

CONCLUDING REPORT

Roadmap toward Effective Flood Hazard Mapping in the PHILIPPINES

JICA-REGION FOCUSED TRAINING COURSE IN FLOOD HAZARD
MAPPING

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A. The role of flood hazard maps to mitigate flood damages in the Philippines ”

a.1 The flood status in the Philippines

Each year the Philippines suffer from water-induced disaster caused by floods and debris flow which brought devastating damages to both lives and properties. Most flood damages were observed in river systems and river basins with small and limited carrying capacity. The government, over the years, has continuously developed responsive schemes to mitigate the negative effects of the natural disasters particularly floods, which disrupts many peoples lives and hampers the country’s economic development.

Aside from the country’s “natural conditions” man’s activities have aggravated the problem. Many mountains in the country are severely deforested, paving easy sedimentation and debris flow. A lot of sediment discharge contributes to riverbed aggradations, which in turn result to floods. Rapid urbanization and land conversion/use impair the natural retention and detention capabilities of the environment. In urban areas, the problem on flood management is compounded by the constraints on infrastructure, natural condition (low-lying areas), encroachment into natural waterways and drainage mains, uncoordinated development, garbage and siltation, increase in runoff in developed areas.

Below is the photo of the the flooding on August 26, 2004 and the damages caused by the 2 typhoons : Marce (international name Aere) and Chaba.



TYPHOONS LEAVE 8 DEAD

[FREE RIDE: A police vehicle ferries stranded passengers along Espana street in Manila where floodwaters rose several feet yesterday morning. - Photo By Revoli Cortez]

“MANILA, August 26 , 2004 (STAR) At least eight people were feared dead while three others were missing as heavy rains overnight caused by two typhoons triggered floods, landslides and a road crash in several parts of the country, civilian and police officials said.

Total of **81 inches of rainfall was recorded**, according to Cesar Lacuna who is MMDA deputy chairman and concurrent chief of the flood control unit.

Pagasa weather bureau said the rainfall was equivalent to 135 million liters of water.

The weather bureau said **typhoons Marce (international name Aere) and Chaba**, both churning off the northeast coast of Luzon, enhanced the seasonal southwest monsoon.

A four-year-old boy is presumed dead after a landslide buried at least one house in San Mateo, Rizal, Office of Civil Defense (OCD) official Elena Aldea told local radio.

A landslide also hit Antipolo City but no one was killed, three people were slightly injured.

A girl drowned while two people are unaccounted for after they fell into a swollen creek in Sauyo in Novaliches, Quezon City.

Floods meanwhile put many parts of Metro Manila under up to three feet of water, paralyzing traffic and forcing many schools to declare holidays.

Eight international flights to Taipei and a cargo flight • all originating from other countries • were diverted to the Ninoy Aquino International Airport (NAIA).

High winds stranded a domestic flight from Manila to Basco in Batanes.

A billboard crashed into overhead power lines, blacking out a section of Manila.

Fernando explained to the President that the **flashfloods were largely due to the overflowing of the San Juan River, which had swelled by more than 150 millimeters early yesterday morning due to continuous rainfall.**

Metro Wide Damage

In Metro Manila, high-water floodwater levels displaced several families in low-lying districts and stranded commuters in flood-prone areas.

Manila Mayor Lito Atienza said **families living along Geronimo street in Sampaloc were taken to a temporary evacuation center in two schools. The flooding was caused by a creek that overflowed. Floodwater in several areas in Manila rose to levels which made many streets impassable to light vehicles.**

Floodwater with waist-high levels was recorded in Tayuman, Abad Santos and Pampanga, Espana, Makiling, Blumentritt, Laon-Laan, Dapitan, Simon, Calamba, Maria Clara, Mendiola Extension and Pandacan.

The OCD said two missing men identified as Franklin Castro and Joey Patugulan of Bago-Bantay in Quezon City fell into a creek and went missing after the strong water current swept them between 8 and 9 a.m.

Six children were also reported to have been trapped inside their house amid rising waters in Barangay Apolonio Samson on Kaingin Road also in Quezon City. One of the kids reportedly drowned. An unidentified girl was also confirmed to have drowned in a creek in Barangay Sauyo although her body was reportedly recovered in Barangay Apolonio Samson.

Two more children reportedly drowned in Barangay Sauyo.

Over 2,000 families were evacuated to higher grounds. Social workers of the Quezon City Hall continued rationing food and relief operations to 15 barangays affected by the heavy downpour.

Meanwhile, reports reaching the Quezon City Hall said a **tree was uprooted while phone cable wires sagged along the street due to strong winds. The fallen tree along the Balara-Katipunan Road briefly caused a traffic jam in the area, while cables sprawled on a side road in Project 3 made the street impassable to motorists.**

In San Mateo, Rizal, **four-year-old Jeremy Laurio was feared to have drowned when he was swept by cascading waters while trying to run from a landslide. Two houses, including where the boy lives, were buried by the landslide.**

Two houses were partially damaged when a landslide hit a residential area in Barangay Silangan in San Mateo.

At least **700 families from low-lying areas in San Mateo were evacuated to Barangays Malanday and Sto. Nino** as floodwaters submerged their homes. **A landslide in Barangay De la Paz in nearby Antipolo City destroyed a house. Its occupants evacuated in time to escape being buried alive, Santiago said.**

Some **400 families in two low-lying areas in Marikina City were also moved to higher grounds amid the overflowing of Marikina river. A number of establishments and a restaurant located at the lower portion of the River Park were submerged in floodwaters while the Tumana Bridge was rendered impassable to all types of vehicles. A number of houses were also submerged in Barangay Tumana.**

In Caloocan City, residents in low-lying areas were trapped on the roofs of their homes due to massive flooding, said National Capital Region Command (NCRCom) chief of operations Lt. Col. Domingo Tiaan. Tiaan said an Air Force UH-1H rescue helicopter from the 505th Rescue Group was dispatched to assist in the evacuation of the marooned residents.

The NCRCom also sent eight of its M35s military trucks, two amphibian trucks and two rubber boats to assist affected families in Caloocan City. The OCD reported that about **1,360 families mostly from Caloocan City and Quezon City have been evacuated.** They were provided with food and medical supplies.

In the flood-prone Camanava area (Caloocan, Malabon, Navotas, Valenzuela), waters rose up to the chest forcing local officials to suspend classes in public and private schools. Murky waters submerged the Kaunlaran Elementary School in Dagat-Dagatan and the overcrowded Caloocan City Jail.

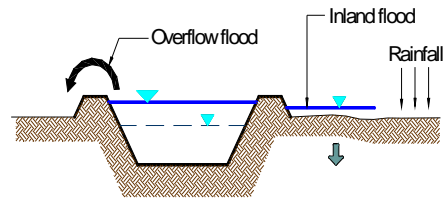
At least five families were evacuated in Barangay 49 in 5th Avenue, Caloocan among other barangays badly affected by the flooding. Eight of Malabon 痲 21 barangays suffered massive flooding. These were Barangays Tugatog, Tonsuya, Tinajeros, Taniong, Santolan, Catmon, Concepcion and Niogan.

In the neighboring municipality of Navotas, three of its 14 barangays were worse-hit by floodwaters namely, North Bay Boulevard South, Daang Hari and San Jose. Vehicles were stranded for several hours in the border of Valenzuela City and Malabon when the Tullahan River overflowed onto the Tullahan Bridge that connects the two cities. At least three shanties in Sitio Kabatuhan in Gen. T. De Leon were destroyed when a concrete wall of a construction site in the area collapsed on them at the height of heavy rains.

In southern Metro Manila, the heavy rains resulted in successive vehicular accidents while residents near Laguna Bay expressed concern over a water spill. In a span of one hour, **three vehicular accidents were reported in Taguig amid slippery roads.** No serious injury was

Based on the records of the Natural Disaster Coordinating Council (NDCC), Office of the Civil Defense, the cost of damage due to natural calamities, covering the period from June 1990 to May 2003 alone, amounted to PhP 96.57 Billion, of which, flood-related is PhP 73.94 Billion, earthquake-related is PhP 12.20 Billion and Volcanic-related at PhP10.42 Billion.

CAUSES AND TYPES OF FLOODING



1. Overflow Flooding

Flooding caused by inadequate capacity of waterway



2. Inland Flooding

Flooding caused by inadequate drainage and/or high-water level in the main channel.



Present countermeasures for mitigating flood damages in the Philippines

Flood mitigation is one of the priority programs of the Philippine government to attain its development goals. Current efforts employ both structural and non-structural measures.

Moreover, the direction is now on integrated efforts, with the concept of flood management and the principles of integrated water resource management.

Structural Measures:

Infrastructure projects are directed to prioritized flood-prone areas that are designed to provide public welfare and safety as well as to improve the health and sanitation of the people in the flood-affected areas, thus also support the land conservation and socio-economic development.

Majority of these structural measures (considered as direct countermeasures) against floods implemented in the Philippines are categorized as follows:

- a. To increase discharge capacity
 - Diking
 - Widening of the waterway
 - Dredging and excavation
 - Combination of the above
- b. To reduce and control the peak discharge of flood
 - Dam
 - Retarding basin (natural or artificial)
- c. To prevent inland flooding
 - Revetment
 - Spur dike

- Cut-off channel
- d. To prevent harmful degradation of riverbed.
- Groundsill
- e. To prevent obstruction against river flow and or maintain/conserves the good condition of the river in order to keep the flow uninterrupted.
- Sabo works
 - Regular maintenance

Non-Structural Flood Mitigation Measures

Structural mitigation measures can only withstand flooding up to design level (e.g. 5-year return period, 10-year return period). In case heavy rains exceed this target level, the structure could not prevent the occurrences of flood damage, and even if we increase the capacity of improvement to say 100-year return period, it would be time consuming and very expensive. Therefore, there is a need for other effective measures for flood mitigation, such as **Non-structural measures** which are preventive and remedial approaches for flood mitigation.

Preventive approaches include flood plain management, watershed management public awareness programs. Flood management/mitigation require a comprehensive approach to help the communities cope with flood disasters.

Remedial approaches are flood forecasting and warning systems, flood fighting and relief operation. Disaster preparedness and evacuation plan greatly minimizes threats to both life and property. The basic tool here is **INFORMATION and HOW** it can be disseminated effectively and promptly to the affected residents and the disaster teams.

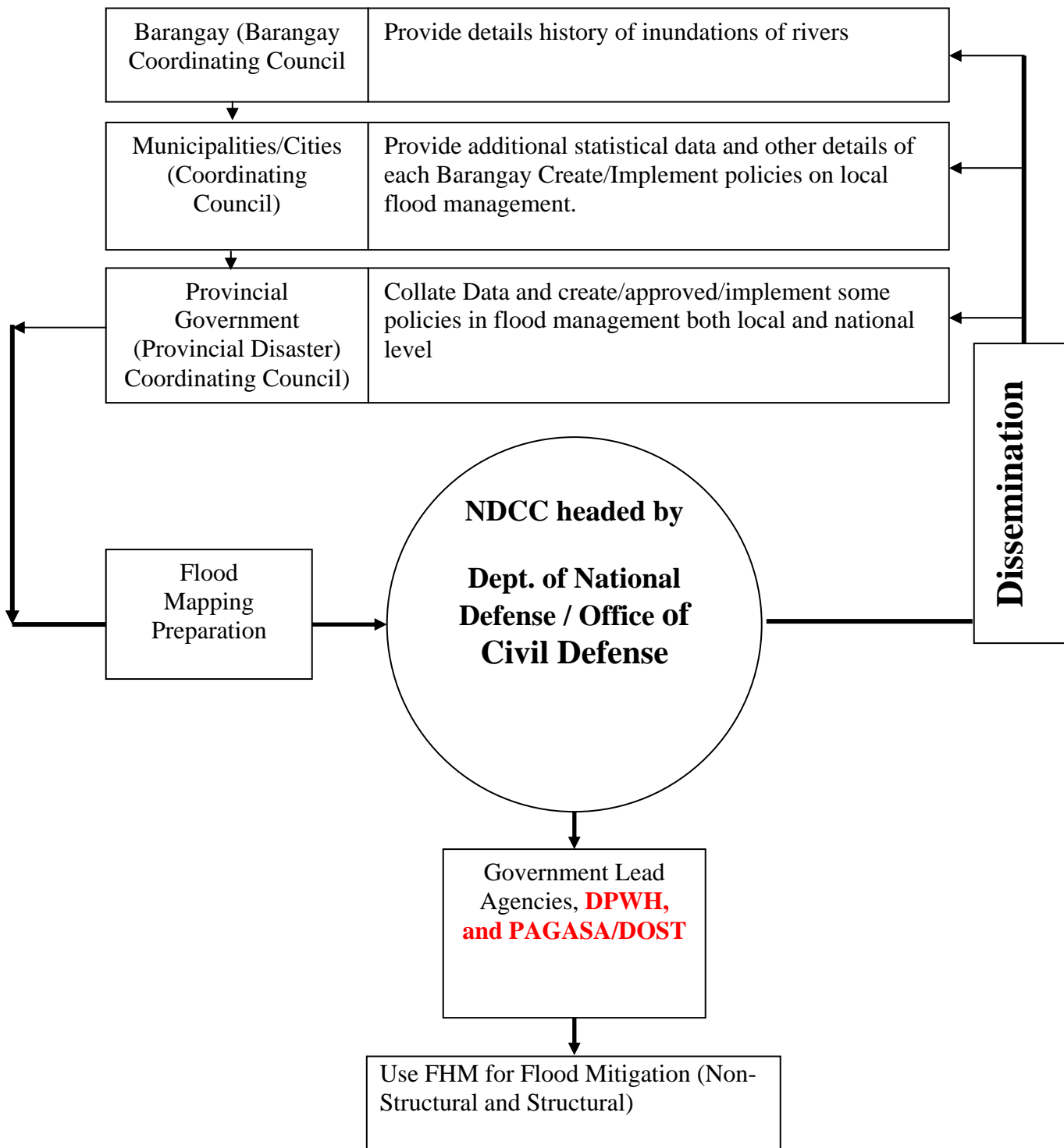
If all cities and municipalities have prepared and distributed the Flood Hazard Maps, to the local residents, casualties and damaged of properties should have been avoided during the flooding of August 26, 2004. With the past flooding experiences, and the situation or location of the Philippines that is always frequented with typhoons, I strongly recommend that Flood Hazard Maps should be prepared, produced and distributed to local residents of all cities and municipalities frequented by flooding.

Since the main objective or purpose of **Flood Hazard Map**, is to provide information on inundation and evacuation, **flood hazard map** will be useful to enhance the awareness of the people on the potential flood area/damage in their respective cities /municipalities, thus ensuring their safety and proper evacuation in the event of flooding.

With the Flood Hazard Map people could get accurate information and could evacuate safely and smoothly in emergencies from areas where flood disasters are anticipated.

B. “The allocation of roles in making flood hazard maps in my country”

National Disaster Coordinating Council (NDCC), headed by the Dept. of National Defense duly supported by the local government units, Department of Public Works and Highways and PAGASA under Dept. of Science and Technology (DOST) must be given the major role in making the flood hazard maps in my country.(Please see chart)



C. “The ACTION PLAN of making flood hazard maps in my country”

TARGET AREA – Pateros River

Pateros is one of the municipalities of Metropolitan Manila. It was also affected by typhoons Marce (international name Aere) and Chaba last August 26, 2004 .in terms of damage of properties in some low-lying areas. Several houses were submerged into a knee deep flooding located at Barangay Sta. Ana and Barangay Martirez. No casualty reported during that flood event.



Pateros is a low-lying area almost of flat terrain with slope rising only up to 2.5% slanting downward towards Laguna Lake. It is only about 2.0 meters above sea level with its highest elevation at about 4.0 meters above sea level. It's almost sea level elevation has caused perennial flooding in most of the municipality. **High tide in Laguna Bay, which causes backflow of seawater from the Manila Bay into the Pasig River up to Pateros River, coupled with heavy rains, has caused floods in the low-lying areas of Pateros.**

The Pateros River, a tributary of Pasig River mainly drains Pateros. This river runs from Barangay Sto. Rosario (K) to Barangay Aguho on the western side of the town. Being linked to the Pasig River, the flow and direction of Pateros River is dictated by –

- (a) the elevation of the lake water surface at the Pasig-Napindan-Marikina junction,
- (b) the tide elevation in the Manila Bay, and
- (c) the elevation of the lake surface of Laguna.

Pateros drainage is governed by the behavior of the bodies of water mentioned. Aside from Pateros River, the municipality is drained by a number of creeks. The other two

major waterways are the Sta. Ana River and Sto. Rosario River. Creeks include Panday Creek and Napindan Creek.

Pateros flood hazard map has no accurate information/ data regarding the inundation depth for certain flood frequencies. What we have is a base map with the location of the evacuation centers only. If we could prepare our Flood Hazard map with an accurate information /data about inundation depth, etc., this will help the residents enhance their awareness on the potential flood area/damage in our municipality, thus ensuring their safety and their property in the event of flood.

With the Flood Hazard Map, this could help people get accurate information and could evacuate safely and smoothly in emergencies from areas where flood disasters are anticipated.

Generally, in making flood hazard maps in our municipality of Pateros the major problem is the financial capability, the availability of accurate data such as basic information and observational data on meteorological and hydrological hazards in terms of nature, frequency and magnitude, historical records used to identify critical hazard zone, maps, human resources or manpower with expertise and the priority of the chief executive.

Proposed Action Plan within the next five years

- 1.. **Recommend to the Municipal Mayor the following activities:**
 - **Conduct Training for Flood Hazard Mapping**
 - **Prepare Flood Hazard Map for the Pateros Municipality**

2. **Gathering Data/Information (within 2 years)**
 - **Coordinate with other government agencies (DPWH, DOST: PAG-ASA, PHILVOCS, DENR, MMDA and other Local Government units) for accurate data/information needed such as Evacuation use Information and Educational use Information for the preparation of FHM**
 - **Conduct actual survey of the pilot area**
 - **Information/Consultation with the local residents**

3. **Preparation and Production of the Flood Hazard Map (within 2 years)**
4. **Distribution of Flood Hazard Map (within 1-2 years)**
 - **Public awareness program**
 - **Training on evacuation planning**
5. **Coordinate with the previous Philippine participants for nationwide campaign on Flood Hazard Map Awareness**

“Disasters cannot always be prevented, but its disastrous effects can certainly be mitigated if appropriate measures are adopted. This can be achieved by proper understanding of the hazards and the threat posted by them.”

Reference:

Study for the Preparation of Flood Control Manual for DPWH Technical Standards ^ Guidelines, 2002
Water and Floods, A Look at Philippine Rivers and Flood Mitigation Efforts, March 2003, 2004

D. EVALUATION AND SUGGESTIONS OF THIS TRAINING COURSE

STRONG POINTS

Flood Hazard Mapping Course is easy to comprehend. Lecturers are knowledgeable and competent. They are accommodating and very patient in answering questions and in giving explanations. Lectures are interesting. This training course is equipped with good facilities, training materials, comfortable and safe accommodations and kind, caring and friendly staff. Training coordinators: Mrs. Yoshimi Shibata, Mr. Kuribayashi, are very caring, kind and supportive.

WEAK POINTS

Insufficient time to finish the given exercises.

SUGGESTIONS

1. Allocate enough time on given exercises and review the topics/subjects well to avoid duplication.
2. If possible move the schedule of this course in the month of September to November, 6 weeks duration will be sufficient to carry out all activities of this course.

CONCLUSION

The Course Objectives such as to provide the trainees:

- a. Professional knowledge and practice on hydrological, hydraulic and river engineering to produce flood hazard maps;
- b. General knowledge of flood hazard maps in the world, in Asia, in Japan;
- c. Understanding of the effectiveness of flood hazard maps, and ways and to disseminate and utilize them for people;
- d. Methods to enhance people's capability and promote public awareness to mitigate flood damage;
- e. Understanding of ways of producing and applying flood hazard maps for their own countries/regions, **were met.** The acquired knowledge of each participant and the assistance from other National Agencies, Local Government Units, local residents, experts and the availability of fund will enable each municipalities and cities of the country to produce its flood hazard maps.

Before I will end my conclusion, on behalf of the Municipality of Pateros and my country, the Philippines, **I would like to express my sincere thanks to JICA and PWRI** in giving us a chance to participate and attend this training course, in order to enhance our knowledge and abilities regarding flood hazard mapping, and to meet new friends. **Thanks for the comfortable accommodation with caring, supportive and understanding coordinators like Mrs. Yoshimi Shibata, Mr. Kuribayashi, Mr. Tanaka and staff of TBIC who make our stay more enjoyable and fruitful.**

DOMO ARIGATO GOZAIMASU !!!