MEMBER REPORT

ESCAP/WMO Typhoon Committee 42nd Session

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Republic of the Philippines

CONTENTS

I. Overview of tropical cyclones which have affected/impacted Member's area since the last Typhoon Committee Session

1.	Meteorological Assessment (highlighting forecasting issues/impacts)	4
2.	Hydrological Assessment (highlighting water-related issues/impact)	14
3.	Socio-Economic Assessment (highlighting socio-economic and	18
	DPP issues/impacts)	
4.	Regional Cooperation Assessment (highlighting regional cooperation	18
	successes and challenges)	

II. Summary of progress in Key Result Areas

1. Progress on Key Result Area 1

a.	Meteorological Achievements/Results	20		
b.	. Hydrological Achievements/Results			
c.	Disaster Prevention and Preparedness Achievements/Results	21		
d.	Research, Training, and Other Achievements/Results	22		
e.	Regional Cooperation Achievements/Results	22		
f.	Identified Opportunities/Challenges for Future Achievements/Results	22		

2. Progress on Key Result Area 2

a.	Meteorological Achievements/Results	24
b.	Hydrological Achievements/Results	24
c.	Disaster Prevention and Preparedness Achievements/Results	24
d.	Research, Training, and Other Achievements/Results	24
e.	Regional Cooperation Achievements/Results	24
f.	Identified Opportunities/Challenges for Future Achievements/Results	24

3. Progress on Key Result Area 3

a.	Meteorological Achievements/Results	24
b.	Hydrological Achievements/Results	24
c.	Disaster Prevention and Preparedness Achievements/Results	25
d.	Research, Training, and Other Achievements/Results	25
e.	Regional Cooperation Achievements/Results	25
f.	Identified Opportunities/Challenges for Future Achievements/Results	25

4. Progress on Key Result Area 4

a.	Meteorological Achievements/Results	25
b.	Hydrological Achievements/Results	26
c.	Disaster Prevention and Preparedness Achievements/Results	26
d.	Research, Training, and Other Achievements/Results	26
e.	Regional Cooperation Achievements/Results	26
f.	Identified Opportunities/Challenges for Future Achievements/Results	27

Page

5. Progress on Key Result Area 5

a.	Meteorological Achievements/Results	27
b.	Hydrological Achievements/Results	27
c.	Disaster Prevention and Preparedness Achievements/Results	28
d.	Research, Training, and Other Achievements/Results	28
e.	Regional Cooperation Achievements/Results	28
f.	Identified Opportunities/Challenges for Future Achievements/Results	28

6. Progress on Key Result Area 6

a.	Meteorological Achievements/Results	28		
b.	b. Hydrological Achievements/Results			
c.	Disaster Prevention and Preparedness Achievements/Results	29		
d.	Research, Training, and Other Achievements/Results	30		
e.	Regional Cooperation Achievements/Results	30		
f.	Identified Opportunities/Challenges for Future Achievements/Results	30		

7. Progress on Key Result Area 7

a.	Meteorological Achievements/Results	30
b.	Hydrological Achievements/Results	30
c.	Disaster Prevention and Preparedness Achievements/Results	30
d.	Research, Training, and Other Achievements/Results	30
e.	Regional Cooperation Achievements/Results	33
f.	Identified Opportunities/Challenges for Future Achievements/Results	34

III. Resource Mobilization Activities

IV.	Update of Members' Working Groups representatives	35

34

I. Overview of tropical cyclones which have affected/impacted Member's area in 2009

1. Meteorological Assessment (highlighting forecasting issues/impacts)

CY2009 has been considered an active year in terms of tropical cyclone formation over the northwest Pacific with a total of 22 tropical cyclones entered and developed inside the Philippine Area of Responsibility (PAR), seven (7) of which are Tropical depression, eight (8) are tropical storm and the remaining seven (7) reached typhoon intensity. From the 22 tropical cyclones shown in Figure 1, ten (10) made landfall and devastated most parts of Luzon particularly during the 2nd half of the year.



Figure 1.1 Tracks of Tropical cyclones that entered the PAR in 2009

The descriptions of the twenty two (22) tropical cyclones that entered and developed within PAR are summarized below.

1) TD "AURING"

TD AURING was the first tropical cyclone that developed inside the PAR for the year 2009. It originated from a low pressure area (LPA) situated to the East of Northern Mindanao or 140 km east of Surigao City. It remained almost stationary for almost 24 hours then gradually moved to the Northwest and veered to the northeast for the succeeding hours. TC AURING has weakened into a low pressure area after 60 hours prior from its initial development over the Philippine Sea due to the cold air entrainment preventing the system for further development. TC AURING contributed significant amount of rain over eastern Visayas and Northern Mindanao causing flashfloods and landslides to most parts of Northern Mindanao and Eastern Visayas. The maximum winds reached 55 kilometers per hour (kph). The initial and final warning was issued 6:30 PM, 03 January and at 5:00 AM, 06 January 2009

respectively. A total of 10 Severe Weather Bulletins (SWB), 11 International Warnings for Shipping (IWS) and (1) weather Advisory were issued.



Figures 1.2 and 1.3 Tracks of TD AURING and TD BISING

2) TD BISING

TD BISING started as a LPA east of Mindanao then developed into a Tropical Depression 3 days later. TD BISING moved closer to Northern Mindanao and Eastern Visayas the following day bringing significant amount of rains over Surigao and Borongan Eastern Samar. Incidentally the ridge of high pressure area extended over Luzon thereby preventing the system to move almost stationary the following day. PSWS # 1 was raised over Surigao Provinces, Dinagat Province and Siargao Island, Agusan del Norte, Camiguin, Eastern and Western Samar, Biliran, Leyte Provinces, Cebu, Bohol, Negros Oriental and Siquijor Island. TD BISING weakened into a low pressure area after 24 hours due to friction to landmass and shear. The maximum sustained winds reached 45 kilometers per hour (kph). The initial and final warning bulletin was issued at 6:30 PM, 12 February and at 5:00 PM, 13 February 2009 respectively. A total of 5 Severe Weather Bulletin and 4 International Warning for Shipping was issued.

3) TD CRISING

The LPA west of Mindoro developed into a Tropical Depression in the early morning of April 30. TD CRISING has was almost quasi-stationary over the South China Sea for 2 days until it weakened into a low pressure area due to the formation of a low pressure area near Vietnam and the other one east of Bicol region. The maximum winds reached 55 kilometers per hour. The initial and final warning bulletin was issued 11 AM, 30 April and at 5 AM, 02, May 2009 respectively. A total of 2 Weather Advisory, 7 Severe Weather Bulletin and 8 International Warning for Shipping were issued.

4) TY DANTE (*KUJIRA*){0901}

After almost a week over the coastal areas of Bicol region and Quezon, this LPA has finally developed into a tropical depression off the coast of Albay in the afternoon of May 01. "DANTE" was almost stationary off the coast of Bicol region due to the interaction with 2 cyclonic vortices east and west of the system then gradually moved north northeast slowly after 30 hours and intensified into a tropical storm. DANTE has intensified further and

reached its typhoon intensity afternoon on May 04 while continuously moving farther away from the land mass of Bicol region. Typhoon "DANTE" created heavy downpour to the area specifically Catanduanes and Albay provinces. The maximum winds/gustiness reached 140/170 kilometers per hour. The initial and final warning was issued 5 PM, 01 May and at 11 PM, 05 May 2009 respectively. A total of 15 SWB and 17 IWS were issued.



Figures 1.4 and 1.5 Tracks of TD CRISING and TY DANTE

5) TY EMONG (CHAN-HOM){0902}

The LPA near Vietnam and the remnants of TD **CRISING** remained almost stationary for about 24 hours prior from its entry into the PAR in the evening of May 06. It entered PAR as severe tropical storm west of Iba, Zambales and intensified into a typhoon after 6 hours. It continued moving east northeast towards the western section of Central Luzon and made landfall over the northern tip of Pangasinan (Bolinao) early in the evening of May 07 while continuously traversing Northern Luzon the whole night. TY EMONG has abruptly weakened after crossing the Cordilleras and the Cagayan Valley region due to the frictional effects of the terrain of northern Luzon. It moved farther away towards the Philippine Sea as it continuously weakened further. EMONG caused moderate to heavy damaged to infrastructure and loss of lives specifically over northern Luzon due to floods and landslides. The maximum winds/gustiness reached 150/185 kilometers per hour. The initial and final warning bulletin was issued at 11 PM, 06 May and at 11 PM, 09 May 2009 respectively. A total of 10 SWB and 13 IWS were issued.

6) TS FERIA (NANGKA){0904}

Feria started as a LPA east of Mindanao then developed into a TD in the early morning of June 23. FERIA abruptly intensified into a storm as it moved towards eastern Visayas and made landfall over Borongan, Eastern Samar in the early afternoon of June 23. It crossed the island of Samar together with Masbate towards Romblon-Oriental Mindoro area and out over the South China Sea after 72 hours. Strong winds and heavy downpour specifically over eastern Visayas and Southern Tagalog region which caused most parts of the area to be under water. Heavy damaged to agriculture and infrastructure and killed atleast 10 persons. The maximum winds/gustiness reached 75/90 kilometers per hour. The initial and final warning bulletin was issued 5 AM, 23 June and at 5 AM, 26 July 2009 respectively. A total of 10 SWB and 13 IWS were issued.



Figures 1.6 and 1.7 Tracks of TY EMONG (CHAN-HOM) and TS FERIA (NAGKA)

7) TD GORIO (SOUDELOR){0905}

The LPA east of Luzon developed and was named GORIO. It started to threaten extreme northern Luzon 9th of July, and crossed the area early morning of the following day. It continued moving almost westward at an average of 22 kph and exited PAR in the afternoon of July 10. TD "GORIO" contributed significant amount of rain over the Ilocos region which caused most parts of Ilocos Norte and the Cordillera region to be under water. "GORIO" has intensified into Tropical Storm after it crossed the western border of PAR. The maximum winds reached 55 kilometers per hour. The initial and final warning bulletin was issued 5 PM, 09 July and at 5 PM, 10 July 2009 respectively. A total of 5 SWB and 5 IWS were issued.

8) TS HUANING

TD "HUANING" developed from the LPA embedded along the monsoon trough 12th of July. It consistently moved northwestward towards southern Taiwan and out of PAR evening of July 13. No significant damaged to property aside from moderate to heavy downpour over the western sections of Northern and Central Luzon. The maximum winds reached 55 kilometers per hour. The initial and final warning bulletin was issued 11 AM, 12 July and at 11 PM, 13 July 2009 respectively. A total of 7 SWB and 7 IWS were issued.



Figures 1.8 and 1.9 Tracks of TS FERIA (NANGKA) and TD GORIO (SOUDELOR)

9) TS ISANG (MOLAVE) {0906}

After 2 days of close monitoring, the LPA east of northern Mindanao has developed into a TD. "ISANG" gradually moved west northwest towards eastern Luzon and started interacting with Tropical Storm "HUANING" positioned south of Hongkong. It slowed down and moved more to the west as it approached the eastern section of northern Luzon 2 days prior from the initial development due to the extending ridge of high pressure area north of the system. It passed closed to northern tip of Cagayan early morning of July 17 raising signal # 2 to most parts of extreme northern Luzon. "ISANG" gradually moved towards the Batanes after crossing the Babuyan and Calayan group afternoon of July 17 and exited PAR early morning of July 19. "ISANG" contributed significant amount of rain over Luzon including Metro Manila which caused flooding at the Metropolis and landslides over Northern Luzon and likewise killed at least 4 persons and 2 missing. The maximum winds/gustiness reached 95/120 kilometers per hour. The initial and final warning bulletin was issued 5 PM, 14 July and at 11 AM, 18 July 2009 respectively. A total of 14 SWB and 15 IWS were issued.



Figures 1.10 and 1.11 Tracks of TS ISANG (MOLAVE) and TS JOLINA (GONI)

10) TS JOLINA (GONI){0907}

It originated from a broad area of low pressure over the Marianas Islands and gradually moved closer to the Philippine Sea before it developed into a Tropical Depression (TD) 3 days prior from the initial detection. It entered PAR and developed into a tropical depression in the evening of July 30 and threatened the northern part of Luzon. "JOLINA" continued moving more to the west and made landfall over Aurora late afternoon of Aug 01 then crossed Northern Luzon after 6 hours. TS "JOLINA" brought significant amount of rains to most parts of the country and forced the Magat dam to open two gates for the spillage and likewise floods and landslides over Northern Mindanao and western Visayas with associated gale force winds. The maximum winds/gustiness reached 75/90 kilometers per hour. The initial and final warning was issued at 5 PM, 30 July and at 11 AM, 02 August 2009 respectively. A total of 9 SWB and 11 IWS were issued.

11) TY KIKO (MORAKOT){0908}

Before the exit of TS"JOLINA" another tropical cyclone developed from a low pressure area (LPA) east of extreme northern Luzon named "KIKO". It intensified into a storm after 18 hours and exited the eastern border 24 hours later. TS "KIKO" has re-entered PAR in the evening of Aug 04 and consistently moved almost westward and reached typhoon intensity afternoon of Aug 05. TY "KIKO" made landfall over central Taiwan causing the island with a severe damage to life and property (flashfloods and mudslides) and killed more than 500

persons. Typhoon "KIKO" likewise brought heavy downpour to most parts of Northern Luzon particularly over the western sections causing the area to wash out roads and bridges, dikes and seawalls over Pampanga, Tarlac, Zambales and Benguet provinces that killed about 21 people. The maximum winds/gustiness reached 175/210 kph. The initial and final warning was issued at 11 AM, 03 August and at 11 AM, 09 August 2009 respectively. A total of 19 SWB and 24 IWS were issued.



Figures 1.12 and 1.13 Tracks of TY KIKO (MORAKOT) and TS LABUYO (DUJUAN)

12) TS LABUYO (DUJUAN){0912}

TC LABUYO originated from a broad area of low pressure east of Northern Luzon embedded along the monsoon trough oriented northeast and southwest 3 days prior from its initial development. LABUYO remained almost stationary for almost a day due to its interaction with another cyclonic vortex over the eastern coast of Vietnam. Because of the strong southwesterly flow LABUYO shifted its direction to the northeast plus the approaching westerly trough west of Japan which gave way for the system to continue moving northeastward farther away from the country. Though LABUYO didn't make landfall and instead re-curved to the northeast still it enhanced the southwest monsoon bringing significant amount of rain to most parts of northern and central Luzon including Metro Manila resulted to flashfloods and landslides particularly Zambales area. The maximum winds/gustiness reached 95/120 kilometers per hour. Initial and final warning bulletin was issued at 5 PM, 02 September and at 11 PM, 05 September 2009 respectively. A total of 9 SWB and 14 IWS were issued.

13) TD MARING (MUJIGAE){0913}

It started from the LPA over the South China Sea near Vietnam that entered and developed inside the PAR in the evening of September 08. Immediately a Public Storm Warning Signal (PSWS) # 1 was raised over the provinces of Pangasinan, Ilocos Sur, Zambales Bataan and Lubang Islands due to its proximity to the area during the time of its development and brought heavy downpour to Central Luzon resulted to flooding in most parts of Central Luzon. "MARING" exited over the northwestern border after 24 hours inside the PAR. However, MARING has intensified into a Tropical Storm after it exited PAR and made landfall Hainan Island early morning of September 11. The maximum winds reached 55

kilometers per hour. The initial and final warning was issued 11 PM, 08 September and 11 PM, 09 September 2009 respectively. A total of 5 SWB and 5 IWS were issued.



Figures 1.14 and 1.15 Tracks of TD MARING (MUJIGAE) and TS NANDO

14) TS NANDO

TC NANDO started from the LPA inside the PAR east of Central Luzon and developed into a TD in the morning of Sept 12. Because of its proximity to the land mass, Public Storm Warning Signal (PSWS) # 1 was raised over Aurora, Cagayan including the Babuyan Group, Isabela, Ilocos Norte, Ilocos Sur, Apayao, Abra, Mt. Province, Kalinga and Ifugao. TC NANDO has made landfall over Isabela in the evening then crossed northern Luzon the whole night and exited PAR towards the South China Sea evening of September 13. NANDO brought significant amount of rain over northern and central Luzon resulted to flashfloods and landslides particularly over the cordillera region. The maximum winds/gustiness reached 65/80 kilometers per hour. The initial and final warning was issued at 11 AM, 12 September and 11 PM, 13 September 2009 respectively. A total of 7 SWB and 7 IWS were issued.



Figures 1.16 and 1.17 Tracks of TS ONDOY (KETSANA) and TY PEPENG (PARMA)

15) TS ONDOY (KETSANA){0916}

It developed inside the PAR from the active LPA east of Luzon and gradually moved westward towards Aurora-Quezon Area. Prior to its landfall, TC ONDOY intensified into a Tropical Storm 130 km Northeast of Virac, Catanduanes. It continued moving more to the west and made landfall over the boundary of Aurora and Quezon at about 11 AM of Sept. 26 then crossed Central Luzon for almost 10 hours causing heavy downpour over the Metropolis and some parts of Central and southern Luzon resulted to flashfloods and landslides over these areas. After crossing central Luzon, it continued moving farther away as it intensified over the South China Sea as it exited the western border towards Vietnam. The maximum winds/gustiness reached 105/135 kilometers per hour. The initial and final warning was issued 11 AM, 24 September and 11 PM, 27 September 2009 respectively. A total of 13 SWB and 15 IWS were issued.



Figure 1.18 Satellite imagery for TS ONDOY "KETSANA" 12 hours before it made landfall over Southern Quezon.



Figure 1.19 ONDOY's (KETSANA) fury taken at Marikina City

16) TY PEPENG (PARMA){0917}

TC PEPENG with international name (PARMA) developed from a broad area of low pressure over the Marians Islands. It gradually moved westward and entered over the eastern boarder of northern Mindanao as a full blown typhoon in the late afternoon of September 30. PARMA gained more strength as it moved closer to eastern Visayas then slightly weakened as it approached the landmass of northern Luzon and made landfall over Cagayan in the afternoon of October 03. PARMA moved west northwest and traversed the mountainous terrain extreme northern Luzon the whole evening of October 03 over the Luzon Strait (Northern Tip of Ilocos Norte) in the early morning of October 04. Typhoon PARMA slowed down and moved almost stationary over the Luzon Strait due to the expected interaction with the approaching typhoon (NEPARTAK) behind of typhoon PARMA. It abruptly weakened to Tropical Storm intensity the following day due to the landmass of northern Luzon.

PARMA has slightly intensified over the off shore of Ilocos Norte and has moved south southwestward and made its 2nd landfall over the northern tip of Ilocos Norte causing heavy downpour over northern and central Luzon resulted to flashfloods and landslides to most parts of northern Luzon. TC PARMA has again traversed the terrain of extreme northern Luzon over the coast of Cagayan early morning of October 08. Again PARMA has remained almost stationary as it changed its course to the west southwestward and made its 3rd landfall over Cagayan.

PARMA has weakened into a tropical depression as it crossed northern Luzon for the whole evening which brought continues rains over the provinces of Cordilleras, Ilocos region, Cagayan Valley and central Luzon forcing the major dams of Luzon to opened their gates for spillage resulted to flashfloods and landslides that killed more than 300 people and severe damage to property. TC PARMA moved over the coast of La Union as it moved farther away from the country and exits the northwestern border in the evening of October 10. The maximum winds/gustiness reached 195/230 kilometers per hour. The initial and final warning was issued at 5 PM, 30 September and 11 PM, 10 October 2009 respectively. A total of 42 SWB, 42 IWS and 2 weather advisories issued.

17) TY QUEDAN (MELOR){0919}

TY QUEDAN was a tropical cyclone behind of "PEPENG" (PARMA) that originated from the Marianas Islands as tropical depression then intensified further and reached typhoon intensity before it entered the PAR in the afternoon of October 05. Typhoon MELOR persistently moved west northwest towards the southern Islands of Japan and exits PAR after 30 hours prior from its entry. MELOR has no direct effect to any part of the country, however, as MELOR it interacted with typhoon PEPENG (PARMA) which was positioned at extreme northern Luzon resulted to a binary effect which caused PEPENG to be quasistationary over the area for almost 5 days and make landfall 3 times over extreme northern Luzon. The maximum winds/gustiness reached 205/250 kilometers per hour. The initial and final warning was issued at 5 PM, 05 October and 11 PM, October 6 2009 respectively. A total of 4 SWB and 6 IWS were issued.



Figures 1.20 and 1.21 Tracks of TY QUEDAN (MELOR) and TY RAMIL (LUPIT)

18) TY RAMIL (LUPIT){0920}

LUPIT developed from the LPA over the Micronesian islands and entered the PAR in the early evening of October 16 east of Luzon as tropical storm. LUPIT intensified further as it slowly moved west northwest and veered to the north for almost 3 days then shifted its course to the west northwest and west southwest as it moved closer to extreme northern Luzon. Typhoon LUPIT has gradually slowed down due to the blocking high pressure area over southern China which resulted for LUPIT to re-curve after 24 hours. It eventually moved northeastward and exited the northern border towards the southern islands of Japan. There were no reported casualties or damage to property except for the shanties situated near the coastal area of Aparri, Cagayan due to big waves generated during the approached of

Typhoon LUPIT. The maximum winds/gustiness reached 195/230 kilometers per hour. The initial and final warning was issued at 6:30 PM, 16 October and 5 PM, 25 October 2009 respectively. A total of 30 SWB, 37 IWS and 5 Weather Advisories were issued.

19) TY SANTI (*MIRINAE*){0921}

It started from the LPA over the Marianas Islands and developed into a Tropical depression morning of October 26. MIRINAE has intensified while over the ocean and became a full blown typhoon before it entered the PAR in the evening of Oct. 28. MIRINAE consistently moved westward during the 1st 3 days then shifted its course to the west southwest and passed very close to Camarines Norte before midnight of Oct. 30. It made landfall over Quezon province (50 km south of Infanta) at around 1:30 AM of October 31. MIRINAE crossed southern Tagalog region in the early morning of October 31 with packing winds of 150 kph a gust of up to 185 kph and heavy downpour resulted to flooding and landslides which washed out at least 2 bridges over Quezon and Batangas. The maximum winds/gustiness reached 150/185 kilometers per hour. The initial and final warning was issued at 11 PM, 28 October and 11 AM, 01 November respectively. A total of 14 SWB, 15 IWS and 3 Weather Advisories were issued.



Figure 1.22 and 1.23 Tracks of TY SANTI (MIRINAE) and TD TINO

20) TD TINO

It developed from the LPA east of Luzon afternoon of November 02. It gradually moved west northwestward closer to extreme northern Luzon. TC TINO is an example of a short-lived tropical cyclone due to interaction of the cold surge (Northeast Monsoon) over mainland China and dissipated after 18 hours. The maximum winds reached 55 kilometers per hour. The initial and final warning issued at 5 PM, 02 November and 11 AM, 03 November 2009 respectively. A total of 4 SWB, 4 IWS and 1 Weather Advisory was issued.

21) TD URDUJA

It started from an LPA east of Mindanao 4 days prior from its initial development then eventually upgraded to tropical depression in the afternoon of November 23. It moved west northwest slowly towards northern Mindanao-southern Visayas area and immediately storm signal # 1 was raised to most parts of Northern Mindanao, Samar and Leyte areas. TC URDUJA made landfall over southern Leyte then remained almost stationary due to the strong Northeasterlies and it interacted with Typhoon NIDA over the Caroline Islands. TC URDUJA brought significant amount of rain over the provinces of northern Mindanao and Leyte resulted to flashfloods and landslides. This interaction has resulted to changed

direction towards the east and eventually downgraded to a low pressure area (LPA) the following day (Nov. 25).



Figures 1.24 and 1.25 Tracks of TD URDUJA and TD VINTA

22) TD VINTA

TD VINTA was the 22nd tropical cyclone that entered over the eastern border of PAR east of extreme northern Luzon. Though TC VINTA has no significant effect to any part of the country but it enhanced the northeast monsoon resulted to strong - gale force winds over most parts of Luzon. VINTA has remained almost stationary and weakened into a tropical depression after 12 hours prior from its entry to PAR and eventually weakened into LPA in the evening of December 03. The maximum winds reached 55 kilometers per hour. The initial and final warning was issued at 5 PM, November 23 and 5 PM, November 25 respectively. A total of 9 SWB, 9 IWS and 4 Weather advisories were issued.

2. Hydrological Assessment (highlighting water-related issues/impact)

There were more than 25 cases of flooding in the Philippines due to the passages of tropical cyclones and the effects of other weather causing phenomena. Consequent to the flooding, flood bulletins were issued in the monitored river basins of Pampanga (40), Agno (65), Bicol (18) and Cagayan (51), 28 flood warning information and dam discharge warnings were issued in the target areas of the monitored major reservoirs of Angat, Pantabangan, Binga/Ambuklao/San Roque and Magat, and 297 flood advisories in principal river basins (non-telemetered) in the country.

Reservoir	2008	2009
Angat	0	2 (TS Ketasana & TY Parma)
Pantabangan	0	1 (Passage TY Parma)
San Roque	0	1 (Passage TY Parma – most devastating)
Magat	2	4 (Passages of TY Chan-Hom, TS Ketsana,
-		TY Parma & TY Lupit)
Total		

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During the passage of Typhoon Parma, it was the first time that seven (7) of the monitored major reservoirs shown in Figure 2.1 operated their spillways.



Figure 2.1 Telemetered major reservoirs in Luzon



Figure 2.2 Flood hydrograph and hyetograph of Magat dam

A number of flood events that occurred in 2009 registered record-breaking data in the telemetred river basins. Typhoon Emong (Chan-hom (0902)), the second tropical disturbance that developed in the South China Sea dumped heavy rainfall over the Cagayan

river basin after crossing the Cordillera mountain ranges on 07 May 2009. Based on the historical record of Magat dam from 1984 to 2008, the flood event in May 2009 recorded the maximum inflow of more than 10,000 cms as depicted in Figure 2.2. It is worth mentioning that this extreme event occurred in May which is within the dry season of the watershed. Spilling operations are normally undertaken during the months from November to December.

The flashflood in the Pasig-Marikina-Laguna Lake river basin (that encompasses Metro Manila) on 26 September 2009 was caused by a 24-hour rainfall of 540 millimeters from an average Tropical Storm (Ketsana) while the extent of devastation was aggravated by anthropogenic factors. The enhanced rainfall over Metro Manila was the result of the interaction between Ketsana and the seasonal southwest monsoon. Storm Ketsana's cyclonic circulation and the southwesterlies resulted to intense wind convergence south of the storm's center which led to torrential rains. The maximum hourly rainfall recorded was 92 millimeters in Quezon City while an hourly average of 64 millimeters persisted for a period of 6 hours (9AM to 3PM, 26 September). The 24-hour rainfall is equivalent to more than a month's average rainfall (392 millimeters is the average for the month of September) in Metro Manila. The estimated return period of the flood is 180 years (University of the Philippines, National Hydraulic Research Center (UP-NHRC, 2009) while the drainage structures which were constructed in 1975 were designed to withstand 10 year floods (JICA, 1990).

The Philippine government was still reeling from the devastation of Tropical Storm Ketsana when Typhoon Pepeng (Parma) entered PAR and crossed Northern Luzon three (3) times (Table 1). Parma dumped a total rainfall amount of 1815 millimeters in Baguio City which is located near the upper reach of the Agno river basin where 3 major reservoirs were constructed along the Agno river (Figure 2). The amount rainfall for an average tropical cyclone passing the island of Luzon is within the range of 350 to 450 millimeters. The maximum inflow to San Roque dam was 5,547 cubic meters per second (cms) in the late evening of 08 October 2009 when the reservoir was barely 1 meter below its top of gate elevation. This critical situation warranted for an "inflow equals outflow" spillway operation.

Date	Inflow	REMARKS
	(MCM)	
30 September 2009	18.00	Typhoon Parma entered PAR.
01 October 2009	19.30	
02 October 2009	20.10	
03 October 2009	27.60	@ 4PM, Parma made 1 st landfall.
04 October 2009	91.30	
05 October 2009	46.30	
06 October 2009	38.98	@ 10PM, Parma made 2 nd landfall.
07 October 2009	74.30	
08 October 2009	196.14	@ 10AM, Parma made 3 rd landfall.
09 October 2009	248.00	
10 October 2009	95.00	@ 10PM, PAGASA issued the Final Bulletin for Parma.

Table 2.2 Daily inflow of San Roque dam during the passage of Ty Parma

From 1975 to 2008, the maximum inflow recorded for the month of October was 304.9 million cubic meters (mcm) in 1993 (Figure 2.3). The observed inflow of 1009.62 mcm in October 2009 was more than 4 times the wet monthly average of 241.3 mcm, about 8 times

more than the average for October (123.2 mcm) in a normal year and less than half of the annual average of 2601 mcm in a normal year. The averages for the month of October in dry, wet and normal years are 70.25 mcm, 241.3 mcm and 123.2 mcm, respectively. The annual averages for dry, wet and normal years are 1075 mcm, 5509 mcm and 2601 mcm, respectively.



Figure 2.2 The three cascading reservoirs along the Agno river

Figure 2.3 Comparison of the monthly maximum, average and 2009 inflow (mcm) of San Roque dam

The impact of the cascading flood waters from the dam caused the breaching of dikes at 3 points along the Agno river and consequently led to widespread flooding. Again, similar to the Metro Manila flooding, there was a mismatch between the flood and the flood control structures that were in place. The observed flood has a return period of 50 years while the dikes and levees were built for a 10-year flood.

3. Socio-Economic Assessment (highlighting socio-economic and DPP issues/impacts)

For CY2009, a total of 2,536,900 families or 12,130,948 individuals were affected by the passages of 14 tropical cyclones in several provinces, particularly the northern and central Luzon island and some provinces in the Visayas. A total of 1,148 people died due to associated flashfloods and landslides. Losses and damages to infrastructures (roads, buildings and bridges), agriculture (crops and livestocks) and private properties amounted to US\$5.2 Billion (PhP210 Billion). The two most significant tropical cyclones in terms of amount of damages and number of casualties were TS Ketsana and TY Parma where a total of 956 people died while damages and losses reached US\$4.3 Billion (PhP206 Billion). What made TS Ketsana more significant was that it crippled Metro Manila, the country's center of government and economic activities.

Tropical Cyclone	Affected Families	Damages/Losses (Million US\$)
International (Local) Name		
TY KUJIRA (Dante)	84,213	27
TY Chan-Hom (Emong)	84,280	26.1
TS Molave (Isang)	56,055	Minimal
TS Goni (Jolina)	53,082	2.7
TY Morakot (Kiko)	24,295	18.3
TS Dujuan (Labuyo)	18,960	Minimal
TS Mujigae (Maring)	87,202	6.4
TS Nando	9,731	Minimal
TS Ketsana (Ondoy)	993,227	4,300 – combined damages of TS
TY Parma (Pepeng)	954,087	Ketsana and TY Parma
TY Lupit (Ramil)	1,271	Minimal
TY Mirinae (Santi)	170,497	10.4

Table 3.1 List of Areas affected by flooding due to tropical cyclones

4. Regional Cooperation Assessment (highlighting regional cooperation successes and challenges)

The initiatives that started in CY2008 and took off this CY2009 are as follows:

4.1 Phase 1 of the JICA Grant Aid project entitled Improvement of the Flood Forecasting and Warning System (FFWS) in the Pampanga and Agno River Basins covering the Pampanga river basin was completed and inaugurated by Her Excellency Gloria Macapagal-Arroyo on 18 March 2009. Preparatory activities for Phase 2 covering the Agno river basin were completed.

- 4.2 Signing of the Minutes of the 2nd Bilateral Meeting between the Korea Meteorological Administration (KMA) and PAGASA in Korea in May 2009 on project implementation, training and data exchange
- 4.3 Completion and inauguration of the first KOICA Grant Project in PAGASA entitled Establishment of Early Warning and Monitoring System for Disaster Mitigation in the Philippines in the three (3) pilot sites namely: Aurora province on 27 February 2009, Jalaur river basin in Iloilo province on 15 May 2009 and 31 August 2009 for the Agus-Lake Lanao flood early warning system.
- 4.4 Signing of Memorandum of Understanding (MOU) between the PAGASA and Ministry of Natural Resources and Environment (MoNRE) and the of National Hydro-Meteorological Services Department of the Government of Vietnam on collaborative research, training and data exchange
- 4.5 RP-Taiwan Cooperative Project Towards Strengthening the Disaster Preparedness Capacities for Meteorological and Hydrological Hazards /Taipei Economic and Cultural Office (TECO); Inauguration of the Upper Air Station in Tanay
- 4.6 Kick off meeting for the implementation of the Japan International Cooperation Agency (JICA) Technical Cooperation Project on the Strengthening of Flood Forecasting and Warning System for Dam Operation (FFWSDO)
- 4.7 Signing of the Exchange of Notes and Grant Agreement for the JICA Grant Project on the provision of 3 Doppler radars in the Philippines in October 2009
- 4.8 Signing of the Grant Agreement of the Norwegian Agency for Development Cooperation (Norad) Project: Strengthening of the Flood Forecasting and Warning System of Magat Dam and Downstream Communities between the PAGASA-DOST and the Embassy of Norway
- 4.9 Signing of the Memorandum of Agreement between the PAGASA in collaboration with NGOs (Christian Aid) in the implementation of flood and storm surge hazard mapping and Oxfam and PLAN Philippines for community based flood early warning system (CBFEWS)
- 4.10 Signing of the Memorandum of Agreement between the National Grid Corporation of the Philippines (NGCP) for the exchange of resources and sharing of real-time data

- **II.** Summary of progress in Key Result Areas (For achievements/results which apply to more than one Key Result Area, please describe them under the most applicable Key Result Area. Then, at the end of the description, place in parentheses () the other applicable Key Result Areas)
 - 1. <u>Progress on Key Result Area 1</u>: Reduced Loss of Life from Typhoon-related Disasters. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

PAGASA has already installed 38 automatic weather stations all throughout the country. The location of which are on the flood prone areas, 15 for mainland Luzon, 2 for Palawan, 6 for the Visayas and 15 for Mindanao. Some of them are already operational and the rest are being calibrated.

b. Hydrological Achievements/Results

• Improvement of the Flood Forecasting and Warning System (FFWS) in the Pampanga and Agno River Basins under the JICA Grant.

Phase 1 of the project covering the Pampanga river basin has been completed and inaugurated by the Her Excellency President Gloria Macapagal-Arroyo on 18 March 2009.

Figure II.1.b.1 Inauguration of the new Pampanga River Basin Flood Forecasting and Warning Center; Shown in the figure are: The Philippine President, DOST Secretary, Japanese Ambassador, JICA Chief Representative and PAGASA Administrator

The construction of the new FFWS Center in Pampanga province will facilitate the provision of timely forecasts while the newly upgraded FFWS will enhance the accuracy of flood forecasts in the Pampanga river basin and thereby improving the services of PAGASA in flood forecasting and warning. The project also provided the MIKE-11 software which is now being calibrated.

• Establishment of Early Warning System for Disaster Mitigation in the Philippines under the KOICA Grant

A network of telemetered rainfall, water level and automatic weather stations are

now in place in the Jalaur river basin in Iloilo province, Agus-Lake Lanao catchment in Lanao provinces and in the Aurora and allied river basins in Aurora province. During the flood season of CY2009, that is, from May to October 2009, the said flood early warning system were utilized and were proven useful and effective, particularly during the passages of tropical cyclones Ketsana and Parma in the province of Aurora. Due to the provision of flood advisories based on the observed data, at risk communities in Aurora province were evacuated and no casualties were reported.

The FEWS in the KOICA project adapts the community based approach in the in the analysis and issuance of flood advisories and warnings.

• The Strengthening of Flood Forecasting and Warning System for Dam Operation (FFWSDO)

This project recently took off with the dispatched of four (4) JICA Experts. Preliminary surveys and site visits to the project sites were undertaken including the setting up of meetings with four (4) Working Groups, namely, Flood Modeling, Data management, meteorology and hydrology and telecommunication.

c. Disaster Prevention and Preparedness Achievements/Results

The UNDP Ready project has sustained the implementation of the various components in hazard mapping, early warning system and IEC programs.

Figure II.1.c.1 IEC component of the Ready project

Figure II.1.c.2 Damaged school grounds in Botolan, Zambales due to the passage of Typhoon Emong (Chan-hom)

It is to be noted that some of the project sites of the Ready project that includes the provinces of Ilocos Sur, Laguna and Zambales were hardly hit by the impacts of a series of tropical disturbances in 2009 (Figure 1.c.2). However, based on the post flood investigations conducted in the said provinces, there were no casualties recorded. The communities reported that they were able to use the flood early warning facilities in warning and evacuation activities.

d. Research, Training, and Other Achievements/Results

13 Hydrologists and 34 Telecom engineers & technicians were trained in connection with the Phase 1 of the JICA Grant project on Improvement of the Flood Forecasting and Warning System (FFWS) in the Pampanga and Agno River Basins by JICA Experts.

e. Regional Cooperation Achievements/Results

Nil.

f. Identified Opportunities/Challenges for Future Achievements/Results

- The Exchange of Note (E/N) on the JICA Grant project: *Enabling Communities* for the Adaptation of Disaster Prevention and Preparedness Measures for Areas Prone to Floods and Rain-induced Landslides was signed by the Ambassador of the Embassy of Japan and the Philippine Secretary of Foreign Affairs in October 2009 while the Grant Agreement for the Detailed Design was signed in early November 2009.
- The project *Enhancement of Tropical Cyclone Early Warning System* funded by the Australia's Bureau of Meteorology (BOM) geared to improve PAGASA-DOST's forecasting capacity by 15% has been completed and inaugurated on 30 October 2009. The TC module is now used operationally.
- The feasibility study grant provided by the U.S. Trade and Development Agency (USTDA) on the Upgrading of the Telecommunication Network of PAGASA's Meteorological and Hydrological Services has been completed and the implementation or plan is being finalized.
- The Grant Agreement of the project: Improvement of Flood Forecasting & Warning System (FFWS) for Magat Dam & Downstream Communities funded by the Norwegian Agency for Development Cooperation (Norad) has been signed on 20 November 2009. The project which aims to address the issues and concerns on the issuance of a timely and accurate flood forecasts and warnings in the Cagayan River Basin and the effective operation of the Magat dam for the safety of the communities in the downstream area will be implemented in CY2010 to 2012.

- Figure II.1.f.1 PAGASA Administrator Dr. P. D. Nilo, with DOST Secretary Alabastro, His Excellency Ambassador Mr. Knut Solem of Norwat and Mr. Kim Johannessen Lande SN Power during the signing ceremony.
- The Memorandum of Agreement between the PAGASA and National Grid Corporation of the Philippines' (NGCP) collaborative undertaking for the sharing of weather and data services was signed at the PAGASA Amihan Conference Room in Quezon City on November 24, 2009.

Figure II.1.f.2 Dr. Prisco D. Nilo, PAGASA Administrator, Mr. Walter Brown, President of NGCP, together with PAGASA and NGCP officials

This involves enabling NGCP's subscription to the weather and hydro meteorological data to support NGCP's Integrated Action Plan (ITAP) that includes the project entitled: Storm Tracking Alert and Relay System (STARS). The system is expected to pave way for the quick implementation of contingency plans and activities that will help prepare for and mitigate the adverse effects of weather disturbances on both transmission facilities and the power customers.

2. <u>Progress on Key Result Area 2:</u> Minimized Typhoon-related Social and Economic Impacts. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)

a. Meteorological Achievements/Results

Please refer to Key Result Area 1(a).

b. Hydrological Achievements/Results

Please refer to Key Result Area 1(b).

c. Disaster Prevention and Preparedness Achievements/Results

Please refer to Key Result Area 1(c).

d. Research, Training, and Other Achievements/Results

For 2009, more than 5000 students, teachers, government personnel, local government units, media, etc. were benefitted from the lectures on hydrometeorological hazards, climatic trends and climate change by PAGASA personnel and officials.

Under the UNDP Ready project, IEC on how to read and interpret multi-hazard maps (hydro-meteorological and geological) was conducted in the provinces of Northern Samar, Eastern Samar, Iloilo, Ilocos Sur and Zambales. In addition, IEC on community based flood early warning system was also undertaken in the provinces of Ilocos Sur, Cavite, Aurora, Iloilo and Northern Samar.

e. Regional Cooperation Achievements/Results

Nil.

f. Identified Opportunities/Challenges for Future Achievements/Results

Nil.

- 3. <u>Progress on Key Result Area 3:</u> Enhanced Beneficial Typhoon-related Effects for the Betterment of Quality of life. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)
 - a. Meteorological Achievements/Results

Nil.

b. Hydrological Achievements/Results

• The Joint Operation and Management Committee (JOMC) of the FFWSDO, an interagency committee that oversees the operational and maintenance activities of monitored major river basins and reservoirs in the Philippines conducted 2 regular meetings. The Sub-Committee on Hydrology convened its members 4 times.

The JOMC also had one (1) special meeting with the experts from NORAD during the preliminary assessment made on the Cagayan and Magat FFWS project.

- Establishment of flood forecasting and warning system in the Caliraya-Botokan-Kalayaan (CBK) river basin in the province of Laguna has been completed and will be made operational in 2010. The FFWSDO will operate similar to the existing FFWSDOs.
- c. Disaster Prevention and Preparedness Achievements/Results

Nil.

d. Research, Training, and Other Achievements/Results

Nil.

e. Regional Cooperation Achievements/Results

Nil.

f. Identified Opportunities/Challenges for Future Achievements/Results

Nil.

- 4. <u>Progress on Key Result Area 4:</u> Improved Typhoon-related Disaster Risk Management in Various Sectors. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)
 - a. Meteorological Achievements/Results
 - The PAGASA Special Tropical Weather Disturbance Reconnaissance, Information Dissemination and Damage Evaluation (STRIDE) or the PAGASA Quick Response Team was dispatched to assess and conduct filed investigation and extend assistance in the mitigation of meteorological hazards and disaster reduction in areas affected by several tropical cyclones namely, TY Kujira, TS Ketsana, TY Parma, TY Lupit and TS Mirinae.

In parallel to these activities, other members of the STRIDE team were assigned at the NDCC office to brief concerned officials and the media on the status of tropical cyclone.

• Aside from the regularly press conferences/briefings during the occurrence of a tropical cyclone inside PAR, simultaneously these warning bulletins and

advisories are being sent to the different sectors of the society either through SMS or emails particularly to the affected areas.

b. Hydrological Achievements/Results

• Flood hazard mapping activities

For CY 2009, flood hazard maps in the provinces of Benguet and Rizal and Zambales and storm surge hazard maps were completed. The hazard maps are provided to concerned local government units (LGUs) as inputs in updating their comprehensive land use plans (CLUPs).

• Post flood investigations were conducted in the provinces of Zambales, Cagayan de Oro, Agusan del Sur, Cagayan, Pampanga, Nueva Ecija, Pangasinan, Metro Manila, Ilocos Norte, Ilocos Sur, La Union and Laguna.

c. Disaster Prevention and Preparedness Achievements/Results

Please refer to Key Result Area 1(c).

d. Research, Training, and Other Achievements/Results

Please refer to Key Result Area 1(d).

e. Regional Cooperation Achievements/Results

On 17 – 19 February 2009, the Philippines hosted the East and Southeast Asia Regional Flood Hazard Mapping Seminar aimed to strengthen the capacity of professionals who have acquired trainings in Japan and an avenue to share experiences on flood hazard mapping techniques and flood disaster management tools. The seminar was sponsored by the International Centre for Water Hazard and Risk Assessment (ICHARM), Public Works Research Institute (PWRI), JICA in coordination with the Government of the Philippines.

Figure 4.e.1 Participants and guests in the East and Southeast Asia Regional Flood Hazard Mapping Seminar held in Manila on 17-19 February 2009

Eight (8) countries from East and Southeast Asia participated in the seminar as follows: Bangladesh, China, Indonesia, Malaysia, Vietnam, Cambodia Laos and the Philippines. Representatives from the Typhoon Committee and the Infrastructure Development Institute (IDI) of Japan attended the seminar.

f. Identified Opportunities/Challenges for Future Achievements/Results

The National Grid Corporation of the Philippines (NGCP) or the power grid operator got a significant boost when PAGASA agreed to share its real-time weather information through a memorandum of agreement signed on 24 November 2009. Such information will be utilized during emergencies caused by severe weather conditions. The system is expected to pave the way for the quick implementation of contingency plans and activities that will help prepare for and mitigate the adverse effects of weather disturbances on both transmission facilities and the power customers as part of NGCP's Storm Tracking Alert and Relay System (STARS). NGCP's subscription to the weather and hydrometeorological data to support NGCP's Integrated Typhoon Action Plan (ITAP).

NGCP, on the other hand, will be providing back-up communication link to the PAGASA data center so as to transmit real-time hydro-meteorological data from flood prone-areas, particularly in the Magat River Basin and Bicol areas. The contract and partnership between NGCP and PAGASA is a giant step towards more enhanced and responsive contingency measures for both companies which in the end will benefit many people and may even help save lives and properties

- 5. <u>Progress on Key Result Area 5:</u> Strengthened Resilience of Communities to Typhoon-related Disasters. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)
 - a. Meteorological Achievements/Results
 - The PAGASA-DOST has implemented the conduct of press conferences/briefing every issuance of a Weather Bulletin and Warning four (4) times a day, every 5AM, 11AM, 5PM and 11PM.
 - Weather Forecasters/Meteorologist also joined the PAGASA IEC group as regular lecturers to the communities concerning hydro-meteorological hazards.

b. Hydrological Achievements/Results

- The PAGASA continues to provide technical assistance to non-government organizations (NGOs and CARE-ACCORD) in Dingalan, Aurora, Calabanga, Camarines Sur, Iriga City and the local government units (LGUs) in San Jose del Monte, Bulacan in the installation of rainfall and water level gauges for the CBFEWS.
- For CY2009, the PAGASA also signed MOUs with 3 NGOs, namely Christian AID and Oxfam in the conduct of flood and storm surge hazard mapping activities in small islands of Jomalig in Quezon province, Rapu-Rapu in Albay and Boac in Marinduque and Plan Philippines in the establishment of CBFEWS in pilot areas in Eastern Samar.

c. Disaster Prevention and Preparedness Achievements/Results

• The PAGASA in coordination with the Office of Civil Defense organized dry runs/pilot testing on the operation of CBFEWS as well as flood drills in areas where the 1:10K flood hazard map has been prepared. In the dry run or flood drill, the evacuation protocols of the community are integrated into the operation of the CBFEWS using the derived flood hazard map.

d. Research, Training, and Other Achievements/Results

Please also refer to Key Result Area 2(d).

e. Regional Cooperation Achievements/Results

From 26-31 October 2009, 2 representatives from Practical Action Nepal, an international NGO visited the areas where the community based flood early warning system such as: Quezon City, Bulacan and Olongapo City. The major purpose of the visit is to learn, gain experience and ideas from the successful model of community based early warning system in Philippines and to incorporate those learning during scale up of early warning system in Nepal. Practical Action Nepal is currently implementing a DIPECHO V project entitled SEWIN – Scaling up Early Warning Systems in Nepal.

f. Identified Opportunities/Challenges for Future Achievements/Results

Nil.

- 6. <u>Progress on Key Result Area 6:</u> Improved Capacity to Generate and Provide Accurate, Timely, and understandable Information on Typhoon-related Threats. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2008 Typhoon Committee Annual Operating Plan goals)
 - a. Meteorological Achievements/Results
 - Recently the 2 conventional radar system of PAGASA (Baler and Baguio Radars) was upgraded to Doppler capability of which all the radar images coming from these two (2) systems are being transfer remotely to the Weather and Flood Forecasting Center of PAGASA Central Office for analysis and serve as an special inputs in weather and flood forecasting warnings and advisories.
 - In the later part of the 3rd quarter, the Tropical Cyclone (TC) Module was installed to improve tropical cyclone forecasts. The software was developed by Australian expert from Bureau of Meteorology (BoM) which is capable of doing consensus forecasting to all the typhoon models over the northwest Pacific area.

Figure 6.a.1 Output of the TC Module software showing the track of TS RAMIL (MIRINAE); color codes indicate the storm signals raised over a specific locality (red – signal # 3, Violet or purple - # 2 and yellow - # 1).

• The detailed design for the acquisition of three (3) Doppler radars by JICA has been completed.

Figure 6.a.2 Buildings where the 3 Doppler radars to be provided by the Japanese Grant will be housed.

• For the other radars that are locally funded, the upgrade of the Baguio and Baler Doppler radars have been completed and are now on experimental modes while the construction of civil works for Tagaytay, Subic, Cebu, Tampacan and Hinatuan radars are on-going.

b. Hydrological Achievements/Results

Please refer to Key Result Area 1(b).

c. Disaster Prevention and Preparedness Achievements/Results

Please refer to Key Result Area 1(c).

d. Research, Training, and Other Achievements/Results

Please refer to Key Result Area 1(d).

e. Regional Cooperation Achievements/Results

Nil.

f. Identified Opportunities/Challenges for Future Achievements/Results

- The Technical Cooperation Project (TCP) under JICA to improve the existing FFWS for monitored major reservoirs of Angat, Pantabangan, Binga/Ambuklao and Magat commenced through a kick-off meeting in November 2009.
- As result of the spillway operation of San Roque dam during the passage of Typhoon Parma in October 2009, Ad Hoc Technical Working Groups in the upper and lower Houses (Senate and Congress) were created to come up with recommendations in the revision of the flood operation protocol for San Roque dam. The series of meetings of both working groups were attended by representatives from concerned technical government agencies and politicians.
- 7. <u>Progress on Key Result Area 7</u>: Enhanced Typhoon Committee's Effectiveness and International Collaboration. (List progress on the Strategic Goals and Associated Activities in the Strategic Plan and progress on the 2009 Typhoon Committee Annual Operating Plan goals)
 - a. Meteorological Achievements/Results

Nil.

b. Hydrological Achievements/Results

Nil.

c. Disaster Prevention and Preparedness Achievements/Results

Nil.

d. Research, Training, and Other Achievements/Results

Related training in meteorology:

• 2 Personnel attended the Forty-first Session of the Typhoon Committee On 19 to 24 January in Chiang-Mai, Thailand by the Philippine Government and the typhoon committee Foundation, Inc. (TCFI) & the Philippine Science Journalists Association, Inc. (PSciJourn)

- 1 personnel attended the Annual Meeting of the American Meteorological Society and the Forum of Meteorological Societies/11-15 January 2009/Phoenix, Arizona, USA
- 1 personnel attended the 31st Meeting of the South East Asian nations (ASEAN) Sub-Committee in Meteorology & Geophysics on 08 to 10 April in Thailand
- 1 personnel attended the RA V Technical Conference on 20 to 24 April in Malaysia by World Meteorological Organization (WMO)
- 1 personnel attended the 9th Group on Earth Capacity Building Committee Meeting (GEO) on 27 – 28 April in Athens, Greece by the European Committee
- 1 personnel attended the 2nd Bilateral Working Group Meeting on 09 to 12 May in Korea by the Korea Met Administration
- 1 personnel attended the 57th Meeting of the ASEAN COST and other related meetings on 25 to 27 May in Bali, Indonesia
- 24 officials and personnel attended the 5-day factory visit on the EEC radar plant on 22 26 June and 13 to 17 July in Alabama, U. S. A. by the Enterprise Electronics Corporation & Construction, Inc.
- 1 personnel attended the Ocean Observation & Hydrographer Survey on 06 to 25 July in Korea by KOICA
- 1 personnel attended the 13TH Session of the Intergovernmental Consultative Committee (ICC) on the Regional Space Applications Programme for Sustainable Development (RESAP)-cum Expert Group Meeting on 20 to 22 July in Bangkok, Thailand by UNESCAP
- 1 personnel attended the Pre-meeting for the 2nd Joint Science & Technology Cooperation on 31 Aug – 02 September in Taiwan by the National Science Council
- 24 officials and personnel attended the TC Integrated Workshop in Cebu, Philippines on 15-18 September 2009
- 1 personnel attended the ASEAN COST Sub-Committee Meeting on 01 to 02 November in Singapore
- 1 personnel attended the International Symposium on Radar and Modeling Studies of the atmosphere on 10 to 13 November in Japan by the Research Institute for Sustainable Humanosphere (RISH)
- 1 personnel attended the Regional Association V (RA V)Sub-Group on Global Telecommunication System-Information and Services System (GTS-ISS) on 02 to 05 December in Hawaii by WMO
- 1 personnel attended the 5th Meeting of the Global Earth Observation System of Systems (GEOSS) Asia Water Cycle Initiative (AWCI) International Coordination Group (ICP) on 15 to 17 December in Thailand by the APN (the Asia-Pacific Network for Global Change Research
- 1 personnel attended the Satellite data Training Course and Workshop on 17 to 18 December in Japan by the WMO
- 8 personnel attended the Training on Doppler Radar Operation, Maintenance and Interpretation on 06 December 2009 to 04 January 2010 in Taiwan

Related training in Hydrology:

• 1 personnel attended the Wilton Pak Conference on Responding to Flooding – Improving the Preparation and Response/26-28 January 2009/ Sussex, UK

- 13 Hydrologists & 34 Telecom & technicians trained under Phase 1of the JICA Grant project Improvement of the FFWS in the Pampanga and Agno river basins by JICA Experts in January to March 2009.
- 1 personnel attended the Training Course on Integrated Water Resource Management (IWRM) on 08 to 14 November in Daejun, Korea by KWater
- 1 personnel attended the Regional Learning Workshop on Early Warning Systems on 26 to 30 July in Dhaka, Bangladesh by ADPC
- 1 personnel attended the The Expert Group Meeting on Innovative Strategies towards Flood Resilient Cities in Asia-Pacific was organized by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) at the United Nations Conference Centre, Bangkok, from 21 to 23 July 2009
- 1 personnel attended the ICHARM Quick Report on Floods 2009/10-11 December2009/ Tsukuba, Japan
- 1 personnel attended the 7th Session of the Regional Association V (Southwest Pacific) Working Group on Hydrology, Regional Training Course on Low Flow Manual and the SEA-HYCOS Planning Meeting/ 14-18 December 2009/ Bandung, Indonesia
- 1 personnel attended the Small group meeting of the Working Group on Hydrology (WGH) of the Typhoon Committee (TC) in Macao, China – 16-17 December 2009

Related training in climate change:

- 1 personnel attended the 3rd GEOSS Asia Pacific Symposium and 4th Meeting of the GEOSS Asia Water Cycle Initiative (AWCI) International Coordination Group (ICG) in 04 to 07 February (successively) both in Kyoto, Japan by the Asia Pacific Network for Global Change Research
- 2 personnel attended the Capacity-building activities of the Tokyo Climate Center of the Japan Meteorological Agency on 09 to 27 February in Tokyo, Japan by the Ministry of Land, Infrastructure, Transport and Tourism of Japan
- 2 personnel attended the South East Asian Regional Workshop on Climate Change Scenario in 16 March, Hanoi, Vietnam by the Japan International Cooperation Agency (JICA) and the Ministry of Natural Resources and Environment of Vietnam
- 4 personnel attended the Final workshop of the Australian Center for International Agricultural Research (ACIAR) on 15 to 17 May in Australia by the ACIAR project entitled "Bridging the Gap Between Seasonal Climate Forecasts in the Philippines and Australia
- 4 personnel attended the World Meteorological Organization (WMO) Workshop on the Content, Communication and Use of Weather and Climate Products and Services for Sustainable Agriculture on 18 to 20 May in Australia by the ACIAR Project
- 2 personnel attended the High resolution climate modeling of climate change over the Indonesian Region workshop on 16 – 31 May in Australia by the Spanish Government
- 2 personnel attended the One-week visit to the CSIRO Marine and Atmospheric Research (CMAR) Aspendale for the summary workshop on climate change on 25 to 31 May In Australia by the Spanish Government

- 1 personnel attended the Capacity Development for Adaptation to Climate Change in Asia Climate Change Analysis on 20 May to June 20 in Japan by JICA
- 2 personnel attended the Training Workshop on Climate Variability and Prediction for South Asia and Eastern Southeastern Africa On 22 to 29 June in Hanoi, Vietnam by the University Corporation for Atmospheric Research (UCAR)
- 1 personnel attended the Workshop on Climate Change & Disaster Risk Reduction on 01 to 15 August in Nathiagali, Abbottabad, Pakistan by the ADPC
- 1 personnel attended the Workshop on "High Resolution Climate Modeling On 10 to 14 August in Trieste, Italy by the International Centre for Theoretical Physics (ICTP)
- 1 personnel attended the Training Workshop on Climate Applications in Association of Southeast Asian Nations (ASEAN) On 05 to 09 October in Malaysia by the Japan ASEAN
- 2 personnel attended the ASEAN Regional Workshop on Providing Regional Climates for Impacts Studies (PRECIS) On 12 to 15 October in Kuala Lumpur, Malaysia by the British Government and Spanish Government
- 1 personnel attended the International Workshop on "Futures of Low Carbon Society: Scenarios for Asia Pacific On 02 to 04 November in Phuket, Thailand by the Thai Government
- 1 personnel attended the Inter-regional Workshop on Indices and Early Warning Systems for Drought On 08 to 11 December in Nebraska, USA by WMO
- 1 personnel visited the Meteorological Research Institute (MRI) on 07 to 10 December by JICA
- 1 personnel attended the Training Seminar on Climate Analysis Using Reanalysis Data on 01 to 04 December by JMA

Related training in Disaster Risk Reduction

- 1 official attended the First Session of the Committee on Disaster Risk Reduction on 25 to 27 March in Thailand
- 1 personnel attended the Global Disaster Alert and Coordination system (GDACS) Global Stakeholders Meeting on 28 29 April in Switzerland by the Emergency Relief Coordination Center

e. Regional Cooperation Achievements/Results

- On 28 July 2008, a Vietnamese delegation headed by an official from the Ministry of Natural Resources and Environment (MONRE) and the Deputy Director of the Department of Meteorology in Vietnam visited PAGASA to discuss an MOU that would facilitate the:
 - Exchange of information on Sea level, Storm, and other weather-related natural disasters occurring in the South China Sea;
 - Research and application of forecast models on water circulation, oil slick and typhoon trajectory in the South China Sea; and
 - Training of personnel.

• In October 2009, an MOU between PAGASA and JAMSTEC for the collaborative research on extreme rainfall events

f. Identified Opportunities/Challenges for Future Achievements/Results

- The disaster brought about by the passage of TS Ketsana served as an opportunity for the national government as well as foreign donors to prioritize early warning activities as important component in total disaster risk management. In response to the requests from foreign donors, the PAGASA came up with a Master Plan for Flood Disaster Risk Mitigation for Metro Manila. Among the components prioritized is the project: Establishment of Early Warning and Response System for Disaster Mitigation in Metro Manila (Pasig-Marikina River Basin) by the KOICA. This project is being proposed as a collaborative undertaking between the three (3) Working Groups of the Typhoon Committee namely, WGM, WGH and WGDPP.
- The Australian Agency for International Development (AusAID) through the UNDP has also came up with the project: Enhancing Metro Manila's Capacities for Effective Disaster/Climate Change Risk Management towards Sustainable Development. The project objectives are: to assess the risks and vulnerabilities faced by Metro Manila to multi-hazards, including those brought on by climate change; initiate/implement mitigating measures such as community-based early warning systems (CBEWS) and integrated contingency planning; improve the capacities of local governments and critical partners (e.g. academe) to mainstream disaster/climate risk management into their comprehensive land use and local development plans, programming & regulatory processes; improve the capacities of the concerned risk management agencies to provide timely and accurate forecasts and advisories for timely and effective decision making by local authorities and other stakeholders; and raise the general level of awareness and competencies of vulnerable communities to deal with disaster and climate change risks.

III. Resource Mobilization Activities

Nil.

IV. Update of Members' Working Groups representatives

1. Working Group on Meteorology

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Note: Dr. Malano is on oficial study leave for one (1) year.