

JICA Regional Focused Training on Flood Hazard Mapping

October 29, 2006 – December 02, 2006

CONCLUDING REPORT

**“Action Plan Towards Effective Flood Hazard Mapping in the
Philippines”**

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INTRODUCTION:

The Republic of the Philippines is an island nation located in the South east Asia between the Philippine Sea and South China Sea and Manila as its capital. It is made up of 7,107 islands with a total land area of approximately 300,000 square kilometers (land=298,170 sq. km. and water=1,830 sq. km.)

Philippines are divided into three geographical areas: Luzon, Visayas and Mindanao. It has 17 regions, 80 provinces, 117 cities, 1,501 municipalities, and 41,982 barangays.

The Philippines is the world's 13th most populous country, with a population of 89,468,677 (as of July 2006, with ages 0-14 composes the 35%, 15-64 is 61% of the population and about 4% of ages 65 or more). Manila the capital is the eleventh most populous metropolitan area in the world

The country experiences different natural hazard like typhoon, land slide, active volcanoes, destructive earthquake and tsunamis.



The Flood Status in the Philippines

Philippines is an astride typhoon belt, it is usually affected by 15 and struck by 5 or 6 cyclonic storm per year. Tabulated below are the recorded annual flood damages in the country starting from 1980 to 2003.

RECORDED ANNUAL FLOOD DAMAGES, PHILIPPINES, 1980-2003

YEAR	POPULATION AFFECTED		CASUALTIES			HOUSE DAMAGED		DAMAGE VALUE (million peso)
	FAMILIES	PERSONS	DEAD	MISSING	INJURED	TOTALLY	PARTIALLY	
1980	248,164	1,666,498	36	4	55	16,510	51,101	1,472.00
1981	250,325	1,472,417	484	264	1,922	44,994	159,251	1,273.00
1982	266,476	1,569,017	337	223	347	84,027	97,485	1,754.00
1983	140,604	747,155	126	168	28	29,892	85,072	523.00
1984	741,510	4,048,805	1,979	4,426	732	310,646	313,391	416.00
1985	318,106	1,643,142	211	300	17	8,204	211,151	3.00
1986	287,240	1,524,301	171	43	155	3,162	14,595	1,838.00
1987	464,162	2,591,914	1,020	213	1,455	180,550	344,416	8,763.00
1988	1,173,994	6,081,572	429	195	468	134,344	585,732	8,675.00
1989	501,682	2,582,822	382	89	1,088	56,473	184,584	4,494.00
1990	1,265,652	6,661,474	676	262	1,392	223,535	636,742	11,713.00
1991	150,894	759,335	5,201	4,278	357	15,458	83,664	74.00
1992	418,964	2,097,693	145	95	51	3,472	8,342	7,359.00
1993	1,523,250	8,202,118	814	214	1,637	166,004	456,773	25,038.00
1994	670,078	3,306,783	266	54	260	58,869	226,291	3,401.00
1995	1,710,619	8,567,666	1,255	669	3,027	294,654	720,502	57,781.00
1996	260,581	1,254,989	124	49	97	2,690	17,557	10,109.00
1997	777,997	3,954,175	199	28	66	13,225	53,980	4,842.00
1998	1,590,905	7,197,953	498	116	873	137,020	406,438	17,823.00
1999	270,424	1,281,194	56	3	25	144	687	1,555.00
2000	1,426,965	6,852,826	338	59	370	24,573	195,536	7,217.00
2001	756,938	3,629,295	431	134	418	14,899	54,422	6,924.00
2002	538,600	3,546,469	169	33	71	2,980	15,947	829.00
2003	702,223	3,362,991	139	28	182	12,306	51,579	4,567.00
TOTAL	16,456,353	84,602,604	15,486	11,947	15,093	1,838,631	4,975,238	188,443.00

This year more than 12 typhoons visited the country and six of these typhoons caused destruction to the country that result in loss of lives and properties as follows:

1. *Tropical Storm Henry* – make a land in the country last August 03, 2006, with affected families total to 120,753 or 545,327 persons. With 2,860 of this families or 12,931 persons moved to 54 evacuation centers. 8 persons were dead, 1 injured 8 are reported missing. A total of 11 houses are totally damaged and 30 houses is partially damaged. The amount of damage is equal to 26,115,000 pesos worth in infrastructure and 101,575,057 pesos worth of agricultural damage. Four hundred forty seven (447) barangays were flooded in 33 affected municipalities with flood water ranging from 0.60 m to 1.20 m, 1 municipality with flood water reached up to 2.5 meters of flood water and 5 municipalities were declared under the state of calamity.

2. *Tropical Storm Inday and Typhoon Juan* – Tropical storm Inday passed the country last August 08, 2006 while Typhoon Juan landed on August 09. Aside from flooding, flash floods and landslide, tornado and storm surge were experienced in some areas.

	Flooding	Tornado	Storm Surge	Flash Floods and Land slides
<i>Affected Populations:</i>				
Affected Persons	62,280	10	6,540	15,877
Affected Families	13,158	2	1,441	2,987
No. of families Evacuated	-	-	-	463
No. of Persons Evacuated	-	-	-	2,152
No. of Evacuation Center	-	-	-	3
No. of Dead	2	-	-	7
No. of affected Barangays	86	1	14	
<i>Damage Properties:</i>				
Partially Damage Houses	1718	1	174	-
Totally Damage Houses	290	1	15	-
Amount of Damage to Agriculture	P 4,726,183	P 35,000	-	-
Amount of Damage to Infrastructure	-	-	-	-

3. *Typhoon Milenyo (Xangsane)* – it is the biggest and most destructive these year. It landed the Philippines last October 12, 2006. The affected areas were 4,435 barangays of 32 cities and 235 municipalities of 21 provinces from 7 regions. The affected population is equal to 825,493 families or 4,022,603 persons with a total of 2,524 families or 15,711 persons evacuated to 96 designated evacuation centers. The casualties are 184 dead, 536 injured and 47 are reported missing. The amount of damages to infrastructures and agriculture are worth 2.6 and 4.0 billion pesos respectively, with a tally of 117,429 totally damaged houses and 378,896 partially damaged houses. Declaration of State of Calamity was made in the following places; Metro

Manila, Province of Cavite, Province of Antique, and Municipality of San Roque and Northern Samar

4. *Typhoon Paeng (Cimaron)* – it landed last October 29, 2006 with a total of 68,783 families or 309,606 persons are affected. The barangays that are submerged to water have a total of 830 from 6 cities and 77 municipalities of 12 provinces. A total of 1,504 families or 6,790 persons were moved to evacuation centers. The casualties are as follows; 23 dead, 65 injured and 15 were reported missing. The results of damages are as follows; 963 totally damaged houses and 7,030 partially damaged; an amount of 155,313,495 estimated damaged to structures and 384,686,297.33 in agriculture. Landslide occurs in 7 areas from different provinces, and electric and communication powers were interrupted in 3 provinces.
5. *Typhoon Quennie* – made a landfall in the country last November 09, 2006 with affected families of 3,958 or 21,250 persons, there are 38 barangays from 7 municipalities and 1 city that suffer from flood. The number of casualty are as follows; 1 dead, 10 persons injured and 228 houses were totally damaged and 1449 were partially damaged due to these flood.

At present the country is flood prone and suffering from this disaster. In Metro Manila, the National capital Region of the country more than 10% of the land area is flood prone, but these was decreased to 50% because in year 2002 around 13,100 hectares or 20 % of the land area is flood prone but due to massive clean up and information campaign we decreased it to 6,500 hectares, but these remaining flood needs structure because we already meet the maximum capacity of the drainage system. Floods do not spare Metro Manila, it occur frequently during the southwest monsoon season causing loss of lives and properties. Topographically, a large portion of Metro Manila is below sea level these are the city of Manila, Valenzuela, Parañaque, Las Piñas, Pasig and Muntinlupa and the Municipalities of Malabon, Valenzuela, Navotas and Pateros. The low lying areas are affected by the rise of water at Laguna Lake and Manila Bay.

Flooding in Metro Manila is caused by two types such as follows;

1. Overflow Flooding – caused by in adequate capacity of waterways.
2. Inland Flooding – caused by inadequate drainage or high water in the main channel.

To mitigate flood damages in the country priority programs are implemented by the Philippine government to attain the development goals and minimize loss of lives and property caused by flooding. In Metro Manila the Flood Control Management Service of Metropolitan Manila Development Authority (MMDA), perform a massive clean-up; information campaign and development of infrastructure projects that prioritize flood prone areas that are designated to provide public welfare and safety as well as to improve

the health and sanitation of the people in the flood affected areas; also support the land conservation and economic development of the regions.

Metro Manila have 41 rivers (length=155,144 m); 125 creeks (length=318,622m); and 30 esteros (length=40,765m) all are under MMDA jurisdiction, in order to mitigate flooding in Metro Manila, the MMDA enhances its capacity to address this issue to prevent and mitigate flooding within the Metropolis, these involves activities that are both structural and non-structural as enumerated:

Structural Measures:

- Construction of Pumping Station
- Drainage Improvement (construction of drainage lines and manholes)
- Bank Improvement (riprapping,)
- Napindan Hydraulic Control Structure
- West Mangahan Floodway Project and construction of revetment wall along major rivers
- KAMANAVA Projects (Construction of dikes within the Kaloocan, Malabon, Navotas and Valenzuela boundary from bodies of water)

Non-Structural Measures:

- Declogging of drainage laterals by the use of mechanical scraper, SRECO machine, vacuum, sewer jet and flushing machine;
- Desilting of Drainage Mains done by crawler crane and scraper;
- Dredging of open waterways using backhoe and crane;
- Demolition of informal settlers along the open waterways;
- Hydrological data acquisition and operation of Effective Flood Control Operation System (EFCOS);
- Operation of the existing Rosario weir flood control structure and its related facilities;
- Close supervision and effective management of the pumping stations, floodgates and automatic trash screen; quick response operation;
- flood watch on a round-the-clock basis during times of calamities; studies and researches and;
- FLOOD HAZARD MAP production and dissemination.

Flood hazard map is very useful in the Philippines because the country lacks of funds to provide all structures needed in mitigating flood. In Metro Manila we use this as guide to choose and decide for the area is to be given priority when funds are available. We also use this in land use; and most of all the concept to use this as basic but powerful tool in evacuation during disaster. Through this map we will be able to minimize loss of human lives and properties and to be able to have a smooth, safe and easy evacuation this will serve as guide. We also used this map to know if the measures/project that was made was effective by comparing the status of the area after a big flood before and after the construction of the structures and the most important is in times of flooding for the residents to know were to go through and what path to used.

Organization involved and responsible in making and disseminating inundation and Flood Hazard Map

In the Philippines NAMRIA is in-charge in producing map, topographic map, land use map and many other kinds of map but due to lack of resources and funds to update the existing data we have in the country they cannot be able to provide an accurate data. In Metro Manila we used an electronic map that came that is used in 2000 project the MMEIRS, this is a study about earthquake status in the region, from the study they have to make survey and aerial data of the area for them to be able to used in plotting the scenario needed, we used this base map and other information like elevation , land use, and other making as the basic map in the agency in producing other map like road guide, for inputting the on-going project, and others because it is more accurate than the one existing in NAMRIA.

Based from my knowledge and work, the MMDA is also the one responsible in making inundation and flood hazard map. At present we already have the inundation map in the region, it based on the observed data and computed from the banks.

The agency the will be involved in disseminating inundation and flood hazard map aside from my department are the local government from different cities and municipalities, barangay officials, academe/university/school, we can also used the internet and media like TV and radio.

My Target Area to make Flood Hazard Map

I choose the San Juan River Watershed/Catchment Area because every time typhoon visited the country and hits the area flooding occurs due to inadequate capacity of the waterways. The water system can only accommodate a maximum rainfall of 50mm/hr rainfall so an increased in this rainfall will cause the area to be flooded. The total length of the river is 10.20 km with a drainage area of 8,938 hectares, 8 percent of this area is flooded and a total of more than 4,000 families is affected every time flooding occurs in the area. It covers 6 cities and 1 municipality in the region. The river has 8 tributaries which comes from different cities and municipalities. The area is basically an urban ecosystem, at present, approximately 90.5% of the total land area is utilized for residential, 6% for commercial and 3.5% for park and open spaces.



San Juan River Catchment Area

What is necessary to make Flood Hazard Map

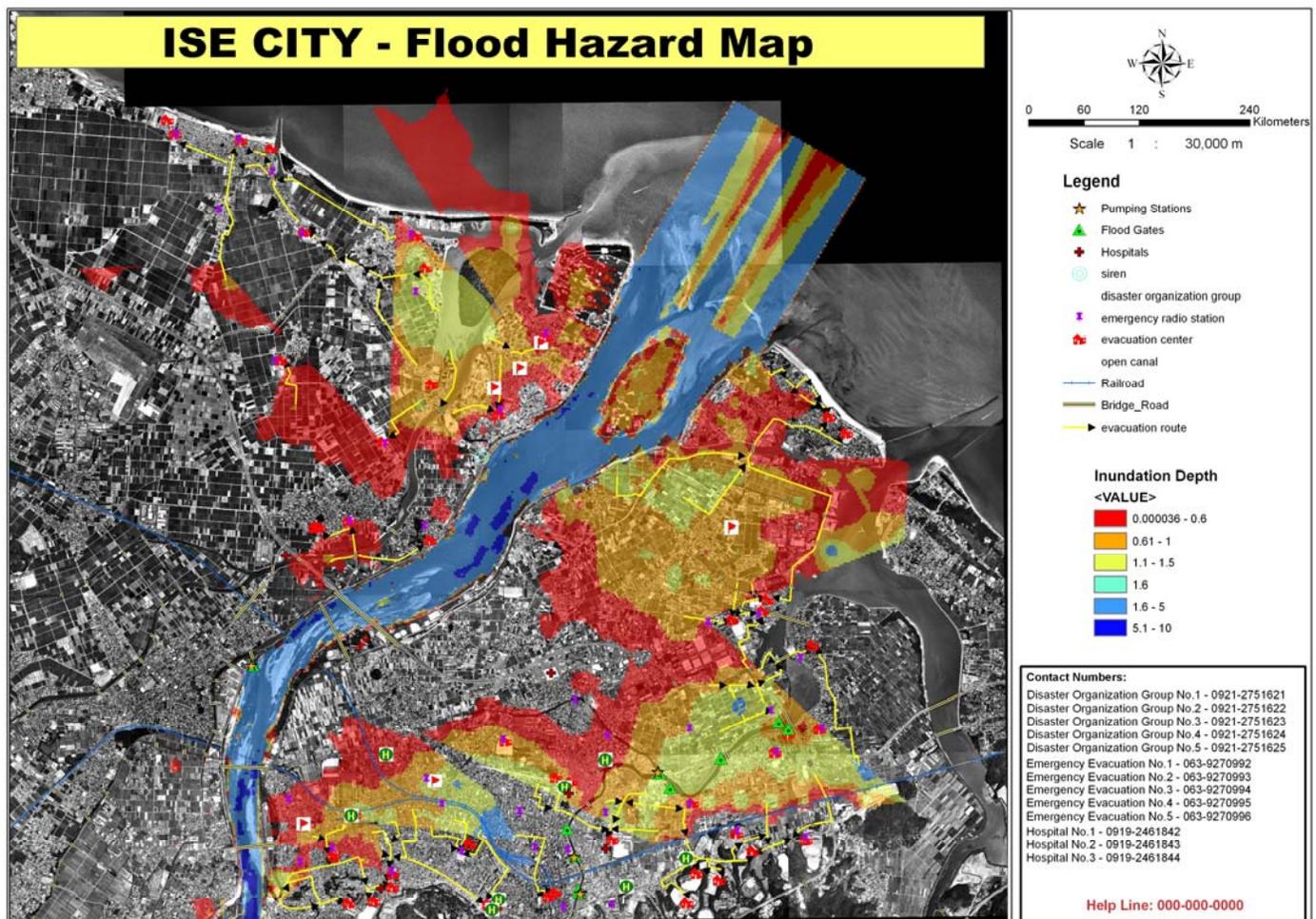
The resources we have and necessary to make Flood are electronic map needed to make FHN like DEM map, the aerial photo, base map and others, We also have the software like GIS in production of maps; inundation map (but based only on survey, observed water elevation during flood; and data computed manually); the number of families that will be affected; evacuation area already identified; critical area/spots already identified (like open manhole/drainage); and location of hospitals and training centers.

The most important that needed to be sourced out is the funds needed in the production of maps and other necessary materials and data and the lack of human resources and experts that have knowledge in making the maps.

My Action Plan within the Next Five Years

Activities	2007	2008	2009	2010	2011
Presentation of the result of my training to my office (December, 2006)					
Enhance my knowledge and continue practicing on using the computer software (starting Dec. 2006)	■				
Proposed and request for budget for the production and dissemination of FHM	■	■	■	■	■
Train engineers and computer operator from my department on the process and method of producing accurate, simple, reliable and effective FHM	■				
Continues update of existing data		■	■	■	■
Continues Preparation and updating of FHM (start Dec., 2006)					
Conduct training/giving information to municipalities/cities/and barangay officials that will be involved in producing and disseminating FHM		■	■	■	■
Dissemination and information campaign of Flood Hazard Map to affected areas but only through internet (but maybe just my target area for now then followed by the next problematic area,) and using the radio station to invite people to access internet or visit us in the office		■	■	■	■
Production of Flood Hazard Map to be used as signages in public places that can have inundation and near the inundated area		■	■	■	■

My own Flood Hazard Map in Ise City



This is my Flood Hazard Map in ISE City, I added the evacuation route, flood gates and pumping stations, hospitals which is necessary in casualties; and danger area like open manhole which will make the people in danger during flooding.

Conclusions:

Flood Hazard map is an effective tools in minimizing the flood disaster in the country, it is very useful to minimize loss of human lives and properties and the smooth , safe and fastest way to move to evacuation area can be attain by using flood hazard map. It is also effective in using this to decide for the flood control structure to be used in different area.

Having one month of stay in japan and focusing on the training of flood hazard mapping is a big help that I gained so much knowledge and friends and enhance my capability in producing effective, simple and informative FHM.

