

2009 Typhoon Ondoy and Pepeng Disasters in the Philippines

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Abstract

On September 25 and 26, 2009, Typhoon Ondoy struck the south-west island of the Luzon islands in the Philippines. Heavy rainfall affected 4.9 million people, causing 501 fatalities. In the middle of October 2009, Typhoon Pepeng struck in and around Baguio City, located in the northern part of the Luzon islands. Heavy rainfall caused a large number of landslides, and 4.5 million people were affected, totaling 539 fatalities. This is a survey report of the great water related disasters that occurred in the Philippines and that were caused by Typhoons Ondoy and Pepeng. The report is focused on the extensive urban flood disaster that occurred in Metro Manila and on the landslides that occurred in and around Baguio City. The investigation was managed and carried out by an interdisciplinary team including a geologist, a geophysical scientist, a geographer, a sociologist, and an anthropologist. This research reveals that changes in socio-economic conditions increases vulnerability to disasters and thereby exacerbates damage. It is suggested that future rapid population growth in urban areas along with global warming could further increase vulnerability to disasters in developing countries.

Key words: Typhoon Ondoy, Typhoon Pepeng, Flood Disasters, Landslides Disasters, Metro Manila, Baguio City

1. Introduction

Three tropical cyclones — Tropical Storm Ketsana (local name: Ondoy), Typhoon Parma (local name: Pepeng), and Typhoon Mirinae (local name: Santi), consecutively hit the central and northern parts of Luzon island in the Philippines in September and October of 2009, resulting in serious damages associated with floods and landslides. In particular, the National Capital Region (NCR), namely, Metro Manila, and Rizal Province were hit hardest by flooding induced by Tropical Storm Ondoy. Out of 10 million inhabitants, this typhoon affected approximately 4.9 million and left 501 missing or dead. Typhoon Pepeng came in mid-October, affecting approximately 4.5 million inhabitants and leaving another 539 missing or dead mainly due to landslides. Subsequently, Typhoon Santi affected approximately 0.8 million and left 39 missing or dead due to the heavy rains and associated inundations in the Laguna Lake (Laguna de Bay) coastal area.

The Philippines is one of the most disaster-prone countries in the world. Its location makes it vulnerable to a variety of natural disasters. Furthermore, social and economic conditions, such as low maintenance standards for disaster prevention facilities and problems with the poor living in damage-prone areas, contribute to an increase in their vulnerability to disasters. It is also a concern that the flood risk would increase along with an increase in heavy rainfall frequency due to global warming. Hence, in order to clarify the characteristics of the disasters and explore solutions to alleviate the damage, it is important to conduct a comprehensive study that is not only geared towards understanding the natural phenomena that caused the disasters but also takes into account the social and economic factors that contributed to the disaster. Thereby, an investigation of the disasters was conducted by an interdisciplinary team that included a geologist, a geophysical scientist, a geographer, a sociologist, and an anthropologist. The team was organized

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The paper is organized as follows. In part 1, the content and a summary of this report are given. In part 2, the meteorological features of the tropical cyclones that caused the severe damages are described. In part 3, the landslide in and around Baguio City and the reasons why landslides caused so much damage are discussed, and in part 4 the flooding in Metro Manila is addressed. Part 5 is focused on the future of the poor in the urban areas affected by Tropical Storm Ondoy, and in part 6, the response of central and local governments to the disasters is described and the social and economical factors that exacerbated the damage is discussed. Note that a brief summary of this report has already been published as a flash report on the website (<http://www.bosai.go.jp/library>).

2. Summary of the Research

This research is focused mainly on the flood disaster in Metro Manila and the landslide disaster in Baguio city that were both caused by Typhoon Ondoy and Pepeng in 2009.

2.1 Overview of the Research Area

The Philippines, which was struck by Typhoons Ondoy and Pepeng in 2009, is located along the western rim of the Pacific and the circum-Pacific seismic belt and thereby is subject to various natural disasters including typhoons, floods, earthquakes, tsunamis, volcanic eruptions, and landslides.

Metro Manila has developed along flood hazard areas on the downstream side of large rivers and continues to be developed while being faced with the dangers of water-related disasters, similar to other major cities in Southeast Asia. Thus, Metro Manila has a high flood risk. Its population has grown from 4 million in the 1970's to 6 million in the 1980's and presently to over 10 million. The population is predicted to grow to 25 million by 2015. Metro Manila is becoming one of the most densely populated urban areas in Southeast Asia (JICA, 2004). This population growth, brought on by urbanization, high-density land use from development, housing developments in flood prone areas, and the swelling of squatter areas, has continually increased the potential for damage caused by water-related disasters.

Baguio City, affected by the landslide caused by Typhoon Pepeng, is home to many famous resort destinations and is located in northern Luzon about 250 km away from Metro Manila. Approximately 4 million tourists visit the city every year. Along with the continuous population growth and development, many squatter houses have been built on steep slopes, and as a result forests for preventing landslides are lost, increasing the risk of slope failure caused by large earthquakes and heavy rainfall. The developing area of Baguio City located on a mountainside was affected by both

floods and landslides resulting from heavy rainfall induced by Typhoon Pepeng in 2009. Many of the houses built on the steep slopes were damaged by slope failures. Slope failures also occurred along main roads leading toward Baguio City, leaving the city isolated for several days.

2.2 Research Team

We intended to examine the disasters in terms of hazards, vulnerability, damages, and response to damages. Thereby, the investigation was conducted by an interdisciplinary team that consisted of five members as shown below. Three of them conducted the field research, and the other two analyzed the documents and data. We conducted the field research and interviewed local residents in the disaster areas and officials of local and government agencies. This field research was also aimed at collecting as much data as possible for subsequent disaster research. The following list shows the members' names and their research fields.

<Field Research Team>

Tadashi Nakasu
Environmental Sociology
(Society and disaster responses in the Philippines)

Takashi Inokuchi
Landslide Geomorphology
(Landslide disasters in the northern part of Luzon)

Teruko Sato
Geography
(Flood disasters in Metro Manila)

<Documents Research Group>

Shinya Shimokawa
Geosciences
(Physical characteristics of typhoons)

Akiko Watanabe
Area Studies on the Philippines
(Social characteristics of the Philippines)

2.3 Overview of the Field Research

We conducted the planning and the field research by using the snowball sampling method. Snowball sampling is a chain referral method used to obtain research and knowledge by having subjects recommend subsequent subjects that they share similar traits with in order to expand the subject pool. It is sometimes used if the sample for a study is rare or limited. Through this method we were able to conduct field and interview surveys from Nov. 26 to Dec. 3, 2009 in Baguio City, Benguet Province, and Metro Manila.

For the field survey, we visited devastated areas and

then inspected flooding conditions, the extent of the damage, and flood control facilities. At the same time, we consulted with local residents. For the interview survey, we interviewed officials of related agencies about the social and natural background surrounding the damage, their damage assessment, and their response to the disasters.

The following is the schedule and overview of the research.

<Research Schedule>

November 27, 2009

We carried out an interview survey at the following offices:

- Baguio City Mayors Office
- Baguio City Disaster Coordinating Council (CDCC) Headquarters
- Mines and Geosciences Bureau (MGB)
- Cordillera Region Disaster Coordination Council
- Benguet Provincial Capital

November 28

We conducted the following field research:

- Landslide disaster and inundated areas within Baguio City
- Landslide disaster areas in Benguet Province

November 29

We conducted the following field research:

- Drainage system facilities in central Manila

November 30

We conducted the following field research:

- Areas affected by an inundation of river water, the inside of the levee in Metro Manila, and flood control facilities (Marikina River Basin, Pasig River Basin, and Laguna Lake region)

December 1

We carried out an interview survey at the following offices:

- National Disaster Coordinating Council (NDCC), which changed its name to the National Disaster Risk Reduction and Management Council (NDRRMC) after the events.
- Office of Civil Defense (OCD)
- Philippines Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
- Mines and Geosciences Bureau (MGB)
- Metro Manila Development Authority (MMDA)
- Philippine National Red Cross (PNRC)

December 2

We carried out an interview survey at the following office:

- Japan International Cooperation Agency (JICA)

December 3

We carried out an interview survey at the following office:

- Asian Development Bank (ADB)

<Summary of the Field Survey>

Investigation in Baguio City and Benguet Province

1) Field Survey Research Areas:

Landslide-Affected Areas in Baguio City and Benguet Province and Flood-Affected Areas in Baguio City

The developing area of Baguio City located on a mountainside was affected by floods and landslides. Many of its houses were built on steep slopes and damaged by slope failures. Slope failures also occurred along main roads such as Kennon Road, leaving the city isolated for five days. The most serious landslide was a sediment disaster at La Trinidad, Benguet Province.

We observed the flood disaster area in Baguio and found that the main causes of flooding in low-lying areas were both the blocking of a drainage path by garbage thrown by local citizens and the blocking of valleys by structures. We also found that the presence of illegal occupants in areas at risk of flood had exacerbated the disasters.

2) Interview Survey

- 1) At Baguio town hall, Mayor Reinaldo "Peter Rey" A. Bautista Jr. discussed the recent problems and future prospects of the city. In this interview, it emerged that Baguio faces serious issues with regard to climate conditions, the vulnerability of pine trees to landslides, the struggle to prevent rapid population growth, and the regional ban on mining development projects. Baguio City also has a high risk of earthquake disasters. For example, the city was devastated by the Luzon earthquake of 1990. There are three fault lines that pass through the city area.
- 2) Data collection and interviews were conducted at the Baguio CDCC.
- 3) We obtained hazard maps, and the vulnerability of Baguio City to landslides was explained at the MGB in the city.
- 4) A disaster response scheme was outlined at the Cordillera Regional Disaster Coordinating Council. We confirmed that the flow of information relating to disaster responses in the Philippines was set up as follows: NDCC - OCD - [RDDCC - PDCC - MDCC - BDCC - local people in the barangays as referred to in Part 6.
- 5) At the governor's office in Benguet Province, interviews were conducted on the subject of landslide disasters and disaster responses at the local level.

Investigation in the Metro Manila area

1) Field Survey

<Marikina River Basin> Inundation of River Water, Extent of Inundation, Flood Control Facilities

<Pasig River Basin (including San Juan River)> Areas Affected by an inundation of River Water, Inside the Levee, Extent of the Inundation, and Flood Control Facilities

<Laguna Lake Area> Inundation from Rising Water Level, Extent of Inundation, and Flood Control Facilities

We surveyed the flood damage caused by the massive rains brought by Typhoon Ondoy in the Marikina, Pasig, and Laguna Lake areas. We surveyed the extent of flooding and the flood control facilities in low-lying areas in Marikina, the Laguna Lake lakeshore areas, and Manila Bay area. On top of the social background of the Philippines, we also looked into the relationship between disaster and poverty in the country.

The following is an overview of the flooding in Metro Manila:

- 1) Heavy rains caused overflowing beyond the capacity of the river channel in the upstream Marikina River Basin, resulting in flooding in low-lying areas in Marikina. For example, a flood close to 7 m was recorded in the upscale Provident Village in Marikina City, which resulted in many casualties.
- 2) In the low-lying parts of the Manila Bay coastal area downstream from the Pasig River Basin, an inundation of river water from river channels was limited since 70% of the flood volume from the upstream Marikina River was diverted into Laguna Lake through the Manggahan Floodway. However, even though the drainage behind levees was working, since the rains were very massive, damage due to large-scale inundation inside the levees happened over a wide area.
- 3) Even in the low-lying areas in these downstream regions, inundation by river water occurred along the San Juan River and the right tributary of the Pasig River, causing damage in residential areas.
- 4) In Laguna Lake, which serves as the flood control basin of the metropolitan area that has expanded from the Manila Bay area's low-lying regions, the water levels rose up due to the heavy rainfall in the area and formed a flood flow from Marikina River, causing flooding of the residential areas around the lake. Furthermore, Bay Breeze Village in Taguig City was still flooded when we visited it in early December, where we had to use boats. There were many squatter areas around the lake that were also flooded.

Although some issues have been pointed out regarding operation after a technology transfer of flood control systems provided by JICA in Metro Manila, based on our field surveys and interviews with local residents and flood specialists, these JICA-funded flood control projects played an important role in abating the flooding damage caused by Tropical Storm Ondoy.

2) Interview Survey <National Agencies>

1) <NDCC>

We interviewed the NDCC, our counterpart in the Philippines, and the OCD, which is their core agency. We then observed their activities and organizational set-ups. We also heard about the extent of damage and the actions taken in response to the disasters by different institutions such as the PAGASA and the MGB, which are part of the NDCC.

2) <MMDA>

We asked the MMDA about their involvement in dealing with the disaster and about the flood control systems in Metro Manila.

3) <National NGOs>

At the Rizal Chapter of the PNRC, we inquired about the PNRC's disaster response activities as an NGO. In particular, we were able to hear about PNRC's effective disaster information gathering system that uses cell-phone text messaging and the process by which they deploy trained Red Cross volunteers to each barangay to carry out prompt rescue operations.

4) <Bilateral Cooperation Agencies>

We asked about the results of the post-disaster needs assessment conducted by the JICA as part of their bilateral cooperation activities.

5) <Multilateral Cooperation Agencies>

We interviewed the ADB, a multilateral cooperating agency, about their disaster response activities for Tropical Storm Ondoy and discussed with them the results of our research as we came up with an overall picture of the disaster.

3. Outline of the Report

Here, we summarize each part in this report.

Part 2: Fujiwara Effect: the Interaction between T0917 and T0918.

Shimokawa, Iizuka, Kayahara, Suzuki, and Murakami

Shimokawa et al. use satellite images and best track data to examine why Typhoons Ondoy and Pepeng caused huge damage in the Philippines. Typhoon Ondoy remained in the Philippines for a long time, leaving and returning. Furthermore, it moved southward, something typhoons do not usually do. The authors suggest that the complex movement of Typhoon Ondoy is due to the interaction between Typhoons Ondoy and Pepeng, resulting in an exacerbation of damage such as landslides and debris flows. This interaction is called the Fujiwara effect named after Sakuhei Fujiwara, the former director of the central meteorological observatory in 1921 in Japan.

Part 3: Landslide Disaster around Baguio City Caused by Typhoon Pepeng in 2009.

Inokuchi, Nakasu, and Sato

This paper contains discussion on the extent of landslide damage and the factors that contributed and exacerbated the damage caused by the massive rains brought about by Typhoon Pepeng in and around Baguio City, based on field surveys and interviews. First, the extent of rainfall in northern Luzon and the landslide disasters caused by the heavy rains are described. Damages due to mudslides and earth slides within and around Baguio City and the possible causal factors based on the field surveys are then discussed. In the paper, it is pointed out that the rapid growth of Baguio City's population has led to the unregulated development of residential areas in steep slopes, which has contributed greatly to exacerbating the harm to human's that was caused by the disaster.

Next, the extent of damage is described and an overview is provided of the earth movements of the rapid landslide disaster that occurred in La Trinidad, Benguet, which resulted in 85 casualties, the worst damage reported in one location. It is also pointed out that the building of many houses on a landslide prone area within a valley exacerbated the severe damage. Finally, the landslide disasters along Kennon Road are reported.

Part 4: 2009 Typhoon Ondoy Flood Disasters in Metro Manila.

Sato and Nakasu

This paper contains an outline on an overview of the water disasters and actual damage that occurred in Metro Manila as well as future challenges. First, the authors distinguish water disasters in Metro Manila into four categories. The first and second types are respectively those that occurred in flood-prone areas along the Marikina River and plains along the San Juan River affected mainly by an inundation of river water. The third and the fourth types of floods happened respectively in the lower zones along Manila Bay and the lower zones along Laguna Lake that were affected mainly by an inundation of water inside a levee. The vulnerabilities to flood disasters in the Metro area are also shown. In addition, the situations reflecting the characteristics of mega cities and the impact of water and land conditions on floods are examined.

With regard to future challenges, as countermeasures for reducing water disaster risks in Metro Manila, the following points are discussed: countermeasures for river channels to reduce occurrences of severe floods, countermeasures for river basins to control the spread of flood discharges, countermeasures for drainage systems to prevent infections and diseases that cause death, and the establishment of social systems to sustain flood control facilities. The challenges of flood prevention in metropolitan areas involving financial, social, and political factors are then discussed. The authors also stress that it is necessary to discuss disaster mitigation

from various view points and with a long term view, with the cooperation of experts from various field.

Typhoon Ondoy, which struck Metro Manila, the capital region, teaches us a lot of lessons, especially when considering the vulnerability of urban areas, which tend to have a concentration of the population in low-elevation coastal zones (LECZ).

Part 5: Representations over a Tropical Storm Disaster and the Restoration of Everyday Lives for Urban Poor Victims in the Philippines; The Case of Typhoon Ondoy.

Watanabe, Nakasu, and Inokuchi

This paper is focused on the embedded social problems in the Philippines from an anthropological viewpoint. Some newspapers held the view that the disasters affected people equally no matter whether they were rich or poor. The authors, however, try to not to hold that view.

For example, in the paper, it is revealed that an affected man had to pay for a damaged work tool worth 100,000 pesos to a company while he was earning only 7,000 pesos a month (Ellao 2009). Not only that, the authors look, from an anthropological viewpoint, at a situation in which the underprivileged class in urban areas was bombarded with resettlement policies.

With the help of respective local governments, the administration is trying to solve the problem with a program for returning to one's province, called "Balik Probinsiya" a program for returning to one's residence from evacuations centers, called "Balik-Bahay," and a relocation program for informal settlers to resettlement sites in Laguna, Rizal, and some other nearby provinces (Labro 2009, Ellao 2009, Cinco 2009) However, in spite of this effort, it is pointed out that the resettlement policy has not met the needs of the settlers for a sustainable resettlement.

The paper is focused on the "ought to have been" steps taken before the disaster and restoration period of the urban underprivileged class together with the way that people see the world and conduct their everyday lives. It is also suggested that there is a strength against disaster in the Filipino people at the social and personal levels.

Part 6: The Exacerbation of Human Suffering and Disaster Response Caused by Tropical Storm Ondoy and Typhoon Pepeng Disasters; Cases of NCR and Baguio City.

Nakasu

In this paper, the author attempts to investigate the factors that exacerbated human suffering caused by Tropical Storm Ondoy and Typhoon Pepeng. The paper is mainly focused on social background and disaster response systems in order to examine those factors. The population of Manila increases continuously through an inflow of people from the outlying

provinces to metropolitan areas, and that causes illegal settlers, garbage, and sanitation issues in the NCR. Baguio City as well is experiencing a rapid growth in population and housing development. As a result, social vulnerabilities against natural hazards in both areas are increasing along with a rapid increase in population and urbanization.

In reference to disaster response systems, it is suggested that the systems in the Philippines are relatively systematized. Thus, strength against disasters at the social and personal levels are relatively high.

The gaps in disaster responses noticeably reflect the gaps in community as seen by the level of community disaster preparedness. The gaps, then, were revealed as the disaster situations.

As mentioned above, Tropical Storm Ondoy revealed the urbanization problems in the coastal areas of Metro Manila. Typhoon Pepeng revealed the urbanization and geological vulnerability of Baguio City, which is 90 % landslide prone. The disasters in both cities could serve as important examples of the future effects of global warming. It is believed that Japan should learn a lot from the experiences of Ondoy and Pepeng.

The term "Tropical Storm" is used instead of "Typhoon" in the case of Ondoy in reference to a post-disaster needs assessment produced by the ADB, UN, World Bank Group, and other partners (2009).

4. Conclusion

The role of the development and urbanization of Metro Manila in water-related disasters became apparent in our survey of the damage caused by Typhoon Ondoy. Likewise, in the study of the damage caused by Typhoon Pepeng, it was found that 90 % of the damage was actually due to an exacerbation of disaster vulnerability brought about by the urbanization of Baguio City, a landslide-prone area. In both disasters, it was apparent that urban development had exacerbated the serious hazards, increased the number of people exposed to danger, and amplified the potential for damage. All these factors resulted in extensive destruction.

Changes in social and economic environments have exacerbated Philippine society's vulnerability to damage. This view overlaps with the problems of overpopulation in urban areas and global warming issues and therefore will become an increasingly important issue that must be addressed to mitigate future causalities from disasters.

Metro Manila is faced with an increasing population, and the current construction boom is expected to further intensify as a result. In light of this reality, it has become clear that aside from using structural measures to control natural phenomena such as the implementation of strict river capacity control measures that reduce flood incidence (this would probably need time due to financial constraints), a shift

to a comprehensive damage mitigation measure is necessary in order to sustain efforts to reduce risks from disasters. This comprehensive approach would include land use management policies that are aimed at curbing hazard and damage potential, a social system that can sustainably maintain the function of flood control facilities, environmental measures that prevent the spread of fatal and infectious diseases, and a more efficient damage reduction response system for people and property. This approach involves various financial, social, and political factors and would necessitate a great amount of time before it could be realized. However, consultations with social scientists and other specialists regarding damage risk reduction from a long-term perspective must be started as soon as possible in order to take the first step towards reaching a solution to this complex problem.

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- Ms. Rose Malekchan and Ms. Minda Licawen of the community radio station in Baguio City for helping us to conduct our research in the city and coordinate with many organizations.
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- The Hon. Reinaldo "Peter Rey" A. Bautista Jr., Mayor of Baguio City, Ms. Olive Lucas, Regional Director of the Cordillera Administrative Region, the Office of the Civil Defense, and the Regional Disaster Coordinating Council for lecturing to us and giving us detailed information on the situation in the Philippines.
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