wiki/Bohol

On November 9, 2013, Super Typhoon Haiyan slammed into the Philippines. Many scientists considered Super Typhoon Haiyan as one of the most powerful tropical cyclones to make landfall in recorded history.[27] Many well-respected media entities reported the conditions on the ground as "worse than hell."[28] The ferocious typhoon destroyed the region's infrastructure and incapacitated all first responders.

In the final quarter of 2013, nearly all the nation's reserves had been depleted. The rebellion in Zamboanga and the earthquake in Bohol taxed the national HADR apparatus. Super Typhoon Haiyan then followed, destroying a huge swath of the southern region spanning across several islands. These three crises occurring consecutively within a three-month period tested the government's disaster response framework and underscored the limitations of its existing contingency plans.

After one year, another Haiyan-like tropical cyclone[29] named Super Typhoon Hagupit (Ruby) threatened the same region in the Philippines. Super Typhoon Hagupit affected eight (compared to nine in Haiyan) out of the 17 administrative regions of the Philippines. The two super typhoons exhibited comparable size before making landfall (FIGURE 2).

Based on the Dvorak Technique, a satellite-based intensity estimation technique, Super Typhoon Haiyan's maximum sustained wind reached approximately 170 knots (approximately 315 kph or 195 mph)[31] while Super Typhoon Hagupit attained 155 knots (approximately 290 kph or 180 mph).[32] The two super typhoons swept across the same general area (FIGURE 3).

Comparing the absolute numbers of casualties and damage of the two super typhoons, Super Typhoon Haiyan clearly remains the most destructive. It made landfall right at peak intensity, which is exceptionally rare and likely unprecedented for a tropical cyclone in modern
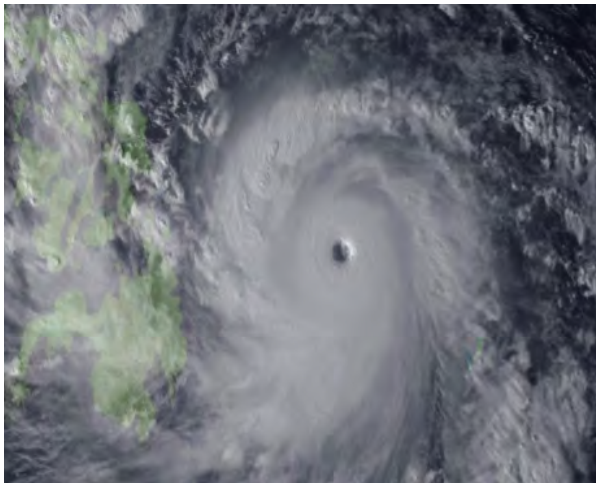
Super Typhoon Haiyan Approaching the Philippines, 2013.
Source: NOAA/ Japan Meteorological Agency
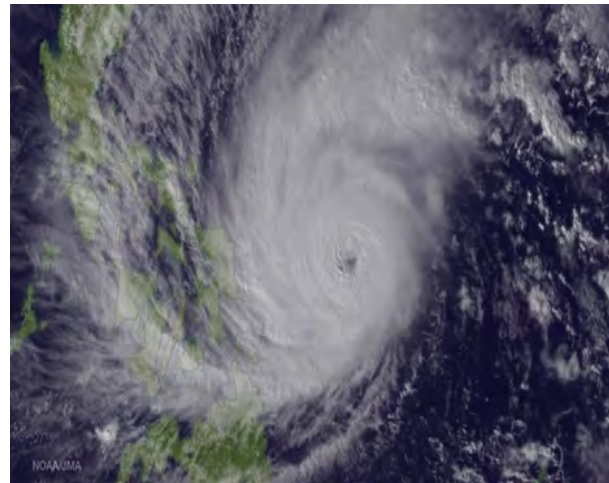
Super Typhoon Hagupit Approaching the Philippines, 2014[30]
Source: NOAA

FIGURE 2. Comparative Images of the Two Super Typhoons Approaching the Philippines

[27] https://www.nasa.gov/content/goddard/haiyan-northwestern-pacific-ocean/; http://blog.noah.dost.gov.ph/2014/06/02/devastating-storm-surges-of-typhoon-yolanda/

[28] http://www.economist.com/news/asia/21589916-one-strongest-storms-ever-recorded-has-devastated-parts-philippines-and-relief; http://www.dailyrecord.co.uk/news/uk-world-news/haiyan-hell-philippines-typhoon-disaster-2718921; http://www.independent.com/news/2013/nov/21/hell-typhoon-haiyan/; http://www.foxnews.com/world/2013/11/19/exodus-from-hell-tacloban-residents-flee-area-ravaged-by-typhoon/; http://www.cnn.com/2013/11/11/world/asia/typhoon-haiyan/

[29] http://newsinfo.inquirer.net/654251/yolanda-like-ruby-heads-for-ph

[30] http://www.dailymail.co.uk/news/article-2863312/600-000-people-flee-Philippine-villages-country-braces-Typhoon-Hagupit-hit.html

[31] http://www.usno.navy.mil/NOOC/nmfc-ph/RSS/jtwc/best_tracks/2013/2013s-bwp/bwp312013.dat

[32] http://www.usno.navy.mil/NOOC/nmfc-ph/RSS/jtwc/best_tracks/2014/2014s-bwp/bwp222014.dat
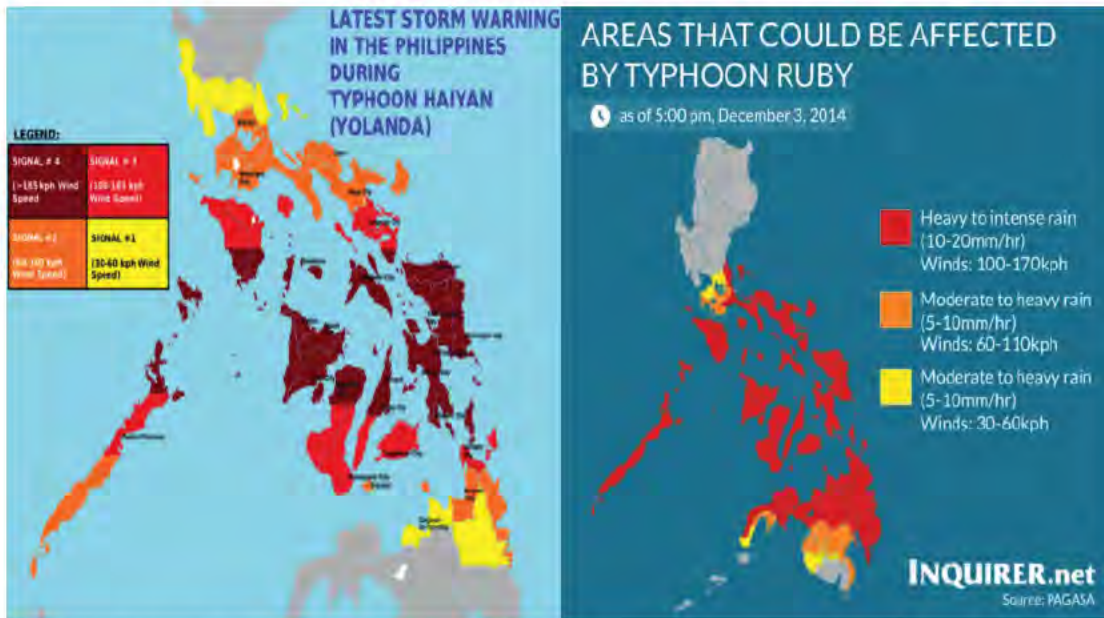
Source: Philippine Public Storm Warning Signals, 2013   Source: Philippine Daily Inquirer, 2014

FIGURE 3. Comparative Images of the Two Super Typhoons Approaching the Philippines

records.[33] Approximately half the houses affected in Super Typhoon Haiyan (45%) were completely destroyed compared to 15% in Super Typhoon Hagupit.

While the number of individuals affected in Super Typhoon Haiyan is roughly four times higher than Super Typhoon Hagupit (approximately 16 million versus 4 million), the number of deaths was not equivalent in magnitude. There were only 18 deaths in Super Typhoon Hagupit compared to 6,300 deaths in Super Typhoon Haiyan which suggests that preventive measures conducted during the one year period between the two super typhoons potentially made an impact (FIGURE 4).

Overview	Super Typhoon Haiyan[34]	Super Typhoon Hagupit[35]
Philippine Area of Responsibility	November 6, 2013 (entered) November 9, 2013 (exited)	December 4, 2014 (entered) December 10, 2014 (exited)
Families Affected	3,424,593	944,249
Individuals Affected	16,078,181	4,149,484
Deaths	6,300	18
Injuries	28,689	916
Total Houses Damaged Completely Damaged Partially Damaged	1,084,762 489,613 595,149	290,670 42,466 248,204

FIGURE 4. Comparative Impacts of Super Typhoon Haiyan versus Super Typhoon Hagupit

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[33] Super Typhoon Haiyan's landfall location led to a strong storm surge in the right-front quadrant of the circulation.
[34] http://www.ndrrmc.gov.ph/attachments/article/1329/Update_on_Effects_Typhoon_YOLANDA_(Haiyan)_17APR2014.pdf; Data gathered as of April 17, 2014.
[35] http://www.ndrrmc.gov.ph/attachments/article/1356/Sitrep_No_27_re_Effects_of_Typhoon_Ruby_as_of_19DEC2014_0600H.pdf; Data gathered as of December 19, 2014.

Findings and Discussion:

> **Best Practice 1: A commonly understood "end-to end warning system" prepares a nation for crises.**

What Happened in Super Typhoon Haiyan:
The term "storm surge" in Super Typhoon Haiyan failed to communicate the severity of impact to the general public. Many considered the storm surge as just another one of the 20 recurring storms of the year. For those that evacuated, some perished in shelters. People did not expect the storm surge-induced water rise to extend two kilometers (1.24 miles) inland.[36] The five-meter storm surge quickly overwhelmed many evacuation sites, killing some residents who evacuated to the shelters.[37] Survivors described the "storm surge" in Super Typhoon Haiyan as "tsunami-like" upon impact.[38]

Lessons Learned: Storm surge warnings alone proved inadequate without taking into account the variability of coastal landscape to accurately estimate the extent of the inundation zone.[39] A shallow continental shelf produces more destructive storm surges because sea water "piles up" more efficiently inland rather than flowing back into the ocean. When coastlines drop off quickly, storm surges dissipate rapidly, but the waves on top of the storm surge can be larger resulting in more wave-induced damages.[40] To understand incoming threats, hazard warnings had to come with analysis of their corresponding impacts on the ground.

The Philippine National Text Blast System established in 2012 used the short messaging system (SMS) for standard hazard warnings from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). Cellular phone numbers of all disaster managers and responders resided in a database that accepts SMS from NDRRMC.[41] However, generic warnings were not enough.

Effective risk communication also required localization of messaging.

The two main lessons learned from Super Typhoon Haiyan consisted of local leaders giving accurate, timely, relevant, and understandable warnings to the public, and secondly, enabling the people to put this knowledge into action.[42] In applying lessons learned from Super Typhoon Haiyan, the President of the Philippines instructed the Department of Science and Technology (DOST), overall lead agency responsible for disaster prevention and mitigation,[43] to deliver information that would inform vulnerable communities how to take appropriate action.[44]

LTC Edwin C. Sadang GSC (SC) PA in action at the OCD Region 8 Coordination Center in Tacloban City, November 15, 2013

After Super Typhoon Haiyan, a series of multisectoral and interagency consultations resulted in the creation of the Pre-Disaster Risk Assessment—Actions, Protocols, and Programs (PDRA-APP), a tool geared towards pre-emptive evacuations that is "Hazard specific, Area focused and Time bound." Undersecretary Alexander P. Pama, Office of Civil Defense Administrator and NDRRMC Executive Director spearheaded the institutionalization of the PDRA on June 11, 2014.[45]

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36 Lagmay, Alfredo Mahar and Kerle, Norman, "Typhoons: Storm-Surge models helped for Hagupit," Nature, March 2015, p. 414.
37 http://policy.aim.edu/
38 http://asiafoundation.org/in-asia/2013/12/18/disaster-response-put-to-the-test-lessons-from-typhoon-yolanda/
39 Ibid.
40 http://www.stormsurge.noaa.gov/overview_formation.html
41 Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.
42 Interview with Prof. Alfredo Mahar Francisco Lagmay, University of the Philippines, June 12, 2015.
43 http://www.ndrrmc.gov.ph/attachments/article/41/NDRRM_Plan_2011-2028.pdf
44 http://www.gov.ph/aquino-administration/disaster-preparedness/
45 http://www.preventionweb.net/files/43379_PHL_NationalHFAprogress_2013-15.pdf

In partnership with PAGASA, the Mines and Geosciences Bureau (MGB), and the Nationwide Operational Assessment of Hazards (NOAH)[46] predicted potential hazard impacts on the populace. Its risk assessments triggered the activation of the 11 response clusters under the Department of Social Welfare and Development (DSWD).[47] It provided guidance on the appropriate level of response actions from the national down to the local level.[48]

Best Practices in Super Typhoon Hagupit: When Typhoon Hagupit threatened the Philippines on December 4, 2014, the PDRA-APP system was already at work. PAGASA issued every six hours to NDRRMC the location, strength, and movement of Super Typhoon Hagupit. Project NOAH provided storm surge models using high-resolution topography of municipalities likely to be hit by storm surges and their corresponding inundation maps.[49]

Combining information from different sources, the NDRRMC issued very specific warnings regarding potential storm impacts on the infrastructure, communication, agriculture and other areas of concerns.[50] Working from the same PDRA-APP report, the response clusters took action in partnership with international agencies based on the newly revised 2014 National Disaster Response Plan.[51] The PDRA-APP served as a baseline for cluster response operations and communications. For the first time, the Philippine government achieved a nationwide consensus on the operating environment.[52]

The operating environment included a shared understanding of various potential scenarios and what needed to be done for each case.[53] Timely and accurate calibration of plans and corresponding courses of action became possible.

The continuous assessment and analysis of the PDRA-APP allowed for all stakeholders to know what to expect particularly in the worst case scenario. National and local leadership maintained clear presence in all phases of the operations that enabled international organizations such as the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) to obtain clear guidance and consensus on the needs assessment, projected scenarios, and corresponding action plans.

Together with the risk analysis and needs assessment, a quick response fund of PHP 4.69 billion pesos (US $272 million dollars) supported a consolidated initiative led by the Department of Interior and Local Government (DILG), the overall agency responsible for preparedness.[54] This programmatic funding mobilized the necessary resources and manpower required to extend immediate assistance in the preparedness and response phases.[55]

Learning from Super Typhoon Haiyan, risk communication with emphasis on visual messaging in the form of accurate scenario-based storm surge inundation maps, facilitated a shared framework on the operating environment.

Government agencies changed the technical term "storm surge" in weather bulletins to include the term "big waves." Easily understandable color-coded advisories warned the people. The media publicized response preparedness measures such as sufficient prepositioned relief supplies,[56] emergency phone numbers, and standardized hashtags approved by the President of the Philippines himself.

In contrast to Super Typhoon Haiyan,

[46] http://noah.dost.gov.ph; The Nationwide Operational Assessment of Hazards (NOAH) project launched in July 2012 in response to Typhoon Washi (Sendong) led by Dr. Mahar Lagmay of the University of the Philippines National Institute of Geological Sciences delivered storm surge modeling and geo-hazard vulnerability maps with regular six-hour updates on typhoon movements.

[47] Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.

[48] NDRRMC Memorandum on the Institutionalization of the Pre-Disaster Risk Assessment, July 14, 2015.

[49] http://www.wsj.com/articles/scientists-use-simulated-maps-to-forecast-typhoon-danger-zones-1417929204; Lagmay, Alfredo

[50] Mahar and Kerle, Norman, "Typhoons: Storm-Surge models helped for Hagupit," p. 414.

[51] http://newsinfo.inquirer.net/654476/hagupit-likely-to-hit-land-critical-areas-identified

[52] http://www.ndrrmc.gov.ph/attachments/article/1334/NDRP_Hydro_Meteorological_Hazards_as_of_2014.pdf

[53] Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.

[54] Ibid.

[55] See http://8list.ph/typhoon-hagupit-philippines/

[56] http://www.unocha.org/top-stories/all-stories/philippines-first-hand-account-typhoon-hagupit%E2%80%99s-wrath

the media acted as a partner rather than a critic in the multisectoral effort towards crisis preparedness in Super Typhoon Hagupit. The Philippine Information Agency (PIA), a member of the NDRRMC council, publicized through radio interviews and television appearances, the pre-emptive measures taken by mayors and governors. In DZMM TeleRadyo (television and radio), various government officials announced on the air all the preparations they assured to put in place in the next 24 hours for Super Typhoon Hagupit. The PIA then invited back the same officials the next day to follow up on their promises.[57]

In holding officials accountable, the NDRRMC also created a group called "Digital Infantry" as part of the Rapid Emergency Telecommunications Team (RETT). RETT served as a rapid deployment team providing Communications, Electronics, and Information System (CEIS) capability services for the response clusters. The Digital Infantry consisted of national government agencies, volunteer groups, and public and private media dedicated to ensure everyone understood the incoming risks in their respective localities.[58] In Super Typhoon Hagupit, the Digital Infantry also took note of public inquiries and concerns for the response clusters to take action.[59]

When Super Typhoon Hagupit exited the Philippine territorial waters, 1.4 million people occupied 3,640 evacuation centers resulting in merely 18 deaths and 916 injured persons despite over 4 million individuals affected.[60] UNISDR described it as the largest peacetime evacuation in Philippine history.[61] While Project NOAH had been operational before Super Typhoon Haiyan,

it was the whole-of-government approach of the PDRA-APP that led to its subsequent successes as shown below (FIGURE 5).

The PDRA-APP inclusive approach to risk monitoring and analysis, needs assessment, and risk communication provided a shared informational platform to achieve consensus on the operating environment.[62] Through the institutionalization of the PDRA-APP, the Office of Civil Defense systematically integrated civil-military collaboration into the overall disaster risk reduction strategy. Undersecretary Pama presented the PDRA-APP process at the UN World Conference on Disaster Risk Reduction in March 2015 in Sendai. The PDRA-APP represented one of the Philippines' best practices in emergency response preparedness using a collaborative multisectoral approach.[63]

Borongan police coordinate emergency response ahead of the typhoon.
Photo and caption: Damien Riquet
Source: https://www.flickr.com/photos/unitednationsdevelopmentprogramme

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[57] Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.

[58] http://digitaleducation.net/drrphilippines/digital-infantry-1600h-23oct2015/; http://humanityroad.org/road-to-manila-pacific-endeavor-2015/; https://www.facebook.com/lou.gepuela/posts/966988050011154?comment_tracking=%7B%22tn%22%3A%22O%22%7D; http://www.rappler.com/move-ph/issues/disasters/109577-typhoon-lando-agos-disaster-volunteer

[59] http://digitaleducation.net/drrphilippines/digital-infantry-1600h-23oct2015/

[60] http://www.ndrrmc.gov.ph/attachments/article/1356/Sitrep_No_27_re_Effects_of_Typhoon_Ruby_as_of_19DEC2014_0600H.pdf; http://download.springer.com/static/pdf/253/art%253A10.1186%252Fs40887-015-0001-y.pdf?originUrl=http%3A%2F%2Flink.springer.com%2Farticle%2F10.1186%2Fs40887-015-0001-y&token2=exp=1444186114~acl=%2Fstatic%2Fpdf%2F253%2Fart%25253A10.1186%25252Fs40887-015-0001y.pdf%3ForiginUrl%3Dhttp%253A%252F%252Flink.springer.com%252Farticle%252F10.1186%252Fs40887-015-0001-y*~hmac=531e344c33ada4002167e74e0361738accfa1723ef7d093e280b9ac9dca4d993; Salazar, Lorraine Carlos (2015). Institute of Asian Studies. Typhoon Yolanda: The Politics of Disaster Response and Management, Volume 2015, pp. 297; http://www.irinnews.org/report/100925/from-haiyan-to-hagupit-what-changed

[61] http://www.un.org/apps/news/story.asp?NewsID=49525#.VgBuu8luiEI; Salazar, Lorraine Carlos (2015). Institute of Asian Studies. Typhoon Yolanda: The Politics of Disaster Response and Management, Volume 2015, pp. 297.

[62] Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.

[63] http://tokyo.philembassy.net/02events/ndrrmc-highlights-pre-disaster-risk-assessment-as-a-means-to-saving-lives-during-pre-evacuation/

DISASTERS AVERTED

FAILED DISASTER MANAGEMENT

FLOOD
LANDSLIDE
STORM SURGE

DISASTERS AVERTED

Project NOAH

FAILED DISASTER MANAGEMENT

Disasters Averted side:

2012 Habagat Flood (9.49 m rise in WL) 0 dead Marikina (pop. 424,150)

2012 Pablo Flood (6-7 m rise in WL) 0 dead CDO (pop. 602,088)

2013 Habagat Flood (8.84 m rise in WL) 0 dead Marikina (pop. 424,150)

2014 Habagat Flood (8.74-m rise in WL) 0 dead Marikina (pop. 424,150)

2014 Ruby Storm Surge 0 dead 1664 houses totally destroyed Brgy. Daram (pop. 41,322)

2014 Agaton Flood 2 dead Butuan (pop. 309,709)

2014 Seniang Flood (7.7-m rise in WL) 1 dead Tagoloan (pop. 63,850)

2015 Ineng Flood (7.8-m rise in WL) Abra River, Ilocos 0 dead Laoag (6.2-m rise in WL) 1 dead

2015 Lando Debris Flows 0 dead Gabaldon (pop. 32,246) Laur 0 dead (pop. 32,205)

Failed Disaster Management side:

1999 Cherry Hills Landslides 60 dead Antipolo

2004 Dingalan Landslides (Debris Flows) 135 dead Dingalan (Debris Flows) 390 dead Infanta

2006 Guinsaugon Landslide 1126 dead 2006 Durian Landslide 1399 dead

2008 Frank Flood 644 dead Iloilo City (pop. 424,619)

2009 Ondoy Flood (10.59 m rise in WL) 465 dead Metro Manila

2009 Pepeng Flood Pangasinan La Union Ilocos Sur Landslide CAR 465 dead

2011 Quiel Flood 97 dead Central Luzon

2011 Pedring Sendong & Flood 1268 dead CDO & Iligan

2012 Pablo Landslide (Debris Flows) 500+ dead New Bataan Compostela Valley

2013 Haiyan Storm Surge 2671 dead Tacloban (pop. 221,174) 1375 dead Tanauan (pop. 50,119) 902 dead Palo (pop. 62,727)

2013 Haiyan Storm Surge 31 dead Estancia (pop. 62,690) 34 dead Carles (pop. 42,666) San Francisco 3 dead (pop. 47,357)

FIGURE 5. Improvements in Philippines Disaster Prevention[64]

[64] Lagmay, Alfredo Mahar Francisco A., (email communication, Oct. 29, 2015).

What Happened in Super Typhoon Haiyan: Characterized as one of the most complex international relief operations in the Asia-Pacific region with 57 contributing countries,[65] the Multinational Coordination Center (MNCC) stood up several days after Super Typhoon Haiyan made landfall to coordinate 29 foreign responding militaries. The AFP quickly realized the lack of personnel trained in operating MNCC particularly in large scale emergencies (FIGURE 6).

The destruction of the communication infrastructure and the prolonged loss of commercial power significantly inhibited coordination across all levels.[67] Consequently, the NDRRMC had difficulties linking up with the AFP particularly with Joint Task Force Yolanda (JTFY). Foreign responding militaries operated relatively independently from different geographic locations.

Nearly all relief efforts were bilateral in nature particularly during the rapid response phase. Civilian and military organizations did not widely share pertinent information such as the immediate conditions of primary and alternate landing zones, conditions of ports and alternate sea landing sites for vessels, and other relevant information.

The Philippine Navy (PN) temporarily set up a "floating government" to allow the local government to regroup and the national civilian agencies to organize for HADR operations. To achieve oversight over the 29 foreign responding vessels, 17 Liaison Officers (LNO) served as critical links between the area commander and the 29 foreign vessels. The LNOs, many graduated from the assisting states naval academies, were selected based on their knowledge and experience of the flag vessel.

Lessons Learned: By many accounts, civil-military coordination in Super Typhoon Haiyan was considered one of the better examples of large-scale disaster response operations. However, recurring challenges in past complex operations also reemerged such as lack of joint planning. The delay in setting up the MNCC also frustrated multilateral action on the ground. Cultural and language barriers posed coordination challenges despite the use of interpreters.

Civil-military coordination largely revolved around logistics such as warehousing, transport, and distribution of relief goods. The lack of a common operating framework and consensus on assessment resulted in duplication of efforts and inhibited optimal civilian use of defense assets. Super Typhoon Haiyan showed the urgent need for the Asia-Pacific region to agree on common standards, procedures, principles and terminologies to facilitate efficient and effective coordination.

Best Practices in Super Typhoon Hagupit: Every foreign disaster response is a bilateral agreement between the assisting state and the affected state. The response in Super Typhoon Haiyan showed that the optimal use of defense assets is best coordinated through the MNCC. Recognizing the need for the MNCC to

Assets Deployed	AFP	Foreign Militaries	Total
Sea Vessels	46	29	75
Aircrafts	46	145	191
Personnel	25,526	15,400	40,92

FIGURE 6. Summary of AFP and Foreign Military Assets Deployed in Response to Super Typhoon Haiyan [66]

[65] Interview with COL Ben Basiao, Defense and Armed Forces of the Philippines Defense Attaché to Thailand, Thailand, June 14, 2015. COL Basiao presented at the World Humanitarian Summit titled "Haiyan to Hagupit: Lessons Learned on Civil-Military Coordination," Singapore, April 13, 2015.

[66] "United Nations Humanitarian Civil-Military Coordination (UN-CMCoord) Multinational Planning Augmentation Team (MPAT) Tempest Express 27 – Staff Planning Workshop" power point presentation, OCHA Regional Office for Asia and Pacific, Manila, Philippines, July 23-31, 2015.

[67] The AFP presentation in the Makani Pahili exercise titled "Typhoon Yolanda (Haiyan): HADR Experience: An AFP Perspective," Hawaii, June 2, 2014.

operate at the strategic and operational levels simultaneously, the MNCC in Camp Aguinaldo became fully operational 48 hours before Super Typhoon Hagupit made landfall.[68]

The MNCC had to operate at the strategic and operational levels simultaneously.

Unlike in Super Typhoon Haiyan, the MNCC in Super Typhoon Hagupit was poised to process and manage potential surges of incoming foreign military assets. Clear and consistent requirements from the civilian response clusters based on the PDRA-APP reports provided consolidated needs assessment.[69] The early preparation and establishment of the MNCC eliminated the time lag that compromised coordination in Super Typhoon Haiyan. The MNCC, nested under a broader national HADR architecture, complemented existing relief mechanisms.

While the Philippine government did not issue an official request for assistance, Australia, Brunei, Canada, China, Indonesia, Japan, Malaysia, Singapore, Thailand, the United Kingdom and the United States offered their support to the Philippines at the height of Super Typhoon Hagupit on December 7, 2014.[70] By that time, the AFP was already on the ground coordinating with national responding agencies. Prepositioning military forces began 120 hours prior to landfall.[71]

The AFP secured the National Food Authority (NFA) warehouses and DSWD food outlets as well as provided water sanitation teams on standby.[72] About 48 hours prior to landfall, the AFP deployed road clearing teams and safety patrol units to prevent looting and crime. It also alerted 476 sealift vessels from different parts of the country to deploy to the affected areas in close coordination with the MNCC.[73] The life-saving role of the navies was maintained in the relief operations.

The concept of a "floating government" in a catastrophic HADR island nation scenario showed the importance of the naval component in assisting air and land components during response operations. In August 2015, the participants of the 9th ASEAN Chiefs of Navy Meeting (ANCM) achieved consensus on the "Standard Operating Procedure for ASEAN Navy Humanitarian Assistance and Disaster Relief Operations" signifying regional commitment on multiple areas of cooperation.

The ASEAN Air Forces, Armies, and Military Medicine Center are all drafting their respective SOPs on HADR. The ASEAN Coordinating Centre for Humanitarian Assistance on disaster management (AHA Centre) is in the process of working together with the ASEAN Defence Senior Officials Meeting (ADSOM) to review the Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations (SASOP) Chapter 6 on the "Facilitation and Utilization of Military Assets and Capabilities." The content of Chapter 6 includes the MNCC SOP that is currently under review by the ADSOM Experts' Working Group (EWG) on HADR.

The strong commitment of regional ASEAN entities to assist in the rapid response phase of Super Typhoon Hagupit demonstrated a dedication to making the Agreement on Disaster Management and Emergency Relief (ADMER) a reality. Before Super Typhoon Hagupit made landfall, the AHA Centre deployed a four person ASEAN Emergency Response and Assessment Team (ASEAN-ERAT), provided two additional staff members to conduct coordination and information management, and maintained 1 local ASEAN ERAT team member on standby in a nearby province.[74] In coordination with the AHA Centre, 4 Singapore Civil Defence Force (SCDF) officers and its Swift Emergency Evaluation Deployment (SEED) team also deployed to conduct a needs assessment.[75]

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[68] Interview with Brigadier General Rodolfo Santiago, AFP CGSC, Camp Aguinaldo, June 3, 2015; Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.

[69] Interview with LTC Edwin Sadang and UNOCHA response advisor Agnes Palacio, OCD, October 20, 2015.

[70] http://reliefweb.int/sites/reliefweb.int/files/resources/OCHAPhilippinesTyphoonHagupitSituationReportNo.2.7December2014.pdf

[71] http://www.gov.ph/2014/12/04/updates-from-afp-preparation-for-potential-landfall-of-typhoon-ruby/

[72] http://www.gov.ph/2014/12/06/updates-from-afp-actions-taken-december-6-2014/

[73] Ibid.

[74] http://ahacentre.org/download-file/sr-gXYxUoB9w8eFMQwh.pdf

[75] http://dr.ntu.edu.sg/bitstream/handle/10220/38581/CO14244.pdf?sequence=1

Based on their Super Haiyan experience, several International Non-Governmental Organizations (INGOs) under the ASEAN Agreement on Disaster Management and Emergency Response Partnership Group (APG) prepositioned food, medical supplies, emergency shelters, hygiene kits, water kits, psychosocial support and other assistance in anticipation of the immediate post-disaster life-saving needs.[76] While the diversity of the Asia-Pacific region continues to test the "One ASEAN, One Response"[77] vision, there is clear intent towards a shared response framework in the region.

> **Best Practice 3: When closely coordinated with the government, the private sector multiplies a nation's surge capacity to meet the life-saving needs of the affected population.**

What Happened in Super Typhoon Haiyan: According to humanitarians, the private sector's assistance during Super Typhoon Haiyan allowed for a "quicker, bigger, and more effective" humanitarian response.[78] Much of the private sector's efforts before Super Typhoon Haiyan were intermittent, sporadic, and largely reactive to the onslaught of natural disasters. During Super Typhoon Haiyan, pockets of coordination occurred without a unified business-led platform. When the crisis passed, the business sector reorganized, intensified its efforts across the entire disaster management cycle, and established enduring efforts towards preparedness.

Lesson's Learned: The Philippines loses 2.5 percent of its Gross Domestic Product (GDP) per year (around PHP 300B or US $6.5M annually) to natural disasters and calamities.[79] For 2016,

projected losses constitute a tenth of the national budget.[80] Although the direct and indirect financial impact of Super Typhoon Haiyan needs further analysis, some economists and international aid agencies cite $14 billion[81] total losses in a country where the minimum wage ranges from $5-10 per day.[82]

The Philippine experience is not unique. The world suffered over US$1.15 trillion in annual economic losses due to natural disasters in the last 45 years starting with $5 billion in the 1970s exponentially rising to $75 billion in the last few years.[83] Economic losses in the Asia-Pacific were particularly acute, escalating almost 15 times since the 1970s, while the region's GDP only grew 5 times.[84] Many businesses quickly realized that continuing to operate in an environment increasingly susceptible to the constantly changing nature of disaster risks[85] would adversely impact their employees, partners and suppliers, and eventually profitability and survival.

Many recent studies in disaster management suggest that government partnership with the private sector promotes general resiliency.[86] While documented lessons learned on the impact of disaster response in livelihood recovery remain scarce, these topics increasingly appear at the forefront of contemporary research as economic losses continue to increase exponentially.[87]

Best Practices in Super Typhoon Hagupit: Recognizing the need to augment the government's response capabilities, private sector-led organizations, as demonstrated by the Philippine Disaster Resilience Foundation

[76] http://ahacentre.org/download-file/sr-gONz9ObNCQJhZmSn.pdf

[77] http://www.asean.org/news/asean-secretariat-news/item/asean-strengthens-its-collective-response-in-disasters

[78] http://www.odihpn.org/humanitarian-exchange-magazine/issue-63/the-private-sector-stepping-up

[79] http://www.philstar.com/headlines/2015/10/05/1507232/philippines-losing-p300-b-disasters-yearly

[80] Ibid.

[81] http://www.ibtimes.com/typhoon-haiyan-financial-economic-impact-devastation-cost-14-billion-markets-remain-largely-1463994

[82] http://www.nwpc.dole.gov.ph/pages/statistics/stat_comparative.html

[83] http://www.unescap.org/sites/default/files/Technical%20paper-Overview%20of%20natural%20hazards%20and%20their%20impacts_final.pdf

[84] Ibid.

[85] https://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf

[86] http://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1231&context=jss; http://www.emeraldinsight.com/doi/abs/10.1108/09600030910973724; http://www.sciencedirect.com/science/article/pii/S1747789107000555; http://ascelibrary.org/doi/abs/10.1061/(ASCE)1527-6988(2000)1:2(83)

[87] http://www.emeraldinsight.com/doi/full/10.1108/09653560810887329

(PDRF),[88] began putting mechanisms in place for a disaster operations center aimed at coordinating and collaborating disaster risk management initiatives of businesses across all industrial sectors (FIGURE 7).[89]

As currently planned, the private sector-led operations center would be a permanent facility with full stand-alone capabilities operating 365 days a year and 24/7 in times of disaster. In normal times, the center would function as a training facility conducting joint planning and exercises.[90] Located with easy access to road networks, seaports, airports, and warehouses, a dedicated operations team would work fulltime to promote disaster preparedness among business members and partners (FIGURE 8).

While much work has been done on how the public sector responds to disasters, a private sector-led disaster response is much less understood. The humanitarian community is just beginning to leverage the innate capability of the private sector to scale up and scale down business assets for disaster relief. In the parlance of PDRF President Rene "Butch" Meily, the Philippines is just beginning to "unleash the power of its private sector" particularly in redefining corporate social responsibility.

In disaster management, businesses seek to restore normalcy in affected areas as soon as possible and provide employment. The cost of business disruptions due to disasters includes the loss of consumer confidence. Business continuity provides a competitive advantage and protects market share. In working closely with the public sector, businesses continuously balance the need to demonstrate to their communities, their employees, and their shareholders that "doing good is good for business."

A monthly multisectoral meeting among national and international key stakeholders such as government agencies, UNOCHA, and private sector-led organizations such as the PDRF, address coordination issues and policy discussions in an inclusive approach towards disaster management. Some 1,289 organizations, many under the PDRF umbrella, recently completed Haiyan-related projects worth P28 billion pesos ($603 million).[91]

In setting up a transparent foundation tightly linked with the government and the humanitarian sector, businesses ensured that they are not perceived as exploiting human tragedy for business purposes. Some businesses located in countries vulnerable to natural hazards such as Australia, Japan, Bangladesh, Sri Lanka and Vietnam considered adapting the Philippine private sector model of integrating preparedness, response, and rehabilitation initiatives under one business-led platform.[92]

The dual use of business assets provides a latent capability for a nation to surge and augment disaster relief capabilities without significant capital outlay.

The emergence of the private sector in close partnership with organizations across a wide range of industries including the public and humanitarian sector[93] could potentially decrease the need for foreign humanitarian assistance and redefine the types of capabilities and training needed in future relief operations.

Tacloba elementary school students hold up a sign saying "Thank you PDRF"

[88] The Philippine Disaster Resilience Foundation (PDRF) is emerging as the access point for businesses interested in disaster management in the Philippines. It has engaged with over 80 businesses implementing over 22 programmes to include educational programs benefiting 35,300 students in 614 schools and shelter program with 540 transitional and permanent housing facilities provided to disaster victims.http://csr-asia.com/report/prudence_csrasia2015_web.pdf

[89] http://csr-asia.com/report/prudence_csrasia2015_web.pdf

[90] http://blog.worldhumanitariansummit.org/entries/private-sector-in-drr/

[91] Meily, Rene "Butch" (email communication, Oct. 8, 2015).

[92] http://business.inquirer.net/165194/for-yolanda-and-future-calamities-the-private-sector-stands-ready

[93] http://www.philstar.com/metro/2015/07/11/1475585/mmda-signs-deal-private-sector-disaster-preparedness; http://www.rappler.com/move-ph/issues/disasters/101032-rappler-moveph-pdrf-partnership-disaster; http://www.philstar.com/headlines/2015/05/08/1452423/australian-disaster-recovery-expert-draws-lessons-yolanda

FIGURE 7. Key Features of Private Sector-Led Disaster Operations Center

FIGURE 8. Proposed Site for Private Sector-Led Disaster Operations Center

Conclusion

All disasters generally have unique attributes, but they typically generate the same types of sociocultural, economic, and psychosocial vulnerabilities. Within a year of the calamitous Super Typhoon Haiyan, the Philippine emerged from its catastrophic experience to achieve the largest peacetime evacuation in its history.[94]

Significant improvements in emergency response preparedness occurred through synchronizing existing national capabilities to create new surge capacities. Loosely coupled governmental units transformed into an integrated network of mutually enforcing crisis preparedness and response systems.

Enhancing internal and external coordination mechanisms through consensus on the operating environment enhanced adaptive surge capacities.

This study shows that advances in civil-military coordination occur when (1) consensus in the operating environment pave the way for unity of effort; (2) systemic changes through an inclusive multisectoral approach streamline disparate efforts on emergency response preparedness; (3) a convergence in concepts, frameworks, protocols, and procedures maintains clear distinction of responsibilities and national sovereignty; and (4) institutionalized internal and external partnerships augment a country's latent ability to surge.

With its exposure to a wide range of hazards coupled with transnational experience in large-scale emergency operations, the Philippines would likely continue to produce and contribute to innovative approaches in disaster management in the years to come. This comparative study highlights their successful and enduring practices as the intent towards regional self-sufficiency becomes the norm in the Asia-Pacific region.

Mayor Romualdez of Tacloban with an emergency responder in a communication center working through Typhoon Hagupit (Ruby). Improved technology and disaster communication training supported through UNDP's projects in the Philippines helped local authorities obtain information rapidly and coordinate on a response during emergencies.
Photo and caption: Hari Krishna Nibanupudi for UNDP
Source: : https://www.flickr.com/photos/ unitednationsdevelopmentprogramme

Officials and UNDP staff preparing for typhoon Hagupit (Ruby) at a typhoon coordination meeting in Guiuan, one of the three local government units in Eastern Samar (Guiuan, Salcedo, Mercedes) involved in organizing during emergencies to support other local entities such as the police, first responders, health officials, etc. UNDP has been supporting in the gathering of data which is used by the operation centers to provide situational reporting format for use in the preparation of local agencies' responses. UNDP has also been working closely with the centers on SMS updates and hourly situational updates to coordinate local groups and officials involved in planning and response.
Photo and caption: UNDP Philippines
Source: : https://www.flickr.com/photos/ unitednationsdevelopmentprogramme

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[94] http://www.un.org/apps/news/story.asp?NewsID=49525#.VgBuu8luiEl

Abbreviations and Acronyms

ADMER	Agreement on Disaster Management and Emergency Relief
ADSOM	ASEAN Defence Senior Officials Meeting
AFP	Armed Forces of the Philippines
AHA	ASEAN Coordinating Centre for Humanitarian Assistance
ANCM	ASEAN Chiefs of Navy Meeting
APG	ASEAN Agreement on Disaster Management and Emergency Response Partnership Group
ASEAN	Association of Southeast Asian Nations
ASEAN-ERAT	ASEAN Emergency Response and Assessment Team
CEIS	Communications, Electronics, and Information System
DAP	Development Academy of the Philippines
DILG	Philippine Department of Interior and Local Government
DMHA	Disaster Management and Humanitarian Assistance
DOD	U.S. Department of Defense
DOST	Philippine Department of Science and Technology
DSWD	Philippine Department of Social Welfare and Development
EWG	ADSOM Experts' Working Group
GDP	Gross Domestic Product
HADR	Humanitarian Assistance and Disaster Relief
INGO	International Non-Governmental Organizations
JFQ	Joint Forces Quarterly

JTFY	Philippine Joint TaszForce Yolanda
JTWC	Joint Typhoon Warning Center
LGU	local government units
LNO	Liaison Officers
MGB	Philippine Mines and Geosciences Bureau
MNCC	Multinational Coordination Center
NDRRMC	Philippine National Disaster Risk Reduction and Management Council
NFA	Philippine National Food Authority
NOAA	U.S. National Oceanic and Atmospheric Administration
NOAH	Philippine Nationwide Operational Assessment of Hazards
OCD	Office of Civil Defense
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PDRA-APP	Pre-Disaster Risk Assessment—Actions, Protocols, and Programs
PDRF	Philippine Disaster Resilience Foundation
PIA	Philippine Information Agency
PN	Philippine Navy
RETT	Rapid Emergency Telecommunications Team
SASOP	Standard Operating Procedure for Regional Standby Arrangements and Coordination of Joint Disaster Relief and Emergency Response Operations
SCDF	Singapore Civil Defence Force

SEED	Swift Emergency Evaluation Deployment
SMS	Short Messaging System
SOP	Standard Operating Procedure
TF	Task Force
UN	United Nations
UNISDR	United Nations Office for Disaster Risk Reduction
USG	United States Government
USPACOM	United States Pacific Command

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