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Relief Operations among Selected Typhoon Disasters in the Philippines: A Workplan for Disaster Relief Management

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Abstract
The National Disaster Risk Reduction and Management Plan (NDRRMP) of the Philippines has been made to fulfill the requirements of RA No. 10121, also known as the Philippine Disaster Risk Reduction and Management Act, of 2010. This provided the legal basis for policies, plans, and programs to deal with all kinds of disasters that will hit the country. There are four (4) thematic areas of the plan, namely, (1) Disaster Prevention and Mitigation; (2) Disaster Preparedness; (3) Disaster Response; and (4) Disaster Rehabilitation and Recovery. Additionally, the agency conveys a vision of a country that is "safer, adaptive and disaster-resilient Filipino communities toward sustainable development." Its long-term goal is to set all Filipinos, men, and women, raise awareness and understanding of DRRM to increase people's reliance and decrease their vulnerabilities. Under Section 3 of Republic Act 10121, the key priority area that this review focuses on is disaster response. Disaster response is defined as "the provision of emergency services and public assistance during or immediately after a disaster to save lives, reduce health impacts, ensure public safety, and meet the basic subsistence needs of the people affected." However, the aftermaths of disasters have been reported to encounter several problems. The efficiency of disaster relief operations depends upon the intensity and quality of the preparation even before a disaster occurs. Therefore, a well-prepared disaster response plan will likely save more lives and make efficient use of the available resources. Thus, this paper reviewed the relief operations of three disastrous typhoons in the Philippines to improve the operations of relief. At the end of this paper, a suggestive work plan has been made to smoothly run relief operations that can be considered to improve food procurement, communication, inclusivity, quality and quantity of relief supplies, coordination and collaboration, and timeliness.
Keywords: Typhoon, Disaster, Disaster Risk Reduction and Management, Relief Operations
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1. Introduction

1.1 Philippine Typhoon Disasters

In the world, the Philippines ranked 17th as the most affected country by extreme weather events according to the Global Climate Risk Index (CRI) (CPBRD, 2021). Every year, the country experiences almost all forms of disasters, including typhoons. Also, in the report of the Congressional Policy and Budget Research Department (CPBRD) last February 2021, the country had a 9.5 risk index point for tropical cyclones. According to PAGASA, the country experiences an average of twenty (20) typhoons per year. It is noteworthy that typhoon disasters are an ever-present threat and are occurring at an increasing rate. Moreover, the country is also considered one of the most vulnerable in terms of the impacts of climate change. Our country experienced several typhoon disasters such as Typhoon Reming (Durian) in November 2006, Tropical Storm Sendong (Washi) in December 2011, and Typhoon Yolanda (Haiyan) in November 2013 (Figure 1). These disasters have tragic social, economic, and human costs which caused a great number of deaths and loss of properties worth billions. Despite the widespread poverty, the Philippines ranked 107th in the Human Development Index, which is four (4) places up with a score of 0.718 (UNDP, 2021), compared to other Southeast Asian countries. In the 3rd quarter of 2021, the Philippine Gross Domestic Product (GDP) posted a growth of 7.1 percent despite the challenges of the ongoing COVID-19 pandemic.

The distant regions of the archipelago placed the local level at the forefront of natural disaster risk management and climate change adaptation. Thus, Local Government Units (LGUs) were given a role to anticipate and respond effectively to these disastrous events. However, their capacities remain limited by many humanitarian and political issues. An oft-cited issue in Philippine disaster management is the lack of capacity of line agencies and LGUs to assume DRRM activities. Generally, these reasons include limited manpower, lack of technical knowledge and understanding, limited financial resources, and lack of technology such as multi-hazard early warning systems. Generally, effective response to disasters such as typhoons requires decentralized decision-making and collaboration among government agencies from the national to the local level (Schneider, 1992). The Republic Act 10121 mandated the adoption of proactive measures to lessen various impacts of disasters (Ani et

al., 2015). Moreover, this law also believes in the effectiveness of cluster approach strategies among government agencies in managing disasters (Jovita et al., 2018). To enhance coordination and collaboration among various government units, the Disaster Risk Reduction Councils were established at the national and local levels. Disaster management significantly determines the country's vulnerability, risk, and resilience level when it comes to disasters such as typhoons.

To achieve a successful preparedness for disaster, there is a need to estimate the needs of the victims. During and after a disaster, adequate and prompt assessment of damage and needs are essential for effective disaster response. As prescribed by the DRRM, disaster response includes a timeframe of 24 to 48 hours for Damage Assessment and Needs Analysis (DANA) to qualify as "rapid." According to Wisetjindawat et al (2014), the factors that can complicate humanitarian logistics include 1) numerous disparate actors, 2) distinct phases of relief efforts, and 3) particular resource requirements (including materials, goods, and people). It was advised that these factors should be taken into account in the overall planning of relief operations to make them smarter, faster, more reliable, and no more expensive than necessary.

This review aims to evaluate the relief operations of the LGUs during the three (3) events of disastrous typhoons, namely, Typhoons Reming (Durian), Yolanda (Haiyan), and Tropical Storm Sendong (Washi). These three (3) disasters were specially selected based on the significant number of lives that were lost and the damages to properties that these have caused. There is a need to go back and evaluate the relief operations of these three (3) disastrous typhoons to improve the operations of relief as some identified activities are still not coherently done. Specifically, this paper describes the procedures done in the distribution of basic needs such as food, water, and medicines after the onset of a typhoon disaster. Factors that cause a delay in the delivery of goods were identified. Also, the procedures as best practices were identified in the activities to serve as benchmarks that can be replicated by other LGUs. Based on the gathered data, this review designed an efficient work plan to improve and enhance the relief management of the disaster response of DRRM. Furthermore, this data is useful for making plans and decisions for the Philippine LGUs and other countries that are also prone to typhoons.

1.2 Weaknesses of the Current Response in the Provision of Relief Supplies

In a report of Government (G)-Watch (a multi-sectoral campaign of Ateneo University School of Governance), which was also found to be consistent with OCHA's findings, one of the identified problems is the susceptibility of disaster relief distributions to corruption (DSWD AO 08 Series of 2006). This challenge was addressed by establishing a partnership between DSWD and the Inter-Faith Groups formalized through MOA on July 26, 2005. The Inter-Faith Groups were composed by the Catholic Bishops Conference of the Philippines (CBCP), the National Council of Churches in the Philippines (NCCP), and the Philippine Relief and Development Services (PHILRADS). Such partnership is aimed at ensuring the smooth implementation of proper monitoring during relief distributions at the local level. Furthermore, Gomez and Ignacio (2020) also identified a problem with the adequacy of food packs distributed by the barangay and municipal subunits of the government of Albay. The food packs were insufficient to meet the daily caloric and micronutrient needs of the general population who relied on the food aids.

Like the Philippines, other developed countries also experience issues in the relief operations of disasters. During Katrina's landfall in the United States, poor disaster response was attributed to a lack of central command and leadership, lack of collaboration and coordination, inefficient budget expenditure system, and poor logistics planning including the planning of transportation and distribution operations (Farahani et al., 2011). These challenges were addressed by the use of a more flexible and transparent logistics system, more involvement of NGOs, volunteers, and private sectors in various relief operations, the use of more reliable communication technologies for enhancing collaboration and coordination, and the use of modern technologies such as GIS and real-time tracking for better and more equitable distribution of disaster relief items. After doing several disaster responses, DSWD recognizes the specific aspects that need improvement to enhance the agency's operation (DSWD AO 03 Series of 2015). These areas include improved logistics and supply chain management (procurement, warehousing, transportation, and communication) to make sure that the goods can reach far-flung areas, insufficiently trained staff as reserve manpower to meet the surges in demand, unclear delineation of responsibilities, and robust communication lines, weak coordination and collaboration between partner agencies, local government, and interagency bodies, and need for locally appropriate service standards for disaster response comparable to international benchmarks.

2. Methodology

2.1 Study Area

The Philippines is one of the world's largest archipelagos with a diverse culture. The country is in Southeast Asia in the Western Pacific Ocean. The archipelago consists of three (3) main islands – Luzon, Visayas, and Mindanao (Figure 1). With its topography, the Philippines is rich in biodiversity due to its mountainous terrains, coastal areas, dense tropical forests, and plains.

The Philippines is also located in the Pacific Ring of Fire which makes the country vulnerable to typhoons, earthquakes, cyclones, and volcanic hazards. However, the Philippine economy has been described as resilient, despite the frequent passing of typhoons, where food and fuel crises our GDP continues to grow and shape the country's greater capacity to develop on its own.

Figure 1. Political Map of the Philippines

2.2 Events of the Selected Typhoons which Happened in the Philippines

2.1.1 Typhoon Yolanda

Yolanda (with an international code name "Haiyan") was considered one of the strongest and most disastrous tropical typhoons with its maximum sustained winds of 195 kph near the center and gustiness of 230 kph when it entered the Philippine Area of Responsibility (PAR). It made its first landfall on November 8, 2013, at 4:40 AM over Guiuan, Eastern Samar, and then moved to Tolosa, Leyte for its second landfall. By 10:40 in the morning, it made its third landfall over Bantayan Island, Cebu, and ravaged Concepcion, Iloilo. The typhoon made its last landfall at 8:00 PM over Busuanga, Palawan (NDRRMC, 2013). In just a matter of fewer than twenty-four (24) hours, the typhoon caused huge devastation leaving many casualties and great economic loss. The total damages of the typhoon are estimated to be US$435 million for infrastructures and US$440 million for agriculture. It affected a population of around 16 million across the 44 provinces in Regions 4A, 4B, 5,6,7,8,10,11, and CARAGA (McPherson et al., 2015). Among the casualties, 6,293 individuals were reported dead, 28,689 were injured, and 1,061 were missing.

2.1.2 Typhoon Reming

Super-typhoon "Reming" (with the international code name "Durian") made a devastating landfall in the region of Bicol on November 30, 2006. With a maximum sustained wind speed of 190 kph in the center and gusts reaching 225 kph, it ravaged southern Luzon causing widespread flooding, landslides, and mudflows (Orense & Ikeda, 2007). Among the severely affected areas are Albay, Catanduanes Sur, Quezon, and Marinduque. Before leaving the PAR, casualties of super-typhoon "Reming" reached a total of 655 fatalities, 2,437 injuries, and 445 missing individuals (OCD-5, 2007). Damages comprising infrastructure and agricultural losses were estimated to be over Php.608 billion (OCHA, 2006).

2.1.3 Tropical Cyclone Sendong

Washi (known as Sendong in the Philippines) started as a tropical depression on December 13, 2011, and has intensified to a severe tropical storm as it approaches the east of Mindanao Island on December 16 with a sustained wind speed of approximately 63 mph (NASA, 2011). In most cases, tropical cyclones' sustained wind plays a major role. However, this does not seem to be the case with Sendong. For a cyclone at this speed, it did not even qualify for 'typhoon' status and, thus, was not expected to cause significant damage to the area where it was expected to make landfall. Unexpectedly, due to combined factors of complex local topographic conditions in Cagayan de Oro (CDO) and Mandulog River, the cyclone created a heavy rainfall that reached 180 mm (2 times the amount of monthly rainfall of December in the region) in just six (6) hours. Casualties included 1,292 deaths, 1,049 missing, and 2,002 injured. A total of 695,195 people were affected in CDO and Iligan City (Rasquinho et al., 2013).

2.3 Comprehensive Review of Literature Resources

Given the limited literature that focuses on the distribution of relief goods during the three (3) typhoon events, a comprehensive review was done to complete the data needed for this paper. The following were done for the conduct of the comprehensive review:

1. Identification of Research Resources

As much as possible, this paper looked for primary data related to the distribution of relief goods such as food, water, and medicines during the events of Typhoon Reming, Typhoon Yolanda, and Tropical Cyclone Sendong. At the same time, local and international primary and secondary data describing best practices relative to the timeliness of the distribution of relief goods during typhoon events were used.

2. Collection of Materials

Resources were gathered from reliable publishers listed in Elsevier and Scopus. Also, the Google search engine will be used for government and non-government articles related to this paper. The keywords "distribution of relief goods" "humanitarian logistics" "disaster relief" "typhoon reming" "typhoon yolanda" and "tropical cyclone sendong" were explored in the title, keywords, and abstract. The collected data was limited only to the available results revealed and cited by this literature.

3. Inclusion and Exclusion Criteria of Research Resources

In this paper, the scope of resources includes analytical and empirical publications such as peer-reviewed articles and proceedings in a conference with a full report. All of the data were related to the distribution of relief goods such as food, water, and medicines during the events of Typhoon Reming, Typhoon Yolanda, and Tropical Cyclone Sendong. When looking for the best practices relative to the timeliness in the distribution of relief goods, the references were from peer-reviewed articles, a full report of conference proceedings, and newsletters published by the government and non-government agencies. The year of publications considered was 2000 up to the present time. Non-English articles and other resources were excluded from the investigation. Furthermore, editorial opinions and news were not included in the presentation and discussion of results.

4. Selection for Issues on Logistics during Relief Distribution

Issues that were common among the three (3) selected typhoons were selected and clustered, subjectively. These issues became the basis for the decision key areas for describing the qualitative review findings, implications, and policy interventions. These findings were described qualitatively based on limited and available outcomes revealed from the reports of other literature about the delivery of relief goods such as food, water, and medicines. On the other hand, the implications drawn from the findings explained the importance of policy interventions. Then, policy interventions are courses of action or activities for the efficiency of time in delivering relief goods to the victims.

3. Results and Discussion

There are several challenges identified during the relief distribution and humanitarian assistance at the onset of the onslaught of the three (3) selected typhoons. In this section, the issues encountered were provided in detail (Table 1).

3.1 Food Procurement

At the onset of the disasters, poor inventory management was generally observed on the three typhoons which resulted in further challenges in the distribution of relief supplies. The determination of the LGU's capacity to respond to the immediate needs of the affected population has become a problem in the absence of proper inventory during Typhoon Reming (Rearo, 2017). Procurement and finding warehouses for relief storage exacerbated the problem. To reduce the logistic time for the delivery of the relief aids to the affected individuals and to ensure a timely response, it is a common practice of many LGUs to coordinate with local merchants to supply basic and immediate needs. However, in the case of typhoon Washi, there was difficulty in finding the supply of goods from the local market requiring the need to make purchases outside the city (CDRC). In the case of typhoon Haiyan, the

local market was unable to meet the soaring demand for needed supplies which consequently stifled the distribution process and delayed lead times (Stumpf et al., 2014). As for some local merchants, there was an uncontrollable increase in basic supply prices and rates despite existing laws prohibiting such acts at times of disaster (Corro, 2016).

3.2 Communication

Despite several typhoons in the past, there is still insufficient resiliency, especially in communication infrastructures, which significantly hampers the communication process during disasters. Because of accompanying hazards during typhoon Reming, landlines, cell sites, and radio antennas were knocked down. This hinders internet connection, SMS, and other communication channels between the regional centers of the PDCC and the lower DCCs and vice versa (Rearo, 2017). Continuous supplication of medicine and medical supplies in the local functional health centers has been halted due to communication problems (IFRC, 2006). Aside from disruption in the communication systems, batteries of radios had become depleted delaying communications among the responders during Typhoon Haiyan (Stumpf et al., 2014). In addition to technical and network difficulties, communication barriers also became a major issue. Because many of the responders are not well-versed when it comes to the local dialect in Tacloban and Leyte, responding agencies have to hire translators to ensure an accurate relay of information for relief distribution activities. The importance of media in covering actual events on the ground was emphasized during Typhoon Haiyan but certain issues of information accuracy on media reports had risen and were observed at the onset of the disaster (Corro, 2016).

3.3 Issues on Inclusivity

In several large-scoped disaster cases, impacts on the remote and less accessible areas are given less attention and most response activities tend to focus more on people living in cities and Poblacion areas. During the onslaught of typhoon Sendong, this has been the case where most of the relief operations and supply distributions focused on Cagayan de Oro and Iligan City rather than in other remotely affected areas (OCHA, 2012). Unfortunately, people who were living in remote areas were not able to receive a fair supply of food and other necessities. Also, people in these less accessible areas were not aware of these social services but rather relied on their neighbors, friends, social networks, churches, and NGOs for the provision of immediate goods and supplies (Jovita et al., 2019). In the case of typhoon Reming, people who were capable of working after the onset of the disaster were not able to access relief items and medical aids as distribution activities were scheduled during working hours (IFRC, 2006). If they will prioritize attending to distribution activities, they fear the loss of required working hours or in the worst case, the loss of their jobs. In barangays with only a few households, immediate grant of food supplies was given to them with no proper inventory and monitoring of relief aid distributions during Typhoon Haiyan (Corro, 2016). Out of desperation for the acquisition of basic need supplies, many people indulged in indirect fraud with donors adding more frustrations which resulted in the unfair distribution of relief aid.

The complex political landscape in Mindanao significantly impacted the inclusivity and fair distribution of relief aid among affected individuals during Typhoon Sendong (IFRC, 2012). This politicization factor resulted in the improper functioning of the response system. Lines of allegiance, party links, and other political factors dictated the resource allocation process which had resulted in bias and unfair relief distributions. Such a problem of political integration in considering resource beneficiaries was also observed in Typhoon Reming (Rearo, 2007).

3.4 Quality and Quantity of Relief Supplies

The determination of accurate relief aids that are supposed to be received by beneficiaries is important to ensure equitable allocations. However, in the absence of proper records and documentation, this could be a huge problem. Moreover, the absence of a systematic process for distribution and lack of coordination among donors may create a chaotic and biased allocation of relief supplies. In several disaster cases, provision of relief assistance is not properly tracked and monitored, duplication can inevitably happen (OCHA, 2012; Rearion, 2007). This has been the case in typhoons Sendong, Yolanda, and Reming. Some clusters also felt that the provided relief was not enough in terms of both quality and quantity and this was attributed to insufficient manpower and limited funding. There were reported cases of violation of the milk code like distributing nearly expired products (OCHA, 2012). Disaster responders took the initiative to reach out to far-flung areas by dropping emergency supplies through service helicopters. However, this method is unsuitable as people are not equipped to receive the supplies with the force of a rotary blade pushing against them. In some instances, the force from rotary blades tore the packaging of supplies destroying the items inside them (Stumpf et al., 2014).

3.5 Coordination and Collaboration

Generally, a lack of proper collaboration and coordination was also observed in the three typhoons. NGOs have a notable role during disaster response as they are known to act promptly even without going through proper coordination with LGUs. Sometimes, coordinating with LGU takes most of their time and, in some cases, there is

an absence of an appointed NGO coordinator who can facilitate them (Jovita, 2018). In these instances, they usually distribute the supplies from their donors directly to the affected individuals. Uncoordinated distribution of relief supplies may result in inequitable distribution. As a result, those people who were not provided properly perceived that some barangays were fortunate to receive more goods than them (Corro, 2016). In some cases, NGOs are hesitant to work with local governments worrying that the donations might get managed improperly by the government authorities. DSWD had already established a system called "one-stop-shop" to improve the coordination of relief goods. Its main purpose is to receive and re-dispatch supplies to proper agencies ensuring an efficient flow of distribution process. However, national, local, and international NGOs did not seem to use this system optimally. However, this could have been very useful to avoid problems with Customs and Importation procedures. This appears that there have been "confidence issues" on the part of Filipino civil society and "visibility issues" on the part of the donor community who were afraid to see their bilateral donations disappearing into the warehouses of the DWSD (URD, 2013).

3.6 Timeliness

The multiple processes that need to be undertaken before accessing public funds cause significant delays in the distribution of relief aid. In the case of typhoon Sendong, the local DRRM council has to convene first to declare a "State of Calamity" status before funds for disaster response can be processed (Jovita et al., 2018). To make necessary good purchases, the requested funds had to go through the regular procurement process of the government. Also, some members of the DRRM council and their respective families were affected by the typhoon which prevented them from acting promptly at the onset of the disaster (Jovita et al., 2019). Claim vouchers were utilized during Typhoon Yolanda to avoid duplication of relief aid distribution and ensure equitable allocation of sources. However, it took 7 days (after the typhoon's landfall) before the supplies arrived in the affected areas. When the supplies reached the area, however, it was not released immediately as the authorities had to plan the distribution process. Distribution lines were too long and had taken 2-3 days leaving the desperate people no option but to loot any available supply in the city of Tacloban (Stumpf et al., 2014). This violent act had jeopardized security, peace, and order in the whole city.

Table 1. Common Technical Findings from the Three Selected Typhoons with their Corresponding Implications and Policy Interventions

Decision Areas	Technical Findings	Implications	Policy Interventions
Inventory and Supply Chain	There is no inventory of emergency response assets (Rearo, 2007) There is difficulty in finding enough supply of goods from the local market during the disaster (Rearo et al.2007; Stumpf et al., 2014) Enterprising people took advantage of the business opportunities and increased their prices and rates, despite the law prohibiting price increases in times of calamity (Corro, 2016)	Inefficient emergency response during disasters Shortage of relief supplies during disasters The poor population cannot access the basic needs due to price soar	Develop regional and provincial databases for emergency response assets Create a MOA between private local suppliers and other relevant agencies (i.e. NFA) for the provision of relief supplies during disasters Implement price freeze, monitoring of commercial establishments, and implementing sanctions on violators

Decision Areas	Technical Findings	Implications	Policy Interventions
Communication during Disaster	Communication failure from damaged networks hampered urgent planning activities for emergency resource mobilization (Reario et al., 2007) Landlines were down, cell sites were down and radio antennas were knocked off (Reario et al., 2007) No information on functioning barangay health stations due to communication failure brought about by damaged communication systems (IFRC, 2006)	The uncoordinated emergency response among different units Insufficient supplies of medicine and medical equipment to affected health stations	Develop a contingency plan in case of communication failure Monitor the resiliency of communication facilities Provide satellite phones to emergency responders Regular monitoring of medical supplies in all barangay health stations during a disaster
Inclusivity	There is political integration of determining communities/beneficiaries (Reario et al., 2007) Working people were not able to receive items and medical attention because the distributions were scheduled during working hours (IFRC, 2006) Many victims were not aware of the social services offered by CSWD/DSWD (Jovita et al., 2019) Donations from NGOs were directly routed to areas having a population that corresponds to a fewer number of supplies (Corro, 2016) There are fraudulent transactions between some residents and donors	Unfair distribution of relief supplies	Update database/record of beneficiaries and monitor receipt of supplies Set a schedule of distribution for the working individuals Enhance IEC to far-flung areas and arrange transportation of beneficiaries from these remote barangays Establish a systematic process of supplies from NGOs and other private donors

Decision Areas	Technical Findings	Implications	Policy Interventions
Quality and Quantity of Relief Aids	The quality and quantity of the package did not always match with what is due to many beneficiaries (Rearío, 2007) Relief aids are duplicated in some areas due to a lack of coordination (OCHA, 2012; Rearío et al., 2007, Corro, 2016) Due to limited funding and human resources, the quantity and quality of relief supplies are compromised (OCHA, 2012) Some donors and service providers did not meet standards for food quality (OCHA, 2012) Contents of relief aids were destroyed by helicopter's rotary blade during distribution in remote areas (Stumpf et al., 2014)	Insufficient food and medicine for some household Supply shortage and unfair distribution of relief supplies Insufficient supply to some households Compromise beneficiary's health Shortage of supplies	Update records/database of each household composition and customize contents of relief supplies based on household composition Assign a focal unit that will take charge of processing donations and assisting NGOs to avoid duplication Conduct volunteer training before a disaster and allot standby funds to meet the supply and demand Implement strict inspection of food quality before distribution Improve the quality of supply packaging to withstand tearing during the distribution process
Collaboration	The "One-stop-shop" of DSWD was not fully utilized due to "confidence issues" on the part of Filipino civil society and "visibility issues" on the part of the donor community (URD, 2013). This results in the uncoordinated distribution of relief supplies to affected communities.	Unfair distribution of relief supplies	Utilize and optimize the one-stop-shop of DSWD and address transparency issues by providing relevant documentation
Timeliness	A long process of government financial procurement delays the distribution of relief supplies (Jovita et al., 2018) Affected DRRM council members were not able to convene immediately to make critical decisions because they had to attend to their affected families first (Jovita et al., 2018; Jovita et al., 2019) Supplies arrived late in the affected areas. Distribution was not implemented immediately due to the official's matter. Due to long lines, some residents resorted to looting out of hunger and desperation (Stumpf et al., 2014)	Late distribution of basic needs to the affected population Paralyze disaster response activities Severe hunger, malnutrition, and even death to the surviving population	Make an alternative or exemption of going through a long procurement process as part of a contingency plan during a disaster Collaboration and coordination with nearby municipality/city DRRM council who were not affected to provide technical support when concerned DRRM council cannot mobilize Conduct an assessment of the community's vulnerability to disasters and allow sufficient funds for stockpiling of relief aids out of the assessment's result.

By utilizing lessons learned from the best practices and strategies of other typhoon events in the distribution

of food, water, and medicines, this paper designed a work plan that may serve to simplify and smoothly operate the relief operations on time (Table 2). These activities can be applied to typhoon events in any typhoon-prone area and country.

Table 2. A Work Plan for Managing the Distribution of Food, Water, and Medicines after the Onset of a Typhoon Disaster

MANAGING THE DISTRIBUTION OF FOOD, WATER, AND MEDICINES AFTER THE ONSET OF A TYPHOON DISASTER IN THE PHILIPPINES				
GOAL: To minimize further damage and loss of lives among typhoon victims, the activities for the proper distribution of food, water, and medicines must be rapid and efficient after the onset of the disaster.				
OBJECTIVE	**OUTPUTS**	**ACTIONS**	**LEAD AGENCY/IES**	**INDICATORS**
Inventory and Supply Chain Provide immediate, efficient, and ample supply of food and other basic needs during disasters.	1. Create a database that will contain a complete list of assets including technical and supply resources. 2. Establishment of a MOA signed by local private suppliers and NFA on the acquisition of needed supplies in case of disasters 3. Provision of city ordinance regarding price freeze during disasters and establishment of a signed agreement between relevant stakeholders to ensure awareness and commitment	1. Personnel with technical skills for database making should gather and plan for the creation of an asset database. 2. A list of local suppliers and relevant government agencies must be obtained. After determining the stakeholders, conduct a meeting with local private suppliers and other supplier-providing agencies (i.e. NFA) and come up with an agreement regarding the provision of supplies during disasters. 3. A meeting with local suppliers with LGU officials should be conducted to determine the fluctuation of prices of goods and establish justifiable and fair supply prices even during a disaster. All stakeholders must sign the agreement acknowledging awareness and commitment.	1. Local DRRM Council - IT personnel - DSWD 2. LGUs - City Officials - Local private suppliers - NFA and other relevant agencies -DSWD 3. LGUs - City Officials - Local private suppliers	1. A working database containing all (100%) LGUs disaster response assets, stockpiles, and other supply sources. 2. A list containing 100% of relevant local suppliers and other government agencies, attendance, and minutes of the meeting. 3. Attendance, minutes of the meeting, agreement document signed by all local suppliers, and city ordinance document

Communication Improve communication for coordinated response activities among different response units and provide alternatives when communication failure happens during a disaster.	1. A contingency plan containing alternative activities in case of communication failure 2. Establishment of a specific unit that will be assigned to do regular monitoring of communication facilities 3. Establishing of monitoring unit that will take charge of monitoring medical supplies to all functioning barangay health centers	1. All DRRM council and responders must convene to formulate a contingency plan when communication is not feasible 2. A meeting must be convened between the LGUs and private sectors in charge of the local communication facilities. This can be done at the regional level or provincial level since networks and cell towers have wider coverage. Issues and concerns of communication facilities' resiliency must be tackled in the meeting. In the meeting, the private sector and the government units must seek doable strategies to improve the resiliency of communication facilities during disasters. 3. Local DRRM council, local health officials, DSWD, and local city officials must conduct a meeting to appoint the monitoring team and to discuss the sustainable provision of medicine to health centers	1. City Officials - DRRM council - All disaster response local units -Barangay Officials -DSWD 2. Provincial/Regional/Local Government units - Business owners of networks and cell sites -DSWD - Provincial/Regional / local DRRM units 3. DRRM Council - LGU -DSWD -Local Health officials	1. Attendance, minutes of the meeting, furnishing copies of a contingency plan to all unit headquarters, and posting of response flowchart process in all (100%) barangay centers. 2. The members and roles of the monitoring unit must be described, provided, and integrated into the Disaster Preparation Plan. A checklist of monitoring matrix must be established too based on the result of the meeting. As part of the contingency plan, 100% of the disaster response leaders in each unit must be provided with satellite phones or other alternative phones that do not utilize terrestrial cell towers and networks to function. 3. Identification of personnel composition and the respective roles in the monitoring unit. Resources of medical supplies, transportation, and needed assistance must be determined. 100% of the individuals with comorbidities and those who need medical assistance should be updated and listed even before disasters.

Inclusivity Proper monitoring and fair distribution of the supply of food and other necessities to affected individuals/families.	1. An updated list of beneficiaries per barangay must be available at hand at the DSWD. 2. Monitored fair distribution of food supplies and other necessities to all the beneficiaries.	1. Each barangay should submit a list of beneficiaries to DSWD for their reference. 2. Implement close coordination between barangay officials and DSWD in terms of the distribution of relief packages to all the beneficiaries.	LGU Barangay Officials City Officials DSWD	1. 100% availability of an updated list of beneficiaries per barangay at the DSWD. 2. 100% fair distribution of food supplies and other necessities to all the beneficiaries.
Quality and Quantity of Relief Supplies Relief supplies to be distributed should be sorted into family packages.	1. Relief supplies should be prepared ahead of time. 2. The contents of the relief supplies should be following the needs of the beneficiaries. This includes food items but is not limited to uncooked rice, canned goods, milk, and non-food items such as used clothing and bedding.	1. Relief supplies to be distributed should feed a family of 5 for 2 days. 2. The contents of the relief supplies should be reviewed periodically by the relief operation in charge to determine their responsiveness to the needs of the beneficiaries.	1. LGU 2. Barangay Officials 3. City Officials 4. DSWD 5. NGOs and other private donors	1. 100% of the relief supplies are ready to be distributed to all the beneficiaries before the onset of the typhoon. 2. 100% of the relief supplies contents were reviewed in response to the needs of the beneficiaries.
Collaboration Fairly distribute food, water, and medicines to the affected individuals with proper collaboration and coordination.	1. Before a typhoon disaster, a complete list of vulnerable individuals and/or families must be generated per barangay. This list must be updated consistently. 2. Establish the "one-stop-shop" of DSWD.	1. During barangay meetings, part of the agenda is the proper planning and updating of the list and number of individuals and/or families vulnerable to typhoon disasters. 2. Barangay officials should constantly coordinate with DSWD to prepare the "one-stop-shop" supplies following the list of identified individuals and/or families vulnerable to typhoon disasters.	1. LGUs • Barangay Officials • City Officials 2. National Government Office • DSWD	1. 100% of the identified individuals and/or families vulnerable to typhoon disasters are on the updated list before a disaster happens. 2. Before a typhoon disaster, food, water, and medicines must be 100% available in the "one-stop-shop" of DSWD. The quantity of the relief goods must be sufficient for at least five (5) days for the identified individuals and/or families in the list.

Timeliness Distribute food, water, and medicines on time without any delays.	1. In every LGU, the budget must be readily available for the use of emergencies such as typhoon disasters. This should be quickly released systematically. Funds must only be used solely for disaster-related emergencies like shortages in food, water, and medicines. 2. Before a typhoon disaster, a list of volunteers must be generated to assign roles, functions, and schedules of their shifts. 3. Before a disaster, food, water, and medicines must already be available in the assigned warehouses and evacuation centers. The quantity of these supplies must be based on the generated list of individuals and/or families.	1. During the budget hearing, the city government must secure funding for emergencies like disasters. The finance office of the LGU must coordinate with the Commission on Audit (COA) on how to come up with a plan for the quick release of emergency funds. 2. In a scheduled meeting before a disaster, the city and barangay officials must meet and coordinate with each other to come up with a list of volunteers. Volunteers will be assigned according to their roles, functions, and schedules of shifts. 3. Days before a disaster hits the areas, aggressive coordination meetings must be done between the assigned local and government officials. Part of the agenda must be the prompt availability of complete supplies in the assigned warehouses and evacuation centers.	1. LGUs • Barangay Officials • City Officials 2. National Government Office • DSWD • DILG	1. Based on the COA Circular 2012-002, the local calamity fund, also known as the Local Disaster Risk Reduction and Management Fund (LDRRMF), must be not less than five percent (5%) of the estimated revenue from regular sources. The balance of the LDRRMF of the current year will be recognized as a Special Trust Fund to be spent in the next succeeding five (5) years. Thus, the amount to be budgeted must conform to this Budget Circular advised by COA. 2. Based on the list of volunteers, 100% of them must be in place according to their roles, functions, and shifting schedules. 3. Before a typhoon disaster, food, water, and medicines must be 100% available in the "one-stop-shop" of DSWD.

5. Conclusion and Recommendations

In the management of disaster response among the three (3) selected typhoons, this review was able to identify important decision key areas specifically on the distribution of food, water, and medicines. This includes the absence of a database of local government assets and supplies that must be available whenever a disaster strikes. Considering the importance of the proper inventory for any government assets, other LGUs might have kept and maintained such an important document. Nevertheless, it is suggested that all cities and municipalities must prepare and maintain a specific number of stockpiles and replenish them whenever they reach their limit. Generally, this amount is not the same for all areas as the population and household composition may vary from one area to another. Since communication is an integral part of the success of all response activities, it is suggested that the concerned regional or provincial government unit enhance the resiliency of existing communication

facilities in close coordination with the private owners of such networks and radio towers. Furthermore, it was also identified that a lack of coordination and collaboration among different response units is rampant not only in the Philippines but also in other countries. Primarily, this may be due to the overwhelming impact of typhoons which may keep everybody busy in doing both personal and public responsibilities. The formulation and implementation of a systematic donation processing and distribution framework will not only solve the problems brought about by lack of coordination, but it can also address the issues of inclusivity, quality, and quantity of relief supplies and the delivery of such basic needs to the beneficiaries on time.

This paper was not only limited to identifying the issues present in relief supply distribution but also tackled and suggested some policy interventions which can help enhance the city or the municipality's response operation. However, it should be noted that it is not emphasized here the "one strategy applies to all" idea since every area varies from each other in terms of issues and resolutions. In this paper, the policy interventions and work plan entailed can be applied to the areas under study unless, otherwise, the same conditions and issues also exist in other areas. The distribution of relief supplies is indeed a critical process and its logistics must be quick and efficient to support disaster operations. In disaster preparedness planning, there must be robust and flexible distribution networks to increase the efficiency of the process. Although every disaster is different, the reactions and responses may be relatively similar. Their difference lies in the number of people affected, the resources required in different areas, and the ease of working in the field. Thus, a multi-modal relief distribution for disaster response operations must be developed to easily project the number of transportation, manpower, goods, and services needed for a particular number of populations.

Moreover, the presence of comprehensive public reports, which may include the actual figures, on disaster response management activities is crucial to the study and analysis of the absolute efficiency of response strategies. Since these important references were absent in the online literature, it is suggested that the concerned LGU units, specifically the DRRMO, should publish them and make the data available to the public. This will not only promote transparency but can also encourage more experts to do further research which will be beneficial not only for the concerned LGU but for the benefit of the whole country as well.

References

Abalos, A., Bautista, P.R., Isaac, P.L.G., Pua, G.A.C. & Pineda, M.V.G. (2014), Designing a Community-Based Disaster Relief Management System for the Non-Governmental organization, OG Cares Foundation, *DLSU Research Congress*.

Ani, P.A., Daquio, C.R. & Aquino, A.P. (2015), Republic Act 10121: An Approach in Strengthening Disaster Risk Reduction and Management in the Philippines, *Food and Fertilizer Technology for the Asian and Pacific Region*.

Office of Civil Defense V. (2007), Typhoon Reming, *Terminal Report*, 5p.

Congressional Policy and Budget Research Department. (2021), *Global Climate Risk Index*, Available: https://cpbrd.congress.gov.ph/2012-06-30-13-06-51/2012-06-30-13-36-50/1291-ff2021-09- global-climate-risk-index-2021.

Corro, L. (2016), Challenges of the Hyogo Framework for Action in the Disaster Relief Response and Early Recovery in a Municipality in Cebu, Philippines in the Aftermath of Supertyphoon Yolanda (International Name: Haiyan), *Public Policy*, Volume XIV.

Department of Social Welfare and Development (DSWD). (2015), Administrative Order No. 03 Series of 2015. *Disaster Response Operating Guidelines*.

Department of Social Welfare and Development (DSWD). (2021), *Distribution Under the DSWD-Interfaith Groups Partnership*.

Department of Social Welfare and Development (DSWD). (2006), *Guideline on the Monitoring of Disaster Relief*. Administrative Order No. 08 Series of 2006.

Farahani R.Z., Rezapour, S. & Kardar, L. (2011), Logistics Operations and Management: *Concepts and Models*, Elsevier, 441-469.

Gomez, K.G. & Ignacio, M.S.E. (2020), Adequacy of Food Aid Packs Provided During Natural Disasters: A Provincial Case Study, Acta Medica Philippina 54(5), 472-478.

International Federation of Red Cross and Red Crescent Society. (2006), Phlippines Typhoons: Focus on Albay, Catanduanes and Camarines Sur.

International Federation of Red Cross and Red Crescent Societies. (2006), Office for the Coordination of Humanitarian Affairs, OCHA: Situation Report: Philippines: Typhoon Durian (Reming) – *DREF Bulletin no. MDRPH003*.

International Federation of Red Cross and Red Crescent Society. (2012), Review of the IFRC-led Shelter Cluster: Tropical Storm Washi. *Shelter and Settlements Department*.

Jovita H.D., Nashir, H., Mutiarin, D., Moner, Y. & Numandi, A. (2019), Social capital and disasters: How does social capital shape post-disaster conditions in the Philippines*? Journal of Human Behavior in the Social*

Environment 29, 1-17.

Jovita, H.D., Numandi, A., Mutiarin, D. & Pumomo, E.P. (2018), Why does network governance fail in managing post-disaster conditions in the Philippines? *Journal of Disaster Risk Studies* 10, 10.4102/jamba.v10i1.585.

McPherson M, Counahan M. (2015), Responding to Typhoon Haiyan in the Philippines, *Western Pacific Surveillance and Response Journal* 6(Suppl 1), 1–4.

National Aeronautics and Space Administration. (2011), Hurricane Season 2011: Tropical Storm Washi (Western North Pacific Ocean).

National Disaster Risk Reduction and Management Council. (2013), NDRRM Update: Final Report Effects of Typhoon Yolanda (Haiyan).

Office for the Coordination of Humanitarian Affairs, OCHA. (2006), OCHA Situation Report No. 4: The Philippines Typhoon.

Orense, R.P. & M. Ikeda. (2007), Damage Caused by Typhoon-Induced Lahar Flows from Mayon Volcano, Philippines. *Soils and Foundations* 47(6), 1123-1132.

Rasquinho O., Liu, J., & Leong, D. (2013), Assessment on Disaster Risk Reduction of Tropical Storm Washi, *Tropical Cyclone Research and Review* 2, Issue 3, Pages 169-175.

Rearío, R. (2007), Office for the Coordination of Humanitarian Affairs (OCHA).

Schneider, S.K. (1992), Governmental response to disasters: The conflict between bureaucratic procedures and emergent norms, *Public Administration Review* 52, 135-145.

Stumpf, J., Colin, W., Carmelita, R. E., & Liwa, U. (2014), Typhoon Yolanda Relief Response Report: A Supply Chain Perspective Volume 14 Mar-HL.

United Nations Development Program (UN). (2021), PHL ranks 107th in UN human development index, up four places.

United Nations Office for the Coordination of Humanitarian Affairs (OCHA). (2012), National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028.

Urgence Rehabilitation Development. (2013), Lessons Learnt on Typhoons in the Philippines (Metro Manila, Cagayan de Oro, and Iligan).

Wisetjindawat W., Ito H., Fujita M., & Eizo, H. (2014), Planning Disaster Relief Operations, *Procedia – Social and Behavioral Sciences* 125, 412-421.