

# **MEMBER REPORT**

ESCAP/WMO Typhoon Committee  
8<sup>th</sup> Integrated Workshop/2<sup>nd</sup> TRCG Forum

**(Lao PDR)**

Macao, China  
2 - 6 December 2013

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# I. Overview of tropical cyclones which have affected/impacted Member's area in 2013(Free format)

## 1. Meteorological Assessment (highlighting forecasting issues/impacts)

### 1.1. Monsoon events

The year 2013, the rainy season in Lao PDR started earlier than normal from the northern to central parts (started from 22 – 26 April) whereas Vientiane Capital, Phonhong and southern part started in near normal (started in mid-May), there were some exceptional areas started quite late such as Bokeo, Luangprabang, Sekong and Attapeu Provinces (Started from end of May to first week of June), the monsoon rain were very active in July to August and prolonging to first week of September, during the monsoon season, there were dry spell occurred in some areas but lasted not more than ten days, the monsoon rain continued mostly up to last week of September then concession in first week of October, it means that the rainy season from the north to south finished earlier than normal.

The annual precipitation of the year 2013 was mostly above normal except Vientiane Capital and Attapeu Province below normal, while the number of rainy day was above normal in the northern and central parts whereas southern part was below normal, but the extreme rainy day (total rain amount more than 100 mm per day) were observed more than 5 days in central and southern areas.

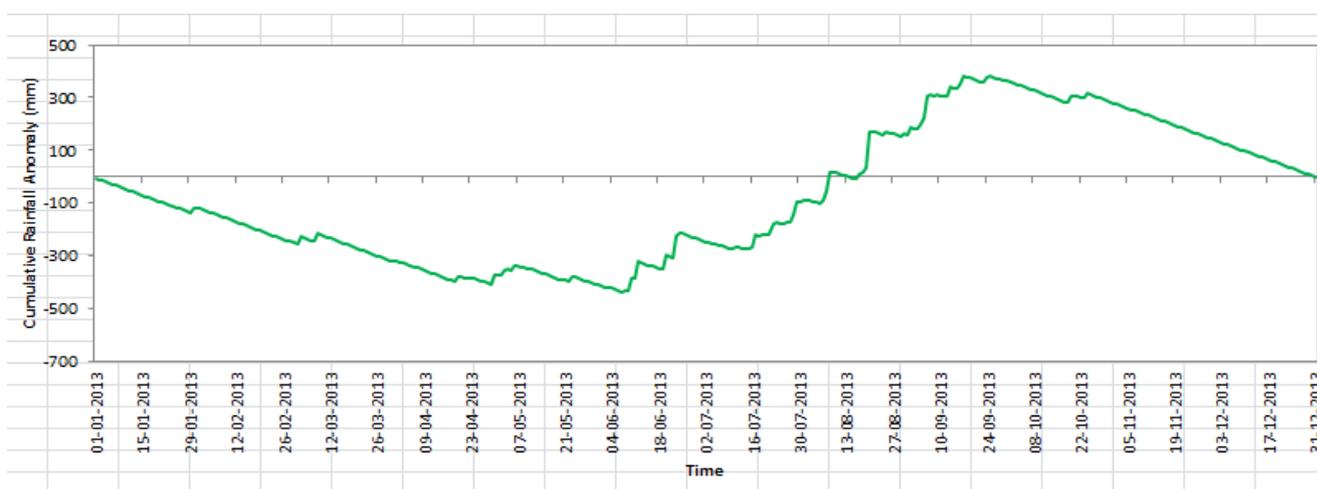


Fig. 1: The monsoon event for Luangprabang (48930).

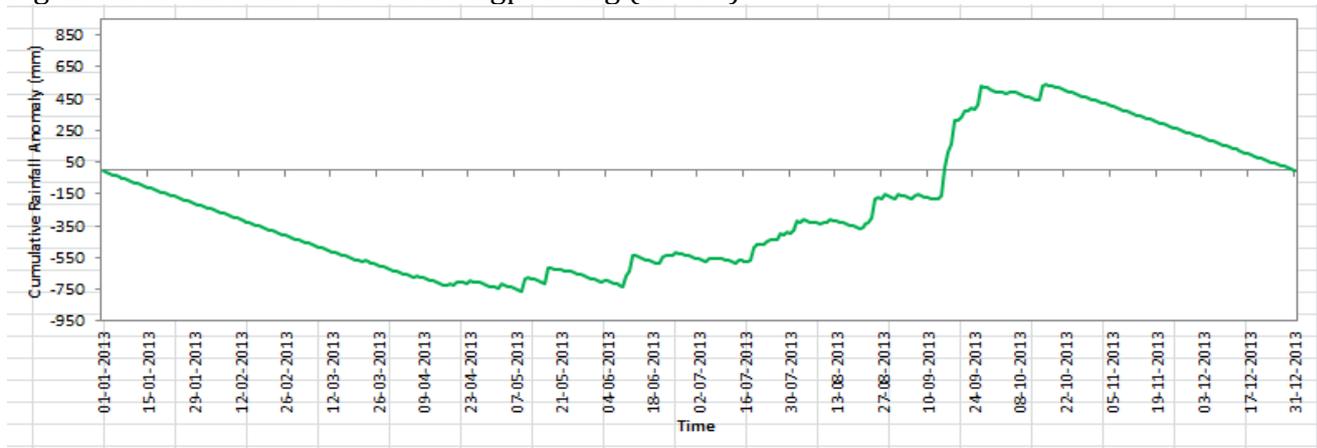


Fig. 2. The monsoon venet for Pakse (48955)

Province (Station Name)	Annual average in millimeter (mm/year)	Peak of rainfall in 24 hours (mm/day)	Number of rainy day (day/year)	Rainy Season 2013		Annual 2013 (mm)	No. of rainy day (2013)	No. of Extreme rain (2013) (≥100 mm)	Maximum Rain in 24hrs (mm) (2013)
				Start	End				
<a href="#">Phongsaly</a>	1497.1	104.0 (23/08/1990)	124	23/04/13	05/09/13	1717.4	131	0	52.7 (29/06/13)
<a href="#">Samneua</a>	1425.3	187.6 (04/10/2007)	119	25/04/13	04/09/13	1201.0	112	0	61.6 (29/07/13)
<a href="#">Xiengkhuang</a>	1436.1	122.8 (28/05/2000)	134	22/4/13	10/09/13	1867.7	135	0	87.5 (20/07/13)
<a href="#">Luangnamtha</a>	1570.4	154.1(15/07/2000)	150	23/04/13	16/09/13	1571.2	134	0	96.1 (08/08/13)
<a href="#">Oudomxay</a>	1430.3	152.7 (26/09/2008)	124	23/04/13	23/09/13	1577.5	125	0	94.6 (08/08/13)
<a href="#">Bokeo</a>	1868.6	243.3 (02/09/1997)	135	31/05/13	23/09/13	2216.6	122	3	172.5 (05/09/13)
<a href="#">Luanprabang</a>	1374.8	180.7 (04/10/1981)	113	08/06/13	17/09/13	1696.1	112	1	141.2 (20/08/13)
<a href="#">Sayabouly</a>	1331.3	155.5 (05/10/1988)	117	26/04/13	25/09/13	1463.7	120	0	72.1 (05/09/13)
Vientiane Cap	1670.8	224.2 (26/08/1976)	120	12/05/13	25/09/13	1441.9	115	0	93.0 (13/08/13)
<a href="#">Phonhong</a>	2019.0	234.1 (05/07/1981)	128	17/05/13	25/09/13	2242.5	114	1	116.0 (12/06/13)
<a href="#">Paksanh</a>	3020.0	450.2 (15/06/1986)	122	26/04/13	24/09/13	3167.1	138	5	175.6 (26/06/13)
<a href="#">Thakhek</a>	2224.5	228.0 (09/08/2009)	129	28/04/13	30/09/13	2214.6	131	3	128.2 (20/07/13)
<a href="#">Savannakhet</a>	1475.0	188.0 (19/06/1985)	103	17/04/13	30/09/13	1518.7	97	0	90.2 (18/09/13)
<a href="#">Saravanh</a>	1724.2	299.0 (18/08/1996)	125	10/05/13	22/09/13	2639.0	113	7	184.1 (18/09/13)
<a href="#">Pakse</a>	2069.5	203.3 (22/06/2002)	141	03/05/13	10/10/13	2636.7	108	7	188.4 (15/09/13)
<a href="#">Sekong</a>	1400.4	107.8 (11/07/2000)	116	23/05/13	10/10/13	1961.2	114	3	187.2 (21/09/13)
<a href="#">Attapeu</a>	2180.9	399.9 (19/09/1996)	133	24/05/13	15/10/13	1504.6	108	1	110.3 (21/09/13)

Fig. 3. The annual precipitation for year 2013.

## 1.2. Tropical cyclones

As the climate characteristic in Lao PDR is influenced by southwest monsoon and associated with direct and/or indirect by tropical cyclone from Western North Pacific Ocean, in the year 2013, Lao PDR has been affected directly by 4 tropical cyclones and a tropical depression, namely: JEBI (1309), MANGKHUT (1310), Tropical Depression (1318), WUTIP (1321), and NARI (1324), there were indirectly affected from 3 tropical cyclones, namely: RUMBIA (1306), UTOR (1311), and KROSA (1329).

### 1.2.1. Typhoon JEBI (1309)

The typhoon JEBI made landfall at Northern part of Vietnam on 03 August 2013 then was downgraded in Tropical Depression and passed over Northern part of Lao PDR. The heavy rainfall and strong wind was observed in these areas

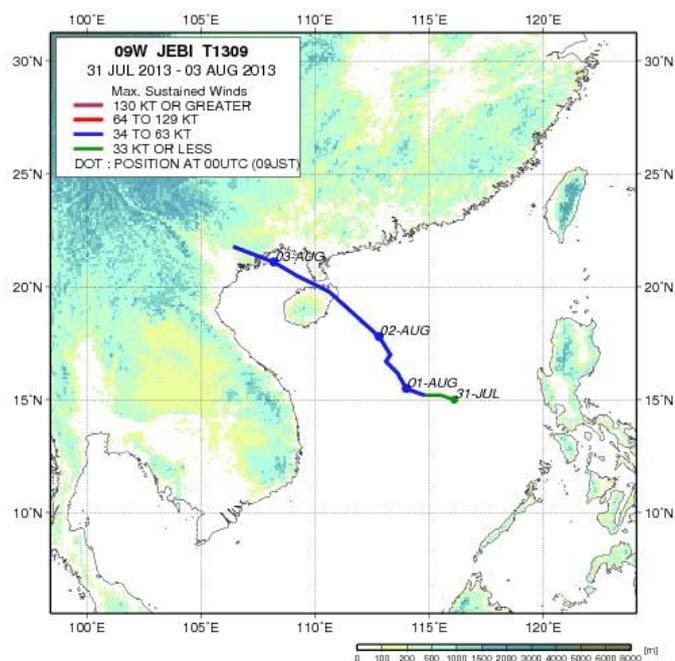


Fig. 4. Typhoon JEBI Track

### 1.2.2. Typhoon MANGKHUT (1310)

On 7<sup>th</sup> August 2013, a Tropical Storm Mangkhut weakened and made landfall over the Northern part of Vietnam then passed over the Northern part of Lao PDR on 8<sup>th</sup> August 2013, resulted, the heavy rainfall (accumulated rainfall for 24 hours) were observed over the Northern and Central parts such: Xiengkhuang (48935): 83.3 mm, Oudomxay (48925): 94.6 mm, Bokeo (48926): 90.0 mm, Luangnamtha (48924): 96.1 mm, and Xaysomboun (489xx): 103.0 mm, flash flood was occurred in some areas of northern part.

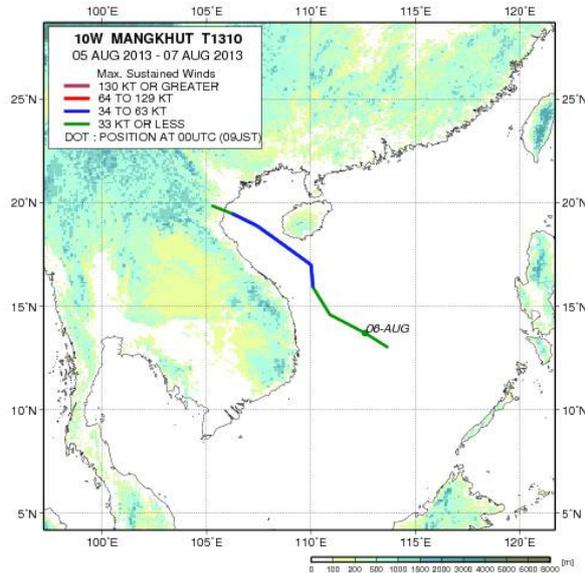


Fig. 5. Typhoon MANGKHUT Track

### 1.2.3. Tropical Depression (1318)

On 15 September 2013, a low pressure system developed over South China Sea and intensified to tropical depression on 17 September 2013 then made landfall over the Central Part of Vietnam then passed over Southern part of Lao PDR and downgrade to low pressure on 19 – 20 September 2013. As a result, there was very heavy rainfall over central and southern parts of Lao PDR, the accumulated rainfall for 5 days were recorded: Savannakhet (48947): 178.7 mm, Saravanh (48952): 425.7 mm, Sekong (48953): 270.7 mm, Pakse (48955): 545.8 mm, and Attapeu (48957): 125.7 mm. The prolonged heavy rainfall to four districts in the south which suffered the worst impact of the floods. It is recorded as the worst flooding in the south of the country in the last 35 years, the flood lasted more than 2 weeks

### 1.2.4. Typhoon WUTIP (1321)

Typhoon WUTIP made landfall in Quangbinh Province of Vietnam on late evening of 30 September 2013, then passed over Central part of Lao PDR, the heavy rainfall and strong wind were recorded, resulted, flash flood and landside were observed in northern part.

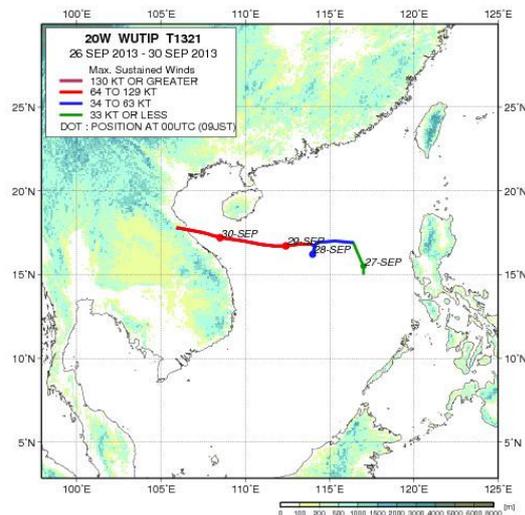


Fig. 6. Typhoon WUTIP Track

### 1.2.5. Typhoon NARI (1325)

Typhoon NARI made landfall in Quangnam Province of Vietnam early morning of 15 October 2013, then passed over Southern part of Lao PDR on 16 October 2013, the gust wind was recorded over Southern part, the aircraft of Lao Airlines was crashed during landing at Pakse International Airport due to downburst (gust wind), there were 49 people on aircraft killed.



Fig. 7. Typhoon NARI Track

The trough of low pressure lied over Lao PDR and associated with strong southwest monsoon, resulted, continuously widespread rain over the central and southern parts lasted more than two weeks.

The Department of Meteorology and Hydrology monitored and weather forecast for the whole country, as well as issuing the early warning to the publics. By using the facilities and source from different forecasting centers under WMO's member, especially from Severe Weather Forecasting and Demonstration Project, JMA, RSMC Tokyo, KMA, CMA, ECMWF, APCC and HKO, DMH issued the daily, 3 days, weekly, one month and three months weather forecast. As a result, DMH issued early warning in this year totally 25 times which included: strong wind, heavy rain, landslides, flash flood, flood and typhoon.

The impact on meteorological are:

- Flash flood caused of heavy rainfall and strong wind in northern and central parts.
- Local storm with gust in northwestern and central parts.
- The passage of tropical cyclones after making landfall at Vietnam coast, it made heavy rain and strong wind.
- Landslides caused of continuously rain in northern part.
- Monsoon rain.

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

### 2.1. Flood events

In Lao PDR, Flood and drought are the main natural disasters resulting directly from the hydrological extreme events. However, the reoccurrences of different magnitude of flood and flash flood from the Mekong and its tributaries are still the main hazard in the rainy season which is a cause by heavy rainfall from southwest monsoon and typhoon.

Due to the periodic flooding conditions, the flood prone areas in the country can be identified in the table below:

No	Name of provinces	Flash flood	Flood inundation
	<b>Northern part</b>		
1	Phongsaly	Flash flood	
2	Luangnamtha	Flash flood	
3	Bokeo	Flash flood	
4	Oudomxay	Flash flood	
5	Luangprabang	Flash flood	
6	Xayabouly	Flash flood	
7	Huaphane	Flash flood	
8	Xiengkhuang	Flash flood	
	<b>Central part</b>		
9	Vientiane	Flash flood	Flood inundation
10	Vientiane Capital		Flood inundation
11	Bolikhamxay	Flash flood	Flood inundation
12	Khammuane		Flood inundation
13	Savannakhet		Flood inundation
	<b>Southern part</b>		
14	Saravane	Flash flood	Flood inundation
15	Champasack		Flood inundation
16	Sekong	Flash flood	Flood inundation
17	Attapeu	Flash flood	Flood inundation

In an effort to reduce the impact of the natural disasters in the future, the Lao Government is focusing on natural disaster management issues, prioritizing the need for early warning systems and natural disaster preparedness for communities by establishing an emergency group, that consisted the representative of ministries and other organizations concerned to manage and solve the problems encountered.

Department of Meteorology and hydrology (DMH) is mandated by the government to take regular observations in the field of meteorology, hydrology and earthquake.

DMH also play a key role in developing and disseminating flood forecasting and provides appropriate early warning at the time of the relevant natural disasters.

### 2.2. The activities of flood forecasting and warning system are under taken in 2013:

- 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 to criteria:
  - Nearly warning: In case of the forecast water level will be expected 0.50 m below the warning level, DMH provides nearly warning.
  - Urgent warning: When the water level exceeded the warning level, DMH provides the urgent warning.

### 2.3. The hydrological situations in the monsoon 2013:

For the Mekong: In generally the water level of the Mekong River was below warning level equivalent average of last 10 years from northern to central parts (Luangprabang, Vientiane, Paksane, Khammuane and Savannakhet provinces, whereas in the southern part was above danger level more than 10 days (Champasack province), see in the table.

For the tributaries: The flash flood occurred in the northern and central parts (Oudomxay, Xiengkhuang and Bolikhamxay provinces), while in the southern part affected by inundation flood due to heavy rainfall and typhoon (Khammuane, Savannakhet, Saravane, Champasack and Attapeu provinces), see in the table.

No	Name of station	Peak of water level 2013 (m)	Warning level (m)	Danger level (m)
	<b>For the Mekong</b>			
1	Luangprabang	13.60 (9/09/2013)	17.50	18.50
2	Vientiane	9.62 (10/09/2013)	11.50	12.50
3	Paksane	12.94 (10/08/2013)	13.50	14.50
4	Thakhek	11.79 (12/08/2013)	13.00	13.50
5	Savannakhet	9.41 (13/08/2013)	12.00	13.00
6	Pakse	12.30 (24/09/2013)	11.00	12.00
	<b>For the tributaries</b>			
7	Nam Ngiep, M. Mai	11.28 (10/08/2013)	10.00	11.00
8	Nam Sane, M. Kao	8.88 (10/08/2013)	7.00	8.00
9	Sebangfai, Mahaxay	14.75 (31/07/2013)	14.00	15.00
10	Sebangfai, Khoase	18.66 (1/08/2013)	17.50	18.50
11	Sedone, Saravane	13.08 (19/09/2013)	10.50	11.50
12	Sedone, Khongsedone	13.79 (24/09/2013)	12.30	13.30
13	SekongAttapeu	17.01 (20/09/2013)	15.00	16.00

### **3. Socio-Economic Assessment (highlighting socio-economic and DRR issues/impacts)**

In the year 2013, Lao PDR has affected by heavy rain, strong wind, landslide, flash flood, flood and tropical cyclones, resulted:

- Flash flood even affected many hundreds of household and people and killed 17 people in Oudomxay Province.
- Flood events occurred in central and southern parts, there were 7 Provinces affected, including 203 villages, 13.465 families and over 60.000 people, over 14.714 hectares of rice fields were flooded, which 10.184 hectares were damaged, 12 irrigation system were damaged and thousands of livestock death. The prolonged heavy rainfall to four districts in the south, which suffered the worst impact of the floods. It is recorded as the worst flooding in the south of the country in the last 35 years
- 49 people were killed due to air crashed in Pakse International Airport, it was worst impact that Lao PDR has never seen before.

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

#### **4.1. Training and workshop**

DMH conducted training for strengthening the capacity of local staff members as well as participated training workshop which organized by WMO and TC:

- Training on Weather Analysis and forecast, there was more than 50 local staff members attended.
- Training on Aeronautical services for Aviation, there was more than 30 local staff members attended.
- Training on Climate data quality control and analysis for seasonal forecast.
- Roving seminar which organized by TC, there was 5 people from DMH participated.
- Typhoon Committee Research fellowship scheme for 2011, on research topic "Improvement of Typhoon analysis and forecast system applying KMA's Typhoon Analysis and Prediction System (TAPS), there was one DMH's staff participated.
- Training on Severe Weather Forecast and Demonstration Project in Macao, there was two DMH's staff participated.
- One attended the 21<sup>st</sup> Meeting of the IHP Regional Steering Committee for Southeast Asia and the Pacific, Gyeongju City, Republic of Korea, 3 – 4 October 2013.
- One attended the 2<sup>nd</sup> Meeting of TC WGH on extreme flood and flood forecasting system in TC Countries from 14 -17 October 2013 in Seoul, Republic of Korea.
- One attended joint field survey on investigation of the current flood forecasting system and operation conditions in selected basins (Korea, Thailand, Philippines and Laos), 27 October – 2 November 2013.
- One attended the conference on Extreme Flood Events – Past, Present and Future, Bringing together Experiences from the Lower Mekong Basin and River Basins in Central Europe, 13 – 14 November 2013, Bangkok, Thailand.
- One attended the training on Flood Risk Management in City, 15 November 2013, Bangkok, Thailand.

By using the knowledge from the training activities, the weather forecasting system in Lao PDR has improved, the warning also improved.

#### **4.2. Warning System**

DMH of Lao PDR develops a warning criteria based on WMO criteria:

- Type of warnings:
  - Strong wind, landslides, flash flood, flood and typhoon warnings.
- Warning criteria:
  - Tropical cyclones occurred in South China Sea: 1 day up to 3 days;
  - Tropical cyclone associated with southwest monsoon.
- DMH generates and issues daily weather forecast 2 times a day which are based on 00 UTC and 06 UTC weather situation (issuing time: 03 UTC and 08 UTC)

In 2013, there were totally 26 warning messages:

- Flash flood caused of heavy rainfall and strong wind in northern and central parts.
- Local storm with gust in northwestern and central parts.
- The passage of tropical cyclones after making landfall at Vietnam coast, it made heavy rain and strong wind.
- Landslides caused of continuously rain in northern part.
- Monsoon rain.

#### **4.3. Lesson Learnt**

- In Lao PDR, the radio is the most powerful for public awareness on weather, flood forecast and warning.
- The timely forecasting and warning dissemination provided by DMH was very helpful.
- Hydro-met networks should be improved to meet future requirement.
- Internal and external coordination mechanism is important for resources mobilization.
- The capacity building on flood prevention and flood preparedness for local line agencies is still needed more intention.
- Education and awareness is as important as the technical aspects of early warning system.
- However, it needs some areas to improve hazard mapping to enhance the effective warning

## **II. Summary of progress in Key Result Areas**

- Developing of Legal Framework for hydro-met (draft of hydro-met law, SOP for early warning), however they need more improvement
- Self-assessment for national capacity on early warning system: Initiative of strengthening DMH's capacity toward to a national early warning center through technical assistance from many development partners (JMA, KMA, CMA, ...)
- Collaboration with national university on development of hydro-met curriculum for under graduated program