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Monographic issue

Meteorological Disaster Risk Profile of the Philippines

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Letter from the editors

The Emergency and Disaster Reports is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This monographic issue is dedicated to the meteorological disaster risk profile of the Philippines.
Early 2014, the Center for Research on the Epidemiology of Disasters highlighted the historical impact of disasters in the Philippines from 1900 to 2012. In this period, geological events sporadically occurred but of significant recurrence were the frequent impacts from the devastating typhoons.

The Republic of the Philippines' high tendency to experience tropical cyclones is mainly due to its geographical characteristics. It is located in the Southeast Asian region with 7107 islands sprawling at the Pacific Ocean. The equatorial ocean heat generates the 30% global tropical cyclones to occur at the North-western Pacific basin.

This disaster risk profile developed is a relevant and comprehensive profile of the meteorological disasters in the Philippines that have occurred over the last 100 years (1900 to 2014)

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LIST OF ABBREVIATIONS

ARMM	Autonomous Region in Muslim Mindanao
AFP	Armed Forces of the Philippines
CAR	Cordillera Administrative Region
CBOs	Community Based Organizations
CCO	Central Census Office
CCOCCC	Climate Change Office of the Climate Change Commission
CHED	Commission on Higher Education
CRED	Center for Research on the Epidemiology of Disasters
CSO	Civil Society Organization
DA	Department of Agriculture
DBM	Department of Budget and Management
DFA	Department of Foreign Affairs
DOF	Department of Finance
DOJ	Department of Justice
DOLE	Department of Labor and Employment
DOST	Department of Science and Technology
DOT	Department of Tourism
DOTC	Department of Transportation and Communication
DPWH	Department of Public Works and Highways
DRRM	Disaster Risk Reduction and Management
DRRMO	Disaster Risk Reduction and Management Office
DSWD	Department of Social Welfare and Development
DTI	Department of Trade and Industry
EOC	Emergency Operation Center
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GSIS	Government Service Insurance System
HFA	Hyogo Framework for Action
HR	Human Resource
HUDCC	Housing and Urban Development Coordinating Council (HUDCC
IASC	Inter-Agency Standing Committee
IFRC	International Federation of Red Cross and Red Crescent Societies
IMF	International Monetary Fund
IOM	International Organization of Migration
IOs	International Organizations
Kph	kilometers per hour
LDRRMF	Local Disaster Risk Reduction and Management Fund
LGU	Local Government Unit
LIDAR	Light Detection and Ranging
MDGs	Millenium Development Goals
NAPC-VDC	National Anti-Poverty Commission-Victims of Disasters & Calamities
NASA	National Aeronautics and Space Administration

NCR	National Capital Region
NCRFW	National Commission on the Role of Filipino Women
NDRP	National Disaster Response Plan
NDRRM	National Disaster Risk Reduction and Management
NDRRMC	National Disaster Risk Reduction and Management Council
NDRRMC	National Disaster Risk Reduction and Management Council
NDRRMP	National Disaster Risk Reduction and Management Plan
NEDA	National Economic and Development Authority
NFI	Nonfood Item
NGOs	Non-government Organizations
OCD	Office of the Civil Defence
OFDA	Office of Foreign Disaster Assistance (USAID)
OPAPP	Office of the Presidential Adviser on the Peace Process
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
PAR	Philippine Area of Responsibility
PDNA	Post Disaster Needs Assessment
PHIC	Philippine Health Insurance Corporation
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PNP	Philippine National Police
PNRC	Philippine National Red Cross
PO	President's Office
QRF	Quick Response Fund
RDANA	Rapid Disaster Needs Assessment
RDT	Rapid Deployment Team/s
SNAP	Strategic National Action Plan
SSS	Social Security System
TARA	Technical Assistance and Resource Augmentation
ULAP	Union of Local Authorities of the Philippines
UN	United Nations
UNDP	United Nation Development Program
UNDP	United Nations Development Programme
UNISDR	United Nations Officer for Disaster Risk Reduction
UNISDR	United Nations International Strategy for Disaster Reduction
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
UNU-EHS	United Nations University and the Institute of Environment and Human Security
USAID	United States Agency for International Development
USD	United States of America Dollar
WASH	Water, Sanitation and Hygiene
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization

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SECTION 1: INTRODUCTION

1.1 Background

In 2013, the Philippines ranked fourth, globally, in countries with the most number of reported disasters. It ranked first with the highest number of mortalities associated with disasters at 7,750 deaths. In addition, it ranked second in the most number of affected persons with 26.67 million. An estimated 4.57% of the annual GDP was lost due to the disasters of that year. Over the last decade, 2003-2013, the Philippines is part of the top 5 countries that are most hit by natural disasters.[1]

Early 2014, the Center for Research on the Epidemiology of Disasters highlighted the historical impact of disasters in the Philippines from 1900 to 2012. In this period, geological events sporadically occurred but of significant recurrence were the frequent impacts from the devastating typhoons.[1] Hence, this profile is primarily focused on the meteorological disasters of the country.

Source:© Eugene Alvin Villar, 2003

Figure 1: The archipelago of the Philippines

The Republic of the Philippines' high tendency to experience tropical cyclones is mainly due to its geographical characteristics. It is located in the Southeast Asian region with 7107 islands sprawling at the Pacific Ocean. The equatorial ocean heat generates the 30% global tropical cyclones to occur at the North-western Pacific basin. Tropical cyclones that form in this area are generally called typhoons.[2,4]

The country is geographically divided into three major island groups. The northernmost is Luzon, the largest island group with an area of 141,000 square kilometers. The southernmost is Mindanao, the second largest, with an area of 102,000 square kilometers. The Visayas is at the middle with an area of 57,000 square kilometers. Each island group is divided into

regions. The regions in Luzon are CAR, I, II, III, NCR, IV-A, IV-B and V. The regions in the Visayas are VI, VII and VIII, while that of Mindanao are regions IX, X, XI, XII, XII and ARMM. The capital is Manila, located at the NCR region.[2, 4]

There are three major bodies of water that surround the archipelago. The Philippine Sea and the Pacific Ocean are on the east. The West Philippine Sea also called South China Sea is on the west and north. The Celebes Sea and the Borneo waters are on the south.[5]

The climate is affected by the tropical monsoon dominated by the wet and dry season. The southwest monsoon brings heavy rains to most parts of the archipelago from June to August, whereas the northeast monsoon brings cooler and drier air from November to February with moderate to heavy rains in the eastern part of the country. The annual average rainfall ranges from approximately 5,000 mm (200 in.) in the mountainous east coast section of the country. Some valleys have a rainfall at less than 1,000 mm (39 in.).[2]

1.2 Significance

This disaster risk profile focuses on the meteorological events. This may provide valuable information to the stakeholders such as the civil society, national government or international humanitarian organizations who wish to understand the hazards, vulnerabilities and capacities of the Republic of the Philippines and its people, the Filipinos.

By tracing the countries' one hundred years of meteorological challenges, patterns may be established so that questions on when and where the disasters are likely to happen can be dealt with appropriate prevention, mitigation, preparation and response. In addition, the coping capacities are explored so that gaps and best practices may be identified. The information may be used as basis for strategies and policies.

1.3 Objectives

The main objective of this report is to develop a relevant and comprehensive profile of the meteorological disasters in the Philippines that have occurred over the last 100 years (1900 to 2014). This report has the following specific objectives:

1. To determine the frequency of the meteorological disasters in the country from 1900 to 2014
2. To assess the impact of the disasters on the population's health, economy, and services
3. To determine trends in annual occurrences and geographical location
4. To discuss the hazards and vulnerabilities associated with the meteorological disasters
5. To determine institutional policies and framework on disaster risk reduction and management
6. To determine community based programs associated to prevention, mitigation

and preparation
7. To discuss the response strategies of the country toward meteorological disasters
8. To identify gaps in practices and provide recommendations on the disaster risk reduction and management

SECTION 2: METHODOLOGY

The Philippine profile of meteorological disasters was developed through the secondary data obtained from the databases and literatures reviewed. For the purpose of this paper, Meteorological disaster is operationally defined as a natural occurrence caused by short-lived or small to meso scale atmospheric processes in the spectrum of minutes to days.[6]

The reports from the national government offices of the Philippines, specifically National Disaster Risk Reduction and Management Council, National Statistics Office, Philippine Atmospheric Geophysical and Astronomical Services Administration were collected and reviewed.

The classification and statistics on the general disasters in the Philippines were adapted from the EM-DAT, the OFDA/CRED international disaster database, version 12.7. The data was retrieved on November 20, 2014. The data accessed were from the period of 1900 to 2014.

The limitation of this study include reports lacking quantitative data such as number of deaths, number of events, total people affected and estimated economic damages. Some qualitative data such as the name of the typhoon and location were cross-referenced with the databases of Reliefweb, Glide and the website of OCD and PAGASA.

Locations were classified or clustered into regions. The data from 1920 to 1929 were not available. Some events are not listed in the database. Such events may have been underreported or doesn't fulfil the criteria of a disaster.

A tropical cyclone is considered a meteorological disaster in the EMDAT database when it fulfils at least one of the following criteria: 1) Ten (10) or more people reported killed, 2) Hundred (100) or more people reported affected, 3) Declaration of a state of emergency, 4) Call for international assistance. The total affected is the sum of injured, homeless, and affected. The estimated damage is quantified by the different institutions but is expressed in (000) US dollars. The number of deaths or the number killed refers to persons confirmed as dead and persons missing and presumed dead.[6]

A simple linear regression was used to determine trends in the number of events and impacts with reference to time or period. The reports from international organizations, particularly

from the United Nations, World Health Organization, International Red Cross and Crescent were also reviewed. Maps, databases and profiles developed by PAG-ASA, NDRRMC, UN OCHA, UNISDR, WHO, Reliefweb and Prevention Web were consolidated with the available national and international documents.

SECTION 3: RESULTS

3.1 Natural Disasters

The Philippines is part of the Pacific Typhoon Belt and the Pacific Ring of Fire. Hence, it is often affected by most natural disasters. The islands are exposed to changes in the sea level with the pressing climate change and the regular onslaught of the tropical storms.

From the EMDAT database, a total of 565 natural disasters were reported in the Philippines from 1900 to 2014. Its impact included 69,777 deaths, and 187 million total people affected. The estimated economic damage is 23 billion US dollars.

Table 1: The impact of different disaster types in the Philippines from 1900 to 2014

Type of Disaster	Number of Events	Number of Deaths	Total Affected	Damage (000 USD)
Drought	8	8	6553207	64453
Earthquake (seismic activity)	27	9924	5798678	583178
Flood	136	3532	28548497	3793743
Mass movement dry	3	361	--	--
Mass movement wet	30	2441	317546	0
Storm	316	49230	143843387	18276583
Volcano	25	2996	1734907	231961
Wildfire	1	2	300	0
Epidemic	18	1283	149422	0
Insect Infestation	2	0	200	925
Total	565	69777	186946144	22950843

Data Source: "EM-DAT: The OFDA/CRED International Disaster Database, Universite catholique de Louvain, Brussels, Bel."
Data version: v12.7, Retrieved on 20-Nov-2014

A relatively few climatological events such as 8 droughts and 1 wildfire were reported. Some biological events consisting of 18 epidemics and 2 insect infestations were listed. Recurring geophysical events such as earthquake, volcanic eruptions and dry mass movements were also reported. Hydrological events relating to 136 general floods or flash floods, and 30 wet mass movements were reported separately from the meteorological events. The meteorological events comprise most of the disasters in the country. A total of 316 tropical cyclones were reported from 1900 to 2014. This caused 49230 deaths, 143 million total affected people and 18 billion estimated economic losses. (See Table 1).

3.2 History and Frequency of Meteorological Disasters

The frequency of the meteorological disasters and its magnitude stresses the need to investigate further its history and impact from 1900 – 2014. This type of disaster makes up 56% of the total natural disasters. Next to it are the floods (24%), earthquake (5%) and wet mass movement (5%). Its impact to the population is also noteworthy as it caused 71% of the death related to natural disasters. The economic losses and total people affected are also large consisting 80% and 77% respectively, while the rest of the natural disasters contributed meagerly to these damages. (See Figure 2)

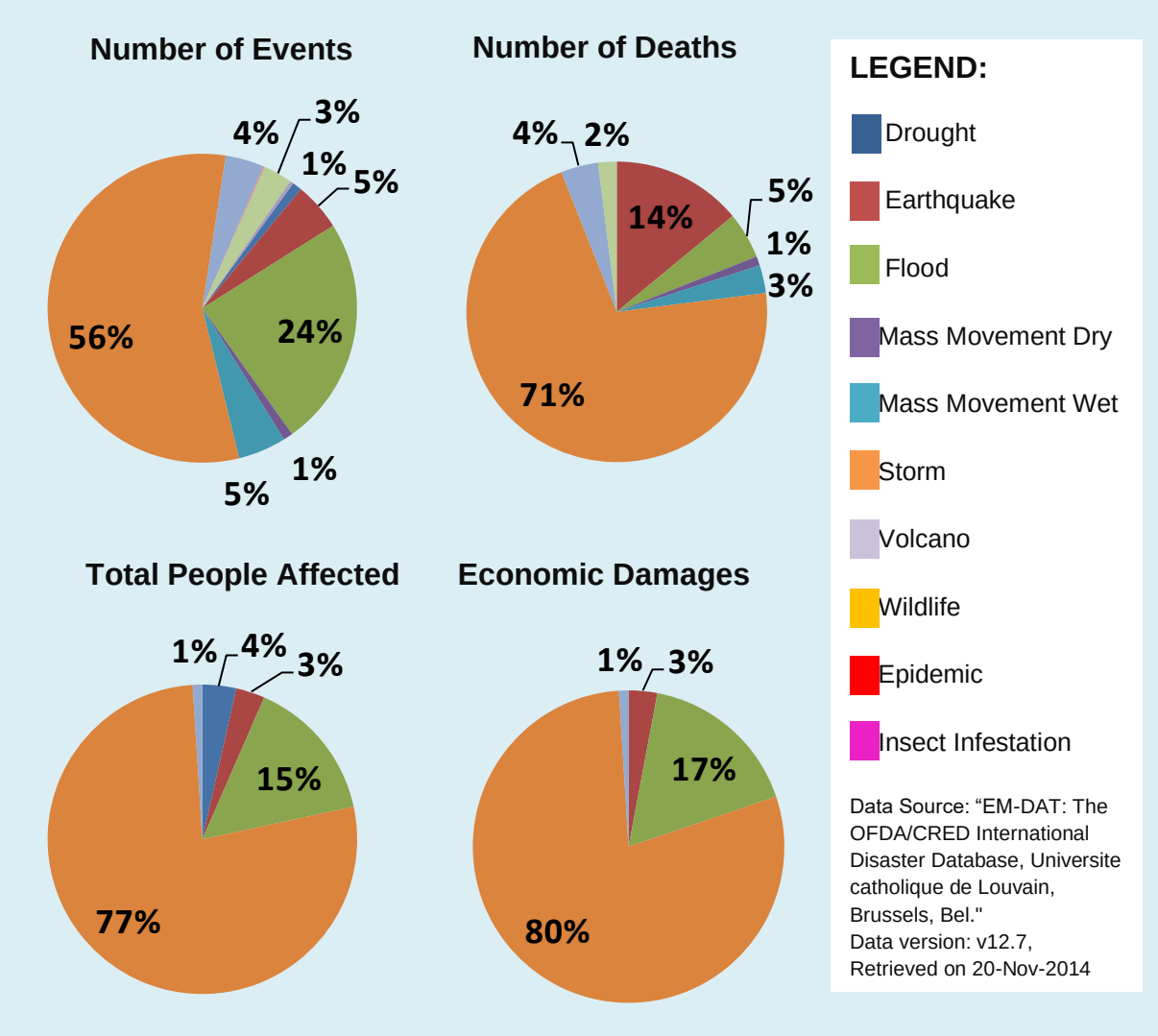


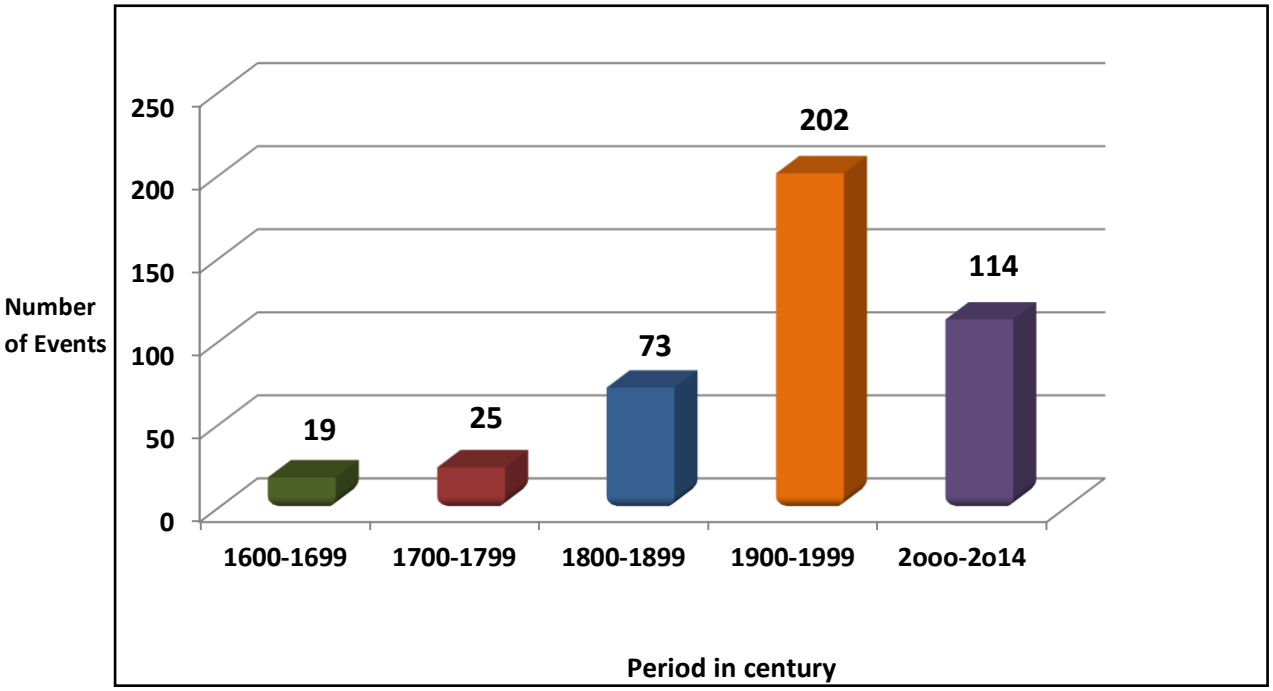
Figure 2: Impact of different natural disaster types in the Philippines from 1900 to 2014

The earliest to document the tropical storms that affected the islands of the Philippines was Miguel Selga, a Spanish Jesuit missionary and director of the Manila Observatory (1926-1946). He compiled accounts from other missionaries and they established 72 other meteorological stations all over the country.[7]

From his chronicles, 19 events were reported from 1600 to 1699 (17th century). There were 25 events from 1700 to 1799 (18th century). An increase of reported events was noted from 1800 to 1899 (19th century) with the establishment of more weather stations. His record included detailed descriptive accounts of the storms and later with measured wind pressures.

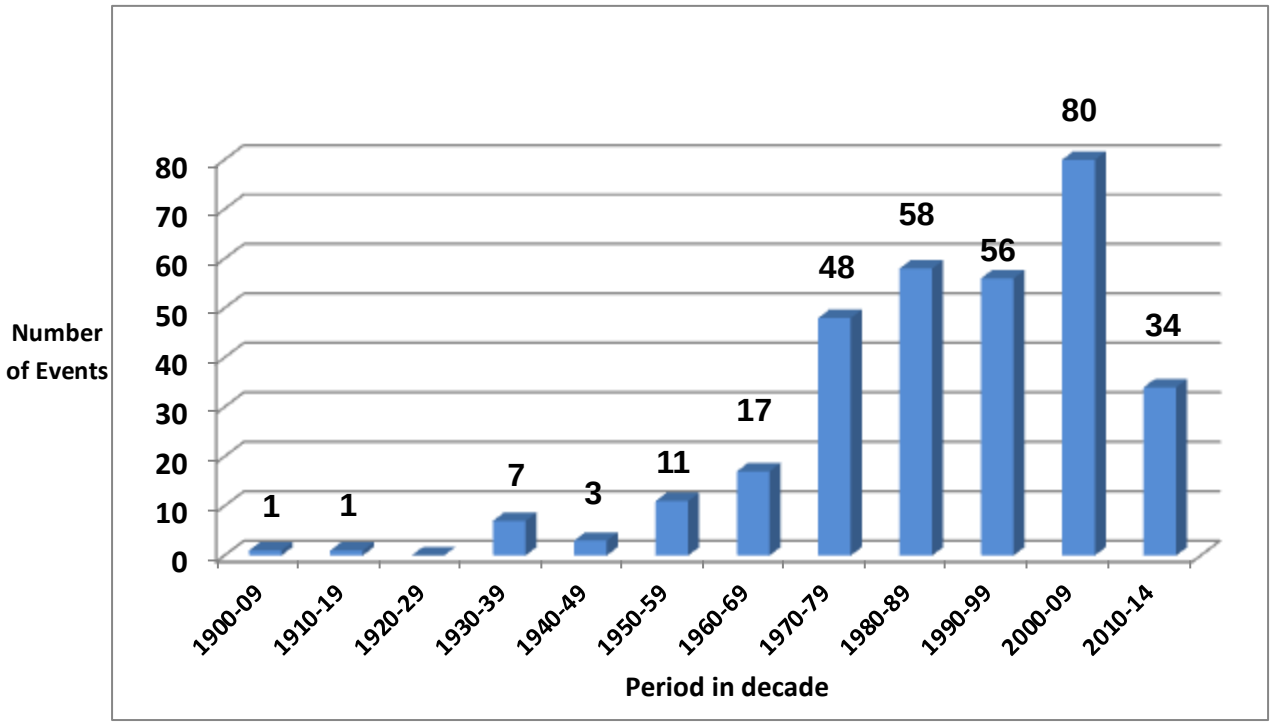
The reported storms were relevant events which gave accounts of how the inhabitants and properties were affected.[7] These records of storms and impacts are similar to the reports of the EMDAT database.

From 1990 to 1999 (20th century), a total of 202 events were reported. In general, there is an increasing trend in the number of meteorological disasters in the four centuries (1600-2000).[7] However, with only the start of the 21st century, 114 events have already been reported.



Data Source: 1600-1899 : Selga Chronicles 1566-1900; 1900-2014:EMDAT Database, Version 12.7. Retrieved 20-Nov-2014

Figure 3: Number of meteorological events in the Philippines from 1600 to 2014



Data Source: "EM-DAT: The OFDA/CRED International Disaster Database, Universite catholique de Louvain, Brussels, Bel."

Data version: v12.7, Retrieved on 20-Nov-2014.

Figure 4: Number of meteorological disasters in the Philippines from 1900-2014

3.3 Trends of the Impact

For the purpose of this report, the period is divided into decades with special attention on years with significant values.

A doubling of reported events is noted on the decade from 1970 to 1979. Within that decade, an increase in reporting is observed. However, 1975 is the year with least number of reported events with only one for the whole year.

The decade with the most number of events is on 2000 to 2009, having 80 reported storms. The year 2009 has the most number of meteorological disasters of all time where 14 events were reported. This is also the same year when four major storms developed consecutively on the same month, September 2, 8, 12 and 24.

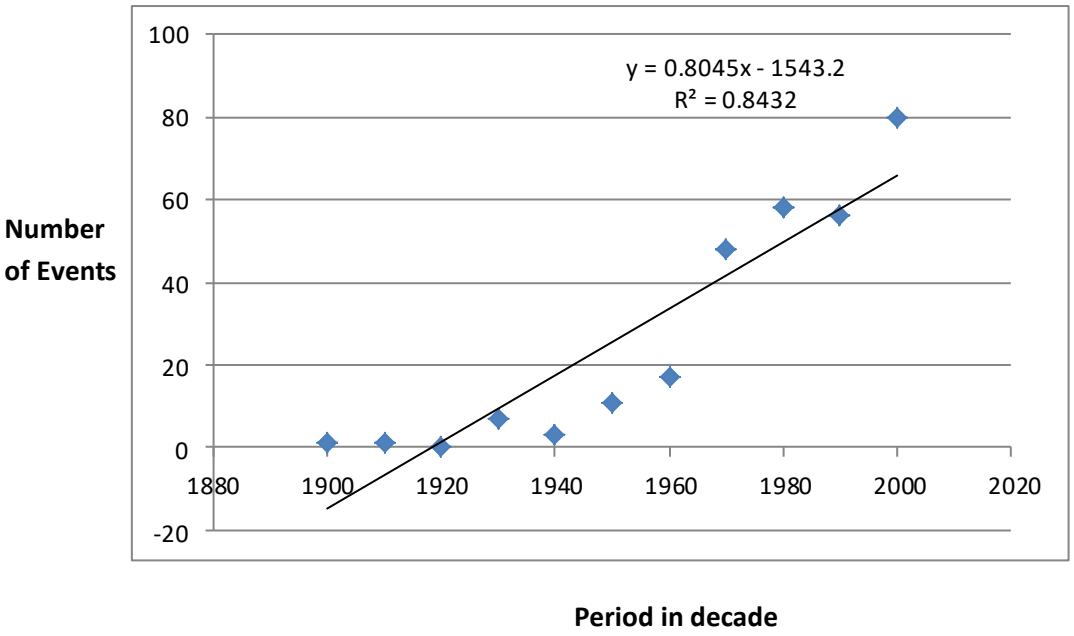
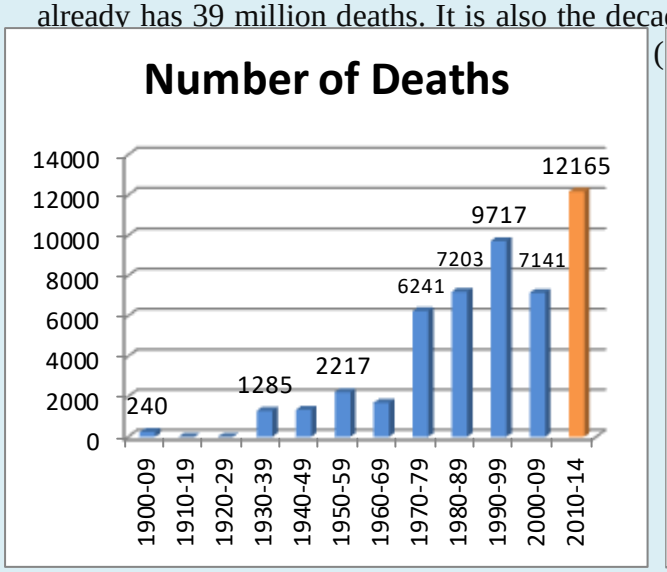


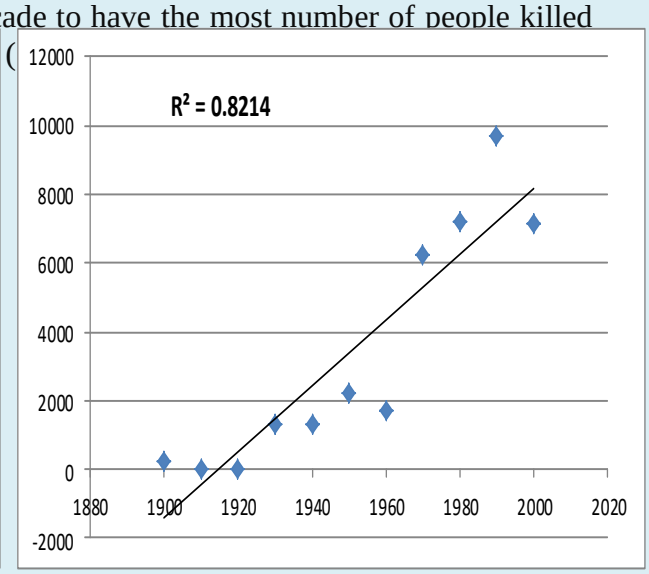
Figure 5: Linear regression on the period vs. the number of meteorological disasters

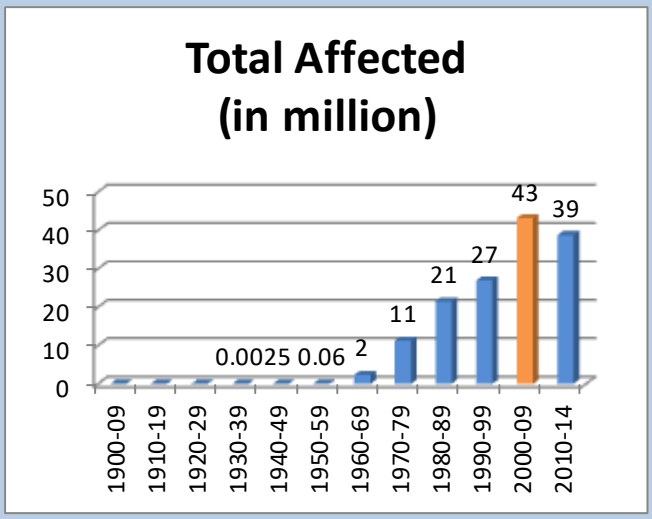
From 1900 to 2014, there is an increasing trend in the number of events. A linear regression was done on the period clustered in decade as independent variable against the number of events as dependent variable. The current decade 2010-2020 is excluded from the analysis. This revealed an r-squared value of 0.84 which is near to the value=1, suggesting that the progression in time is a good determinant on the frequency of occurrences. (See Figure 5)

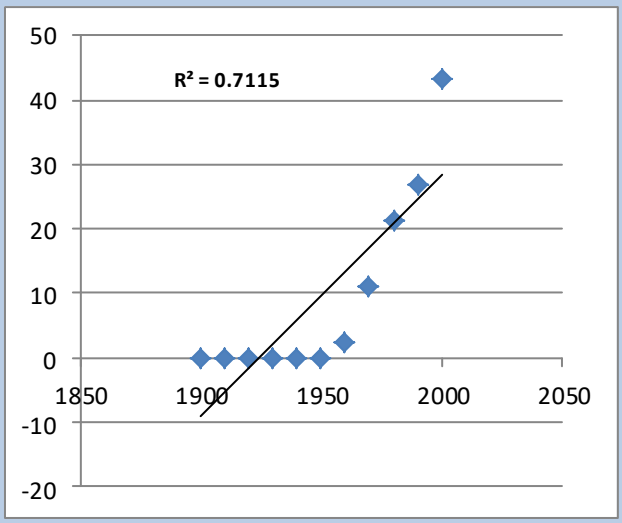
There is an increasing trend as well in the number of deaths, number of total people affected and the estimated economic damages over the last century. A linear regression, excluding 2010-2014 data, was also done with these three impacts against times clustered in decades. It showed an R-squared value of 0.82, 0.71 and 0.75 respectively. (See Figure 6)

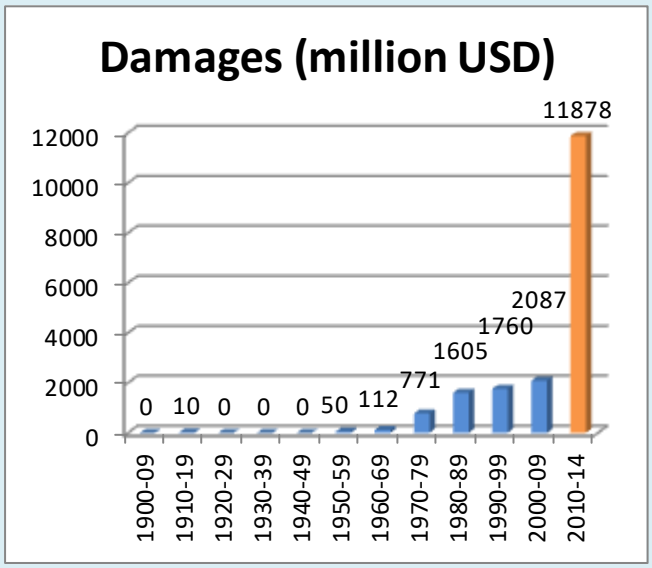
The decade from 2000 to 2009 has the most number of total people affected with 43 million affected individuals. Even though 2010-2014 is just half-way to completion as a decade, it already has 39 million deaths. It is also the decade to have the most number of people killed

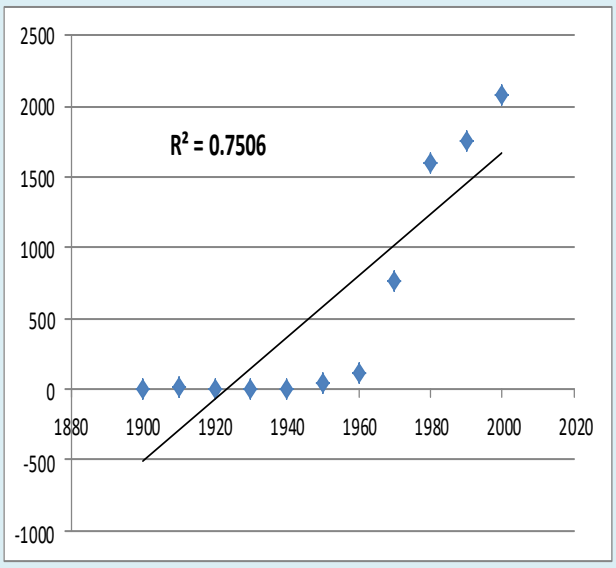










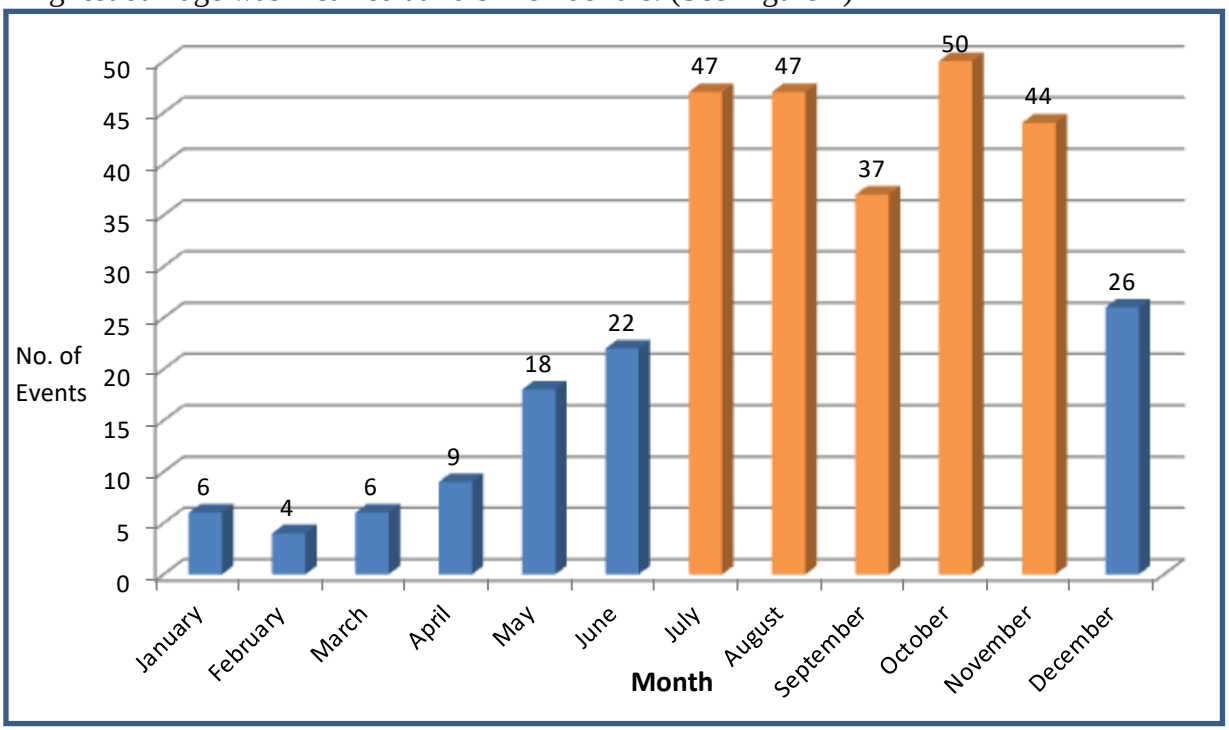


Data Source: "EM-DAT: The OFDA/CRED International Disaster Database, Universite catholique de Louvain, Brussels, Bel."Data version 12.7

Figure 6: Historical impacts of meteorological disasters in the Philippines per decade from 1900 to 2014

3.4 Annual Cycle

The year with the most number of deaths is on 2013 with 8047 deaths. It is also the year with the most number of most affected with almost 18 million individuals. The same year, the highest damage was incurred at 10 billion dollars. (See Figure 7)



Data Source: "EM-DAT:The OFDA/CRED International Disaster Database, Universite catholique de Louvain,Brussels, Bel."Data version 12.7

Figure 7: Number of meteorological disasters per month from 1900 to 2014

Among the 316 reported disasters from 1900 to 2014, majority (71%) took place from the months of July to November. The month of October has the most number of occurrences while the month of February has the least. The early half of the year has reduced frequency of events. The range is from 4 to 22 but this doubles starting from the month of July to November. This wanes by December. The deadliest storms are often observed on the month of November. (See Figure 7)

3.5 Top Ten High Impact Meteorological Disasters

The top costliest and widely affecting typhoons are dispersed within the peak months of July to November. This is consistent with the typhoon season in the country observed by PAGASA and other international weather stations. However, a single major storm, Fengsheng, occurred in June. (see Table 2)

Tropical cyclones are classified based mainly on its strength or maximum sustained winds. The Tropical Depression has a wind speed of up to 63 kilometers per hour (kph). The tropical storm has a wind speed of 64 to 118 kph, while a typhoon has a wind speed of 118 to 239 kph. The super typhoon has a wind speed of 240 kph or higher. Majority of the top meteorological disasters are classified between typhoons to super typhoons.

Table 2: The top ten deadliest meteorological disasters from 1900 to 2014

Rank	Typhoon	Wind Speed (kph)	Month	Year	Region/s Affected	No. Killed
1	Haiyan	315	Nov	2013	IV-B, VI,VII, VIII	7986
2	Thelma	240	Nov	1991	VI, VIII	5956
3	Bopha	280	Dec	2012	XI	1901
4	Winnie	260	Nov	2004	II, III, IV, V	1619
5	Joan	240	Oct	1970	V, IX, X, XI, XII, XIII, ARMM	1551
6	Washi	97	Dec	2011	VI, IX, X, XI, XIII, ARMM	1439
7	Ike	235	Sep	1984	VI, VII, X, XI, XII, XIII, ARMM	1399
8	Durian	250	Nov	2006	IV-A, IV-B, V	1399
9	Agnes	185	Nov	1984	VI, VIII	1079
10	Tropical Cyclone	---	Oct	1949	VI, VII	1000

Data Source: "EM-DAT:The OFDA/CRED International Disaster Database, Universite catholique de Louvain,Brussels, Bel."Data version 12.7

Table 3: The top ten meteorological disasters from 1900 to 2014 in terms of number of total affected

Rank	Disaster	Max Wind Speed (kph)	Month	Year	Region/s Affected	No. Affected (Million)
1	Haiyan	315	Nov	2013	IV-B, VI,VII, VIII	16.11
2	Bopha	280	Dec	2012	XI	6.25
3	Mike	280	Nov	1990	VIII, V, IV-B, VI, VII	6.16
4	Ketsana	170	Sep	2009	CAR, NCR, I, II, III, IV, V, IX, XII	4.9
5	Fengsheng	200	Jun	2008	VI, VII, VIII, XII, IV-B, V, XI, XII	4.79
6	Pepeng	250	Sep	2009	CAR, I, II, III, IV-A, V, VI	4.48
7	Babs	250	Oct	1998	V	3.9
8	Xangsane	235	Sep	2006	NCR, I, II, III, IV,	3.84

					V,VI	
9	Vera	130	Nov	1973	VII, VI	3.4
10	Ruby	235	Oct	1988	III, NCR, VII, IV-A, IV-B, V, X	3.25

Data Source: "EM-DAT:The OFDA/CRED International Disaster Database, Universite catholique de Louvain,Brussels, Bel."Data version 12.7

Haiyan remains the most powerful super typhoon across all reported meteorological disasters with a maximum wind speed of 315 kph. It ranks as the deadliest, killing 7986 people, the most extensive and costliest, affecting a total of 16 million people with an estimated 10 billion USD in economic loss. (See Table 2, 3 & 4)

The next major super typhoon is Bopha which affected the southern part of the Philippines with torrential rain and flooding. There were 1901 fatalities, 6.25 million total people affected and 898 million economic damages. (See Table 2, 3, 4)

Table 4: The top ten meteorological disasters from 1900 to 2014 in terms of estimated economic damage

Rank	Disaster	Max Wind Speed (kph)	Month	Year	Region	Damages (Million USD)
1	Haiyan	315	Nov	2013	IV-B, VI,VII, VIII	10000
2	Bopha	280	Dec	2012	XI	898
3	Pepeng	250	Sep	2009	CAR, I, II, III, IV-A, V, VI	585
4	Mike	280	Nov	1990	VIII, V, IV-B, VI, VII	389
5	Pedring	290	Sep	2011	NCR, I, II, III, IV, V, VI	344
6	Fengsheng	200	Jun	2008	VI, VII, VIII, V, IV-B, XI, XII	285
7	Megi	300	Oct	2010	I, II, III, CAR	276
8	Angela	290	Nov	1995	CAR, NCR, I, II, III, IV, V, VI, VII, VIII	244
9	Ruby	235	Oct	1988	III, NCR, VII, IV-A, IV-B, V, X	241
10	Ketsana	170	Sep	2009	CAR,I, II, III, IV, V, IX, XII	237

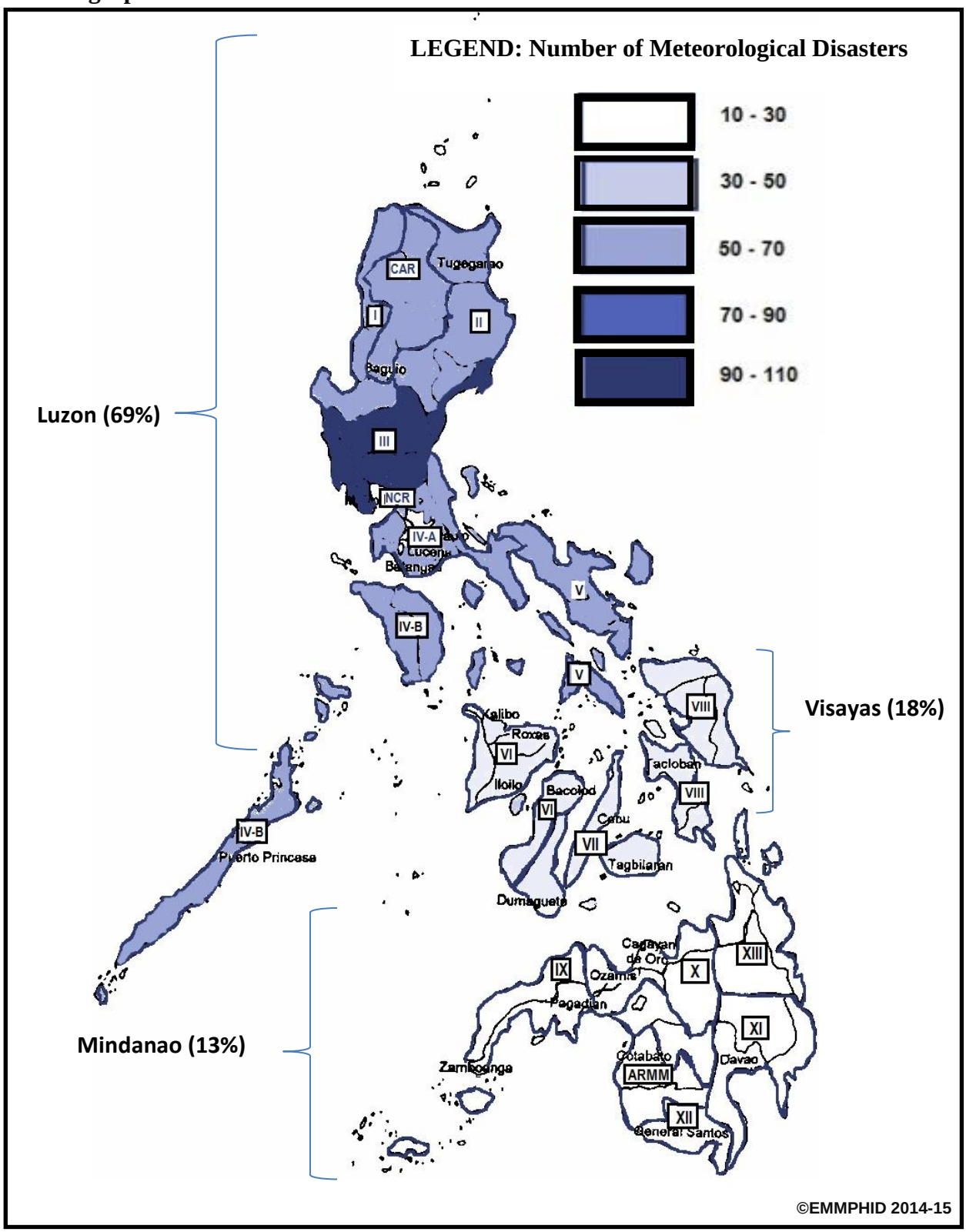
Data Source: "EM-DAT:The OFDA/CRED International Disaster Database, Universite catholique de Louvain,Brussels, Bel."Data version 12.7

An interesting phenomenon of Fujiwhara effect was observed with three typhoons proximal to each other within the Philippine area of responsibility occurred together. This was the effect of Ketsana, Pepeng and Mujigae on each other's track which caused more damage. This brought significant deaths and losses in 2009. (See Table 3 & 4)

Majority of these disasters were observed in the 21st century with better weather instruments for detection. The increase of hazards and predisposing vulnerabilities further contribute to their occurrence which will be discussed further.

The top 10 disasters that have highest number of total affected and economic damages affected multiple regions in a single event. On the average, they reached 4 regions upon entry to the Philippine area of responsibility.

3.6. Geographical Location

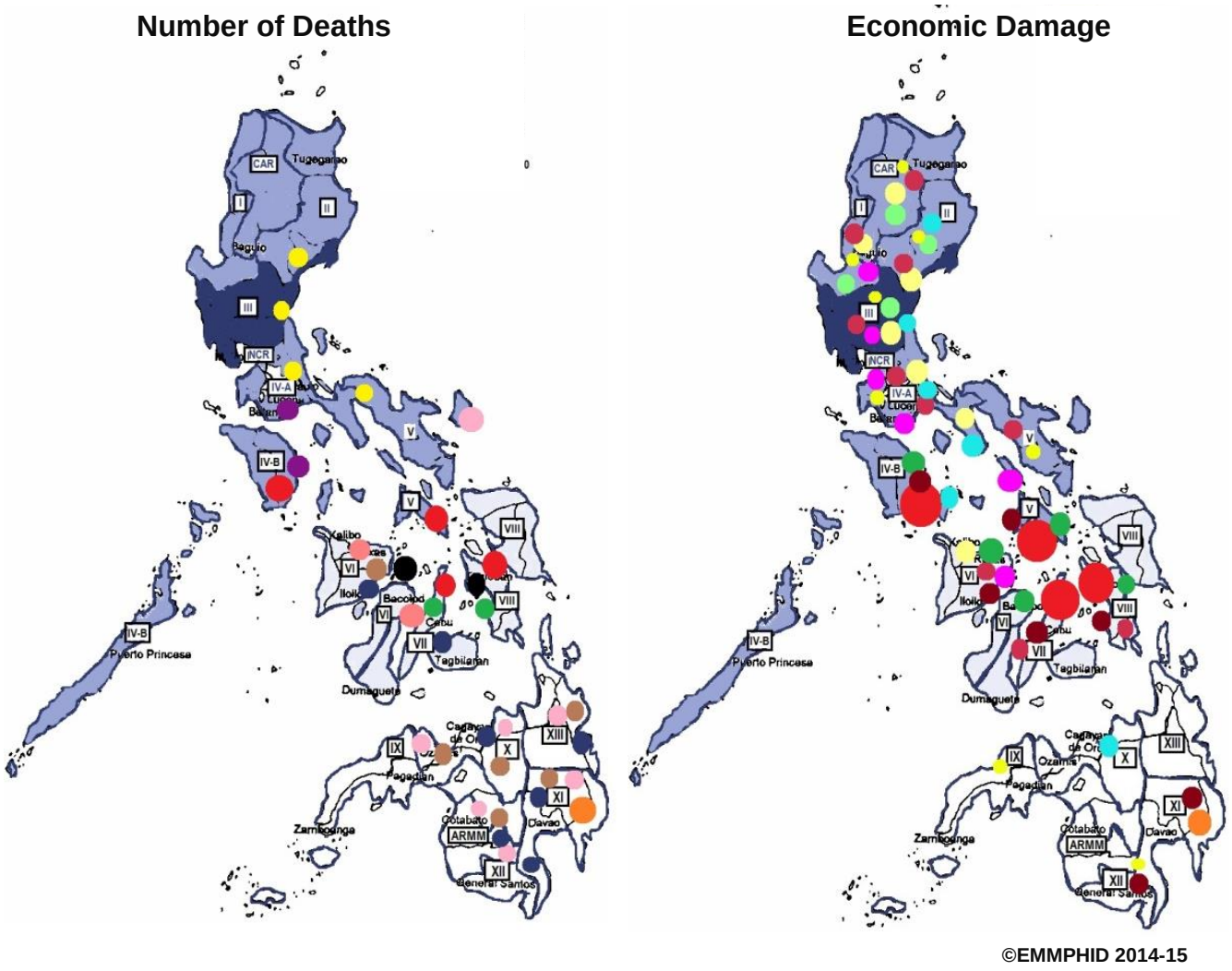


Data Source: "EM-DAT:The OFDA/CRED International Disaster Database, Universite catholique de Louvain,Brussels, Bel."Data version 12.7

Figure 8: Geographic distribution of reported meteorological disasters from 1900-2014

In more than 100 years, majority of the events affected NCR, CAR and Region I-VII. These regions are found in the main islands of Luzon and Visayas with a mode of 60 occurrences per region.

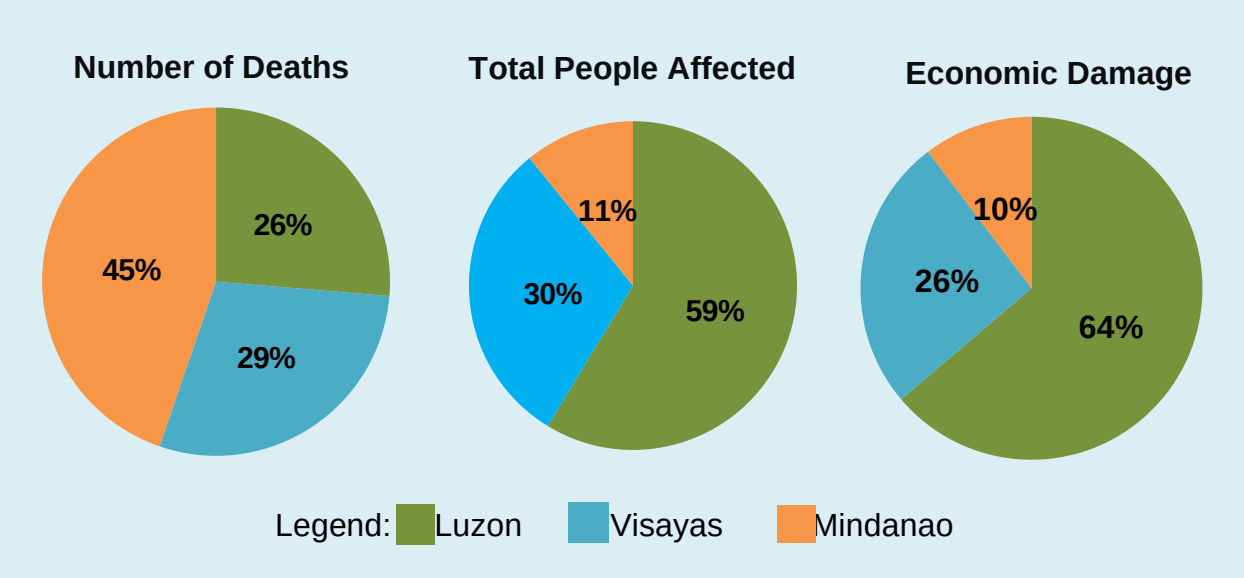
Conspicuously, Region III has practically twice the frequency of 105 events as compared to its neighbouring regions. The Southern Philippines, include the main island group of Mindanao, is less affected with disasters. Only 10-30 disasters occurred per region in Mindanao. Region XI has the least number with only 11 meteorological disasters in one century. (See Figure 8)



Data Source: "EM-DAT: The OFDA/CRED International Disaster Database, Universite catholique de Louvain, Brussels, Bel."Data version 12.7

Figure 9: Geographic distribution of high impact disasters from 1900-2014

The plotted locations of disasters with high number of deaths are concentrated in regions not frequently affected by the tropical cyclones. Most disasters occur in Region III or the main island group of Luzon, the deadly tropical cyclones happened in the regions of Visayas (29%) and Mindanao (45%). In contrast, the costliest disasters when plotted are concentrated in the Luzon (64%) and Visayas (26%) areas. Although some are found in Mindanao (10%), these are in the major urban cities of Davao, General Santos, Cagayan de Oro and Zamboanga. The costly disasters are less frequent in the Visayas compared to Luzon but larger plotted dots in the Visayas indicate a higher economic loss per event (See Figure 9 and 10).



Data Source: "EM-DAT: The OFDA/CRED International Disaster Database, Universite catholique de Louvain, Brussels, Bel."Data version 12.7

Figure 10: Pie chart of the main island distribution of high impact disasters (1900-2014)

The distribution of the total people affected and estimated economic damages are similar. Majority of them occurred in Luzon and Visayas. (See Figure 10)

3.7 Regional Vulnerabilities

The population density for the regions in Luzon is from 82 to 19137 persons per square kilometer. Most regions in Luzon have high population density except for CAR, IV-B and II. The population density in Mindanao only range from 97 to 220 while Visayas has a range of 176 to 428. Although some regions have low population density, there are major urban areas within the region having high population estimates. Examples of which are Zamboanga City, Cagayan de Oro and Davao City in the regions of Mindanao.[9] (See Table 5)

On the other hand, a comparison of the human development index among the regions revealed a very large gap in the three basic dimensions of a healthy life, literacy and standard

of living. Mindanao's HDI has the worst from 0.114 to 0.249 ;Visayas has a range of 0.231 to 0.256 while Luzon has a wide range of 0.217 to 0.716. [10](See Table 5)

Table 5: Population density, human development index and selected major urban areas

Region	Population Density in person/km^2 (2009)	Human Development Index (2012)	Major Urban Areas and Est. Population (2014)
LUZON			
NCR	19137	0.716	Manila: 22,710,000
CAR	82	0.330	
Region I	366	0.332	
Region II	114	0.497	
Region III	460	0.389	Angeles City: 800,000
Region IV-A	758	0.443	
Region IV-B	93	0.238	
Region V	299	0.217	Naga City: 150,000
VISAYAS			
Region VI	342	0.256	Bacolod City: 525,000 Iloilo: 500,000
Region VII	428	0.231	Cebu: 2,511,000
Region VIII	176	0.256	
MINDANAO			
Region IX	200	0.183	Zamboanga: 771,000
Region X	210	0.249	Cagayan de Oro: 600,000
Region XI	220	0.220	Davao City: 1,526,000
Region XII	183	0.224	
Region XIII	113	0.185	
ARMM	97	0.114	

Sources:Philippines Statistics Authority 2009-12, and Demographia World Urban Area, 2014

3.8 Legal Framework

In a 2004 study by the World Bank, it emphasized that the efforts to reduce poverty in the Philippines will not be sustainable unless an effective disaster risk management is established. The World Bank suggested that significant consideration be given "to determine policy and legal changes required to support implementation of an integrated strategy."[11]

In support of the Hyogo Framework for Action and with the recent shift in the Philippine government's risk reduction approach, proactive strategies have been prioritized in the legal framework. The policies legislated include the following:

3.8.1 Strategic National Action Plan

The 2009-19 Strategic National Action Plan was legislated on 2010 to hasten HFA compliance and to immediately reform the disaster risk reduction management in the country. It integrated the HFA's five priorities for action and tailored national strategic objectives on developing legal framework and cost-effective actions to alleviate socio-economic damages.[12]

3.8.2 Philippine Disaster Risk Reduction and Management Act

The Philippine Disaster Risk Reduction and Management Act or Republic Act 10121 was passed on May 2010. This law adheres to the HFA's international guidelines and to the objectives of SNAP. The DRRM Act envisions a "comprehensive, all-hazards, multi-sectoral, inter-agency, and community-based approach to disaster risk reduction and management.". [13, 14]

3.8.3 The National Disaster Risk Reduction and Management Framework

National Disaster Risk Reduction and Management Council is the lead organization in implementing the Philippine National Disaster Risk Reduction and Management Act. In June 2011, the council approved NDRRM Framework which has a vision outlined from the DRRM Act. It aims to address underlying causes of vulnerabilities and institutionalising these arrangements into policies and strategies. [15]

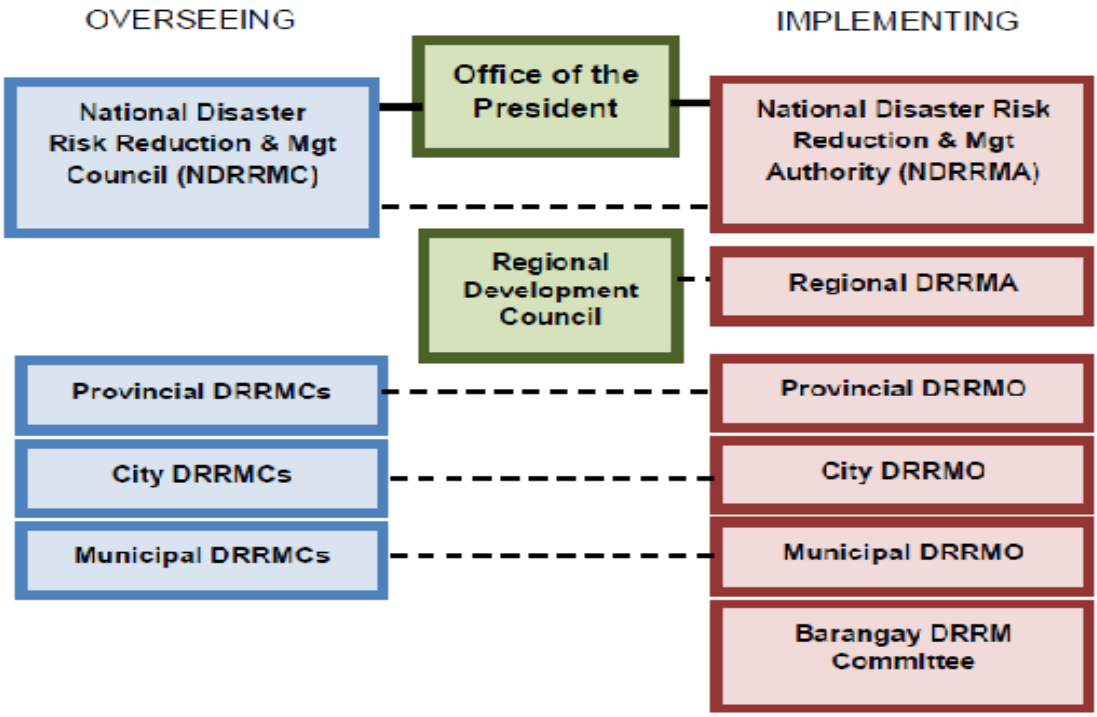
The vision of the framework is to achieve a "safer, adaptive and disaster-resilient Filipino communities towards sustainable development." The framework emphasizes that through time with regular monitoring and evaluation, the resources invested in disaster prevention, mitigation, preparedness and climate change adaptation will be more effective. [15]

3.8.4 National Disaster Risk Reduction and Management Plan

When the DRRM Act became a law in 2010, it contained provisions for an action plan. The 2011-28 National Disaster Risk Reduction and Management Plan was developed to address and realize this. The 2011-28 NDRRMP is a roadmap drawn from multiple sectors on the strategies and key implementers of the provisions. It contains guidelines agreed through consultation from multiple sectors on DRRM. [16]

3.8.5 National Disaster Risk Reduction Management Council

The NDRRMC is chaired by the Secretary of the Office of Civil Defence. It has 4 Vice-Chairpersons. The vice-chairpersons come from the Secretary of the lead agencies corresponding to the four priority areas of the NDRRMP, namely: (1) disaster prevention and mitigation – Department of Science and Technology; (2) disaster preparedness – Department of Interior and Local Government; (3) disaster response – Department of Social Welfare and Development; and (4) rehabilitation and recovery-National Economic and Development Authority.[13, 15, 16]



Source: Philippine NDRRMC, 2011

Figure 11: The institutional mechanism of the NDRRM Framework

The council has 39 members including representatives of four CSOs and one from the private sector. Aside from the chairperson and vice-chairperson, the members include the following:

1. Secretary of the Department of Health (DOH)
2. Secretary of the Department of Environment and Natural Resources (DENR);
3. Secretary of the Department of Agriculture (DA)
4. Secretary of the Department of Education (DepEd)
5. Secretary of the Department of Energy (DOE)
6. Secretary of the Department of Finance (DOF)
7. Secretary of the Department of Trade and Industry (DTI)
8. Secretary of the Department of Transportation and Communication (DOTC)
9. Secretary of the Department of Budget and Management (DBM)
10. Secretary of the Department of Public Works and Highways (DPWH)

11. Secretary of the Department of Foreign Affairs (DFA)
12. Secretary of the Department of Justice (DOJ)
13. Secretary of the Department of Labor and Employment (DOLE)
14. Secretary of the Department of Tourism (DOT)
15. The Executive Secretary
16. Secretary of the Office of the Presidential Adviser on the Peace Process (OPAPP)
17. Chairman, Commission on Higher Education (CHED)
18. Chief of Staff, Armed Forces of the Philippines (AFP)
19. Chief, Philippine National Police (PNP)
20. The Press Secretary
21. Secretary-General of the Philippine National Red Cross (PNRC)
22. Commissioner of the National Anti-Poverty Commission-Victims of Disasters and Calamities Sector (NAPC-VDC)
23. Chairperson, National Commission on the Role of Filipino Women
24. Chairman, Housing and Urban Development Coordinating Council (HUDCC)
25. Executive-Director of the Climate Change Office of the Climate Change Commission;
26. President, Government Service Insurance System
27. President, Social Security System
28. President, Philippine Health Insurance Corporation
29. President of the Union of Local Authorities of the Philippines (ULAP)
30. President of the League of Provinces in the Philippines (LPP)
31. President of the League of Cities in the Philippines (LCP)
32. President of the League of Municipalities in the Philippines (LMP)
33. President of the Liga ng Mga Barangay (LMB)
34. Four (4) representatives from the CSOs
35. One (1) representative from the Private Sector
36. Administrator of the OCD

The act includes the establishment of a permanent Local DRRM Offices in every province, city, and municipality. These offices shall set the direction, development, implementation, and coordination of DRRM programs within their area of responsibility.

Together with the technical management group, the OCD conducts a regular monitoring with a standard evaluation template of the program ensuring that it is on time. The systematic monitoring and evaluation includes the LGU, regional and national levels which are based from the HFA priorities. A report is submitted annually to the office of the President, Senate and House of Representatives.[16]

3.9 Preparation, Prevention and Mitigation Strategies

The NDRRMC through the Office of Civil Defense has taken steps in disaster risk reduction and management. The initiatives include the following:

3.9.1 Public information and Mainstreaming

An extensive campaign is conducted to increase the public awareness of disaster risk reduction. It is done before, during and after disaster through trainings, campaigns, manuals, bulletins and media. The civic consciousness is enhanced through special events like fire prevention month and the disaster consciousness week. Watershed management projects with reforestation efforts have been employed. [17, 18]

Contingency plans have been developed based on hazards and risk mapping for flood, communities and lifelines at risk, capacity and vulnerability assessment, strategic interventions. The pilot local government unit is Hinulaton, a low-income class municipality in the province of Surigao del Sur. Inspite of the limited resources, the community developed local hazard and risk maps. Through involvement of the all sectors and all stakeholders' respective roles and responsibilities were determined to increase the resilience of the population. [18]

3.9.2 Infrastructure and Socioeconomic Assistance

The Philippines has also allocated resources for infrastructure and facilities to mitigate flooding such as the construction of river dikes and sea walls. Multi-sectoral initiatives have been done to declog critical sewage, drainage system and water tributaries. These projects have been launched in major cities of Metro Manila, Davao City and Cebu City to be sustained by the locality. [18, 19]

The government launched multi-sectoral rehabilitation program in the areas of Southern and Central Mindanao which have been severely affected by climate change. Its strategies include the creation of livelihood and household income, improving the health and nutrition services, protecting and supporting the vulnerable communities, agricultural development and modernization. [19, 21]

3.9.3 Early Warning System

The knowledge on disaster management in the country remains inadequate. Hence, research and development in disaster reduction techniques have been developed and integrated into the national disaster management program. The priorities in this strategy include the development of the Philippine weather bureau known as the PAGASA. This encompasses the researches on tropical cyclones, track prediction, typhoon formations, typhoon intensification research, and meteorological and hydrological hazards assessment. The Philippine Institute of Volcanology and Seismology (PHIVOLCS) is also part of the development where seismic activities of in Luzon, Visayas and Mindanao are monitored and hazards are studied as well. [15,16] Warning systems for typhoons, tsunamis, flood, volcanic eruption and lahar flows have been set up in strategic places in the Philippines. [17, 22]

The National Operational Assessment of Hazards, aptly called project NOAH, is an information and map hazards platform through multiple media. The USD48 million project was launched in July 2012. It incorporated automated rain gauges in river basis around the country, allowing on time tracking of rainfall and river water levels. It also enhanced

visualization through the LIDAR technology which allows high-resolution 3D mapping of the country's topography.

The important component of the system is the social media capability. This allows the civilian to have regular updates on calamity stricken areas while allowing them to post an update. The Philippines has an overall internet penetration rate of about 33% of its 100 million people. Through social media networking, information is shared faster together with the broadcasting networks.[20]

3.10 Community Based Capacities

The participation of civil society organization is important in effective disaster risk reduction and management. The DRRM Framework emphasizes the principle of multi-sectoral accountability since disasters have a cross-cutting effect. Disasters affect all sectors of the society and have a major impact to the most vulnerable groups particularly the poor, women, children, elderly and the differently-abled.

The CSOs help in breaking the barriers of social exclusion, marginalization and economic inequity. They provide a venue for the vulnerable groups to express the conditions and needs of the grassroots communities. In addition, the CSOs have huge experience and knowledge on risk assessment and risk reduction approaches in the locality. [15] They have filled gaps in the government response and complement the capacities of the government. These have ranged from medical care, housing to search and rescue. The church, schools and media have become strategic avenues for disaster management and information dissemination.[22]

Listed in Appendix 2 (Table 9) are the civil society organizations in the different regions and provinces of the Philippines which have implemented community based risk reduction and management program.[22] Some organizations were established through local initiatives while some under the assistance of international nongovernment organizations.

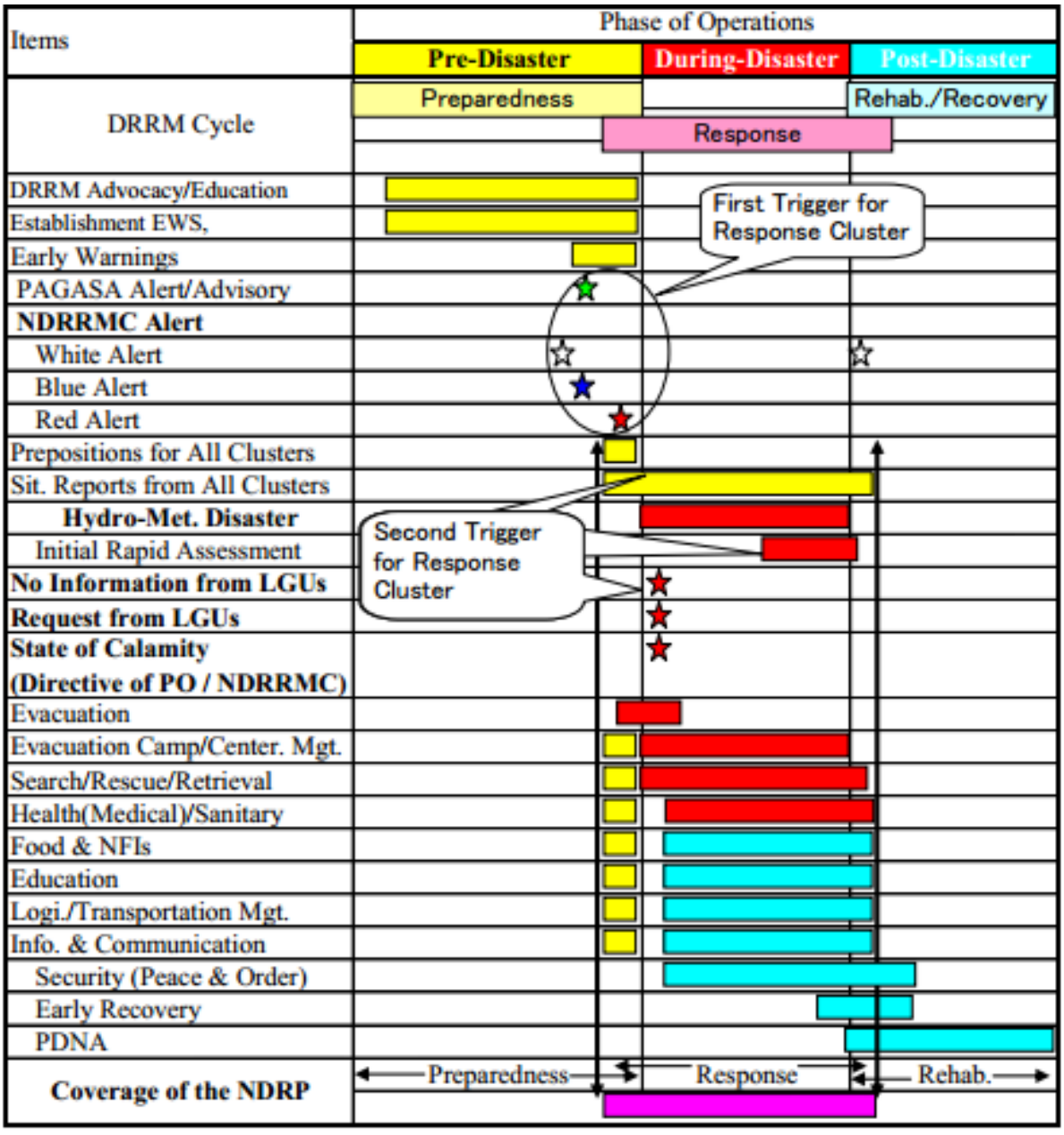
3.11 National Disaster Response Plan

The NDRP was developed by the Office of Civil Defence with the recommendations from the NDRRMC member agencies. It provides guidance on the processes and mechanisms in a coordinated response by the national or/and local offices.

The NDRP is categorized into parts which refer to the type of the disaster. The activities are based on the cluster approach targeted to specific emergency and disaster needs. Exemplified in table 6 is the response for hydrometeorological disasters which covers tropical cyclones. The details of the procedures are discussed further in the operations protocol.

The role of the OCD is to coordinate and mobilize resources for response and information management. The role of the DSWD, head of the Response Cluster of the NDRRMC, is to provide Technical Assistance and Resource Augmentation (TARA) together with Camp Coordination and Management. It also provides food and non-food Items to the affected families. [23]

Table 6: Activities Covered in the NDRP for Hydrometeorological Disasters



Data Source: Philippine NDRRMC, 2011

The activities are divided into disaster phases which include the following: 1) Pre-Disaster, 2) During Disaster, and 3) Post Disaster. Cross-cutting activities were identified as well,

namely: a) early warnings, b) rapid assessment, c) early recovery, d) post disaster needs assessment, and e) mobilization of resources.

3.11.1 Pre-Disaster Phase

The NDRRMC issues alert messages to the public according to the warning messages from authorized agencies. PAGASA heads the warning for floods, tropical cyclones, storm surges, Mines and Geoscience Bureau for landslides due to rainfall; PHIVOLCS for tsunami and volcanic disasters; and, the DOH for pandemics and/or epidemic. Upon issuance of alert, the other cluster agencies shall commence operations to mitigate or minimize damage of the approaching disaster.

3.11.2 During Disaster Phase

The approach includes 1) augmentation and 2) assumption of response activities. Augmentation includes the LGU providing the rapid needs assessment on the ground to the NDRRMC for augmentation. The respective Response Cluster members validate the status through their respective point person. Assumption of response activities commences on a trigger point when there is no information coming from and going through the affected areas within 6-12 hours after landfall of the tropical cyclone.

Prepositioned Rapid Deployment Teams (RDT) are deployed when there is no communication from the affected areas on the 12th hour. The RDT conducts a Rapid Disaster Needs Assessment and Rapid Aerial survey. The goal of the aerial survey is to assess the magnitude of the damage and location for the installation of operations. RDT also determines initial number of resources required to run a 3-5 days of operations for relief and rescue operations. The RDT prepare and execute a location for the installation of the following: (1) Information and Communication Operations (2) Relief Operations, 3) Supply and Storage Areas, (4) Emergency Power and Fuel Station, (5) Unified International Humanitarian Assistance Operation

3.11.3 Post Disaster Phase

The Post Disaster phase involves sustaining the operations done from the previous phases. This may include mobilization of national government funds to assist the LGU. The resources needed are assessed by the affected LGU in coordination with the Cluster Lead. This may also involve the conduct of the Post Disaster Needs Assessment.[23]

3.12 International Assistance

In the advent that the coping capacity of the country does not suffice to meet the needs caused by the disaster, a cluster approach is implemented as well to international humanitarian organizations. Each cluster corresponds to a lead government agency which the international counterpart is paired and coordinated.[24]

There is a Guidance Note on Using the Cluster Approach to Strengthen Humanitarian Response. This emphasizes that not all instance call for activation of the clusters. At some

point, only some are activated. The recurrence of disasters in the Philippines and armed conflict in Mindanao has resulted to the regular coordination mechanism in the country through the NDRRMC. The NDRRM council includes mainly of government agencies but has included five national NGOs and the Philippines Red Cross National Society. [25]

Table 7: Cluster Approach

Cluster	Cluster Lead	IASC Counterpart
Nutrition	Department of Health (DOH)	United Nations Children's Fund (UNICEF)
Water, Sanitation and Hygiene (WASH)		World Health Organization (WHO)
Emergency Shelter	Department of Social Welfare and Development (DSWD)	International Federation of Red Cross and Red Crescent Societies (IFRC); UN Habitat
Protection		UNICEF
Food		World Food Programme (WFP)
Livelihood		International Labour Organisation (ILO)
Camp Coordination and Management	Office of Civil Defense – Provincial Disaster Coordinating Council (OCD-PDCC)	International Organization of Migration (IOM)
Agriculture	Department of Agriculture (DA)	Food and Agriculture Organization (FAO)
Early Recovery	Office of Civil Defense (OCD)	United Nations Development Programme (UNDP)
Logistics		WFP
Emergency Telecommunications		UN Office for the Coordination of Humanitarian Assistance (UN-OCHA); WFP; UNICEF
Education	Department of Education (DepEd)	UNICEF

Source: NDCC Memorandum No. 04, s. 2008, 07 March 2008 – Addendum to NDCC Memorandum No 05, S-2007

SECTION 4: DISCUSSION

4.1 History

The chronicles of the first meteorologist in the Philippines, Miguel Selga, attest the significant impact the tropical cyclones have on the people in terms of health, trade and livelihood. This prompted the creation of weather stations all over the country. The accounts are mostly descriptive in nature and are not of the same criteria as that of EMDAT. However, the record details and similar weather patterns suggest that the people in the early centuries recognize its tremendous effects and more importantly its recurrence. An increase in number is noted from 1800-1899 with more reporting done through the establishment of the meteorological service under the Observatorio Meteorologico de Manila.

The chronicles in conjunction with the EMDAT database further suggest an increasing trend in the number of events. It increases almost 3 times from the previous century. Currently in the early part of the 21st century (2000-2014), there is already half in the number of events from the previous century (1900-1999). This is clearly shown in Figure 3.

This paper explores further the meteorological disasters from 1900-2014 (see Figure 4). The period is clustered into decades. There is a sudden increase in the number of events from 1960 which is in consonance with the modernization of the Philippine Weather Bureau, acquiring new equipments with the use of radars and satellite meteorology.

An average of 20-22 tropical cyclones enters the Philippine Area of Responsibility but only 8 to 9 make a landfall. Consequently, not all detected tropical cyclones equate to a meteorological disaster. Nevertheless, there has been an increasing trend in the number of disasters reported every decade. The most number is on 200-2009 with 80 events.

4.2 Trends

The incidence of disasters is notably increasing over the whole century. Although developing a mathematical model is not part of the objectives of this paper, a simple linear regression was employed for instructive or educational reason. This is to be interpreted with caution since the model may not be an accurate estimate given the conditions of climate change and worsening hazards and/or vulnerabilities. However, the model confirms the notable increase in meteorological disaster over time.

The statistical model shows a linear relationship between variables. The R^2 (r-squared) value obtained is 0.84 which is near the value=1. From the best fit line and formula, it can be extrapolated that the predicted number of events that will occur from 2010-2019 is 74 meteorological disasters. This result supports the increasing number of meteorological disasters with the progression of time.

The same simple linear regression was applied to the decade against the number of deaths; total people affected and estimated economic damage. All these impacts progress to an increasing trend over the decades. The R^2 values are 0.82, 0.71 and 0.75 respectively which confirms the trend of the impacts over time (see Figure 6). Using the model it can be extrapolated that the predicted impacts are 9110 deaths, 32 million total affected, USD 1.9 billion estimated economic loss for 2010 to 2019. Comparing these figures with the effects of a single super typhoon, Haiyan, these figures are underestimates since it already caused 7986 deaths, 16 million affected and USD 10 billion economic losses within half the period, stressing the effects of climate change, vulnerabilities, hazards and capacities. The figures however reinforce the fact that there will be increased severity in terms of impact in the next few decades.

In terms of location, majority of the meteorological disasters frequently affect the Luzon island groups which include CAR, Regions I to V and NCR. The frequency decreases to the Visayas and Mindanao area (see Figure 8). This is consistent with the typhoon risk map plotted by PAGASA.[37] The primary regions at risk for tropical cyclones are those of Northern Luzon. Interestingly, the area plotted to have the most number of disasters is noted in Region III or Central Luzon.

4.3 Impacts

Region III or Central Luzon together with Region IV-A are the top contributors to the output of the agricultural and fisheries sector of the country. Region III has one of the most fertile soils in the country. [26]

For the period of 2007 to 2011, region III had the highest monetary value damage to rice farming due to typhoons at USD 0.6 million. Region XI had no damage to rice farming during the same period.[26] Consequently, being the top producer with the highest damages incurred from tropical cyclones, this region experience tropical cyclones more significantly than others. The disaster has a large repercussion to the very livelihood in Region III. Hence, the tropical cyclones that occurred in the area are generally experienced and reported more than in any other region in the country. In addition, Region III is particularly at risk for flooding with the presence of the Marilao-Meycauayan-Obando (MMO) River Basin.

From 2000-2012, NDRRMC reported that the agricultural sector is the most affected by natural disasters with the estimated collective damages of USD 2.4 billion, or 58% of the registered total damages. The crops subsector, in particular, had the largest economic damages due to the combined impacts of tropical storms, floods and droughts, followed by fisheries and livestock subsectors. [27]

The situation in the agricultural sector of Region III reveals that aside from deaths, disasters have caused injury, loss of homes, affected the health, livelihood and incurred economic damages. [28] The 80% of victims and 77% economic damages from natural disasters are attributed to meteorological disasters alone. A loss of 2.7% of the country's GDP was inflicted by two typhoons in 2009. An estimated 5% GDP was lost with the tropical cyclones of 2013. [28, 29]

The infrastructure and private sector registered total damages of USD 1.76 billion due to disasters. The country's development efforts and achievement of the Millennium Development Goals particularly on poverty reduction, health, water, environmental sustainability and human settlements may have also been hampered by the occurrence of natural disasters as funds are often reallocated from government's development programs to relief and reconstruction assistance. [29, 30]

4.4 Hazards

The recurrence of tropical cyclones in the Philippines is largely due to its location. The archipelago is in the Western North Pacific Ocean which is the formation area of 30% of the 100 Tropical Cyclones in the world annually of which two-thirds become typhoons. Global tracking of tropical cyclones and their intensity through NASA space stations show the Philippines under high risk for super typhoons.[31] The hazards of a tropical cyclone include flooding, storm surge and high winds.[37]

4.4.1 Storm Surge and Coastal Flooding

The fatality of super typhoon Haiyan on November 8, 2013 in Tacloban is attributed to the storm surge of more than 24.6 feet (7.5 meters) above sea level it created. This is produced by the intense low pressure and strong force of the winds pushing the ocean water to the shore. This can cause coastal flooding along beach fronts and shallow coastlines. Pedring on September 2011 also flooded Manila, the capital of the country, where it damaged the sea walls and buildings located in front of the Manila Bay.[31, 37]

4.4.2 High Winds

A wind of more than 185 km/hr is considered catastrophic. Of the 30 listed high impact tropical cyclones in the Philippines, 25 (83%) have wind speed of more than 185 km/hr. This wind speed can destroy concrete structures of houses and buildings. Buildings in high-rise buildings are 20% higher to be affected. The highest winds are located along the northeast portion of the typhoon's eye wall. [31, 37]

4.4.3 Inland Flooding and Landslides

A review of the high impact tropical cyclones in the Philippines indicate that majority of the victims were affected by inland flooding and landslides. The torrential rain can result in flooding in overflowing rivers, saturated soil, low-lying areas and poor drainage. The most number of deaths and economic losses come from this type of hazard. [31]

Typhoon Washi, ranked 6th among the deadliest, had a wind speed of only 97 km/h. Its casualty was due to the heavy rainfall that caused the volcano, Mt. Mayon, to spill volumes of mud flow and caused landslides to the low lying provinces.

Environmental concerns such as deforestation are worsening the risk of floods and landslides. The uncontrolled urban growth, poor land use, the decrease in the number of protected forests and riverbanks, poor waste disposal and housing have clogged waterways and increased the risk of floods. [29]

4.4.4 Climate Change

In the past 20 years, the sea levels around the Philippines have risen by half an inch. This rate is faster than the worldwide average. It is clearly a consequence of global warming. This can intensify the risk of storm surges. The areas vulnerable to a 1 meter sea level rise are regions located in southern Luzon, Visayas and Mindanao (see Table 8). These areas are determined to have high number of casualties from previous tropical cyclones.[36]

Table 8: Areas in the Philippines most vulnerable to a 1 meter sea level rise

Rank	Province	Region	Area Vulnerable to a 1 meter sea level rise in (square meters)
1	Sulu	ARMM	79728300
2	Palawan	Region 4B	64281600
3	Zamboanga del Sur	Region 9	37818900
4	Northern Samar	Region 8	33882300
5	Zamboanga Sibugay	Region 9	32740200
6	Basilan	ARMM	30294000
7	Cebu	Region 7	27888300
8	Davao	Region 11	27005400
9	Bohol	Region 7	23895000
10	Camarines Sur	Region 5	22680000
11	Quezon	Region 3	21124800
12	Tawi-tawi	ARMM	17390720
13	Masbate	Region 5	14256000
14	Negros Occidental	Region 6	13996800
15	Camarines Norte	Region 5	13591800
16	Capiz	Region 6	10748700
17	Catanduanes	Region 5	10643400
18	Samar	Region 8	10635300
19	Zamboanga del Norte	Region 9	10570500
20	Maguindanao	ARMM	9169200

Source: Greenpeace 2007

4.5 Vulnerabilities

The recurrent risks posed by the tropical cyclones to the regions of Luzon suggest that most catastrophic effects are likely to occur in such area. The statistics of the whole country draws the focus towards these regions where hazards are prominent. This provides a macro level of understanding the disaster risk profile of the country. However, this dilutes the pressing needs in certain areas of the country.

As a consequence to the numerous islands of the Philippines, there also comes the diversity of socioeconomic attributes among the regions. Addressing the risk of the country requires contextualizing not only the hazards but also the vulnerabilities per region. An enclosed single-minded national risk assessment should be avoided to get an overall picture of the country while not undermining the regional hazards, vulnerabilities and capacities.

By reviewing the top 10 high impact disasters of the country in terms of number killed, total affected and economic damage, the vulnerabilities of the regions are highlighted. The multiple factors that affect the national risk become more evident in a regional perspective.

The regions reported to be frequently affected by the deadliest typhoon are Region VI and XI. Four typhoons caused significant deaths in these areas namely: 1)Region VI – Haiyan, Washi, Agnes and an unnamed Tropical Cyclone 2) Region XI: Bopha, Joan, Washi and Ike. The regions are located in the Visayas and Mindanao respectively.

Forty-five percent of the deadliest disasters occurred in Mindanao while 29% affected the Visayas. Luzon on the other hand has 26% (see Figure 10). These figures are contrasting to the overall 100-year frequency of disasters; 69 % occurred in Luzon, 18% in the Visayas and 13% in Mindanao (see Figure 8). Hence, the frequency of disasters does not necessarily result to more deadly disasters in the area. Instead, vulnerabilities have to be considered.

4.5.1 Poverty

The HDI range of the regions in Mindanao is from 0.114 to 0.249 while that of the Visayas is 0.256 to 0.231. The HDI of Luzon is at the range of 0.217 to 0.716. This very large disparity may have pushed the southern parts of Philippines to have significant deaths even with minimal typhoon visits. (See Table 5)

A disaster in the Philippines is aggravated by the state of poverty. The country has a GDP of USD 454 billion. Its population is 105 million as of 2013. IMF categorized the Philippines as a developing economy. The Under 5 mortality rate is 32/1000 live births. The life expectancy at birth is 71 years. In every 100,000 live births, 99 women die from pregnancy related causes.[30] Malaria is endemic in some parts of the country. Seventy four percent of the population is vulnerable to hazards with the poor being the most vulnerable to damage caused by natural disasters. [33]

The Human Development Index of the Philippines for 2013 is 0.660. This is above the average of 0.614 for countries in the medium human development category. The position of the country is at 117 out of 187 countries and territories. The average annual increase is 0.46%. Approximately 65.9% of adult women have reached at least a secondary education compared to 63.8% among men. About 26.9% of parliamentary seats are held by women.[32]

Poor infrastructure and weak governance have affected the immediate disaster response in the Philippines. Only 22% of the nation's roads are paved. The humanitarian relief workers often struggle with accessing affected areas. The use of light or weak construction materials has also added to the damaging and lethal effects of storms. Most homes are made of wooden frames and exteriors. Some have dried grass or coconut leaves as roofs. The exploitation of natural resources to alleviate poverty such as deforestation of the mangroves has led to the destruction of the natural barriers against storms. [29, 36, 43]

Almost one-third of the country's employment is based on agriculture. Disasters have contributed to the increasing incidence of poverty. The disaster consequently hinders their opportunity of closing the poverty gap. The Philippine Development Plan of 2011- 2016 stated that 16 out of the 32 provinces with poverty rates of at least 40%, are hit by typhoons at least once a year. [30]

4.5.2 Conflict and Displacement

Mindanao has the least number of meteorological disasters since it is has minimal exposure to tropical cyclones. However it remains to be the most vulnerable to natural disasters revealing significant number of deaths with the high impact tropical cyclones.

Although Mindanao meets 40% of the country's food needs through its agricultural production, its rural development has long been overlooked. Its regions' Human Development Index (HDI) rankings are the worst in the country. [29]There have been persistent gaps in access health services, education and investment opportunities. This disparity has led to unrest among the people which goes into the futile cycle of violence and worsening of socioeconomic situation of the people.

Most of the regions in Mindanao, primarily ARMM, are affected by this longstanding internal conflict between the rebel groups and the government. This has led to the displacement of the people from their homes and livelihood.

Internal Displacement continues with the armed conflict between the government and non-state armed groups. This is worsened by clan-related violence. Approximately 327,000 people have fled their homes and means of livelihood. Most of the conflict can be traced to underdevelopment and marginalisation of the Muslims and indigenous people. At least 3.5 million people have been displaced since 2000. [33, 34]

The majority of the displaced have sought shelter with their relatives where they have poor living conditions. Access to food and basic services is minimal. Disasters by natural hazards have worsened their status.

In 2013, Typhoon Haiyan caused more displacement than the internal conflict as it devastated the western and central areas of Visayas region. Displacement caused by conflict goes into a futile downhill trend towards increased poverty and less resilience to cope with disasters. Some experience secondary displacement when both conflict and disaster affect them. Communities affected by typhoon Bopha in Eastern Mindanao in December 2012 were already highly vulnerable with conflict related displacement when the storm hit. This resulted to one of the deadliest typhoons in the history of the Philippines. The IDPs and the general population in general lacked access to water, sanitation, agricultural assets, education and health care. [33, 34]

On March 27, 2014, the Comprehensive Agreement on Bangsamaro was signed. This paved the way for the peace treaty among Muslim groups and the government. It opened reforms on social and political recovery and rehabilitation. In 2013, the UN adopted a convergence strategy for Mindanao by developing a framework to enhance the government's capability to address the humanitarian, security and development needs of IDPs and other communities affected by conflict. In so doing, improve the resilience and pave the way to long term solutions. [34]

4.5.3 Urbanization and High Population Density

The degree of vulnerability of the regions maybe associated with the population density. Population is often associated with urbanization in the region. Luzon has a population density which ranges from 82 to 19137 as compared to Mindanao which has 97 to 220. The population density is directly related to the degree of urbanization in the area. (See Table 5)

Densely populated areas are easily threatened by disasters on loss of more lives or assets. This is evident in figure 9 and 10 where the regions having the most economic losses and number of people affected are located in highly populated or urbanized areas. Costly disasters are also those that affect the major urban areas in the regions listed in Table 5.

Urbanization is one of the determinants which affect the vulnerability of the population to natural hazards. Those living riverbanks and estuaries are highly prone to flooding. This is triggered by typhoons, tropical depression and continuing heavy rains and worsened by man-made activities such as dam failures, clogging of water ways by garbage and poor design of street drainage.[30] Rapid urbanization has also caused the increase of unplanned, informal, and overcrowded settlements houses.

With the climate change, the country is expected to experience significant sea level rise. This would result to 70% of the 1,500 municipalities located along the coast vulnerable to this phenomenon. [10]

According to World Bank, numerous people live on low-lying coastal islands and almost 60% of the population live in coastal zones. Ten of the largest cities are located along the coast. Rapid urbanization is likely to increase this figure in the next decades.[35] The city of

Tacloban, the most affected by the super typhoon Haiyan, has nearly tripled in population over the past four decades.[36]

4.6 Vulnerabilities and Disparities

The Philippine Disaster Risk Reduction and Management Act 0f 2010 – Section 21 states that "not less than 5% of the estimated revenues from regular sources will be set aside as the Local DRRM Fund (LDRRMF) to support activities of pre-disaster preparedness program including training, purchasing equipments, supplies, insurance and medicines. Of the amount appropriated for LDRRMF, 30% will be allocated as Quick Response Fund (QRF) or stand-by fund for relief and recovery programs."[16] This provision allows the local government to allocate funds for prevention, mitigation, preparedness and response.

This reflects the shift of the government's priorities. The previously known calamity fund is disposable without waiting for a disaster to occur. However, the provision also indicates the dependence of the fund from regular sources obtained from the local government's revenues. This overlooks the result of this study which reveals the most impoverish regions, having low HDI, are more vulnerable to meteorological disasters resulting to more deaths. Accordingly, these poor regions won't have enough funds to comply with the action plans of the law.

The CSOs have been actively contributing to community based disaster reduction and management activities in the different regions in the country. However of note are the minimal programs implemented in the regions located in Mindanao. There are 38 programs concentrated in Luzon as compared to the 16 programs in the Visayas and only 6 programs (10%) in Mindanao (See Table 9). This disparity has to be addressed taking into account the vulnerabilities of the regions in southern Philippines.

4.7 Incorporating DRRM in the Socioeconomic Calendar

There is an increasing trend in the number of meteorological disasters in the Philippines. Based from the results of this paper, most disasters occur during the second half of the year. There are 7 months of relatively lesser tropical cyclones namely January, February, March, April, May, June and December. In between are the months of increased number of events on July, August, September, October and November. These events reported in a period of more than one hundred years are consistent with the monthly distribution extracted from the Selga Chronology in period of 1566-1900 and from the Joint Typhoon Warning Center in the Pacific for the period of 1951 to 1999.[7] The periodicity is similar revealing February with a minimum incidence. The Selga chronology show peak months on August to October as well while the result from the paper show increased incidence as well before and after these months which are July and November. PAGASA reports that the typhoon months in the

Philippines usually find its peak in July to September which is within the range of the results of the study.[37, 39]

This recurrence and periodicity can be useful in scheduling the strategies for the disaster risk reduction and management cycle on a yearly basis. As such, prevention, mitigation and preparation can be strengthened on the early months of the year. The logistics and personnel for rapid response unit can also be increased during the second half of the year. Evaluation of response can be scheduled when the typhoons wane on the months of December or January which shall include the inventory.

Aside from the disaster cycle, the periodicity can be incorporated in the livelihood calendar. This is particularly important among farmers. To improve their decision-making on the best months for tending crops, the International Rice Research Institute and the Department of Agriculture of the Philippines recommended a rice calendar. The calendar is based on multiple factors including adverse climatic conditions and geographic variations. The calendar is divided into 3 seasons of planting and harvesting with color coded months and location. [40]

In view that Region III has the most reported disaster events; it is noteworthy that the calendar of IRRI and DA suggest peak planting and harvesting months on the disaster-prone months. For season 1, the peak rice planting month is set on July and the peak harvesting month is set on December which all falls on the disaster-prone months. Although season 2, a better option when considering disasters, is also recommended. [40] Nevertheless, it is important that farmers even up to the scientist should consider disaster more in the socioeconomic calendar.

In 2010, harvesting time extended until the rainy season which coincided with the arrival of strong typhoons. Consequently, flooding destroyed the crops. Some farmers observed that the weather pattern has been unpredictable for farming. [39] However, it is certain that the tropical cyclones are increasing in number and the lesson from the hundred years of report point to predictable months. Some communities in the Region of CAR have shifted their cropping calendar to the warmer and less typhoon prone months from January to June. They have also utilized short harvest cycle of 3-4 months where rice grown in January is harvest on April.[42, 43]

4.8 Hyogo Framework for Action - Country Progress

In a summary of progress report developed by UNISDR, the Philippines is one of the 12 countries who show substantial achievement attained but with recognised limitation in capacities and resources for priority 1 which is to ensure that disaster risk reduction becomes a national and local priority with a strong institutional basis for implementation. The country made significant strides with the NDRRM Act of 2010. This allowed US 111 million to be allocated to the National Disaster Risk Reduction and Management Fund.

The same level was achieved for priority action 2 and 5. Priority 2 is to identify, assess and monitor disaster risk and enhance early warning. Priority 5 is to strengthen disaster preparedness for effective response at all levels, The Department of Education Culture and Sports together with the Department of Health pledged to develop 100,000 education and health facilities that are safe from disasters in support of the "One Million Safe Schools and Hospital Programme". [44]

For priority action 3 and 4, the country only achieved institutional commitment attained, but achievements are neither comprehensive nor substantial. Priority 3 is to use knowledge, innovation and education to build a culture of safety and resilience at all levels. Priority 4 is to reduce the underlying risk factors. [44] The reduction of risk factors in the country includes the discussed hazards, vulnerabilities and gaps in the coping capacities. This will require a mutisector cooperation from the government down to the grassroots level. Innovations have from the indigenous knowledge on resilience and coping capacity have to be harnessed to achieve a sustainable form of DRRM and community development.

SECTION 5: CONCLUSION

A total of 565 natural disasters were reported in the Philippines from 1900 to 2014. Its impact included 69777 deaths, and 187 million total people affected. The estimated economic damage is USD 23 billion.

The meteorological events compose most of the natural disasters. A total of 316 tropical cyclones were reported which is 56% of all natural disasters. It caused 49230 deaths, 143 million total affected people and 18 billion estimated economic losses.

The accounts from previous centuries, 1600 to 1900, indicate that tropical cyclones have significantly affected the inhabitants of the archipelago which prompted establishment of early weather bureaus. Correlating these accounts to the current reporting of meteorological disasters by EMDAT, the incidence is observed to be increasing. This is supported by the data from 1900 to 2014. A linear regression of this period reveals an R-squared value of 0.84 which confirms the increasing trend of incidence with the progression in time. Consequently, the impacts on social, health and economic losses are also increasing. This may even be higher given the conditions of climate change and worsening multiple factors associated with the hazards, vulnerabilities and capacities of the country.

Given the certainty of increased occurrences and major impacts, this paper attempted to determine the location and period so that priorities can be set accordingly based on the risks. Majority of the disasters affected the regions of Luzon and the Visayas. This is consistent with the risk areas identified by the weather bureau, PAGASA as most tropical cyclones come from the North-western part of the pacific. Conspicuously, the highest number of events is in Region III or Central Luzon. This region is one of the main providers of agricultural products in the country. Livelihood in the region is highly dependent on the weather. Hence most tropical cyclones which visit the area are experienced as a disaster by the community in the region.

Most of the deaths and victims of the meteorological disasters are associated with the hazard of flooding. This is aggravated by climate change which increases the ocean heat inciting more frequent storm formation. Climate change is also associated with an increase in sea level which poses a hazard to regions commonly affected by tropical cyclones.

The frequency of the disaster does not immediately justify the prioritization of the regions for DRRM. An analysis of the top high impact disasters reveal that most deadly events occurred in the southern parts of the country. These regions are clustered in the Visayas and Mindanao. Visayas had the most number of casualties due to the super typhoon Haiyan. Mindanao has

the worst human development index. The regions are plague with chronic issues of conflict and displacement.

The top disasters with the highest number of affected people reach an average of 4 regions in one event. The costliest disasters are observed to affect mainly the regions of Luzon and Visayas with high population density and urbanization.

Considering the regional differences, there is no single strategy for DRRM. However, the Philippine DDRRM Act of 2010 paved the legal framework of a comprehensive, multi-hazard, multisectoral and community-based approach to disaster risk reduction and management. The law provides provisions on prevention, mitigation and preparation. This is headed by the National Disaster Risk Reduction and Management Council. It has a corresponding office per barangay, city, municipality and province which allows it to determine the appropriate strategy under its jurisdiction. However, the Local DRRM Fund should be re-evaluated in terms of source since low income regions will require more intervention with their vulnerabilities. Having low HDI means they lack resources for the LDRRMF. Unfortunately, it has been demonstrated that the deadliest disasters are concentrated in areas with low HDI. The Community based DRRM programs may need to increase their coverage to the regions of Mindanao as well. A cluster approach is implemented among government and international agencies to target priority needs and avoid duplication.

Most of the disasters occur from July to November annually. This cycle can be used in the timetable for the DRRM. The prevention, mitigation and preparation strategies can be scheduled during the first half of the year and evaluation can be done during December or January. This strategy can also be applied to the socioeconomic calendar which can be ingrained to the culture and work schedule. The agriculture sector is the most widely damaged during tropical cyclones. However, disaster-prone months are not yet assimilated into agricultural calendar such as that of rice planting and harvesting where peak season are placed in the range of disaster prone months. Some farmers have shifted in farming schedule from January to April through short harvest cycle.

In general, the Republic of the Philippines has shown significant strides in attaining disaster risk reduction as a national and local priority with the enactment of its DRRM legal framework. It also improved in developing early warning systems and preparedness through new technologies and multimedia networking. However, significant efforts must be done on the area of reducing underlying risk factors such vulnerabilities relating to poverty, conflict, high population density and hazards associated with meteorological disasters. The priorities must be based on context, risk and capacity on regional or local level.

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SECTION 7: APPENDICES

7.1 Glossary

Adaptation - the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Capacity - a combination of all strengths and resources available within a community, society or organization that can reduce the level of risk, or effects of a disaster. Capacity may include infrastructure and physical means, institutions, societal coping abilities, as well as human knowledge, skills and collective attributes such as social relationships, leadership and management. Capacity may also be described as capability.

Civil Society Organizations" or "CSOs" – non-state actors whose aims are neither to generate profits nor to seek governing power. CSOs unite people to advance shared goals and interests. They have a presence in public life, expressing the interests and values of their members or others, and are based on ethical, cultural, scientific, religious or philanthropic considerations. CSOs include nongovernment organizations (NGOs), professional associations, foundations, independent research institutes, community-based organizations (CBOs), faith-based organizations, people's organizations, social movements, and labor unions.

Climate Change - a change in climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period typically decades or longer, whether due to natural variability or as a result of human activity.

Community-Based Disaster Risk Reduction and Management or CBDRRM - a process of disaster risk reduction and manAagement in which at risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities, and where the people are at the heart of decision-making and implementation of disaster risk reduction and management activities.

Disaster - a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. Disasters are often described as a result of the combination of: the exposure to a hazard; the conditions of

vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences.

Disaster impacts may include loss of life, injury, disease and other negative effects on human, physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.

Disaster Risk - the potential disaster losses in lives, health status, livelihood, assets and services, which could occur to a particular community or a society over some specified future time period.

Disaster Risk Reduction and Management - the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster. Prospective disaster risk reduction and management refers to risk reduction and management activities that address and seek to avoid the development of new or increased disaster risks, especially if risk reduction policies are not put in place.

Early Warning System - the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss. A people centered early warning system necessarily comprises four (4) key elements: knowledge of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression "end-to-end warning system" is also used to emphasize that warning systems need to span all steps from hazard detection to community response.

Exposure – the degree to which the elements at risk are likely to experience hazard events of different magnitudes.

Hazard - a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihood and services, social and economic disruption, or environmental damage.

Mitigation – structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation, and technological hazards and to ensure the ability of at-risk communities to address vulnerabilities aimed at minimizing the impact of disasters. Such measures include, but are not limited to, hazard-resistant construction and engineering works, the formulation and implementation of plans, programs, projects and activities, awareness raising, knowledge management, policies on land-use and resource management, as well as the enforcement of comprehensive land-use planning, building and safety standards, and legislation.

Post-Disaster Recovery - the restoration and improvement where appropriate, of facilities, livelihood and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors, in accordance with the principles of "build back better"

Preparedness – pre-disaster actions and measures being undertaken within the context of disaster risk reduction and management and are based on sound risk analysis as well as pre-disaster activities to avert or minimize loss of life and property such as, but not limited to, community organizing, training, planning, equipping, stockpiling, hazard mapping, insuring of assets, and public information and education initiatives. This also includes the development/enhancement of an overall preparedness strategy, policy, institutional structure, warning and forecasting capabilities, and plans that define measures geared to help at-risk communities safeguard their lives and assets by being alert to hazards and taking appropriate action in the face of an imminent threat or an actual disaster.

Rehabilitation – measures that ensure the ability of affected communities/areas to restore their normal level of functioning by rebuilding livelihood and damaged infrastructures and increasing the communities' organizational capacity.

Resilience - the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Response – any concerted effort by two (2) or more agencies, public or private, to provide assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected and in the restoration of essential public activities and facilities.

Risk - the combination of the probability of an event and its negative consequences.

Typhoon – A weather phenomenon, called differently in different places. The term hurricane is used in the Atlantic and Northeast Pacific. The term cyclone is used in the South Pacific and Indian Ocean. Typhoon is the term used for the same weather disturbance in the Northwest Pacific. "Bagyó" is the local term to any tropical cyclone in the Philippine Islands.

Vulnerability - the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. Vulnerability may arise from various physical, social, economic, and environmental factors such as poor design and construction of buildings, inadequate protection of assets, lack of public information and awareness, limited official recognition of risks and preparedness measures, and disregard for wise environmental.

7.2 Community Based DRRM Programs

Table 9: Community Based Disaster Risk Reduction and Management Activities of Civil Society Organization

REGION AND PROVINCE	ORGANIZATION	CBDRM RELATED ACTIVITIES
National Capital Region		
Quezon City	Aksyon Bayan Kontra Disaster, Inc (ABKD)	Seminars in Community-Based Disaster Management
	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Training-Seminar on Disaster Risk Reduction/Community Based Disaster Management
Taguig City	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Training-Seminar on Disaster Risk Reduction/Community Based Disaster Management
Cordillera Administrative Region (CAR)		
Benguet	Philippine National Red Cross (PNRC)	Integrated Community Disaster Preparedness Program
	Philippine Relief and Development Services, Inc (PhilRADS)	Training-Seminar on Disaster Risk Reduction/Community-Based Disaster Management
Surigao Del Norte	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Integrated Community Disaster Preparedness Program
	World Vision Development Foundation	Children in Emergencies Training
Agusan Del Norte (Butulan)	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Barangay Disaster Response Team Training on Disaster Management for 25 coastal barangays of Agusan Del Norte
Region I		
Pangasinan	Center for Disaster Preparedness, Inc (CDP)	Program for Hydro-meteorological Disaster Mitigation for Secondary Cities in Asia (PROMISE)
Region II		
Cagayan Valley	World Vision	Children in Emergencies Training: Municipalities of Solana and Cagayan
Isabela	World Vision	Children in Emergencies Training
Region III		

Pampanga	Pampanga Disaster Response Network, Inc (PDRN)	Enhancing Capacity and Reducing Vulnerability to Disasters of Poor Families in Pampanga: Municipalities o f Minalin, Sto. Tomas, Sasmuan, Floridablanca, Guangua, Lubao
		Enhancing the Disaster Management Capabilities of the Local Government Units of Minalin and Sto. Tomas, Pampanga
		Consolidating Local Structures towards Risk Reduction of Flood Prone areas of Pampanga: Municipalities of San Simon, Guagua, Sasmuan, Minalin, Sto. Tomas, Lubao, Floridablanca, Candaba
		Sustaining the Disaster Management Initiatives of the Local Government units Towards it integration in the Local Development Planning: Municipalities of Minalin and Sto. Tomas.
Region IV-A (CALABARZON)		
Aurora	Corporate Network for Disaster Response (CNDR)	Lobbying for the disaster preparedness allocation, Research and Documentation on Disaster and Vulnerable Sectors, Multi-Hzard Risk Mapping
		Simulation Exercises for Disaster Preparedness: Municipality of Dingalan
	Philipping Relief and Development Services, Inc (PhilRADS)	Training-Seminar on Disaster Risk Reduction/Community Based Disaster Management
Cavite	Philippine Relief and Development Services, Inc (PhilRADS)	Training-Seminar on Disaster Risk Reduction/Community Based Disaster Management
	World Vision	Children in Emergencies Training
Rizal	Center for Disaster Preparedness, Inc (CDP)	Community-Based Disaster Risk Management: Municipality of San Mateo
	Corporate Network for Disaster Response (CNDR)	Lobbying for disaster preparedness allocation, Research and Documentation on Disaster and Vulnerable Sectors, Multi-Hzard Risk Mapping, Simulation Exercises for Disaster Preparedness: Municipality of San Mateo
	Philippine Relief and Development Services, Inc (PhilRADS)	Training-Seminar on Disaster Risk Reduction/Community-Based Disaster Management
Quezon (Lopez-Calauag)	World Vision Development Foundation	Children in Emergencies Training:Province level
Region IV-B (MIMAROPA)		
Occidental Mindoro	Balay Rehabilitation Center, Inc (Balay)	Training on Rights of Internally Displaced Persons and Community Based Disaster Management: San Jose City
Palawan	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Integrated Community Disaster Preparedness Program
Region V		

Catandanuanes	Accion Contra El Hambre	Disaster Risk Reduction through the reinforcement of coping capacities at local and sub-national level: Municipalities of Carramoran and San Miguel
	International Organization of Migration	Relief to Typhoon "Reming" victims by handling transport of relief supplies, construction materials and personnel, coordinated with government to improve living conditions of the displaced population
	Pampanga Disaster Response Network, Inc (PDRN)	Emergency Assistance towards Increasing the Disaster Management Capacity of Communities Affected by Typhoon Reming
Albay	Asian Disaster Preparedness Center	Integrating Disaster Risk Reduction (DRR) components and strategies in the Comprehensive Land Use Plan (CLUP) and in enhancing early warning system and evacuation procedures at the barangay level
	Internation Organization Migration	Relief to Typhoon "Reming" victims by handling transport of relief supplies, construction materials and personnel, coordinated with government to improve living conditions of the displaced population
	Plan International	Albay Disaster Response Project: Enhancing School Community Safety Against Disasters: Municipalities of Cagrary, Batan and Rapurapu
	Save the Children	Disaster Preparedness and Emergency Assistance: Municipalities of Guinobatan and Camalig
	World Vision Development Foundation	Albay Shelter Assistance Project: Municipalities of Sto. Domingo, Bacacay and Malilipot
	Pampanga Disaster Response Network, Inc	Emergency Assistance towards increasing the Disaster Management Capacity of Communities affected by Typhoon Reming in the Bicol Region
	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Training on Critical Stress Debriefing: Municipality of St. Bernard
Camarines Sur	Accion Contra El Hambre	Disaster Ris Reduction through the reinforcement of coping capacities at local and sub-national level: Municipalities of Cabussao and Bato
	CARE Philippines	Emergency Response and Rehabilitation Assistance for the Affected Communities by Typhoon Durian: Municipality of Calabanga
	Internation Organization Migration	Relief to Typhoon "Reming" victims by handling transport of relief supplies, construction materials and personnel, coordinated with government to improve living conditions of the displaced population
	Save the Children	Disaster Preparedness and Emergency Assistance: Municipalities of Nabua, Baao, and Buhi

	World Vision Development Foundation	Children in Emergencies Training
	Corporate Networrk for Disaster Response (CNDR)	Lobbying for disaster preparedness allocation, Research and Documentation on Disaster and Vulnerable Sectors, Multi-Hazard Risk Mapping, Simulation Exercises for Disaster Preparedness: Municipality of St. Bernard
	Philippine National Red Cross (PNRC), Camarines Sur Chapter	Trainers Training on Disaster Management: Municipalities of Siruma, Presentacion, Balatan, Sagnay and Garchitorena
		Family Disaster Preparedness Training: Municipality of Sipocot
		Orientation on CBDRM for local officials of Bgy Del Pilar, Garchitorena
		Training on Disaster Preparedness for Response Teams in 10 hazard-prone barangays: Municipality of Tigaoan
Region VI		
Antique	Creative Community Foundation, Inc (CCF)	Community-Based Disaster Management/Community Hazards Mapping: Barangay Malabor, Municipality of Tibiao
Iloilo	Creative Community Foundation, Inc (CCF)	Community-Based Disaster Management/ Community Hazard Mapping: Barangay Bacolod, Municipality of Leon
	International Organization of Migration (IOM)	Relief to Typhoon "Remin" victims by handling transport of relief supplies, construction materials and personnel, coordinated with the government to improve living conditions of the displaced population
Capiz	World Vision Development Foundation	Children in Emergencies Training
Guimaras	Creative Community Foundation, Inc (CCF)	Community-Based Disaster Management/Community Hazards Mapping: Barangay San Isidro, Municipality of Sibung
Region VII		
Bohol	Save the Childre	Disaster Preparedness and Emergency Assistance
Cebu (Metro Cebu)	World Vision	Children in Emergencies Training
	Philippine Relief and Development Services, Inc (PhilRADS)	Training–Seminar on Disaster Risk Reduction/Community– Based Disaster Management
Region VIII		
Leyte	German Technical Cooperation (GTZ)	Disaster Preparedness
	Save the Children	Disaster Preparedness and Emergency Assistance
	Balay Rehabilitation Center, Inc (Balay)	Training on Rights of Internally Displaced Persons and Community-Based Disaster Management: Tacloban City
Southern Leyte	Corporate Network for Disaster Response (CNDR)	Lobbying for disaster preparedness allocation, Research and Documentation on Disaster and

		Vulnerable Sectors, Multi-Hzard Risk Mapping, Simulation Exercises for Disaster Preparedness: Municipality of St. Bernard
	Philippine National Red Cross (PNRC)	Integrated Community Disaster Preparedness Program
	Philippine Relief and Development Services, Inc (PhilRADS)	Training on Critical Stress Debriefing : Municipality of St. Bernard
Western Samar	German Technical Cooperation (GTZ)	Disaster Preparedness
Region VIII		
Biliran	German Technical Corporation (GTZ)	Disaster Preparedness
Region IX		
Zamboanga Sibugay	World Vision Development Foundation	Children in Emergencies Training: Zamboanga City
Region X		
Bukidnon (Malaybalay City)	Balay Rehabilitation Center, Inc (Balay)	Training on Internation Humanitarian Law and Rights of Internally Displaced Persons: Municipality of Don Carlos
Camiguin	Center for Disaster Preparedness, Inc (CDP)	Community-Based Disaster Risk Management
Autonomour Region in Muslim Mindanao (ARMM)		
Maguindanao	Balay Rehabilitation Center, Inc (Balay)	Training on Rights of Internally Displaced Persons: Municipality of Upi
	Suara Kalilintad	Training on Disaster Preparedness: Municipality of Pangalungan
	Balay Rehabilitation Center, Inc (Balay)	Traininng on Rights of Internally Displaced Persons and Community-Based Disaster Management: Municipality of Bongao

Source: Partnership for Disaster Reduction South East Asia Phase 4, April 2008. Monitoring and Reporting Progress on Community-Based Risk Management in the Philippines. April 2008. www.adpc.net. Available from: http://www.adpc.net/v2007/programs/CBDRM/INFORMATION%20RESOURCE%20CENTER/CBDRM%20Publications/2008/final_crphilippineshires_23nov.pdf