

MEMBER REPORT

ESCAP/WMO Typhoon Committee 11th Integrated Workshop

“Improving Typhoon Impact-based Forecasting and Warning”

LAO PDR

24 – 28 October 2016
Cebu, the Philippines

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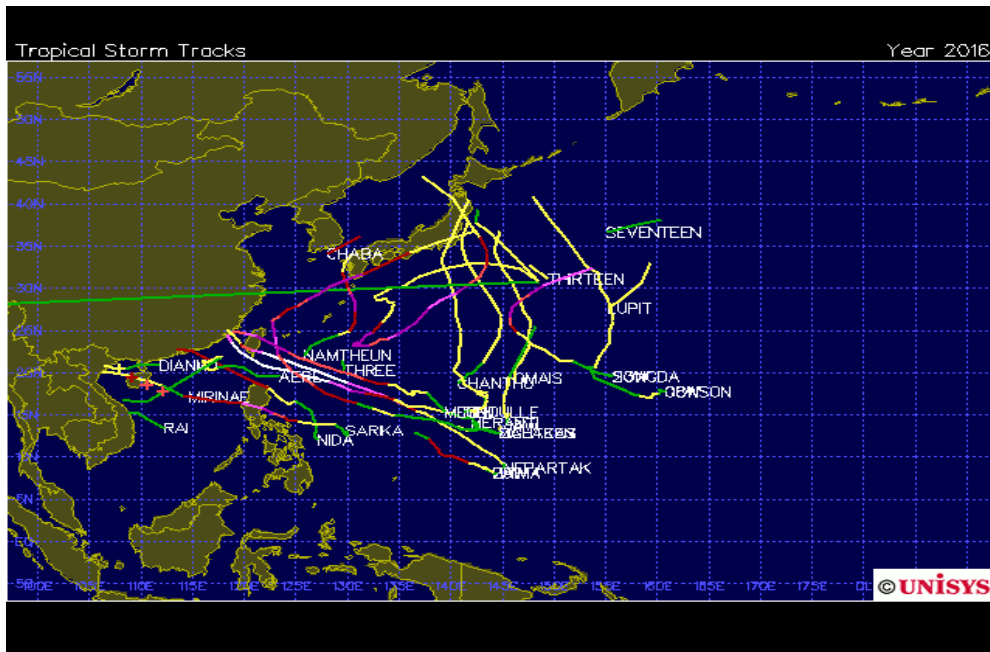
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I. Overview of Tropical Cyclones which have affected/impacted Member's area since the last Typhoon Committee Session

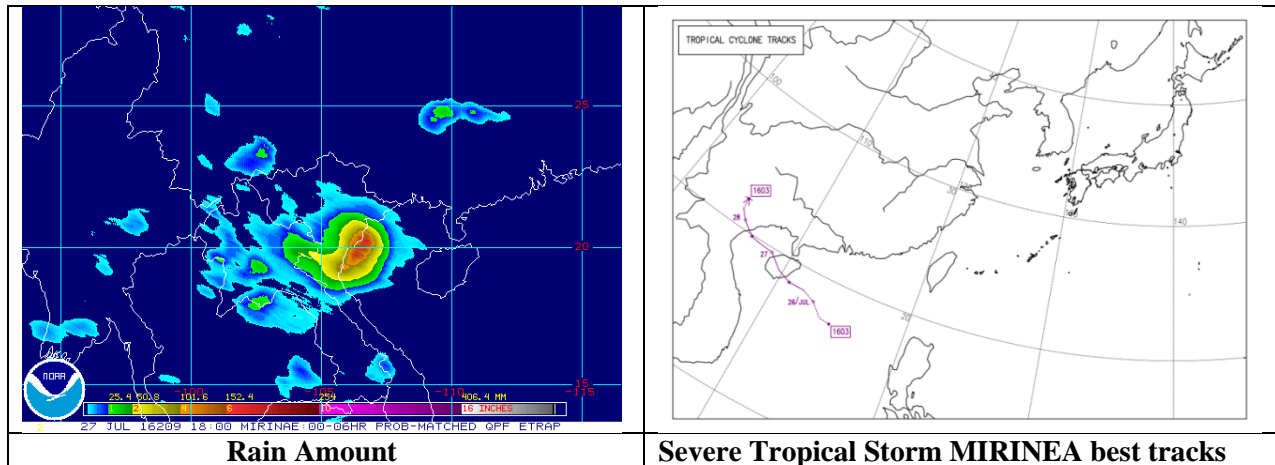
1.1. Meteorological Assessment (highlighting forecasting issues/impacts)

From January to October 2016, Lao PDR was affected by two direct impact of tropical storm from Western North Pacific namely Dianmu number 8 (1608) and Rai number 15 (1615), and two indirect impact of tropical storm namely Mirinae number 3 (1603) and AERE (1619). The weather situation related to each event described as below:



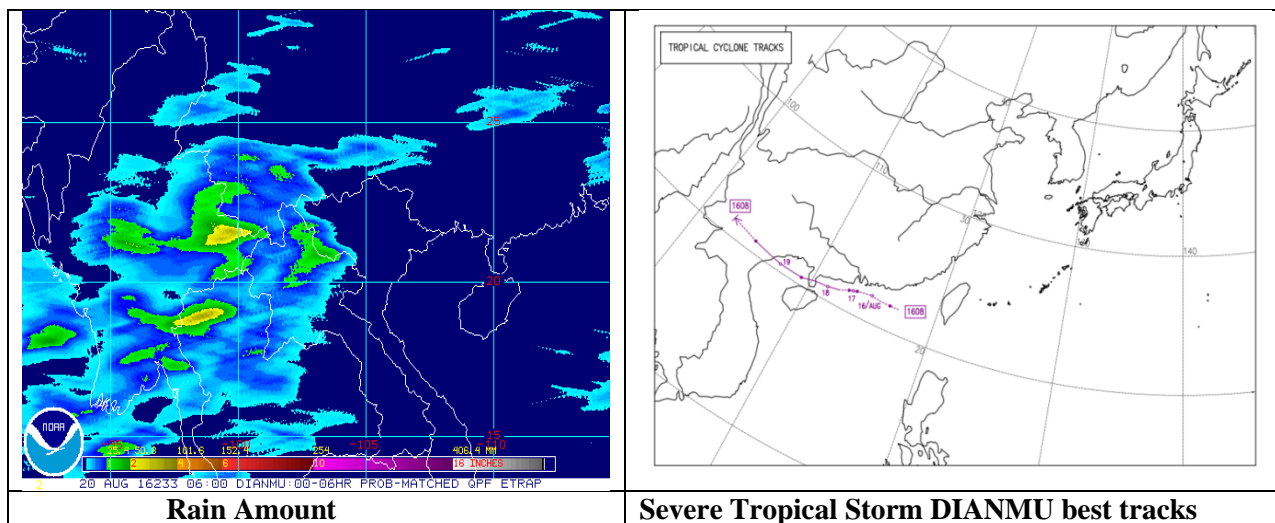
1.1.1. TS MIRINAE (1603)

Mirinae formed as a tropical depression over the central part of the South China Sea on 25 July 2016 and moved west-northwestwards; it intensified into a tropical storm the next morning. Mirinae made landfall over the east coast of Hainan Island on the night of 26 July and weakened slightly while crossing Hainan Island. After entering Beibu Wan, Mirinae re-organized and re-intensified the next morning, becoming a severe tropical storm on the evening of 27 July and reaching peak intensity with an estimated sustained wind of 90 km/h near its centre. Mirinae made landfall over the coast of northern Vietnam that night and weakened gradually. It finally dissipated over northern Vietnam on the evening of 28 July. During the passage of Tropical Storm MINRINAE, the strong southwesterly wind covered over the central and southern parts of Lao PDR, as a result, there was heavy rainfall, flash floods and landslides in some provinces of northern and central parts.



1.1.2. TS DIANMU (1608):

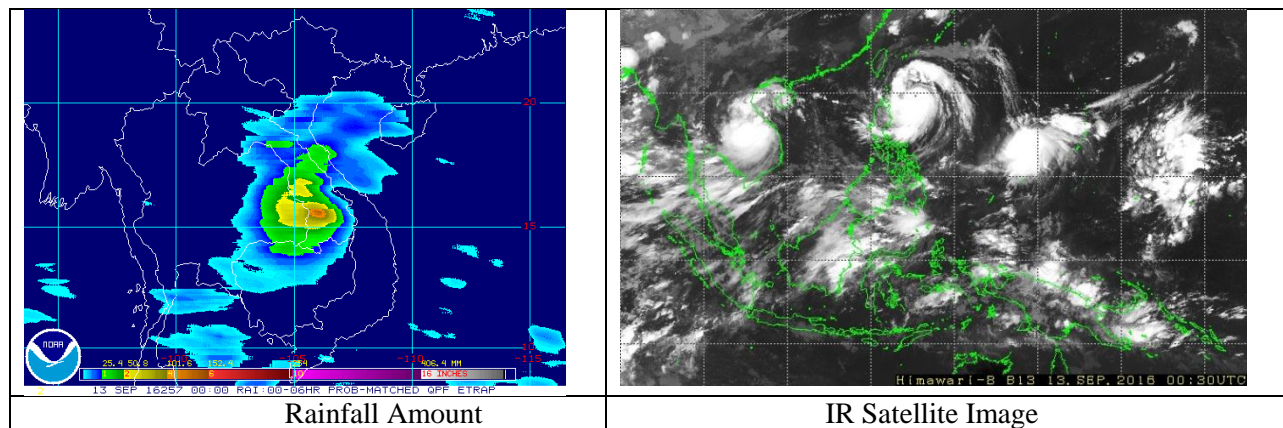
A tropical depression formed over the northern part of the South China Sea on 17 August 2016 and moved slowly and intensified gradually that day. The tropical depression intensified into a tropical storm and was named Dianmu the next morning. Moving generally westwards, Dianmu made landfall over Leizhou Peninsula on the afternoon of 18 August and entered Beibu Wan that night. It re-intensified as it moved across Beibu Wan, reaching its peak intensity with an estimated sustained wind of 85 km/h on the morning of 19 August. After making landfall over the northern part of Vietnam in the afternoon and passed over northern part of Lao PDR, Dianmu moved inland and weakened gradually. It finally degenerated into an area of low pressure over the northern part of Myanmar on the morning of 20 August 2016



The Southwesterly wind over the central and southern parts was very strong, as a result, there was heavy rain, strong wind, flash flood and landslides in northern and central parts, such as: Oudomxay, Bokeo, Luangprabang, Sayabouly and Vientiane Provinces.

1.1.3. TS RAI (1615)

A tropical depression formed over the Central part of South China Sea on 12 September 2016 in latitude 13.9 north and longitude 111.7 east, and it moved west-northwestward in speed 15 kilometers per hour. This tropical depression intensified in to tropical storm on 13 September 2016 then made landfall at Vietnam Coast and passed over the southern part of Lao PDR on afternoon of that day, it downgraded into tropical depression then move forwarded to Thailand. As result, heavy rain with gust wind occurred in central and southern parts of Lao PDR, resulted, 4 provinces affected by flash flood and strong winds.



1.2. Hydrological Assessment (highlighting water-related issues/impacts)


1.2.1 Flood events

Due to dry condition at the beginning of the rainy season 2016, the water level of both Mekong mainstream and its tributaries in Lao PDR was mostly very low prolonging until the third week of July, after that the water level started to rise up and reach to the peak during mid-August to beginning of September.

The activities of flood forecasting and warning system are under taken in 2016:

- The nearly real time data collection from more than 40 stations.
- Flood forecasting for 6 key stations along Mekong River for 2 days ahead (Luangprabang, Vientiane, Paksane, Thakhek, Savannakhet and Pakse).
- Use MRC FFG for flash flood watch and flash flood warning for 1, 3, 6, 12 and 24 hours.
- Inflow forecast to Nam Ngum reservoir for dam operation (daily, weekly, and monthly).
- Use MRC URBS model to forecast the water level in Sebangfai river basin for 7 days ahead.
- Issues flood bulletins and warning information.
- Disseminate flood bulletins and warning information to the organizations concerned and via the mass-media (TV, Radio and Newspaper).
- DMH divides the flood warning in three categories:
 - Normal stage in case of water level was below warning level.
 - Nearly warning: In case of the forecast water level will be expected to reach the warning level, DMH provides nearly warning.
 - Urgent warning: When the water level exceeded the warning level, DMH provides the urgent warning.

Our daily product to disseminate is shown as below:

										
LAO PEOPLE'S DEMOCRATIC REPUBLIC										
Peace Independence Democracy Unity Prosperity										

Ministry of Natural Resources and Environment					Date of issue 18, Oct 2016					
Department of Meteorology and Hydrology										
Mekong water levels & Inflow of Nam Ngum Dam Bulletin										
Forecast period: 19 - 20, Oct ,2016										
No.	Stations(River)	24hr	Observed				Warning Level (m)	Danger Level (m)	Forecasted	
		Observed Rainfall (mm)	Water Level (m)			Water Level (m)				
			17-Oct	18-Oct	Different			19-Oct	20-Oct	
1	Luangprabang (Mekong)	0.0	7.46	7.14	-0.32	17.50	18.00	6.97	6.98	
2	Vientiane Km4 (Mekong)	0.0	4.60	4.54	-0.06	11.50	12.50	4.56	4.37	
3	Paksane (Mekong)	0.0	5.97	5.78	-0.19	13.50	14.50	5.75	5.76	
4	Thakhek (Mekong)	0.0	6.17	6.05	-0.12	13.00	14.00	5.96	5.94	
5	Savanakheth (Mekong)	0.0	4.73	4.71	-0.02	12.00	13.00	4.65	4.60	
6	Pakse (Mekong)	0.0	5.30	5.45	0.15	11.00	12.00	5.44	5.41	
7	Mahaxai(Sebangfai)	0.0	7.04	6.68	-0.36	14.00	15.00	6.43	6.28	
8	Sebangfai Bridge(Sebangfai)	0.0	12.40	11.50	-0.90	17.50	18.50	11.23	11.12	
9	Nam Ngum Dam(Up)	3.5	210.97	210.97	0.00	212.00	212.31	210.97	210.96	
10	Nam Ngum Dam(Down)		166.50	166.50	0.00					
11	Inflow to Reservoir(Q in m ³ /s)		252.438	257.413	4.98					
12	Turbine(Q in m ³ /s)		323.467	257.413	-66.05					
13	Spill Way(Q in m ³ /s)									
Remark: - : Not available Data 0.0 : No Rain Q : Inflow m ³ /s: cubic meter per second										
Director General of DMH					Head of Hydrology Division					

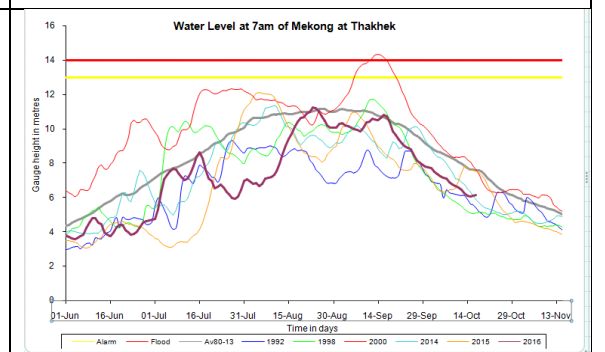
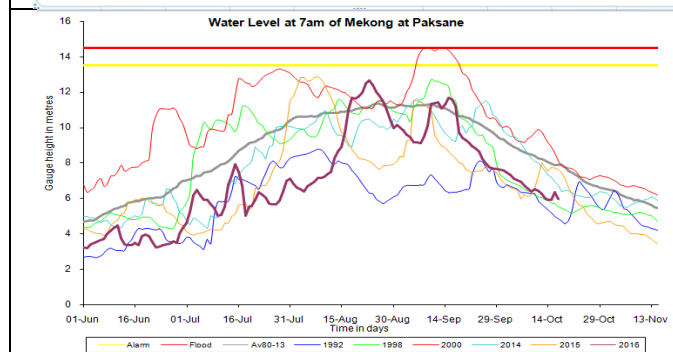
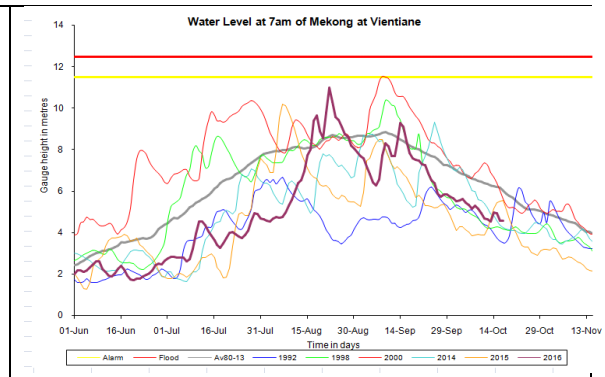
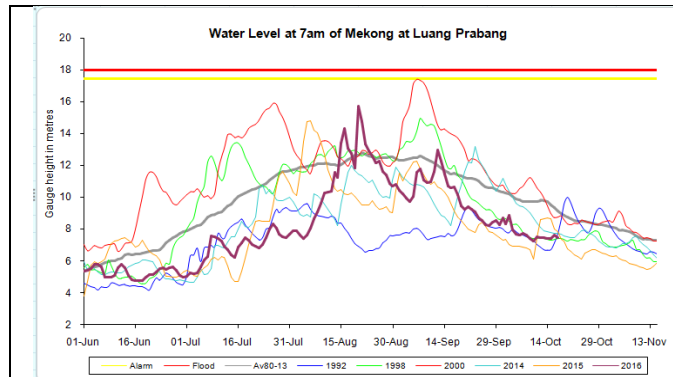
The hydrological situations in the monsoon 2016:

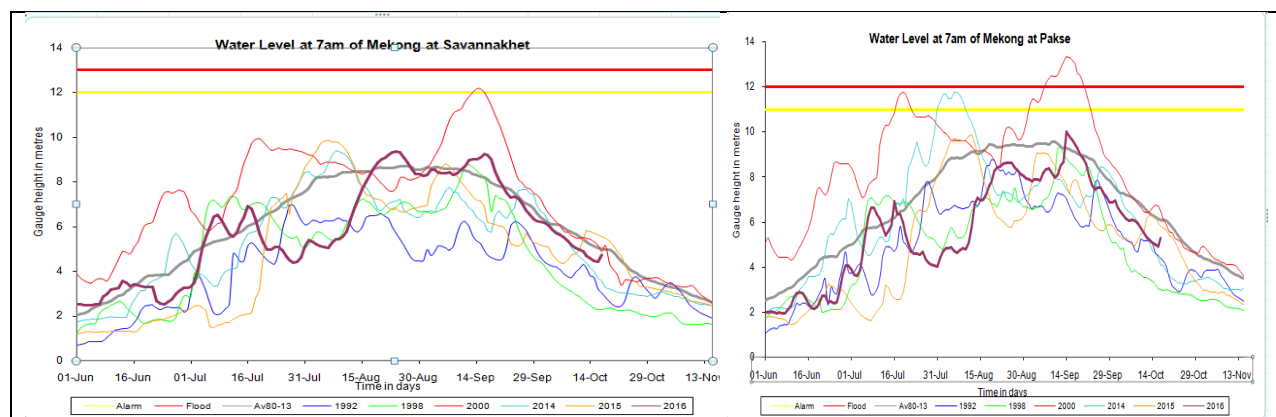
- **For the Mekong River:**

In this year, the peak water level of Mekong River was observed below warning level at each station from north to south (from Hiousai to Pakse).

Table 1. The Peak Water Level of Mekong River in 2016

No	Name of station	Warning Level (m)	Dangerous Level (m)	Peak Water Level in 2016 (m)	Remark
1	Mekong at Hiousai	16.50	17.50	6.53 (13/09/16)	
2	Mekong at Pakbeng	29.00	30.00	16.76 (17/08/16)	
3	Mekong at Luangprabang	17.50	18.50	15.76 (20/08/16)	
4	Mekong at Paklay	16.00	15.00	13.20 (21/08/16)	
5	Mekong at Vientiane	11.50	12.50	11.00 (22/08/16)	
6	Mekong at Paksane	13.50	14.50	12.67 (23/08/16)	
7	Mekong at Thakhek	13.00	14.00	11.25 (23/08/16)	
8	Mekong at Savannakhet	12.00	13.00	9.37 (24/08/16)	
9	Mekong at Pakse	11.00	12.00	10.00 (14/09/16)	





- **For the main tributaries:**

The flash flood occurred in the northern and central parts of the county (Oudomxay, Xayabouly, Luangprabang, Vientiane, Xiengkhuang and Bolikhamxay provinces), while in the southern part affected by inundation flood due to heavy rainfall and typhoon (Khammuane, Savannakhet provinces).

Table 2. The Peak Water Level of the Mekong's Main Tributaries in 2016

No	Name of Station	Warning Level (m)	Dangerous Level (m)	Peak Water Level in 2016 (m)	Remark
1	Nam Ou at M. Ngoy	16.50	17.50	10.10 (15/08/16)	
2	Nam Khan at Xiengngeun	11.00	10.00	--12.20 (20/08/16)	
3	Nam Song at Vangvieng	3.50	4.50	3.88 (20/08/16)	
4	Nam Lik at Hineheup	14.00	15.00	8.80 (20/08/16)	
5	Nam Sane at Bolikhane	7.00	8.00	8.91 (21/08/16)	
6	Nam Ngiep at M. Mai	11.00	12.00	7.32 (20/08/16)	
7	-Nam Ngum at Thalot	16.00	17.00	10.20 (21/08/16)	
8	Nam Ngum at Pakkagnoung	11.00	12.00	7.54 (21/08/16)	
9	Nam Ngum at Veunekham	12.00	13.00	10.62 (6/08/15)	
10	Nam Kading at Ban Phonesi	13.75	14.75	8.72(22/08/16)	
11	Sebangfai at Mahaxay	14.00	15.00	13.13 (16/09/16)	
12	Sebangfai at M. Sebangfai	17.50	18.50	17.50 (16/09/16)	
14	Sechamphone at Kengkok	7.50	8.50	7.38 (13/08/16)	

15	Sebanghieng at Kengdone	14.00	15.00	9.92(15/09/16)	
16	Sedone at Slavane	10.50	11.50	6.68 (12/08/16)	
17	Sedone at Khongsedone	12.30	13.30	10.22 (13/08/16)	
18	Sekong at Sekong	16.00	17.00	6.50 (19/08/18)	
19	Sekong at Attapeu	15.00	16.00	13.98 (16/09/15)	



1.3. Socio-Economic Assessment (highlighting socio-economic and DRR)

1.3.1. Socio-Economic loss by Cold Weather in January 2016:

An area of high pressure with strong intensity extended from China to all part of Lao PDR during the January 2016, the cold weather covered all part of Lao PDR and associated with moderate rain in some areas. As a result, it impacted to live of the people and animal as well as agriculture sectors.



1.3.2. Socio-Economic loss by Local Storm in February 2016:

From 24 – 28 Feb 2016, there was local storm occurred in Bokeo Province, resulted 2 villages at Huaxay District, Bokeo Province affected by strong wind associated with moderate rain. There were one person died, 80 houses destroyed, more than 100 ha destroyed by strong wind.



1.3.3. Socio-Economic loss by Local storm in April 2016:

In April is the hottest month of the year, strong with heavy rain always occurs in some areas especially in the northern and central parts. From 22 – 28 April 2016, local storm occurred many places which were affected to the properties and live of the people as well as socio-economics, such as: Oudomxay, Luangprabang, Sayabouly, Bolikhamxay and Khammouan Provinces. The table below shown the affected by local storms:

No.	Date	Type of Disaster	Affected	Province
	8 Apr 2016	Gust wind	Schools, electricity posts brokend, and houses damages	Bolikhan District, Bolikhamxay Province.
	21 Apr 2016	Heavy rain, hail with gust wind, landslides.	160 houses damages, schools, road cut, agricultures productivities sector, livestock.	Paklay District, Sayabouly Province
	22, 25 Apr 2016	Heavy rain, hail with gust wind	Schools, electricity posts brokend, temples and houses damages, 1 person died	Luangprabang Province
	22 Apr 2016	Gust wind	9 Villages affected, 178 Household damages, 1 person died, 876 people affected.	Gnomalath District, Khammouan Province
	24 Apr 2016	Heavy rain, hail with gust wind	Schools and houses damages.	Muang La, Oudomxay Province
	26 Apr 2016	Heavy rain with gust wind	Schools, electricity posts brokend, temples and houses damages.	Thakhek District, Khammouan Province



1.3.4. Socio-Economic loss by Local Storm in May 2016:

On 2 May 2016, local storm occurred in Paklay District, Sayabouly Province, there were two villages affected by strong wind such as: houses, school, and government offices.

On 4 May 2016, hail storm occurred in Paktha District, Bokeo Province, many roof of houses were damaged by hail storm.



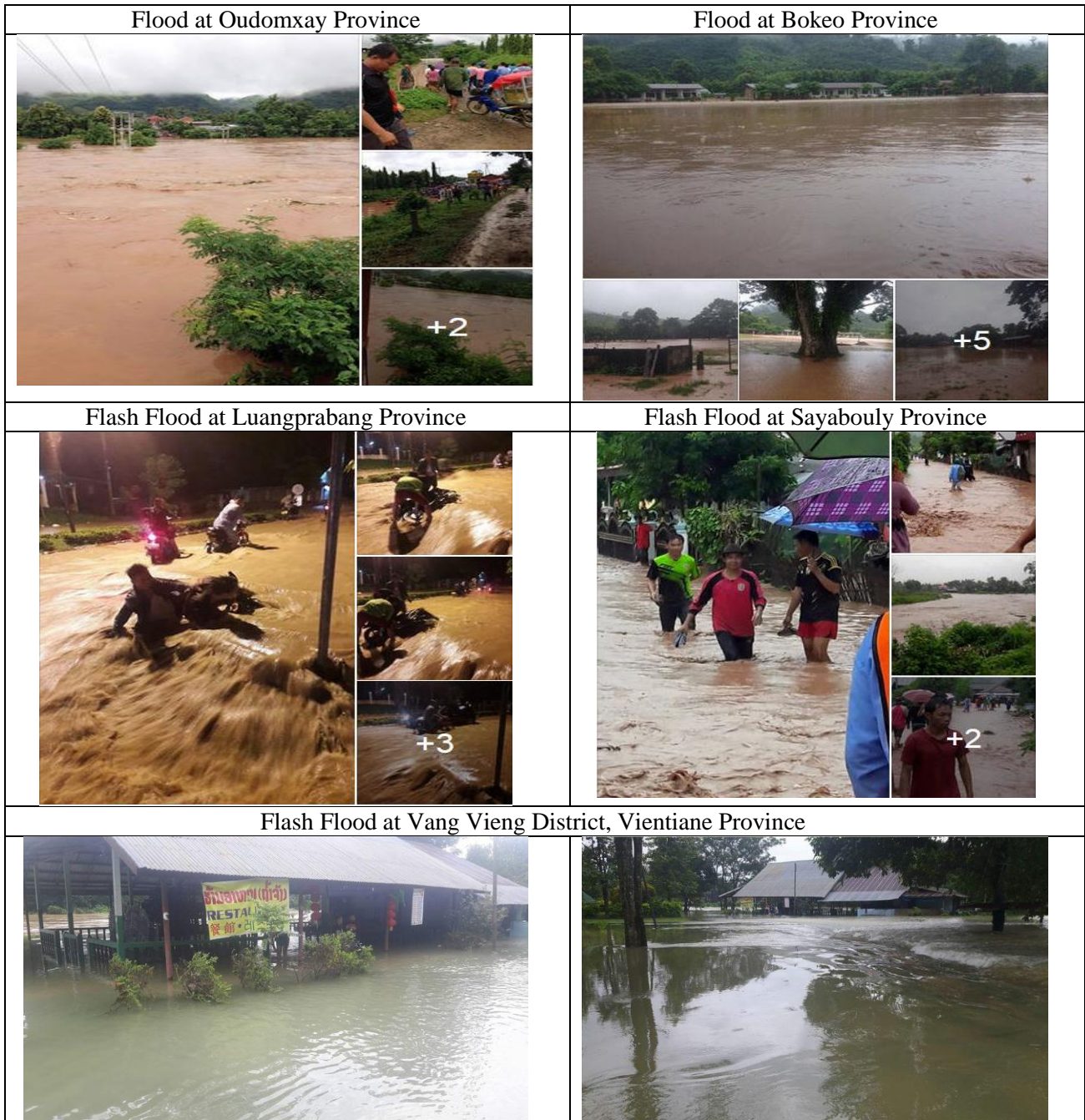
1.3.5. Socio-Economic loss by Tropical Storm MIRINAE (1603) in July 2016

Mirinae made landfall over the coast of northern Vietnam that night and weakened gradually. It finally dissipated over northern Vietnam on the evening of 28 July. During the passage of Tropical Storm MINRINAE, the strong southwesterly wind covered over the central and southern parts of Lao PDR, as a result, there was heavy rainfall, flash floods and landslides in some provinces of northern and central parts.



1.3.6. Socio-Economic loss by Tropical Storm DIANMU (1608) in August 2016

TS DIANMU made landfall over the northern part of Vietnam in the afternoon of 19 August 2016 and passed over northern part of Lao PDR, Dianmu moved inland and weakened gradually. It finally degenerated into an area of low pressure over the northern part of Myanmar on the morning of 20 August 2016. The Southwesterly wind over the central and southern parts was very strong; as a result, there was heavy rain, strong wind, flash flood and landslides in northern and central parts, such as: Oudomxay, Bokeo, Luangprabang, Sayabouly and Vientiane Provinces.



1.3.7. Socio-Economic loss by Tropical Storm RAI (1615) in September 2016

During the passage of TS RAI, the heavy rain with gust wind occurred in central and southern parts of Lao PDR, resulted, 4 provinces affected by flash flood and strong winds namely: Savannakhet, Sekong, Salavanh and Champasack Provinces.

Flood at Sekong Province



Strong wind at Savannakhet Province



1.4. Early warning system and Technologies for Disaster Risk Reduction in Lao PDR

Department of Meteorology and Hydrology is main key governmental department to be responsible for hydrological and meteorological early warning information to the nation; to conduct the hydro-meteorological activities related to management, monitoring, and data collection. The other governmental agencies are mandates authority to improve early warning tied to their functional responsibilities in addition to MONRE.

In 2016, Department of Meteorology and Hydrology issued the warning in total 20 warning and also disseminated the warning to Prime Minister's Office, government lines agencies and the public by using variation means such: telephone, fax, e-mail, What Apps, website. The warning information reached to risk areas quite in time.

During the disaster occurred the government takes an action to disaster relief and emergency response operations and issued the order from Prime Minister's Office to lines agencies concerned under National Disaster Management Committee. And also the private sectors donated the materials such as food, drink, closed, rice, etc. to the affected people.



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

1.5.1. **The Typhoon Committee Roving Seminar 2015** was successfully held on, 4-6 November 2015 in Lao PDR. The seminar was hosted by the Department of Meteorology and Hydrology (DMH), Lao PDR. The theme of this seminar was on “Flash flood and landslides” and, in collaborating with WGH, the sub-topics and speakers of the seminar have been identified as follows :

Topic A – Risk Reduction and Mitigation of Sediment-related Disaster

(Mr Yoshiki Nagai from National Institute for Land and Infrastructure Management)

Topic B – Advances and Challenges of Flash Flood Modeling and Prediction

(Prof Xu-dong Fu from Tsinghua University)

Topic C – River and Urban Flash Flood’s forecasting and Mitigation

(Dr Dong-ryul Lee from Korea Institute of Civil Engineering and Building Technology)

The Seminar was attended by 22 participants from Bangladesh (1); Cambodia (2); China (2); Myanmar (1); Pakistan (1); Philippines (1); Lao PDR (8); Sri Lanka (1) and Thailand (5). Three resource persons came from China, Japan and Republic of Korea with two representatives from the Typhoon Committee

Secretariat and ESCAP. With the support of ESCAP, Members of Panel on Tropical Cyclones (PTC) are also invited to attend the seminar. The participants considered the lectures and advice provided by the four resource persons are useful and examples of good practices on the relevant topics. Most participants also indicated that they learned new ideas and methodologies on flash flood and landslides, while they might not have the resources for implementation at the moment. A summary report of the seminar can be found in Annex II.

15.2. Department of Meteorology and Hydrology nominated one representation to attended the 5th WGH Meeting and 7 World Water Forum on 14 – 18 April 2015, Seoul, Republic of Korea.

II. Summary of progress in Key Result Areas

2.1. Installation of early warning and alert system in interested Member's countries, AOP3a under WGDRR (Promote the international cooperation research)

Main purpose of this project is to build resilience and strengthen the capacity on disaster risk reduction within TC member countries. In this project, NDMI, DMH (Department of Meteorology and Hydrology, Laos) cooperate to install the Automatic Rainfall Warning System (ARWS) and Flash Flood Alert System (FFAS) in Lao PDR. After finishing the installation of the systems, education and training courses will be executed for both countries.

In year 2016, the Department of Meteorology and Hydrology of Lao PDR has selected one district to install the Automatic Rainfall Warning System (ARWS) and Flash Flood Alert System (FFAS), namely: Vang Vieng District, Vientiane Province, the purpose of this project is to strengthen the DRR capacity in Lao PDR.

In April 2016, NDMI and DMH conducted the field sites survey for selecting the suitable areas, as a result, there were 2 sites for installation Automatic Water Level, 2 sites for Automatic Rain gauge, 2 posts for Automatic Warning Post.

In September 2016, NDMI and DMH in Lao PDR completed the installation of Automatic Rainfall Warning System including rainfall gauge, water level gauge, and warning post in Nam Song River Basin, such as: Automatic Water Level including Automatic Rain Gauge at Vang Pho Village and Pha Tang Village, Automatic Flash Flood Warning Post at Muang Song Village and Huay Yae Village. Also, in order to monitor the installed systems and dispatch the warning NDMI installed the Rainfall Warning System at Hydromet Office at Vang Vieng District and also installed the Flash Flood Alert System in DMH Headquarter. During the installation, NDMI trained the local staff as well as DMH's headquarter staff to use the system as well as maintenance the system, testing the system. As a result, the system up to date is working correctly but there is some failures cause of data transmission between the sites and data centre.

Automatic Water Level Station including Raingauge at Pha Tang Bridge



Automatic Water Level Station including Raingauge at Vang Pho Bridge



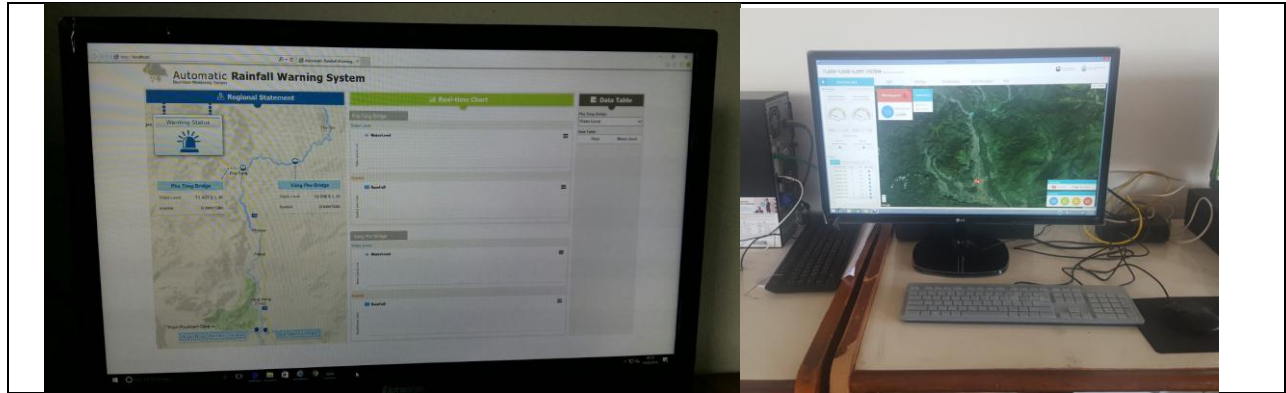
Automatic Flash Flood Early Warning Post at Ban Muang Song



Automatic Flash Flood Early Warning Post at Ban Hua Yea



Data Center



III. Update of Member's Working Groups representatives

3.1. Working Group on Meteorology (WGM)

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3.2. Working Group on Hydrology (WGH)

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3.3. Working Group on Disaster Risk Reduction (WGDRR)

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3.4. TRAINING AND RESEARCH COORDINATION (TRCG)

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