Aftermath of Tropical Storm Ondoy (Ketsana)

24-30 September, 2009

8/15/2014

AIM – Stephen Zuellig Graduate School of Development Management Tashfeen Siddique – Research Fellow



Credit: Post-Disaster Needs Assessment (PDNA) Report, November 26, 2009

Table of Contents

Acronyms and Abbreviations:iii
Overview1
Chronology of Typhoon Ondoy4
Public Advisories and Evacuation9
Climatology / Science
Effects and Damages13
Affected Population13
Casualties13
Damages14
Metro Manila or National Capital Region14
Marikina City15
Quezon City
Caloocan City20
Pasig City21
Metropolitan Manila Development Authority (MMDA)23
Manila City25
Common Findings from the interviews25
Disaster Management and Response26
Role of Media
Recommendations
Conclusion
Annexures
Annex: I - Public Storm Warning Signals (PSWS)
Annex: II – Warnings issued by PAGASA
Annex: III – PAGASA ServicesIII
BibliographyIV
Special Thanks

List of Figures

Figure 1 : Image courtesy of BBC News, article written by Mr. Alastair Leithead, BBC News, Manila2
Figure 2 : Image Courtesy of NASA, Hurricanes/ Tropical Cyclones, image showed the amount of rain dropped by
typhoon Ketsana
Figure 3: Credit to NASA, NASA's Aqua satellite AIRS instrument captured 17W just east of the northern Philippines,
poised for landfall. The purple areas indicate strong thunderstorms with cold cloud tops, colder than -63F5
Figure 4 : Credit: US Navy/Joint Typhoon Warning Center/NASA, Satellite image showed the center of circulation
just to the east of the northern Philippines
Figure 5 : Track of Typhoon Ketsana/Ondoy, Japan Meteorological Agency, Annual Report on the Activities of the
RSMC Tokyo -Typhoon Center 2009
Figure 6: Track of Typhoon Ondoy – Provided by PAGASA-DOST
Figure 7 : Image taken from the final report of NDCC on typhoon Ondoy8
Figure 8 : Metro Manila Map, Credit: Philippine ZIP Codes Directory14
Figure 9: Graph showed the water level during Ondoy, Credit to Marikina City: Image taken from the Presentation
on Ondoy Vs. Habagat
Figure 10: Red shows highest flood level areas, Credit to Marikina City: Image taken from the Presentation on
Ondoy vs. Habagat
Figure 11: Flood affected areas due to TS Ondoy; Image Credit to QC Hazards, Vulnerability and Risk Assessment
Report
Figure 12: Caloocan City location in MM, Map courtesy of Wikipedia
Figure 13: Pasig City Map, Credit: Pasig City DRRMO
Figure 14: Four distinct thematic areas for sustainable development; Image credit to: MMDRRMC presentation by
Ms. Susana M. Cruz, Regional Director, OCD-NCR

List of Tables

Table 1 : Ketsana details from Japan Meteorological Agency, Annual Report on the Activities of the RSMC Tokyo -
Typhoon Center 2009
Table 2 : Damages and Destruction details; the table is created on the basis of data provided by NDCC/NDRRMC
and PAGASA
Table 3: Humanitarian Assistance to Ondoy and Pepeng; Table from NDCC final report on TS Ondoy and TY Pepeng
Table 4 : Damages or losses cost along with finance required for recovery and reconstruction, Table adapted fromPost disaster Needs Assessment (PDNA) report of Nov 26, 2009

Acronyms and Abbreviations:

CAR	Cordillera Administrative Region
DRRMO	Disaster Risk Reduction and Management Office
Kph	Kilometers per hour
LPA	Low Pressure Area
LGU	Local Government Unit
Mph	Miles per hour
MM	Metro Manila
MMDA	Metropolitan Manila Development Authority
NASA	National Aeronautics and Space Administration
NCR	National Capital Region
NDCC	National Disaster Coordinating Council
NDRRMC	National Disaster Risk Reduction and Management Council
NDRRMC PAR	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility
NDRRMC PAR PSWS	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal
NDRRMC PAR PSWS PDNA	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment
NDRRMC PAR PSWS PDNA PAGASA	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment Philippine Atmospheric, Geophysical and Astronomical Services Administration
NDRRMC PAR PSWS PDNA PAGASA QC	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment Philippine Atmospheric, Geophysical and Astronomical Services Administration Quezon City
NDRRMC PAR PSWS PDNA PAGASA QC STS	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment Philippine Atmospheric, Geophysical and Astronomical Services Administration Quezon City Severe Tropical Storm
NDRRMC PAR PSWS PDNA PAGASA QC STS	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment Philippine Atmospheric, Geophysical and Astronomical Services Administration Quezon City Severe Tropical Storm
NDRRMC PAR PSWS PDNA PAGASA QC STS TD	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment Philippine Atmospheric, Geophysical and Astronomical Services Administration Quezon City Severe Tropical Storm Tropical Depression
NDRRMC PAR PSWS PDNA PAGASA QC STS TD TS	National Disaster Risk Reduction and Management Council Philippine Area of Responsibility Public Storm Warning Signal Post Disaster Needs Assessment Philippine Atmospheric, Geophysical and Astronomical Services Administration Quezon City Severe Tropical Storm Tropical Depression

Aftermath of Tropical Storm Ondoy (Ketsana)

24-30 September, 2009

Overview

About five year have been passed since the typhoon or tropical storm Ondoy hit the entire areas of Philippines but still painful rainfall memories are still active in the minds of common people and specifically affectees. The fears of this catastrophe have griped their soul in such a way that they take every normal routine continuous rain as an indication of another Typhoon ondoy which may bring irreparable loss to their lives and property like the previous one. In the year 2009, twenty-two tropical cyclones formed over the Western North Pacific and South China Sea. The tropical cyclones (TC) season began in May with the formation of TC Kujira, which formed east of the Philippines and moved northeastward to the southeast of Japan. Out of these twenty-two TC, twelve formed in the month of August and September including typhoon Ondoy¹.

Although typhoons are not new for the people of Philippines but every typhoon which bang the various provinces of the country generally bring fresh challenges and dimensions that have not been experienced before like Typhoon Frank brought flash floods with unexpected amount of thick mud, typhoon Pablo surfaced with both heavy rains and strong winds, typhoon Yolanda came up with six land falls and powerful strong winds. Likewise, typhoon Ondoy (International name "Ketsana") poured rain equal to one month in a single day, resulting in substantial flooding and it affected almost everyone. Some of the articles and news clips depicting the devastation caused by this typhoon are elucidated below:

Philippines Daily Inquirer reported about rainfall and its effects in a news clip titled "Too much rain too soon - Months' worth of rain; storm Ondoy kills 40" on 27th September, 2009

"Nearly a month's worth of rain fell in just six hours over Metro Manila Saturday, triggering the worst floods in nearly 40 years, stranding people on rooftops, causing wide-spread blackouts and killing at least 40 people, officials said.

In my experience, this is the worst that I have seen, Defense Secretary Gilbert Teodoro said as he described how authorities grappled to deploy limited resources amid a barrage of pleas for help after Storm ?Ondoy? Slammed ashore.

The government declared a state of calamity in Metro Manila and 25 provinces in Luzon as the massive flooding paralyzed businesses and transportation. The

¹ (Japan Meteorological Agency, 2009)

calamity declaration allows officials to withdraw emergency money for relief and rescue"².

According to BBC News published on 29th September, 2009:

"BBC's Alastair Leithead in Manila says the rescue operation is now focusing on getting supplies to those who have been displaced. Ketsana, with winds of up to 100km/h (62mph), Typhoon Ketsana floods the Philippines



Officials say more Manila

than 40cm (16in) of rain fell on Manila within 12 hours on Saturday, exceeding the 39cm average for the whole month of September^{"3}.

CNN highlighted the event in the following words on 27th September, 2009:

"(CNN) -- Downpours subsided temporarily in the Philippines on Sunday, a day after Tropical Storm Ketsana pummeled the capital Manila with its heaviest rainfall in

² (Philippine Daily Inquirer, 2009)

³ (BBC News , 2009)

more than 40 years. More than 80 percent of the capital was under water that swallowed whole houses and buses.

Though the Philippines are no stranger to floods, Saturday's downpours approached a record, with a month's worth of rain falling within six hours.

The average rainfall for the entire month of September is 391 mm (15.4 inches), said Gilberto Teodoro, secretary of national defense and chairman of the National Disaster Coordinating Council.

The capital experienced 341 mm (13.4 inches) between 8 a.m. and 2 p.m., he said."⁴

Relief Web International, a specialized digital service of the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) described the situation in the following words on 29th Sep, 2009:

"Tropical Storm "Ketsana," locally known as "Ondoy," swept across metro Manila and parts of Central Luzon on Saturday, September 26, 2009, and brought a month's worth of rain in just 12 hours. The waters rose so fast that people living in low lying areas were caught unaware and had to stay on the roofs of their houses to avoid being swept away by the floods. At least 140 died from the storm, and more than 450,000 people have been displaced and have sought shelter in schools,

churches and other evacuation shelters⁷⁵.

The National Aeronautics and Space Administration (NASA), an agency of the United States government defined the situation of flooding and rain fall on 1st October, 2009:

"According to the Philippine Atmospheric Geophysical Astronomical Services Administration (PAGASA), Ketsana dropped 17.9 inches (455 mm) of rain in

⁵ (Presbyterian Disaster Assistance, 2009)



Figure 2 : Image Courtesy of NASA, Hurricanes/ Tropical Cyclones, image showed the amount of rain dropped by typhoon Ketsana

⁴ (CNN.com/asia , 2009)

Manila in just 24 hours on Saturday, September 26.

The TRMM(Tropical Rainfall Measuring Mission)-based, near-real time Multi-satellite Precipitation Analysis (TMPA) at the NASA Goddard Space Flight Center, Greenbelt, Md. is used to monitor rainfall over the global Tropics. TMPA rainfall totals for the 7day period 21 to 28 September 2009 for the northern Philippines and the surrounding region showed that the highest rainfall totals occurred south of the storm's track in an east-west band over central Luzon that includes Manila. Amounts in this region are on the order of 375 mm (~15 inches) to over 475 mm (~19 inches). The highest recorded amount from the TMPA near Manila was 585.5 mm (almost 24 inches)^{*n*6}.

World Bank report titled "Philippines - Typhoons Ondoy and Pepeng: postdisaster needs assessment (Vol. 1 of 3)", Report number: 64628, released on 23rd September, 2011 described the situation as follows:

"Tropical storm Ondoy (international name Ketsana) hit the Philippines on September 26, 2009, causing widespread flooding. Ondoy, the equivalent of a Category I storm, brought an unusually high volume of rain which inundated the central part of Luzon. During the 12-hour period starting at 8:00 am on September 26, the rainfall was recorded as approximately 450 mm at the Manila Observatory, an extremely rare occurrence. In turn, these intense rains generated high flooding in the Marikina River that exceeded the river's carrying capacity. Ondoy caused extensive flooding in the Metro Manila area and the neighboring Rizal province, including the cities of Antipolo, Makati, Malabon, Marikina, Muntinlupa, Pasig, Quezon, San Juan, Taguig, and Valenzuela"⁷.

There are several other reports and articles evidences about the extra ordinary amount of rain brought by typhoon ondoy which results in massive flooding and incurred heavy losses to infrastructure and agriculture.

Chronology of Typhoon Ondoy

Typhoon ondoy (International Name Ketsana) was identified as tropical depression early in the afternoon of 24th September, 2009. The chronology of the event was reported by different Meteorological and weather agencies with the forecast of heavy rains.

⁶ (National Aeronautics and Space Administration (NASA), 2009)

⁷ (The World Bank, 2011)

According to National Aeronautics and Space Administration (NASA) website:

"NASA's Aqua satellite Atmospheric Infrared Sounder (AIRS) instrument captured 17W just east of the northern Philippines on September 24 at 1:29 **p.m.** as it was poised for landfall. The purple indicate strong areas thunderstorms with cold cloud tops, colder than -63F.

The U.S. Navy's Joint Typhoon Warning Center forecast said "The system will continue to track generally westward towards Luzon, making landfall shortly after [1 p.m. EDT Sept. 26]. The [low level center of circulation] is expected to weaken some, but improved upper level [atmospheric] conditions favorable and sea surface temperatures will promote reintensification as the low level center of circulation emerges into the South China Sea." 17W After that, will continue to track westward towards



Figure 3: Credit to NASA, NASA's Aqua satellite AIRS instrument captured 17W just east of the northern Philippines, poised for landfall. The purple areas indicate strong thunderstorms with cold cloud tops, colder than -63F



Figure 4 : Credit: US Navy/Joint Typhoon Warning Center/NASA, Satellite image showed the center of circulation just to the east of the northern Philippines.

Vietnam and strengthen in the warm waters in the Gulf of Tonkin.

At 15:00 UTC (1 p.m. EDT) on September 25, the center of 17W was located approximately 330 nautical miles east of Manila, Philippines, near 14.6 north and 126.1 east. It had maximum sustained winds near 35 mph, and was moving west-northwest near 10 mph. It was generating waves as high as 12 feet, so the east facing shores of the northern Philippines can expect heavy surf and beach erosion, accompanied by gusty winds and downpours.

Ketsana maintained minimal tropical storm intensity as it crossed central Luzon on the afternoon of the **26th** (local time). The main deluge in the Manila area, located on the western side of Luzon, began around 8:00 a.m. local time (00 UTC **September 26**) even though the center of Ketsana had yet to make landfall on the eastern side of the island. A record 13.43 inches of rain fell in Manila in the 6 hours between 8:00 a.m. and 2:00 p.m. local time, which is equivalent to about a month's worth of rain for the area.

On September 28 at 1500 Zulu Time (11 a.m. EDT), Ketsana (Ondoy or 17W) had moved into the South China Sea and strengthened into a typhoon. Ketsana had maximum sustained winds near 90 knots (103 mph). It was located about 200 nautical miles east of Hue, Vietnam, near 16.2 norths and 110.6 easts. It was

moving west-northwest near 10 mph, and generating waves 26 feet high.

By 10 p.m. local time on September 29, the center of Ketsana had moved inland and was located 70 miles south of Hue, Vietnam, near the border of Vietnam and Cambodia. The storm was weakening quickly. It was still moving westward near 13 mph and is expected to dissipate sometime late on Wednesday, 30th September⁸".

Japan Metreological agency has shared the track and movement of typhoon Ondoy (Ketsana) in their Annual report on the activities of the RSMC Tokyo- Typhoon Center 2009 in the following words:

"Ketsana formed as a tropical depression (TD) east of the Philippines at 00 UTC on 25

⁸ (National Aeronautics and Space Administration (NASA), 2009)

Date Time (UTC)		Ce pos Lat (N)	nter ition Lon (E)	Central pressure (hPa)	Max wind (kt)	CI num.	Grade
		ł	Cetsan	a (0916)		
Sep.	25/00	14.2	127.9	1000	-	1.0	TD
	25/06	14.3	126.8	998	-	1.0	TD
	25/12	14.7	125.3	998	-	1.5	TD
	25/18	14.9	123.7	996	-	2.0	TD
	26/00	15.1	122.4	994	35	2.0	TS
	26/06	15.1	121.2	990	40	2.5	TS
	26/12	15.4	119.5	990	40	2.5	TS
	26/18	15.3	117.7	990	45	2.5	TS
	27/00	15.2	116.5	985	50	3.0	STS
	27/06	15.2	115.5	985	50	3.0	STS
	27/12	15.6	114.5	980	55	3.5	STS
	27/18	15.7	113.7	975	60	3.5	STS
	28/00	15.8	112.8	970	60	4.0	STS
	28/06	15.8	111.9	960	70	4.5	TY
	28/12	16.0	111.1	960	70	4.5	TY
	28/18	16.0	110.2	960	70	4.5	TY
	29/00	15.5	109.5	960	70	4.5	TY
	29.06	15.4	108.9	965	70	4.5	TY
	29/12	15.3	108.4	980	60	4.0	STS
	29/18	15.3	107.9	990	45	3.5	TS
	30/00	15.3	107.6	994	35	3.0	TS
	30/06	15.3	107.1	998	-	2.5	TD
	30/12	15.2	105.9	1000	-	-	TD
	30/18	15.1	105.0	1002	+	-	TD
Oct.	01/00						Dissip.

Table 1 : Ketsana details from JapanMeteorological Agency, Annual Report on theActivities of the RSMC Tokyo -Typhoon Center2009

September 2009 and moved westward for the whole of its existence. It was upgraded to tropical storm (TS) intensity at 00 UTC on 26 September just before crossing Luzon Island. Moving westward over the South China Sea, it was upgraded to typhoon (TY) intensity at 06 UTC on 28 September, reaching its peak intensity with maximum sustained winds of 70 knots and a central pressure of 960 hectopascal (hPa). Ketsana hit Vietnam the next day with strength almost equivalent to its peak intensity, then weakened rapidly and was downgraded to TD intensity at 06 UTC on 30 September before dissipating 18 hours laterⁿ⁹.



Figure 5 : Track of Typhoon Ketsana/Ondoy, Japan Meteorological Agency, Annual Report on the Activities of the RSMC Tokyo -Typhoon Center 2009

The Weather forecasting Section of Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) summaries the timeline of typhoon Ondoy as follows:

⁹ (Japan Meteorological Agency, 2009)

"It developed inside the Philippine Area of Responsibility (PAR) from the active LPA east of Luzon and gradually moved towards westward Aurora-Ouezon Area. Prior from its *landfall, "ONDOY", intensified* into a tropical Storm 130 km Northeast of Virac, Catanduanes. It continued moving more to the west and made landfall over the boundary of Aurora and Quezon at approximately 11 AM of Sept. 26 then it crossed Central Luzon for almost 10 hours causing heavy downpour over the Metropolis and some parts of Central and southern Luzon resulted to flashfloods and



crossing central Luzon, it continued moving farther away as it intensified further over the South China Sea and exits the western border towards Vietnam"¹⁰.

The Final report developed by National Disaster Coordinating Council

(NDCC) Tropical on Storm"Ondoy" (Ketsana) and "Pepeng" (Parma) Typoon reported the timeline of the track in the country as follows:

"24th Sept, 2009 – a low pressure area, east of Luzon developed into a Tropical Depression (TD) and was named "Ondoy".

25th Sept, 2009 - TS Ondoy maintained its strength as it moved closer to the west northwest in the general direction of Central and

Figure 7 : Image taken from the final report of NDCC on typhoon Ondoy

¹⁰ (PAGASA-DOST, 2009)

Northern Luzon and intensified into a tropical storm as it moved towards Aurora-Isabela area. PAGASA highlighted the occurrence of flashfloods and landslides.

26th Sept, 2009 –accelerated further as it moved closer to Central Luzon, made its landfall at 9:00 AM near the boundary or Aurora and Quezon, crossed Central Luzon area for 12 hours and moved off the Coast of Zambales.

27th Sept, 2009 – exited out of the country over the western border of PAR (South China Sea). Its maximum center winds was 105 kph with gustiness of 135 kph while its movement from 11 to 19 kph^{''11}.

Almost all the National and International agencies have reported the event more or less in the same way. PAGASA have their own forecasting equipments installed and as a member of World Metreological Organization they are linked with metrological or weather agencies around the world and get updates or forecast about weather disturbances. PAGASA is also responsible for giving timely advisories or alerts in case of weather disturbances to safe the people from natural hazards.

Public Advisories and Evacuation

There are evidences available that PAGASA have issued warnings about rainfall and flash floods at the time of typhoon Ondoy but they are not aware with the magnitude of rainfall. The highest Public Storm Warning issued by PAGASA was *PSWS # 2 which means that disaster agencies /organizations concerned must act at once to alert their communities*¹² (*See: Annex-I*). No one even PAGASA or International Meteorological agencies have expected such large scale of rains, therefore, they have given usual forecast of heavy rains.

National Aeronautics and Space Administration (NASA) have verified the issuance of warnings by PAGASA on 25th September, 2009 in their website clip:

"Tropical depression 17W formed in the Philippine Sea very early today, September 25, and its forecast track takes it across the northern Philippines this weekend. The Philippine government has designated the storm as Tropical Depression "Ondoy."

Warnings have already been posted in the Philippines today. Public storm warning signal number 1 is already in effect in the Philippines provinces of: Albay, Burias Island, Quezon, Marinduque, Rizal, Bulacan, Aurora, Nueva Ecija, Nueva Vizcaya, Quirino, Isabela. Public storm Public storm warning signal number 2 is raised in the

¹¹ (National Disaster Coordinating Council (NDCC), 2009)

¹² (PAGASA-DOST, 2012)

following Philippines provinces: Catanduanes, Camarines Norte & Sur, Polillo Island^{'13}.

Philippine Daily Inquirer article titled "Floods submerge Metro Manila areas" published on 26th September, 2009 discussed about the warnings in the following words:

"PAGASA raised storm signal warning number 2 over Aurora, Quirino, Nueva Vizcaya, Nueva Ecija, Pangasinan, Tarlac, Zambales, Pampanga, Bulacan, Rizal, Northern Quezon and Polillo Island.

Storm warning signal number 1 was hoisted over Isabela, Mountain province, Ifugao, Benguet, La Union, Ilocos Sur, Laguna, Cavite, Batangas, Mindoro Provinces, Lubang Island, Marinduque, Camarines Norte, Bataan, Metro Manila and the rest of Quezon Province. Ondoy was expected to enhance the southwest monsoon and bring rains over Central and Southern Luzon and parts of Visayas, PAGASA said^{''14}.

The unexcepted amount of rain broke all the previous records.

On the release issued on 28th September by NASA, they quoted the words of PAGASA administration:

"Tropical Depression 17 W, now named Ketsana, and also named Ondoy in the Philippines, dumped record-breaking rainfall there over the weekend. PAGASA, the Philippine Atmospheric, Geophysical and Astronomical Services Administration noted the total rainfall on Saturday from 8 a.m. to 2 p.m. surpassed the highest 24-hour rainfall that the weather bureau recorded back in June 1967 for Manila. The rainfall generated from Ondoy (Ketsana) during its first six hours over land measured 13.43 inches (341 millimeters). The old record from 42 years ago was 334 millimeters in 24 hours. NASA's Tropical Rainfall Measuring Mission (TRMM) satellite data confirmed the rainfall from its orbit in space"¹⁵.

Another news clip described that Ondoy dumped more rain then Katrina, published by Philippine Daily Inquirer on 27th September, 2009

""Katrina" was no match to "Ondoy." The 15th weather disturbance that hit the Philippines in 2009 dumped a total of 455 millimeters of rain in Quezon City alone in 24 hours, compared to the 250 millimeters of rain that Hurricane Katrina brought to New Orleans in Louisiana in the United States in 2005.

¹³ (National Aeronautics and Space Administration (NASA), 2009)

¹⁴ (Philippine Daily Inquirer, 2009)

¹⁵ (National Aeronautics and Space Administration (NASA), 2009)

This was the report presented to President Gloria Macapagal-Arroyo by Dr. Prisco Nilo, the chief of the Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) at a briefing of the National Disaster Coordinating Council (NDCC) in Camp Aguinaldo on Sunday^{"16}.

The warnings issued only to make them alert or" Be Ready" but no warning or alert for the evacuation (see the warning details issued by PAGASA in Annex-II). The evacuation took place only when the flood water start rising or enter into the houses. Most of the people protected their lives by moving on the rooftops of their houses.

BBC News reported about the situation on 29th September, 2009:

"Public buildings including schools, universities and the presidential palace have become relief centers.

"Evacuees will be given shelter in available areas among the Malacanang [palace] buildings and in tents that will be put up in between the buildings," Philippines President Arroyo said in a statement announcing the opening of the palace compound.

She said that if required, palace employees would "yield their work stations to provide more space for our displaced countrymen", and that she had temporarily moved her office to another section of the compound along the Pasig river.

After word of the offer spread, hundreds of people converged on the palace and received plastic bags filled with noodles and canned sardines¹⁷.

The situation reported by Philippine Daily Inquirer on 27th September, 2009 as;

"By Sunday afternoon, the helicopters and boats had rescued more than 5,000 people, but many others were frantically waiting for help while battling thirst and hunger.

"If you are on the roof, don't try to leave. Just remain there and we will do everything to rescue you," Defense Secretary Gilberto Teodoro said in a radio broadcast"¹⁸.

The evacuation occurred only when flood reached to roof level and most of the areas went under water. According to the final report of NDCC; 244 evacuation

¹⁶ (Philippine Daily Inquirer, 2009)

¹⁷ (BBC News , 2009)

¹⁸ (Philippine Daily Inquirer, 2009)

centers established in the country with 15,798 families / 70,124 persons stayed inside the evacuation centers¹⁹. The unpredicted amount of rainfall affected the life of all irrespective to rich and poor **reported by Philippine daily Inquirer on 27th September, 2009.**

"The epic flood caused by Typhoon Ondoy in Metro Manila became the great equalizer as rich and middle-class residents fled their homes for safety, turning into "evacuees" themselves.

Joey Salgado, chief of Makati's public information office, said his family took only their dogs and a few belongings with them as they left their three-story house in Northview 2 in Quezon City at 3 p.m. Saturday.

"By the time we left, malapit na sa second floor yung baha (the flood was near the second floor). This rarely happened in our area. All the neighbors were surprised because this is a middle-class subdivision," he said, adding that their village was usually spared despite being near the Marikina River^{"20}.

Climatology / Science

Nature cannot be predictable; everything unexpected can be happened without any time. National Aeronautics and Space Administration (NASA) explained the science behind remarkable rainfall in a day in their issue of 29th September, 2009;

"The reason for the enhanced rainfall over on the Manila-side of the island as the storm approached was the interaction between Ketsana's low-level circulation and the seasonal southwest monsoon. The southwest monsoon comes about from the summertime heating of the Asian landmass. As warm air rises over the continent it induces low pressure as the surface, which draws air in from surrounding regions. The southwest monsoon typically runs from June to September in the Philippines and draws warm, humid air up from the southwest across the South China Sea and into the islands where it can interact with the topography. Ketsana's counterclockwise circulation enhanced the effect, which resulted in the torrential rains"²¹.

Typhoons or Tropical cyclones are dangerous due to the hazards attached with them like Strom Surges, landfalls, strong winds, heavy rains / floods, Landslides, mud flows and mud slides which results in destruction of lives and properties.

According to Mr. David Michael V. Padua, Sr. Typhoon Specialist of Meteomedia Philippines Corporation;

¹⁹ (National Disaster Coordinating Council (NDCC), 2009)

²⁰ (Philippine Daily Inquirer, 2009)

²¹ (National Aeronautics and Space Administration (NASA) , 2009)

"The fantastic energy of a Tropical Cyclone is remarkable! Consider for example, that an ordinary afternoon thunderstorm (which lasts for 1 to 2 hours) has the energy equivalent of about 13, 20-kiloton atomic bombs. Now, a small typhoon carrying winds of 120 kph has an energy equivalent of almost 500,000 atomic bombs, or about 6 atomic bombs per second! A typhoon also releases about 20 billion tons of water.

*So, if you have a tropical cyclone like Super Typhoon REMING (Durian) of November 30, 2006 where its peak winds topped 250 kph, its equivalent energy was estimated about 1 million atomic bombs! Just imagine!*²²

Effects and Damages

The extra ordinary amount of rainfall caused record flooded and initially almost all the media agencies and other relevant authorities discussed about the high number of displaced persons but eventually the final number of internally displaced persons reduced to only 37 reported by NDCC²³.

Affected Population

The National Disaster Coordinating Council (NDCC), an agency of the Philippine government under the Department of National Defense responsible for ensuring the protection and welfare of people during disasters or emergencies represented the following information in their final report which is considered as most esthetical;

According to their report a total of 993, 227 families / 4,901,234 persons were affected in 2,018 barangays, 172 municipalities, and 16 cities of 26 provinces in 12 regions²⁴. See Table 2

Casualties

There were 464 deaths, 529 injured and 37 missing as the result of typhoon $Ondoy^{25}$.

Details		Ondoy (Ketsana)
Deaths		464
Injuries		529
Missing Perso	ns	70
(IDP's)		57
Totally	-	20.092
Damaged	ο C	50,062
Partially		154,922
Total		185,004
Families		993,227
Persons		4,901,234
Barangays	Aff	2,018
Municipalitie	ect	172
S	ed	172
Cities		16
Provinces		26
Evacuation	Ē	244
Centers	/aci	244
Families	ute	15,798
Persons		70,124
Infrastructure		4,299,000,000
Agriculture		6,669,000,000
Total (Infra & Agri)		11.000.000.000

Table 2 : Damages and Destruction details; thetable is created on the basis of data provided byNDCC/ NDRRMC and PAGASA

²² (David Michael V. Padua, 2012)

²³ (National Disaster Coordinating Council (NDCC), 2009)

²⁴ (National Disaster Coordinating Council (NDCC), 2009)

²⁵ (National Disaster Coordinating Council (NDCC), 2009)

Damages²⁶

Typhoon Ondoy caused an estimated loss of Php11 Billion to both infrastructure and Agriculture with a breakdown of Php4.299 Billion to infrastructure including schools and health facilities and Php6.669 Billion to agriculture and livestock. A total of 1,382 school buildings were damaged. The total number of damaged houses were 185,004 (30, 082 totally and 154,922 partially damaged). Agriculture and livestock was also badly affected by Ondoy and a total number of 203,477 hectares incurred losses of about 329.230 MT of crops (rice, corn, high value commercial crops).

NDCC also reported that at the peak time of storm, there were 57 road sections rendered impassable either to light vehicles and or all types of vehicles in Regions II, III, IV, CAR and NCR due to eroded shoulders, floodwaters and landslides. Thirty

Seven (37) road sections in Metro Manila were not secure for light vehicles due to flooding. Isabela – Cabagan –Sta Maria Overflow Bridge in Sta Maria was not drivable due to swollen Cagayan River. Nueva Viscaya – Daang Maharlika 255+500 km Abian Section bambang – one lane was not safe for journey due to landslide and eroded shoulders.

Metro Manila or National Capital Region

The enhanced southwest monsoon brought about by TS Ondoy caused widespread floodings in almost all parts of Metro Manila. Almost 80% of metro Manila was affected due to severe floods.

According to NDCC final report on typhoon Ondoy; a total of 239 barangays in Metro Manila were flooded with a break down; Pasig City (28,836), Quezon City (22,966), Manila City (21,118), Caloocan City (18,110), Muntinlupa City (16,560) and Marikina



Figure 8 : Metro Manila Map, Credit: Philippine ZIP Codes Directory

²⁶ (National Disaster Coordinating Council (NDCC), 2009)

City (15,631 houses or families affected). The most heavily affected by flood waters ranging from knee / neck to roof top $deep^{27}$.

In one of the presentations provided by Mr. Robert Z. Quinto, Senior Weather Specialist, PAGASA identified the causes of flooding and destruction in Metro Manila as; Insufficient carrying capacities of Marikina, Pasig rivers, Manggahan floodway & Napindan Channel, Uncontrolled development, deforestation, Informal settlers, and Insufficient response²⁸.

The glimpse of interviews of the relevant stakeholders conducted in Metro Manila to gather the details about level of preparedness and response observed by various agencies during and after the crisis of typhoon ondoy is given as under:-



HIGHEST WATER LEVEL: 22.6s. & 22.5 mtrs. & 22.4 mtrs.

Till evening the water Figure 9: Graph showed the water level during Ondoy, Credit to Marikina City: level reached above chest Image taken from the Presentation on Ondoy Vs. Habagat

in his street which is not normally flooded due to heavy rains. The water color was dark black at the beginning which looked like overflow from drainage lines but when the water from Marikina river entered into his street turned the water color to brown. His house was also flooded; he and his family safe their lives by moving to the second floor.

able to attend his office.

²⁷ (National Disaster Coordinating Council (NDCC), 2009)

²⁸ (PAGASA- DOST, 2009)

No one was aware about the flood and there was no preparation at that time told by Mr. Mendoza. People start shifting to nearby schools by their own but later the schools were also got flooded. On 27 September at around 3 AM, the water start subsiding and there was one inch mud left in all over the city. Marikina city consists of 16 barangays and out of these 14 are flooded. 80% of the population of Marikina got affected and 90% of the Govt. employees are the victims of typhoon Ondoy. 18,642 houses damaged and 1500 people relocated outside of the city. 68 deaths were recorded and 14,724 persons shifted to evacuation centers.

After typhoon Ondoy, the residents of provident village (most vulnerable village of Marikina city) decided to



(most vulnerable village of Figure 10: Red shows highest flood level areas, Credit to Marikina City: Image Marikina city) decided to taken from the Presentation on Ondoy vs. Habagat

relocate and most of them sold their properties and shifted to safer areas. He described that Marikina city was popular in the past due to its agricultural land and now the agricultural land is only exist near the surroundings of river. There was no pre-evacuation and the evacuation only took place during the flood. The office of DRRMO was established in 2012 under the Philippine Disaster Risk Reduction and Management Act of 2010. Earlier there was office of Rescue 161 but not active and now Rescue 161 is working under DRRMO.

Mr. Mendoza also pronounced that there were reported looting incidences during typhoon ondoy. It's a usual practice here told by Mr. Mendoza that during evacuation, every family left one house member in house (usually father) for the security of their valuables. Now by law it's allowed to do forced evacuation and police is patrolling for protecting the valuables and properties of the evacuees of the area.

He discussed the activities of DRRMO by stating that now they are well prepared to deal with natural hazards as compared with the past. The rain, wind and flood gauges are already installed in different locations of the city. They have a Siren system which they usually test in dry weather on regular intervals as if they test the siren in rainy weather then people get scared and they consider as an alert. When the water level reach to 15 meters in Marikina river they used 1st Alarm that will continuous airing for 1 Minute; 2nd Alarm is used on 16 meters of water level with 2 minutes intermittent airing which means prepare to evacuate, 3rd Alarm is used to evacuate people to designated centers and used at 17 meters of water level by 5 minutes of continuous airing and the fourth alarm is for 18 meters or above water level with 5 minutes of continuous airing and for forced evacuation. During evacuation they used Flood Emergency Evacuation Tag (FEET), one tag for a family which usually helped them to make record of evacuates in evacuation centers.

Schools, gyms and some other buildings are identified as an evacuation centers but the good thing is that unlike the other parts of the country they are doing the inspection of the buildings before considering them as an evacuation center and Infrastructure Audit team is responsible for that. Marikina city as part of "Alliance 7"- (Alliance of seven cities for proactive response to disasters) is now well prepared to deal with natural hazards. Although, it is located over the fault line and may move any time due to earthquake.

Marikina City Disaster Risk Reduction and Management office is continuous focusing on four areas:

- 1) Prevention and Mitigation
- 2) Preparedness
- 3) Response
- 4) Recovery and Rehabilitation

MDRRMO is doing several activities under each focus area like in preparedness they are doing trainings and capacity building for awareness raising on all levels of the society i.e. Media, Schools, public and private sector and local community. Some of the trainings includes; Basic Fire Fighting, First Aid, water safety & Rescue, incident command system, Rescue and response trainings and many more. They also have organized citywide earthquake drills.

Regarding response they have Central Communications and Control Center which is fully equipped with latest technology. 100 High definition cameras are installed all over the city, with one additional camera under the main Marikina river bridge to monitor the water level. Further Mr. Mendoza discussed that they have Response vehicles, heavy machinery, rescue equipment's, Text Messaging Alert System (TMAS) and Five Minutes Quick Response team which provide guaranteed response (medical, fire, police and other assistance) within 5 minutes.

Marikina city won several awards and prizes like Healthy cities good practice award 2006, Best highly urbanized city Disaster Risk Reduction and Management Council 2013 and many more. At the end of discussion, Mr. Mendoza argued that although they did so many things regarding disaster preparedness but they are unable to promise that Marikina will be safe in case of natural hazards as there is Marikina river and the whole city is located on fault line. He said our focus area is preparedness with continuous trainings. Marikina Settlement office is guiding local

community for construction of safe houses. They conduct seminars and meetings with local community for safer or resilience designs of construction. Interview: 12th May, 2014, 9:45 to 11:00 AM

Quezon City					
Mr. Pssupt Jesse J STO Domingo (Ret.)	Mr. Karl Michael E. Marasigan				
Special Assistant to the QCDRRMC Action	Special Assistant for Operation, QCDRRMC				
officer	Department of Public order and Safety				
Department of Public order and Safety	Quezon City Disaster Risk Reduction and				
Quezon City Disaster Risk Reduction and	Management Council (QCDRRMC)				
Management Council (QCDRRMC)	Quezon City Hall Compound, Kalayaan				
Quezon City Hall Compound, Kalayaan	Avenue, Quezon City				
Avenue, Quezon City	Ph. #. (632) 927-5914, 988-4242 Loc 8038				
Ph. #. (632) 927-5914, 988-4242 Loc 8038	Cell # (+63) 917-5219-382 (Globe)				
Cell # (+63) 917-8250-656 (Globe)	Email: marasigan.karl@yahoo.com				
(+63) 922-8750-027 (Sun)					
Email: jessedomingo@yahoo.com					

Mr. Domingo stated that although he was not working in DRRMC at the time of typhoon ondoy but as a resident of Quezon City, he still remembered that there was no preparation at that time. There were heavy rains but no one excepted such a big amount of flooding in Metro Manila. Almost 80% of the Metro Manila was under severe flooding and billions of Pesos loss caused by that typhoon.

The other reason he argued is that under the previous law the calamity funds can only be used in case of natural calamity or disaster. Typhoon ondoy made it possible to make changes in the law and the offices of Disaster Risk Reduction and Management council are established under the law. Previously there was Disaster Control division in Quezon City which was replaced by DRRMO.

According to Mr. Domingo; Quezon City has more than 3 Million populations with highest number of informal settlers in Metro Manila. The LGU have given three options to informal settlers for relocation. These include: off-site, on-site and near site. LGU is constructing off-site houses for informal settlers which they get by paying cost in small installments for 20-30 years. The LGU also bound informal settlers to shift their house at-least ten meters away from the bank of the river. He further argued that some LGU's are compromising if someone moves to 3 meters far from the river bank but there are so many ongoing programs to protect informal settlers from natural disasters.

Quezon City consists of 142 Barangays and there are three rivers passing from the city i.e. Tullahan, Marikina and San Juan river. Quezon City also has a largest water reservoir "La Mesa Reservoir" which is the source of drinking water for 80% of the Metro Manila said by Mr. Domingo. Out of 142 barangays, 15 are located near the bank of the rivers with a break down i.e. 9 barangay with Tullahan river, 2 Marikina and 4 barangays with San Juan river. 40% of the flood prone barangays have retaining or flood control wall and there are some on-going projects also.

FLOODED AREAS DUE TO TYPHOON "ONDOY" 26 SEPTEMBER 2009 - DEPTH CALC DIVISION OF A DIVISIONO A DIVISIO A DIVISIONO A DIVISIONO A (B- 624) 28-57 12-13 43.45 8. 12 ON DESCRIPTION OF THE DRUGHT AND PERMIT

Almost all the barangays have Barangay Disaster Risk Reduction and Management Committees with a group of trained volunteers.

Figure 11: Flood affected areas due to TS Ondoy; Image Credit to QC Hazards, Vulnerability and Risk Assessment Report

Mr. Domingo further discussed that as compared to 2009 now the Quezon City is better prepared and we are continuously focusing on preparedness trainings. Early warning systems are installed, Evacuation protocols are in place and evacuation centers are identified. A state of art multi-purpose evacuation center with a capacity of more than 1000 evacuees is under construction in Barangay Bagong Silangan.

According to him; Department of Public Order and Safety (DPOS) have main responsibility to control the traffic but they can be used as relief and rescue workers as they are well trained. Further Quezon City has developed a Disaster Risk Reduction and Management Plan 2014-2020 which is now in implementation phase. The main objective of the plan is to make the Disaster Resilient City.

Finally, he discussed the future plans which include the installation of 500 High definition CCTV cameras in strategic locations for criminology and traffic control, Inspection of structural integrity of almost all the public and private buildings and continuous trainings for preparedness and awareness rising.

Interview: 12th May, 2014, 12: 45 to 2:15 PM

Caloocan City				
Mr. Alex P. Nadurata	Mr. Kareem Mohammad Sali RN			
Local Disaster Risk Reduction &	Emergency Medical Technician /			
Management officer	Consultant, North Caloocan Rescue			
Caloocan City Disaster Risk Reduction &	Caloocan City Disaster Risk Reduction &			
Management Office (CCDRRMO)	Management Office (CCDRRMO)			
Caloocan City	Cell # (+63) 999-3574-332			
Ph. # (632) 310-7563 / 668-7142	Email: kreenvalue kreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvaluekreenvalue			

Mr. Kareem discoursed that the Caloocan City has two parts i.e. North and South.

Wikipedia

North Caloocan is located on high laying areas or up streams and considered as more safe while the south is over populated and located at low lying area. According to him due to its geographical location it is hardly affected by disasters. Caloocan city consists of 188 barangays and main city is located in south Caloocan. He mentioned that Caloocan city have more trees and less buildings as compared to Manila and that is another reason of less affected by disasters.

Mr. Kareem by profession is a Registered Nurse and used to work with a private ambulance company in Manila during the time of typhoon ondoy. He described that the north part of Caloocan city was not affected due to Ondoy, it's only the south which got flooded due to poor sewerage and garbage problem at that time but now they have a proper drainage and regular



garbage collection programs. The highest possible disaster for the city is the earthquake, he discussed as they are far from the river.

Caloocan city Disaster Risk Reduction and Management office (CCDRRMO) has recently been established in January, 2014, both in north and south. Earlier there was Department of Public Safety and Traffic Management (DPSTM) and now the rescue group from DPSTM became part of CDRRMO. CDRRM office in the north is now in construction phase and they have a single small room office and according to him they are mostly sitting outside of office as there is no space inside but in the north they have a well-equipped office. Only one barangay in Caloocan city have their own Barangay Disaster Risk Reduction & Management Committee (BDRRMC) and the rest ones are in the planning phase.

According to Mr. Kareem now they are focusing mostly on preparedness and rescue trainings and they have continuous training program at all levels. They have trained volunteers group for relief and rescue operations. Mr. Kareem joined the CCDRRMO as an Emergency Medical Technician, he has a passion to do work for his own area and contribute his part for making the Caloocan city a resilient one.

Interview : 12th May, 2014, 3:30 to 4:15 PM

Pasig City						
Mr. Ritche Van C. Angeles	Ms. Maricel M. Evangelista					
Local Disaster Risk Reduction &	DRRMO/C3 Admin					
Management Officer	Pasig City Disaster Risk Reduction and Management					
Pasig City Disaster Risk Reduction	Office (PCDRRMO)					
and Management Office (PCDRRMO)	Pasig City Hall, 8th Floor, Caruncho Avenue,					
Pasig City Hall, 8 th Floor, Caruncho	Barangay San Nicolas,					
Avenue, Barangay San Nicolas, Pasig	Pasig City, Ph. # (632) 643-0000					
City	Che-evangelista3010@yahoo.com.ph					
Ph. # (632) 643-0000						
Mr. Noel C. Perez						
OIC- Pasig City Fire Brigade, Red Training Center, C. Raymundo Avenue caniogan,						

Pasig City DRRMO-C3, Ph. # (632) 643-0000, Cell # (+63) 917- 501-2808 Email: No el gimiketo@yahoo.com, Redtrainingcenter@yahoo.com

Ms. Evangelista still remembered the devastations caused by typhoon Ondoy as she was also one of the victims of that typhoon. She still remembered the date and according to her it was the morning of 26th September, 2009 when she looked outside from a window of her house and got surprised that there was 3 ft. water in the street and slowly it reach to above chest level. The water entered to her house also with a level of above 3 feet. At that time she was living with her two small children (having the age of 5 and 3) and her husband was working abroad. She received call from her office to report immediately, so she shifted her children to her Mother in law's house which was flooded very little. Then she went to office by walking in 4 to 5 ft. water. There was no preparation at that time and it happened without any notice. They have seen heavy rains but not so much flood due to rain

in the past so they are not prepared for that.

They tried to contact volunteers during flood but most of the volunteers are also the victims of the typhoon ondoy. She said, at that time there were so many incidence of looting and some people get benefit of the situation and charged high money for

shifting the people from flood water to safe areas. Although, they delivered flood response trainings even before the typhoon Ondoy but unable to respond properly due to its devastation and intensity. Luckily there were very few causalities and injuries.

Ms. Evangelista described the current situation of DDRRM office which is fully with equipped latest technology and trained They workers. have installed 165 Hiah definition CCTV cameras in the strategic locations of Pasig citv and continuous monitoring the city, 90 additional

are



Figure 13: Pasig City Map, Credit: Pasig City DRRMO

installed in public elementary and high schools to provide more security to students from harassment and other related crimes. All the CCTV cameras are linked with fiber optic cable. Earthquake monitoring devices, Early warning systems, rain fall gauges and flood monitors are also installed. PCDRRMO office is working 24/7 and fully prepared to deal with hazards.

cameras

Further, Pasig city have implemented color coding alert system and alerts are represented by four colors i.e. white alert used for normal situation, yellow means standby or listen radio , blue- 50 % of the staff will stay ready and check all the equipment, and red color alert is used for deployment of 100% man power and resources means full force alert.

Ms. Evangelista also debated that the city started green initiatives and their city hall is smoke free building. They are giving advices regarding green technologies. Moreover they have the Green police who give violations receipts to smokers with first warning then plenty. The activities of green police are supported by city ordinance. City has a proper garbage collection office with a proper disposal or dumping of garbage facility.

Pasig City consists of 30 barangays and western side of the city is located on fault line. She discussed that they have big buildings that can be used as evacuation centers and there sports complex have a capacity of more than 10,000 evacuees. Some schools are also identified as an evacuation centers but schools are only used as a last resort. Every Evacuation center has assigned team's i.e. Health team, rescuers group, volunteers group and monitoring & communications team. The DRRM office has volunteers from all levels including the corporate or business sector. They have a stock of V-Bags with all the necessary things in it i.e. soap, shampoo, towel, toothpaste, brush etc... For the evacuees.

Ms. Evangelista also discussed that the city have no debts and they are relaying on their own resources. The DRRM office has their own well equipped training center called Red training center (Rescue Emergency Disaster Training Center). The Training center offered ten different short courses on search and Rescue, Fire Fighting, First Responder course, Technical Rope Rescue, first aid etc... It's a first quality training center in Metro Manila and delivering training to all neighboring LGU's.

There future plans includes; continuous trainings, adding state of the art equipment's, continuous and regular inspection of buildings and make Pasig a resilient city. The city also helped other LGU's during typhoon Yolanda and adapted five cities affected by typhoon Yolanda.

Interview : 13 th May, 2014,	8:45 to 11:00 AM
---	------------------

Metropolitan Manila Development Authority (MMDA)

Mr. Pablo R. Bautista Jr.

Assistant Head, Flood Control Information Center

Metro Manila Disaster Risk Reduction and Management Council (MMDRRMC)

Metro Manila Development Authority, MMDA Building, EDSA Corner, Orense St. Guadalupe,

Makati City; Ph. # (632) 882 – 0925; Email: jhua_bautistajr@yahoo.com

According to Mr. Bautista, Flood control Information center and Metro Manila Disaster Risk Reduction and Management office was established in 2011. The main

task of flood control information center is to monitor the flooding of Metro Manila

(MM) and timely issue the warnings to cities and municipalities in MM or National capital region.

MM consists of 17 cities with above 1700 barangays. Manila bay is located in the west corner of MM. During typhoon ondoy, the incident commander was from MMDA and they established the incident command post in Marikina city, as it was the most affected city of MM. MMDA played the major role in relief, rescue and rehabilitation.



MMDRRMC presentation by Ms. Susana M. Cruz, Regional Director, OCD-NCR

MM has upgraded the drainage system told by Mr. Bautista and they have installed 50 plus censors all over MM for monitoring the flood and water level with the help of Department of science and Technology (DOST). For controlling the flooding, total of 52 pumping stations present in MM. Out of these total, 25 are large pumping stations. These pumping stations pumped the water from inland and retained it in pond and then transferred it to Pasig River. Some pumping stations throw water directly to Manila bay from the pond. Although the ponds exist during typhoon ondoy but the amount of water was so much high that almost all the pumps got flooded and unable to perform operations. 10 small Pumping stations added after typhoon ondoy.

Additionally MMDA have installed 35 automated weather stations all over MM for issuing timely weather updates. Mr. Bautista also discussed that MMDRRMC has developed IEC materials for the guidance of LGU's and they issue advises to LGUs to avoid dumping of garbage near the river banks and keep the river or lakes clean. MM have their own training center located at Napindan and they are continuously providing trainings on preparedness, rescue and response. The mandate of MMDA is to make MM more livable, free from flooding's and disasters.

Interview : 13th May, 2014, 11:30 to 12:30 PM

Manila City

Mr. Johnny G.YU	Mr. Nigel S. Tabliago
Local Disaster Risk Reduction &	Staff- DRRMO
Management Officer	Disaster Risk Reduction & Management
Disaster Risk Reduction & Management	office (DRRMO)
office (DRRMO)	102 Ground floor, Delpan Evacuation Center,
102 Ground floor, Delpan Evacuation Center,	Delpan Street., Binordo, Manila City
Delpan Street., Binordo, Manila city	Ph. # (632) 527 – 0984 / 527- 4939
Ph. # (632) 527 – 0984 / 527- 4939	Cell # (+63) 917-7834-323
Cell # (+63) 917-8589-337	

Manila city Disaster Risk Reduction and Management office is located very far and almost at the corner of the city in Delpan Evacuation center. Mr. Tabliago said that this office is temporary and soon they will shift in the Manila city hall. DRRMO is established on 27th September, 2013 under the city ordinance 82 &23.

He further discussed that the former mayor of Manila have established two evacuation centers one is in Delpan in which there office is currently located and the other is in Baseco. DRRM office is equipped with latest technology and equipment's but due to its location they also faced problems in coordination. He said his office is doing continuous trainings and already did Multi hazard study of the city with the help of several donors. Now days they are planning to conduct city wide multi hazard drill which possibly be organize in the month of July.

Manila city consist of 896 barangays and all have trained volunteers for relief and rescue work. According to him they have identified all the possible disasters of the city and now preparing the city to safe from all possible future hazards.

Interview : 13th May, 2014, 3:00 to 4:00 PM

Common Findings from the interviews

- There were heavy rains but no one was prepared for the floods. The flood level was mostly above chest to roof tops. It's the first time that they experienced massive floods. Most of the people safe their lives by climbing over the rooftops.
- Evacuation took place during or after flood. Even most of the evacuation centers were flooded.
- Rescuers and Govt. Servants were also become the victims of typhoon Ondoy and unable to perform their functions well.
- Inefficient or no timely warnings for the flood.
- DRRM offices were established after typhoon Ondoy. The law restricted the use of available calamity funds until and unless natural disaster actually occurs which is amended after typhoon Ondoy. In most of the visited areas or cities the DRRM offices were established in 2012 and 2013. Some of them have recently been established like Manila and Caloocan city offices.

- DRRM offices claimed that now they are fully prepared and continuously focusing on preparedness trainings.
- All the DRRM offices have trained volunteers and rescuers even barangays have their own DRRM committees with trained volunteers.
- Most of offices are equipped with rescue equipment's and necessary vehicles.
- Improved warning systems like color alerts in Pasig city, and alarms airing in Marikina city.
- Rain Gauges, Flood monitors, CCTV cameras are already installed in most of the cities.
- Only Quezon and Manila City have their own evacuation centers others still treating schools, Gyms, sports complex and other big buildings as an evacuation centers. Only few are focusing on inspection of buildings before considering them as an evacuation center.
- Pasig City and MMDA have their own well equipped training center.
- Informal settlers are still in danger.
- In the opinion of few individuals their area is located at disaster free zone and hardly hit by any disaster like Caloocan city especially the North Caloocan.

Disaster Management and Response

According to United Nations office for Disaster Risk Reduction (UNISDR);

"There is no such thing as a 'natural' disaster, only natural hazards.

Disaster Risk Reduction (DRR) aims to reduce the damage caused by natural hazards like earthquakes, floods, droughts and cyclones, through an ethic of prevention^{"29}.

During Ondoy no one was prepared for the destructive floods as it happened instantly, resulting in massive destruction to lives and properties. Normally the first responders were the local people or volunteers who started the relief and rescue work with the help of LGU and other local organizations. The second responders like relief agencies, NGO's usually came after the incident passed or incurred.

The same happened in case of typhoon Ondoy but the response was not so much efficient because most of the volunteers and Governments officials also became the victim of the typhoon. So firstly they prefer to safe their own families and after that they reported for their assigned relief and rescue work.

²⁹ (United Nations office for Disaster Risk Reduction (UNISDR))

The Final report of NDCC presented the following information regarding humanitarian assistance in response to TS Ondoy and TY Pepeng. The Typhoon

Pepeng came at the same time as early the TS ondoy passed.

Table 3 showed the volumeof assistance provided bythe National Government,LGUs,NGOs andGovernment organizations

sponse to T	he Typhoon		
Agency	TS Ondoy	TY Pepeng	Total
OCD-NDCC	22,493,125	21,170,000	43,663,125
(Rice)	(24,750 sacks)	(23,200 sacks)	(47,950 sacks)
DSWD	95,862,360	59,218,045	155,080,405
LGUs	25,169,867	71,370,735	96,540,602
NGOs / INGOs	17,740,150	57,809,036	75,549,186
Grand Total	161,265,502	209,567,816	370,833,318

and Table 3: Humanitarian Assistance to Ondoy and Pepeng; Table from NDCC final report on TS Ondoy and TY Pepeng

for food, non-food items, early recovery and shelter was amounting to Php 371 million. Out of total Php 161million to TS ondoy and Php 209 million to TY Pepeng' response³⁰.

While on the other hand this response seems to very little as compared to the required amount identified by Post Disaster Need Assessment (PDNA) for recovery and reconstruction in their assessment report of 26th November, 2009;

Sector	Damages and Losses			Needs		
	Damages	Losses	Total	Recovery	Reconstr.	Total
Productive Sectors	557.8	2,661.7	3,219.5	351.8	1,422.4	1,774.3
Agriculture	80.1	769.2	849.3	291.6	59.7	351.3
Industry	209.2	194.1	403.3	15.8	220.5	236.2
Commerce	256.2	1,644.4	1,900.6	33.7	1,126.8	1,160.4
Tourism	12.3	54.0	66.2	10.8	15.4	26.2
Social Sectors	706.5	212.5	919.0	197.0	1,606.3	1,803.3
Housing	541.6	188.8	730.3	166.4	1,444.9	1,611.4
Education	53.5	4.9	58.4	8.9	65.1	74.0
Cultural Heritage	6.0	0.5	6.5	0.6	6.8	7.5
Health	105.5	18.3	123.8	21.1	89.4	110.5
Infrastructure	181.1	56.2	237.3	42.3	397.2	439.5
Electricity	15.2	18.7	33.9	0.0	15.2	15.2
Water and Sanitation	7.9	16.4	24.3	0.7	2.8	3.4
Flood Control, Drainage and Dam Management	15.3	0.0	15.3	0.0	171.3	171.3
Transport	138.7	21.2	159.8	41.6	208.0	249.6
Telecommunication	4.1	0.0	4.1	0.0	0.0	0.0
Cross-Sectoral	6.3	0.9	7.1	351.8	54.1	405.9
Local Government	6.3	0.9	7.1	0.2	6.4	6.6
Social Protection	0.0	0.0	0.0	351.5	6.7	358.2
Financial Sector	0.0	0.0	0.0	0.1	2.9	3.0
Disaster Risk Management & Reduction	0.0	0.0	0.0	0.0	38.1	38.1
Total	1,451.7	2,931.3	4,383.0	942.9	3,480.1	4,423.0

Table 4 : Damages or losses cost along with finance required for recovery and reconstruction, Table adapted from Post disaster Needs Assessment (PDNA) report of Nov 26, 2009

According to PDNA assessment and as shown in Table 4

³⁰ (National Disaster Coordinating Council (NDCC), 2009)

"The estimated damage and losses from Ondoy and Pepeng amount to a total of US\$4.38 billion. The PDNA found that damage to physical assets in the affected areas amounts to an estimated Php 68.2 billion, equivalent to US\$1.45 billion. Associated losses in production and other flows of the economy were estimated at nearly Php 137.8 billion or US\$2.93 billion, equivalent to two-thirds of the total disaster effects. While the destruction or damage to assets occurred at the time of the storms, the associated changes in economic flows will last beyond the present calendar year. In some sectors and cases, the effects will be felt in 2010 and 2011 depending on the speed and efficiency of the post disaster recovery and reconstruction activities"³¹.

The above table and cost mentioned for recovery and reconstruction is for short and medium terms and for long term plans it needs an extra amount of Php 17 Billion (USD 362.6 Million-not included in above table) estimated by PDNA.

PDNA presented the estimated amount required for recovery and rehabilitation but there is no single report available which showed the actual amount spent for that. It is common practice that organizations both public and private mostly focus on short and medium term plans and if another disaster happens they forget the previous and focused on the new or latest. So might be the same case happened with TS ondoy. Humanitarian assistance reports of few organizations are available which they developed for showing their work and attract more donors and funding agencies.

Role of Media

This case study truly showed the role and importance of media as many points or information gathered from online newspapers. Role of media is very essential both in updating the public about the incidents and hazards attached with it and recording the event for future preparations.

The print, electronic and social media can also be helpful in issuing well in time warnings to public to protect them from disasters or future hazards. Some of the DRRM offices have developed their pages on Face book (FB) which they are regularly updating by posting weather updates. Additionally they also attract volunteers through FB for trainings. Updates are also issued regarding preparedness. There are so many pages developed on FB regarding typhoon ondoy but with the new typhoons or disasters the old pages became inactive. During big or super typhoons the internet technology and other relevant backup equipment's also get destroyed and it is hard to use social media during disasters especially for

³¹ (Post-Disaster Needs Assessment (PDNA), 2009)

victims but others can use it for attracting funds, finding their relatives, appeal for help, giving good advises and for many other ways.

Recommendations

Although Philippines are always vulnerable to natural hazards especially typhoons but the lessons learnt are the same as they are in few years ago. Only few changes have been made in terms of improvements but a lot need to be done to make the cities more live-able or resilience from future hazards. Some of the recommendations are the following:

- Although PAGASA have improved their forecasting system by installing more radars and newly developed rainfall measurement system but it need more technological improvements for better forecasting and issuance of well advance warnings or advisories.
- The Warning or advisory system should need to be more efficient by making it more easy or understandable. Innovative warnings or alert systems should need to be introduced for common public like color alert, alarm airing, flag raising etc.
- DRR System is also much improved as compared to the past but it need to be more effective and efficient. The focus of all DRRM offices is on trainings and drills which is an essential component of preparedness but along with that the offices should need to be equipped with state of the art equipment's and technology.
- Only trainings will not protect the people from future hazards in the absence of resilient evacuation centers. It's a usual practice in almost all over the Philippines that school, gyms, sports complex and municipal halls are considered as evacuation centers due to their big capacity to absorb the evacuees without inspecting the buildings. During the field interviews in different parts of the country there are several examples in which the LGU did forced evacuation and shifted the people to evacuation centers but in the course of typhoon, the evacuation centers start collapsing or shaking and then they shifted the evacuees to other buildings. Luckily they got safe but if something happened to that evacuation centers then it will be a more big disaster with thousands of causalities.
- There is hardly any LGU which is giving advises or guiding people regarding resilient or safe construction of houses. After every typhoon or disaster the people construct the same kind of houses and they again got affected in next

disaster. The continuous re-building of houses without observing proper construction code would bring more poverty to common people. The resilient designs instead of old local construction should need to be introduced for adapting the common public in this approach which may protect them from hazards and natural disasters.

- The informal Settlers or the people living near the river banks become victims of typhoon or disasters resulting in more vulnerability. There is a severe need to provide them permanent shelters with some livelihood interventions.
- Flood control measures should need to be updated or upgraded to meet the future needs. Metro Manila is surrounding by sky rise buildings and hundreds of new buildings are adding every year which results in more sanitation and drainage needs. It should be mandatory for the contractors to get approval from the Government by submitting drainage along with actual construction plan before starting work.
- Many of the DRRM offices staff discussed about the little compensation for the hard and risky work they are doing. The salary of the staff should need to be competitive or market based. This would help in retaining experienced and qualified staff along with attracting more talented workers.
- Only few DRRM offices have their own permanent buildings and the rest are still planning due to unavailability of sufficient budgets. For efficient work it is recommended that the DRRM office should have their well-furnished and well equipped buildings as they have a duty of 24/7.
- The good examples of other countries can also put in practice for more efficient disaster preparedness, mitigation and management. DRR should also need to be part of sustainable development.
- The coordination of all stakeholders at all levels is necessary for better planning, implementation and mitigation. The community based approaches should need to be adopted for efficient and effective development plans.
- Deforestation, illegal logging, pollution, inefficient mining etc. should need to be controlled.
- Green technologies, environment friendly approaches and more plantations should also need to be part of DRR preparedness.

- Advanced backup system for electricity and communications should need to be installed for stay active in case of emergencies.
- The mock earthquake and flood drills should be conducted on regular basis to prepare the general public for all type of disasters.

Conclusion

Tropical Storm Ondoy is one of the most destructive disasters in Philippines' history. The remarkable amount of rainfall in a single day broke all the previous records and results in massive flooding. The inappropriate warnings and poor forecasting resulted into more destruction. Hundreds of people died due to Ondoy and many safe their lives by staying on the rooftops. The rescuers, volunteers and other Govt. servants were also become the victims of the typhoon.

Many things changed after TS Ondoy but still lot of improvement required to be done in different areas to deal with future hazards. Better planning, proactive, efficient and coherent Disaster Risk Reduction and Management system should need to be placed. The focus will need to be shifted to resilient housing instead of traditional ways of construction. There should be at-least one permanent evacuation center with all the necessary facilities in each and every municipality. The nature friendly plans, climate change issues, less pollution, more plantations etc. are some of the ways to safe the country from more destructive future hazards. The coordination amongst the stakeholders at all levels would result in more appropriate planning which may lead towards sustainable development. The better preparation at public/private sectors would cause less destruction and leave positive/healthy impact on country's economy to attract the investors.

Annexures

Annex: I - Public Storm Warning Signals (PSWS)³²

PSWS No.	Meanings	What to Do
1	A Tropical Cyclone will affect the locality. Winds of not more than 60 kph may be expected in at least 36 hours*. Disaster preparedness plan must now be activated to alert status.	 ✓ Listen to your radio for more information about the weather disturbance. ✓ Check the ability of the house to withstand strong winds and strengthen it if necessary. ✓ The people are advised to monitor the latest severe weather Bulletin issued by PAGASA every six hours. In the meantime, business may be carried out as usual except when flood occurs.
2	A moderate Tropical Cyclone will affect the locality. Winds of 61 to 100 kph may be expected in at least 24 hours*. Disaster Agencies / organizations concerned must act now to alert their communities	 Special attention should be given to the latest position, the direction and speed of movement as the cyclone may intensify and move towards the locality. The general public, especially people travelling by sea and air are cautioned to avoid unnecessary risks. Protect properties before the signals are upgraded. Board up windows or put storm shutters in place and securely fasten it. Stay at home.
3	A strong Tropical cyclone will affect the locality. Winds of 101 to 185 kph may be expected in at least 18 hours*. Disaster agencies / organizations concerned must now be ready to act in response to actual emergency.	 Keep your radio on and listen to the latest news about typhoon. Everybody is advised to stay in safe and strong houses. Evacuate from low-lying areas to higher grounds. Stay away from coasts and riverbanks. Watch out for the passage of the "Eye" of the typhoon.
4	A very intense typhoon will affect the locality. Winds of more than 185 kph may be expected in at least 12 hours*. Disaster Agencies / Organizations concerned are now fully responding to emergencies and in full readiness to immediately respond to possible calamity. *Times are valid only the first time the signal numbers is raised.	 ✓ Stay in safe houses or evacuation centers. ✓ All travels and outdoor activities should be cancelled.

³² (PAGASA-DOST, 2012)

Annex: II – Warnings issued by PAGASA³³

Public Storm	was raised over Camarines Provinces, Burias Island, Catanduanes, Quezon
Warning Signal	including Polillio islands, Aurora, Rizal, Bulacan, Nueva Ecija, Quirino, Aurora,
(PSWS) # 2:	Nueva Vizcaya, Pampanga, Tarlac, Zambales, Pangasinan and La Union.
Public Storm	was raised over Albay, Laguna, Cavite, Batangas, Isabela, Mt. Province, Ifugao,
Warning Signal	Ilocos sur, Mindoro Provinces, including Lubang island, Marinduque, Bataan
(PSWS) # 1:	and Metro Manila.

³³ (PAGASA-DOST, 2009)

Services	Products
Weather Forecast & Tropical Cyclone Warning Services	 24 –Hr. Public Weather Forecasts and Severe Weather Bulletins Hourly Tropical Cyclone Warning Update
	 Shipping Forecasts & Tropical Cyclone Warning for Shipping
	 Gale Warning Meteorological Aviation Services for Aeronautical Users through Access to
	the World Area Forecasts Systems (WAFS)
	Rainfall Warning System
Flood Forecasting & Warning System	 Basin Flood Bulletins for Telemetered Basins and General Flood Advisories for the Non-Telemetered Basins
Cycloni	 Dam Discharge Warning Information during Spilling Operation of Monitored
	Dams
	 Community-Based Flood Early Warning System Daily Hydrological Forecasts during Non-Flood Watch
Climatoligical & Farm Weather	Daily Farm Weather Forecasts & Advisories
Services	 10-day Regional Agroclimatic Weather Advisories
	 10-day Philippine Agrocilmatic Advisories El Niño/La Niña Watch and Information
	 Monitoring and Prediction of Seasonal Rainfall Forecasting
Research and Development	Dispatch of the Special Tropical Cyclone Reconnaissance, Information and
	Data Evaluation (STRIDE) QUICK Response Team to threatened and affected
	 Conduct Calibration, Repairs & Testing (for private and government sectors)
	of Barometers and other related Equipment
	 Assist Researchers from Different Schools, Colleges, Universities and other Agencies
Astronomical Services	Philippine Standard Time (PST)
	 Promotion of Astronomy through Stargazing/Telescoping Sessions and Planetarium Show
	 Planetarium Tour in selected Areas in Luzon
Information, Education and	Public Awareness Campaign on Natural Hazards specifically Weather,
Public Outreach	Climate, Typhoons, Floods, Storm Surges and other related hazards
	 Conduct of Information, Education and Dissemination Activities Conduct of Seminars/Workshops on Meteorological and Hydro
	meteorological Hazards
	 Conduct of Seminar for Science Teachers on Basic Astronomy
	 Public Information Drives for the target areas of monitored Dams Conduct of Flood Drillo
	 Conduct of Flood Dhils Conduct of Annual Media Seminar-Workshops on PAGASA Services
	 Conduct of Annual Typhoon and Flood Awareness Week
	 Participation in Special Events like Exhibitions, School Celebration and other
	government and non-government organizations
	brochures, posters and exhibit display materials

Annex: III – PAGASA Services³⁴

³⁴ (PAGASA- DOST)

Bibliography

- BBC News . (2009, Sep 29). *Philippine flood death toll rises*. Retrieved May 1, 2014, from BBC News: http://news.bbc.co.uk/2/hi/asia-pacific/8279801.stm
- CNN.com/asia . (2009, Sep 27). Dozens dead as flooding engulfs Manila. Retrieved Feb 18, 2014, from CNN.com/asia : http://edition.cnn.com/2009/WORLD/asiapcf/09/27/philippines.floods/index.html?eref=edition
- David Michael V. Padua, S. T. (2012, April 16). *Typhoon Climatology*. Retrieved Mar 13, 2014, from The Weather Philippines Foundation: http://weather.com.ph/typhoon/climatology
- Japan Meteorological Agency. (2009). Annual Report on the Activities of the RSMC Tokyo Typhoon Center 2009. Tokyo, Japan.
- National Aeronautics and Space Administration (NASA). (2009, Oct 1). *Hurricanes / Tropical cyclones*. Retrieved March 20, 2014, from National Aeronautics and Space Administration (NASA): http://www.nasa.gov/mission_pages/hurricanes/archives/2009/h2009_Ketsana.html
- National Disaster Coordinating Council (NDCC). (2009). *Final Report on Tropical Storm "Ondoy" {Ketsana} and Typhoon "Pepeng" {Parma}*. Quezon City, Philippines: National Disaster Coordinating Council (NDCC).
- PAGASA- DOST. (2009). Tropical Storm Ketsana Flood Disaster: Causes, Impacts and Lessons Learned. *Tropical Storm Ketsana Flood Disaster: Causes, Impacts and Lessons Learned*. Quezon City, National Capital Region, Philippines: PAGASA-DOST.
- PAGASA- DOST. (n.d.). *About us* . Retrieved Jan 23, 2014, from PAGASA- DOST: http://www.pagasa.dost.gov.ph/about-us
- PAGASA-DOST. (2009). Tropical cyclone summary 2009. *Tropical cyclone summary 2009*. Quezon City, National Capital Region, Philippines: PAGASA-DOST.
- PAGASA-DOST. (2012). A Prmier on Tropical Cyclone "Bagyo". *A Prmier on Tropical Cyclone "Bagyo"*. Quezon City, National Capital Region, Philippines: PAGASA-DOST.
- Philippine Daily Inquirer. (2009, Sep 27). 73 dead, more than 300,000 displaced by Ondoy . Retrieved May 5, 2014, from Philippine Daily Inquirer: http://newsinfo.inquirer.net/breakingnews/nation/view/20090927-227130/73-dead-morethan-300000-displaced-by-Ondoy
- Philippine Daily Inquirer. (2009, Sep 26). Floods submerge Metro Manila areas . Retrieved May 6, 2014, from Philippine Daily Inquirer: http://newsinfo.inquirer.net/breakingnews/nation/view/20090926-227047/Floods-submerge-Metro-Manila-areas

- Philippine Daily Inquirer. (2009, Sep 27). *No rich, no poor for Ondoy's onslaught.* Retrieved May 2, 2014, from Philippine Daily Inquirer: http://newsinfo.inquirer.net/breakingnews/metro/view/20090927-227193/No-rich-no-poorfor-Ondoys-onslaught
- Philippine Daily Inquirer. (2009, Sep 27). Ondoy dumped more rains than Katrina . Retrieved May 7, 2014, from Philippine Daily Inquirer: http://newsinfo.inquirer.net/breakingnews/metro/view/20090927-227186/Ondoy-dumpedmore-rains-than-Katrina
- Philippine Daily Inquirer. (2009, Sep 27). Too much rain too soon . Retrieved May 2, 2014, from Philippine Daily Inquirer: http://newsinfo.inquirer.net/inquirerheadlines/nation/view/20090927-227074/Too-much-raintoo-soon
- Post-Disaster Needs Assessment (PDNA). (2009). *Philippines, Typhoons Ondoy and Pepeng:Post-Disaster Needs Assessment (PDNA).* Post-Disaster Needs Assessment (PDNA).
- Presbyterian Disaster Assistance. (2009, Sep 29). Situation report Philippines Typhoon Ondoy. Retrieved May 3, 2014, from Reliefweb International: Tropical Storm "Ketsana," locally known as "Ondoy," swept across metro Manila and parts of Central Luzon on Saturday, September 26, 2009, and brought a month's worth of rain in just 12 hours. The waters rose so fast that people living in low lying areas w
- The World Bank. (2011, Sep 23). Documents and Reports Philippines Typhoons Ondoy and Pepeng : post-disaster needs assessment (Vol. 1 of 3) : Executive summary (English). Retrieved Feb 23, 2014, from The World Bank: http://documents.worldbank.org/curated/en/2011/01/15115760/philippines-typhoons-ondoypepeng-post-disaster-needs-assessment-vol-1-3-executive-summary
- United Nations office for Disaster Risk Reduction (UNISDR). (n.d.). What is Disaster Risk Reduction? Retrieved Jan 21, 2014, from United Nations office for Disaster Risk Reduction (UNISDR): http://www.unisdr.org/who-we-are/what-is-drr

Special Thanks

- Dr. Vicente B. Malano, Acting Administrator, Office of the Administrator PAGASA Central Office, Science Garden, Agham road, Diliman, Quezon City 1100, Philippines Ph. # 632-434-9040 / 632-434-2698/ 632-434-5886; Email: <u>vmalano@hotmail.com</u>
- DR. Flaviana D. Hilario, Acting Deputy Administrator, Research and Development PAGASA Central Office, Science Garden, Agham road, Diliman, Quezon City 1100, Philippines Ph. # 632-929-1953
- Ms. Rose S. Barba, Senior weather Specialist, Climate and Agromet Data Section (CADS), PAGASA Central Office, Science Garden, Agham road, Diliman, Quezon City 1100, Philippines Ph #.632- 434-2698 Cell # +63-919-6177-890; Email: <u>rosebarba28@gmail.com</u>
- Ms. MA. Cecilia A. Monteverde, Assistant Weather Services Chief, Hydrometeorology, Tropical Meteorology & Instrument, Research and Development Section (HTMIRDS), PAGASA Central Office, Science Garden, Agham road, Diliman, Quezon City 1100, Philippines Ph. # 632-434-2715; Cell # +63-917-9377-244; Email: <u>charmiem@yahoo.com</u>
- Mr. Roberto S. Sawi, Officer-in-Charge, Weather Division
 PAGASA, WFFC Building, Agham Road, Diliman, Quezon City 1100, Philippines
 Ph. # 632-922-1996 /632-929-4570 Email: rssawi@pagasa.dost.gov.ph
- Mr. Dante D. Balao, OIC, Plans & Program Division
 National Disaster Risk Reduction and Management Council (NDRRMC),
 Office of Civil Defence (OCD), Camp Gen. Emilio Aguinaldo, Quezon City 1110, Philippines
 Ph. # 632-912-6675 / 632-912-2424; Cell # +63-905-4871-376 Email: ocda.ocd@gmail.com
- Ms. Susan Quiambao, Trainings Division
 NDRRMC, Office of Civil Defence, Camp Gen. Emilio Aguinaldo, Quezon City 1110, Philippines
 Ph. # 632-912-4832; Cell # +63-917-8431-765 Email: <u>ocdndrrmctraining@gmail.com</u>, <u>quiambao2003@yahoo.com</u>
- Maj. Reynaldo B. Balido Jr. PA, Officer-in-Charge, NDRRMC Operations Center, National Disaster Risk Reduction and Management Council (NDRRMC), Office of Civil Defence (OCD), Camp Gen. Emilio Aguinaldo, Quezon City 1110, Philippines Ph. # 632-912-6675 / 632-911-5061 to 64 Loc. 101; Cell # +63-917-5658-681/ +63-920-9748-918 Email: <u>balido99@yahoo.com</u>, <u>balido.jr@gmail.com</u>
- Engr. Floventino Sison, Civil Defense Officer-II, NDRRMC Operations Center, National Disaster Risk Reduction and Management Council (NDRRMC), Office of Civil Defence (OCD), Camp Gen. Emilio Aguinaldo, Quezon City 1110, Philippines Ph. # 632-912-6675 / 632-911-5061 to 64 Loc. 101; Cell # +63-905-4836-962 Email: tinosison@yahoo.com
- Ms. Kathreen Ong, NDRRMC Operations Center, National Disaster Risk Reduction and Management Council (NDRRMC),

Office of Civil Defence (OCD), Camp Gen. Emilio Aguinaldo, Quezon City 1110, Philippines Ph. # 632-912-6675/632-911-5061 to 64 Loc. 101; Cell # +63-943-3970-554

- Ms. Rownie Aura Abella, NDRRMC Operations Center
 National Disaster Risk Reduction and Management Council (NDRRMC),
 Office of Civil Defence (OCD), Camp Gen. Emilio Aguinaldo, Quezon City 1110, Philippines
 Ph. # 632-912-6675 / 632-911-5061 to 64 Loc. 101; Cell # +63-932-7960-213
- Mr. Robert Z. Quinto, Senior weather Specialist, Hydrometeorology, Tropical Meteorology & Instrument, Research and Development Section (HTMIRDS), PAGASA Central Office, Science Garden, Agham road, Diliman, Quezon City 1100, Philippines, Ph. # 632-434-2715; Cell:+63-947-3946-749 Email: bertzg@yahoo.com
- Ms. Susana M. Cruz, Regional Director, OCD-NCR and Senior Vice-Chairperson MMDRRMC
 2 F/3F RBA Building No.81, 15th Avenue, Murphy, Cubao, Quezon City
 Ph. # (02) 9132786 / 4211918 Email: <u>ordncr@yahoo.com</u>, <u>officeofcivildefensencr@yahoo.com</u>
- Ms. Kristin M. Roxas, Officer –In charge Marikina City Disaster Risk Reduction & Management Office (MCDRRMO),Office of Civil Defense, Marikina City, Ph. # (632) 646 -0427
- Mr. Rameses E. Mendoza, Operations & Warnings Supervisor, Marikina City Disaster Risk Reduction & Management Office (MCDRRMO), Office of Civil Defense, Marikina City; Ph # (632) 646-0427; Email: <u>mcdrrmo@marikina.gov.ph</u>
- Mr. Pssupt Jesse J STO Domingo (Ret.), Special Assistant to the QCDRRMC Action officer Department of Public order and Safety, Quezon City Disaster Risk Reduction and Management Council (QCDRRMC), Quezon City Hall Compound, Kalayaan Avenue, Quezon City Ph.# (632) 927-5914, 988-4242 Loc 8038; Cell # (+63) 917-8250-656 (Globe); (+63) 922-8750-027 Email: jessedomingo@yahoo.com
- Mr. Karl Michael E. Marasigan, Special Assistant for Operation, QCDRRMC, Department of Public order and Safety, Quezon City Disaster Risk Reduction and Management Council (QCDRRMC) Quezon City Hall Compound, Kalayaan Avenue, Quezon City, Ph. # (632) 927-5914, 988-4242 Loc 8038; Cell # (+63) 917-5219-382 (Globe); Email: marasigan.karl@yahoo.com
- Mr. Alex P. Nadurata, Local Disaster Risk Reduction & Management officer Caloocan City Disaster Risk Reduction & Management Office (CCDRRMO) Caloocan City; Ph. # (632) 310-7563 / 668-7142
- Mr. Kareem Mohammad Sali RN, Emergency Medical Technician / Consultant North Caloocan Rescue, Caloocan City Disaster Risk Reduction & Management Office(CCDRRMO) Cell # (+63) 999-3574-332; Email: <u>kreemylicious@yahoo.com</u>
- Mr. Ritche Van C. Angeles, Local Disaster Risk Reduction & Management Officer
 Pasig City Disaster Risk Reduction and Management Office (PCDRRMO)
 Pasig City Hall, 8th Floor, Caruncho Avenue, Barangay San Nicolas, Ph. # (632) 643-0000

- Ms. Maricel M. Evangelista, DRRMO/C3 Admin Pasig City Disaster Risk Reduction and Management Office (PCDRRMO) Pasig City Hall, 8th Floor, Caruncho Avenue, Barangay San Nicolas, Pasig City Ph. # (632) 643-0000; Email: <u>Che-evangelista3010@yahoo.com.ph</u>
- Mr. Noel C. Perez, OIC- Pasig City Fire Brigade Red Training Center, C. Raymundo Avenue caniogan,, Pasig City DRRMO-C3 Ph. # (632) 643-0000, Cell # (+63) 917- 501-2808 Email: <u>No el gimiketo@yahoo.com</u>, <u>Redtrainingcenter@yahoo.com</u>
- Mr. Pablo R. Bautista Jr., Assistant Head, Flood Control Information Center Metro Manila Disaster Risk Reduction and Management Council (MMDRRMC) Metro Manila Development Authority, MMDA Building, EDSA Corner, Orense St. Guadalupe, Makati City, Ph. # (632) 882 – 0925, Email: jhua_bautistajr@yahoo.com
- Mr. Johnny G.YU, Local Disaster Risk Reduction & Management Officer Disaster Risk Reduction & Management office (DRRMO)
 102 Ground floor, Delpan Evacuation Center, Delpan Street., Binordo, Manila Ph. # (632) 527 – 0984 / 527- 4939; Cell # (+63) 917-8589-337
- Mr. Nigel S. Tabliago, Staff- DRRMO, Disaster Risk Reduction & Management office (DRRMO) 102 Ground floor, Delpan Evacuation Center, Delpan Street., Binordo, Manila Ph. # (632) 527 0984 / 527- 4939; Cell # (+63) 917-7834-323