
Kingdom of Cambodia
Religion
ព្រះរាជាណាចក្រកម្ពុជា
KINGDOM OF CAMBODIA

APEC Climate Symposium on Climate Prediction and Application, and US-Korea Workshop on Dynamical Seasonal Prediction

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CLIMATE AND NATURAL DISASTER IN CAMBODIA and Hy BMG 2.0.7 Method Utilization

Content

1- Introduction,

2- General climate condition,

3- Main natural disaster

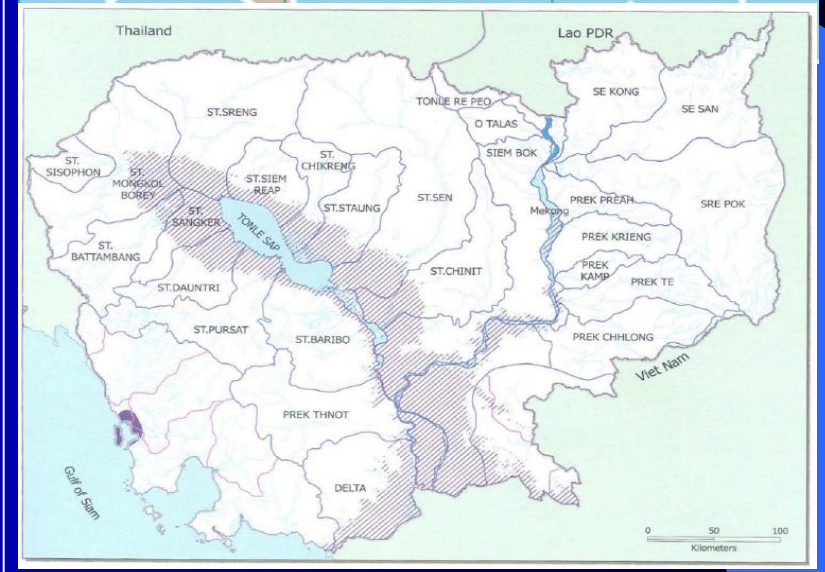
4- Responses to Flood Events in Cambodia

5- First experience using Hy BMG method Indonesia.

GEOGRAPHY OF CAMBODIA

- TERRITORY OF 181,035 Km^2.
  - **Lat: 10°- 15°N**
  - **Long: 102° - 108°E**
- Bordered with Lao PDR in North, Vietnam in the south and east, Thailand in the north and west and Gulf of Thailand in the south.
- POPULATION IS ABOUT 14 millions.
  - **The major river- MEKONG river.**
  - **Gread lac- TONLE SAP**

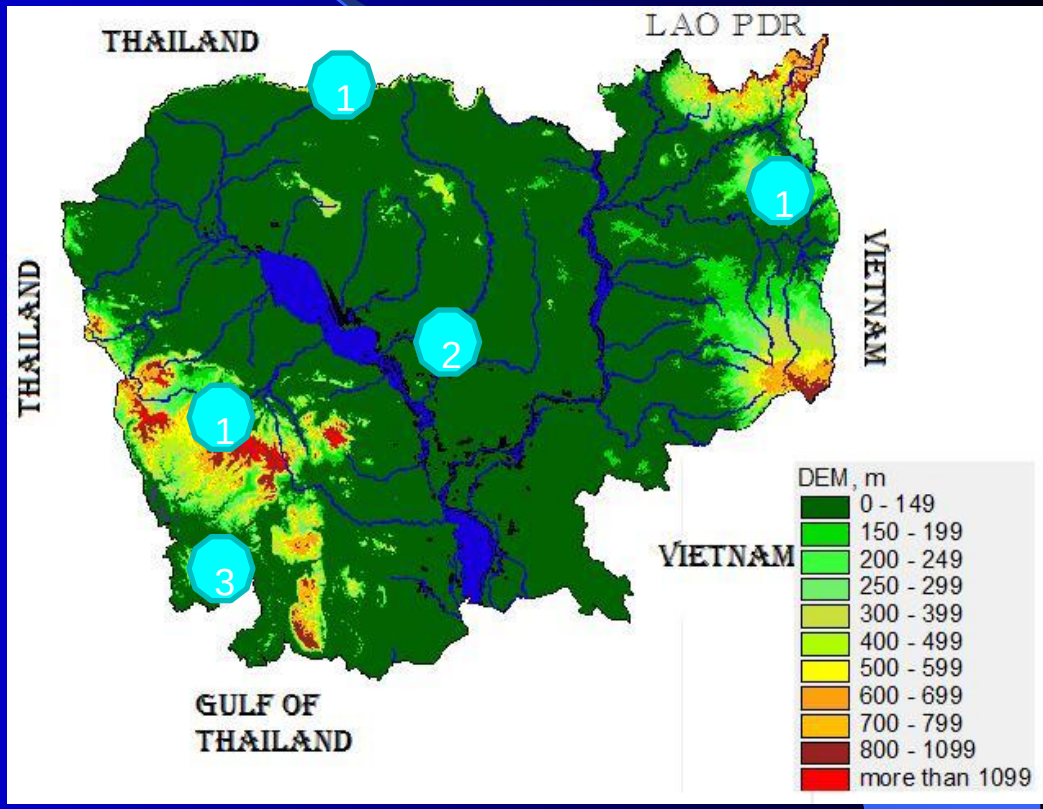
Main livelihood sources: rice cultivation and fishing



GEOGRAPHICAL FEATURES OF CAMBODIA

Three relief profiles were classified :

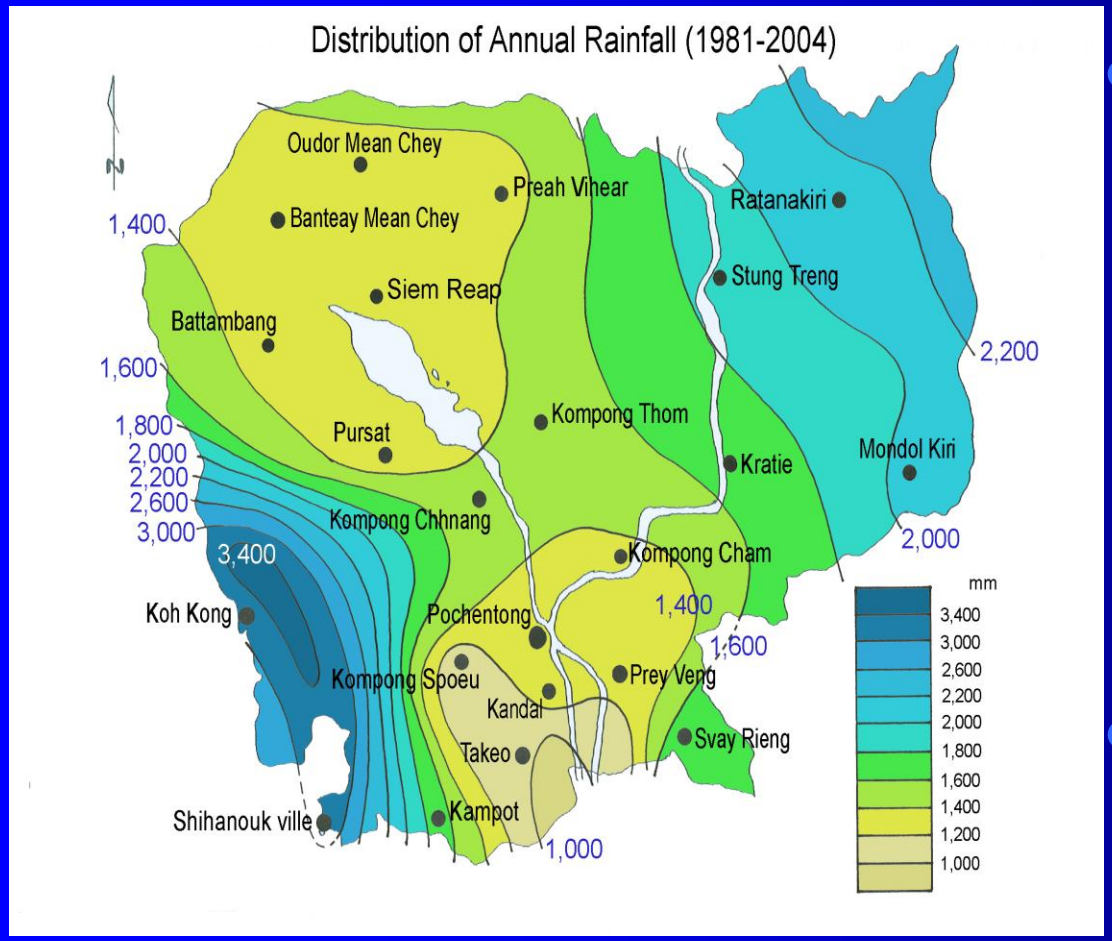
1. hilly and mountainous lands,
2. central plains or terraces, and low land flood plains.
3. Coastal area



CLIMATE

Seasons	Period	Weather Events	Temperature c/ Rainfall (mm)
Dry Season or Northeast Monsoon	December to April	-Cool: Dec to Feb -Hottest months: March and April	- Minimum temperature between16 °C Temperature varies between maximum 36 °C
Rainy Season or Southwest Monsoon	May to November	-Heavy Precipitation -Dry spell or drought last two weeks(July and/or early August)	- 90% - light showers occur

Distribution of Annual Rainfall



- The Average of Annual rainfall varies from 1100mm to more 4000 mm
- - central plains or terraces:1000- 2000mm
- - hilly and mountainous lands: 1800-3000mm
- - Coastal area: 2600-4000mm

Table 1: monthly average climate components distribution at Pochentong (1981-2006)

Climate components	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly
Rainfall, mm	7.7	5.1	23.2	74.8	120.2	133.8	164.8	177.5	272.4	240.0	131.6	23.5	1365
Min. Temp, °C	21.8	22.8	24.4	25.5	25.6	25.1	24.9	24.8	24.5	24.4	23.8	22.4	24.2
Max. Temp, °C	31.8	33.3	35.1	35.6	34.8	34.0	33.0	32.7	32.3	31.3	30.8	30.2	32.9
Wind speed, m/s	1.20	0.90	1.00	0.90	1.00	0.69	1.00	0.90	0.90	0.69	1.00	1.20	0.9
Solar radiation, $MJ/m^2/day$	23.2	22.5	22.7	20.0	16.0	14.9	13.0	15.8	15.4	19.9	21.2	22.1	18.9
Relative humidity, %	75	73	71	74	77	77	80	80	83	83	79	74	77

Main Natural Disaster in Cambodia

Flood

- Mekong Flood
- Flash Flood

Drought

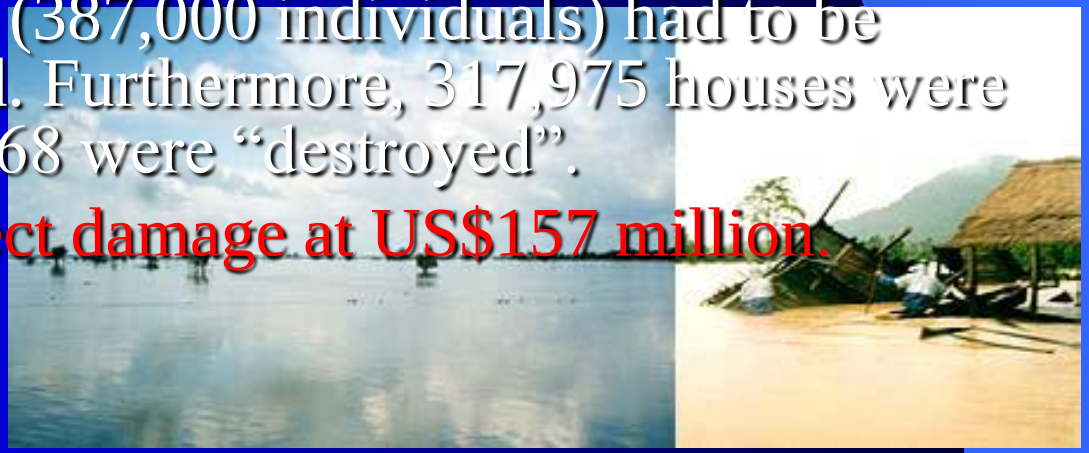
Storm Surge

Strong wind

lightning

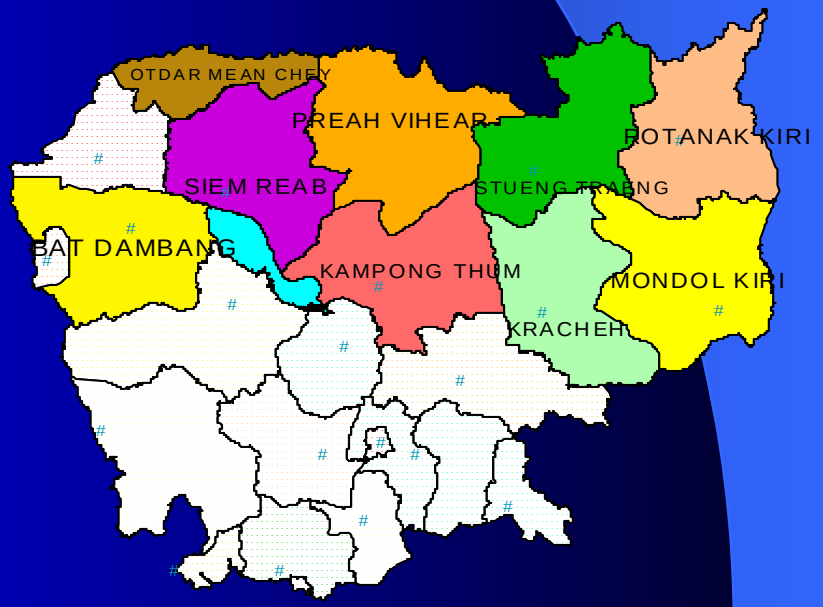
Flooding

- **Mekong flood**: which caused by cumulative of rainfall in the upper catchments throughout the rainy season and most severe floods are the results of tropical storms and depression affected by typhoons.
- Mekong extreme floods occurred in 1978, 1991, 1996, 2000, 2001, 2002, 2007 and 2009.
- The **2000 flood** was reportedly the worst in more than 70 years. The NCDM official report put the death toll at 347 (80 percent of whom were children). Of the 750,618 families (3,448,629 individuals) affected by flooding, about 85,000 families (387,000 individuals) had to be temporarily evacuated. Furthermore, 317,975 houses were "damaged", while 7,068 were "destroyed".
- total physical and direct damage at US$157 million.

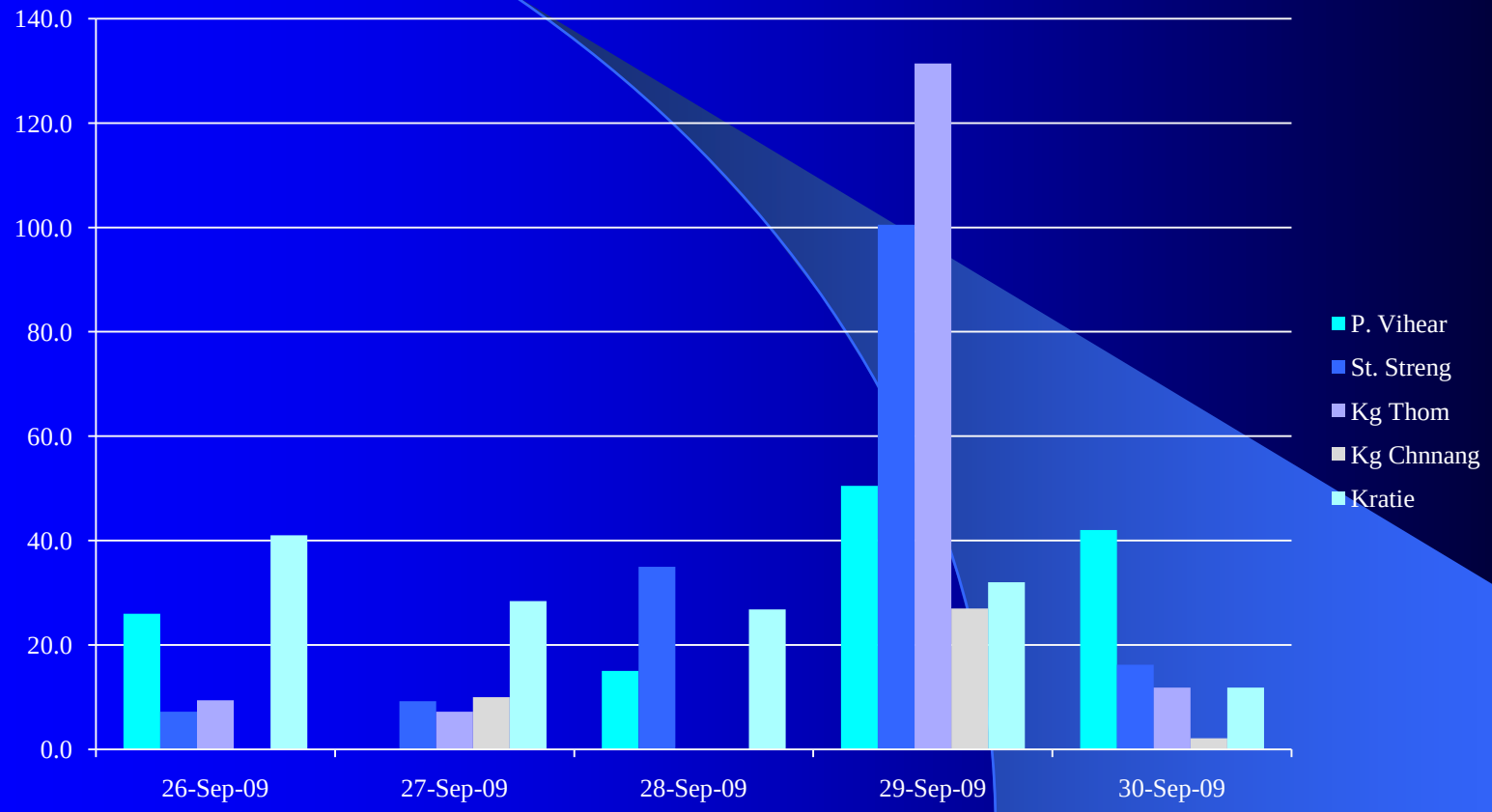


Typhoon Ketsana

- Typhoon Ketsana hit Cambodia on Tuesday 29th September 2009 around 17:00 typhoon Ketsana struck central and northern Cambodia, causing widespread damage(8 provinces including 73 districts)
- - 43 people dead
- - Thousands of families are displaced and their livelihoods are badly affected.

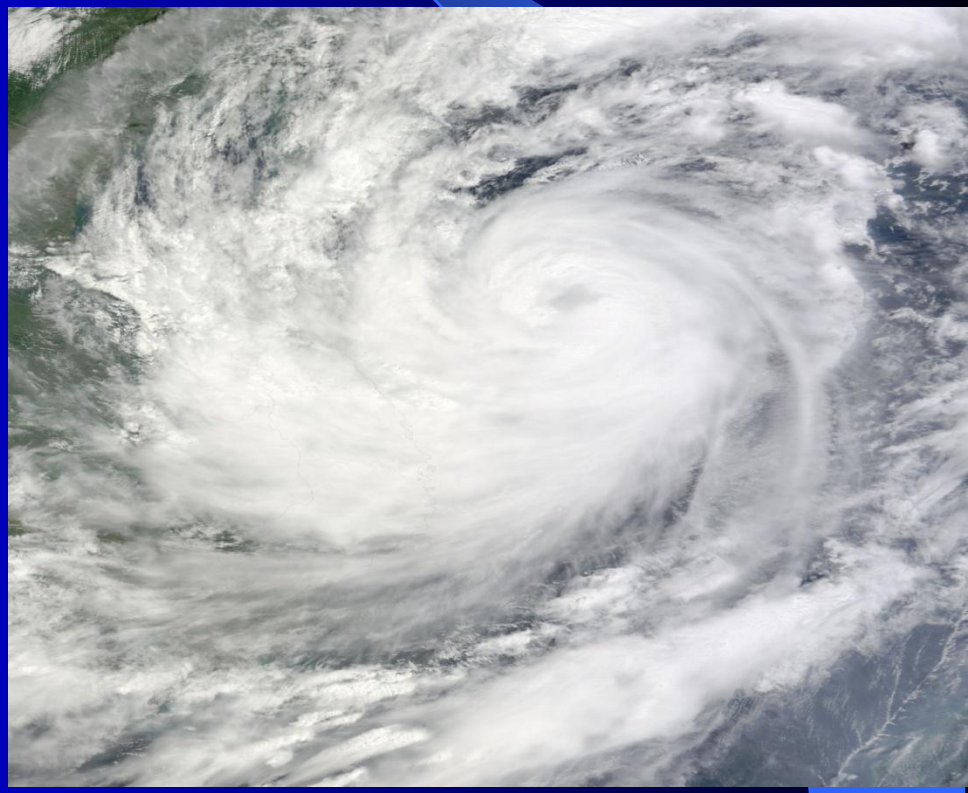


24 hours Rainfall from 26-30 Sept 2009



Typhoon Ketsana destroyed over US$140 Million estimated by National Committee for Disaster Management(NCDM)

- - More than 30,000 hectares of rice crops are flooded
- - 2000 homes destroyed
- - The flood waters also took away many cattle, destroyed roads and other social infrastruture.

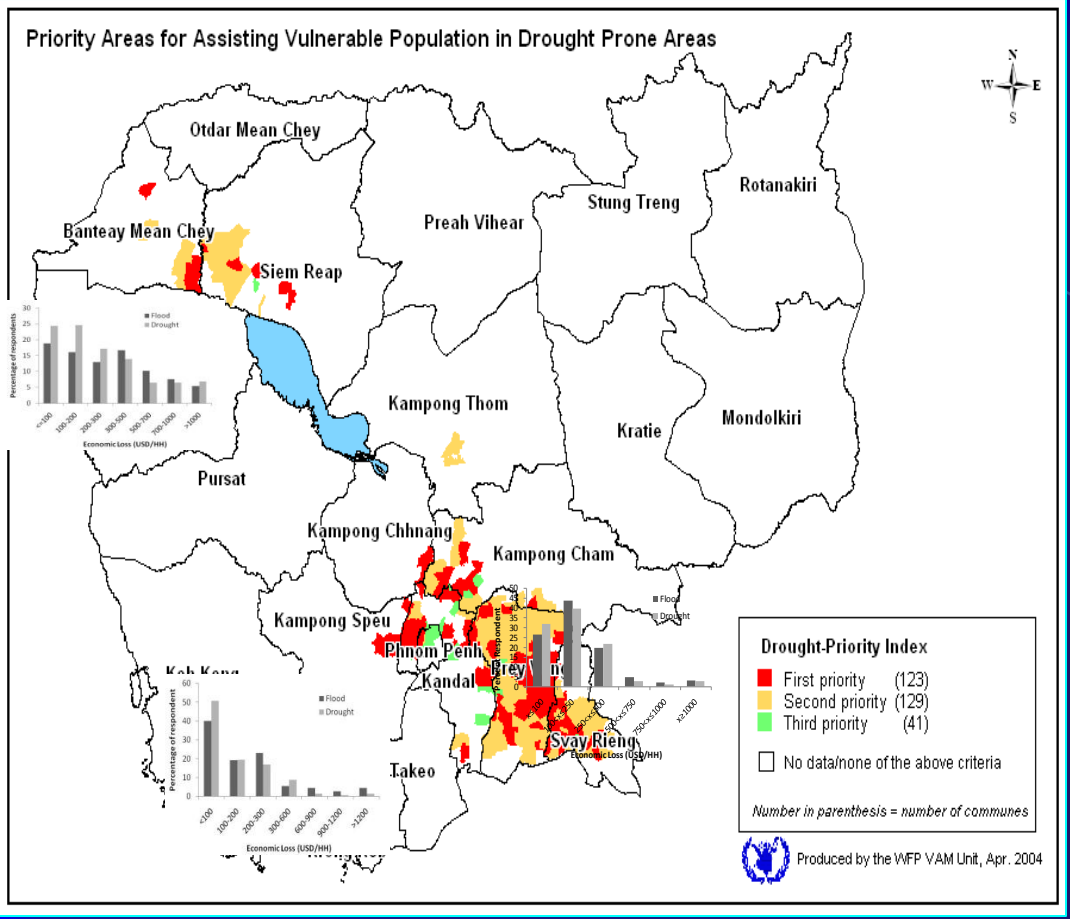


Droughts

Drought: drought in Cambodia is also another natural disaster. Droughts are most often associated with low rainfall and semi arid climates.

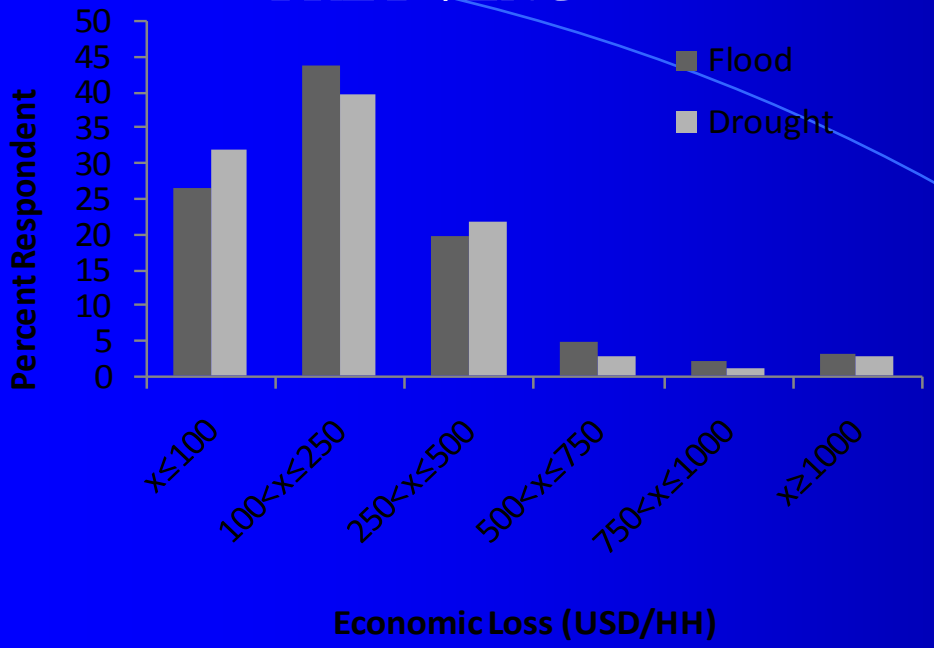
- Cambodia was hit badly by droughts in 1995, 1998, 2001 and 2002.
- In 2001, Battambang, Pursat, Prey Veng, Kampong Speu, Kampong Cham, Kampot, and Svay Rieng were affected by drought. Food shortages affected approximately 133,000 families, about half a million people. At the start of 2002, a long dry spell affected eight provinces covering almost 72,000 hectares.

Drought and Flood Priority Index 2008



Most of vulnerable Communes of three provinces are currently expose to higher frequency of extreme events (floods and drought) meaning that climate risk are high in these commune

PREY VENG

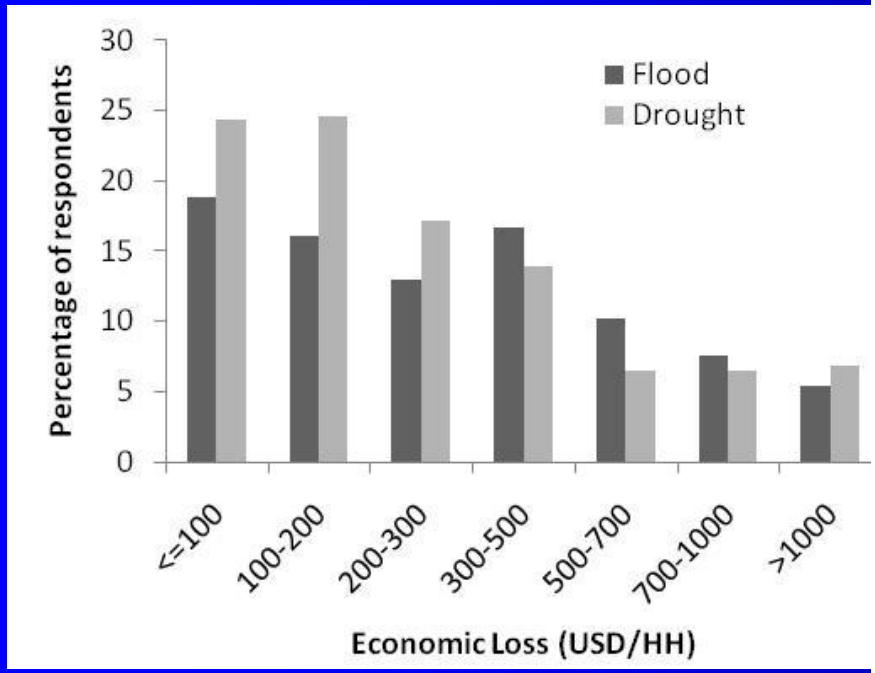


ECONOMIC LOSS DUE TO FLOOD AND DROUGH IN AGRICULTURE SECTOR

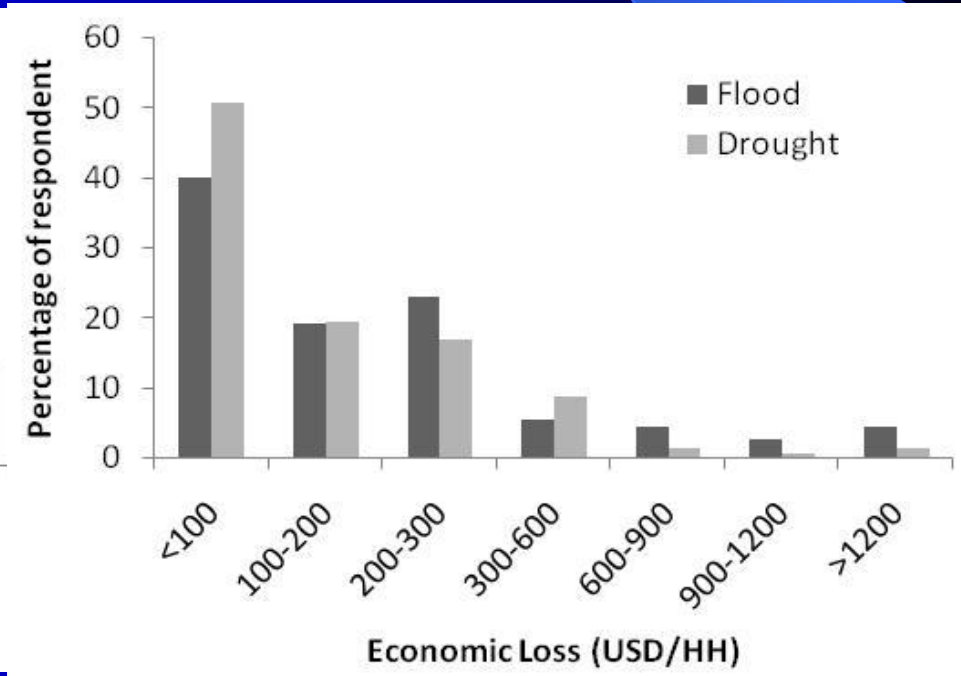
Distribution of economic loss suggests that Prey Veng is impacted more seriously by Extreme Climate Event (ECE) than other two Provinces.

Eco. Loss due to ECE in Three pprovices range from 100 to 5000 US$/HH

BATTAMBANG



KAMPOT

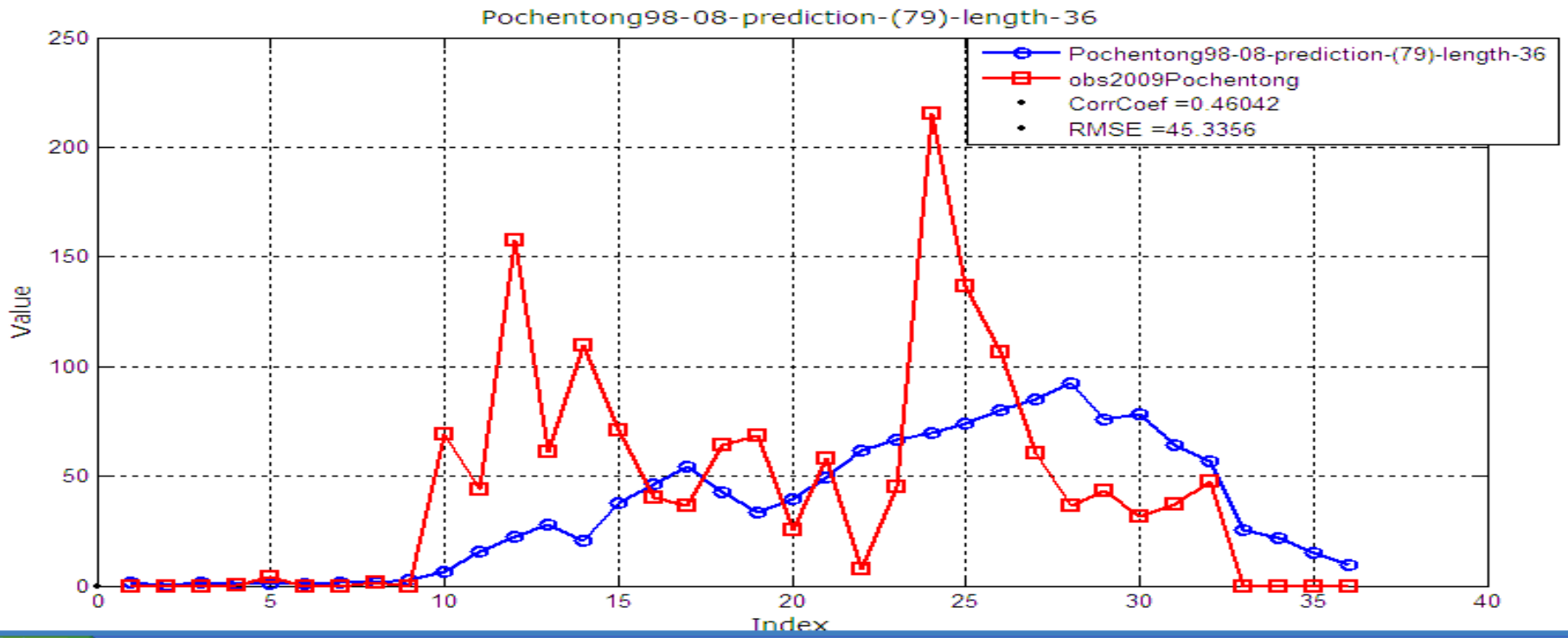


First experience by using HyBMG version 2.07 Indonesia

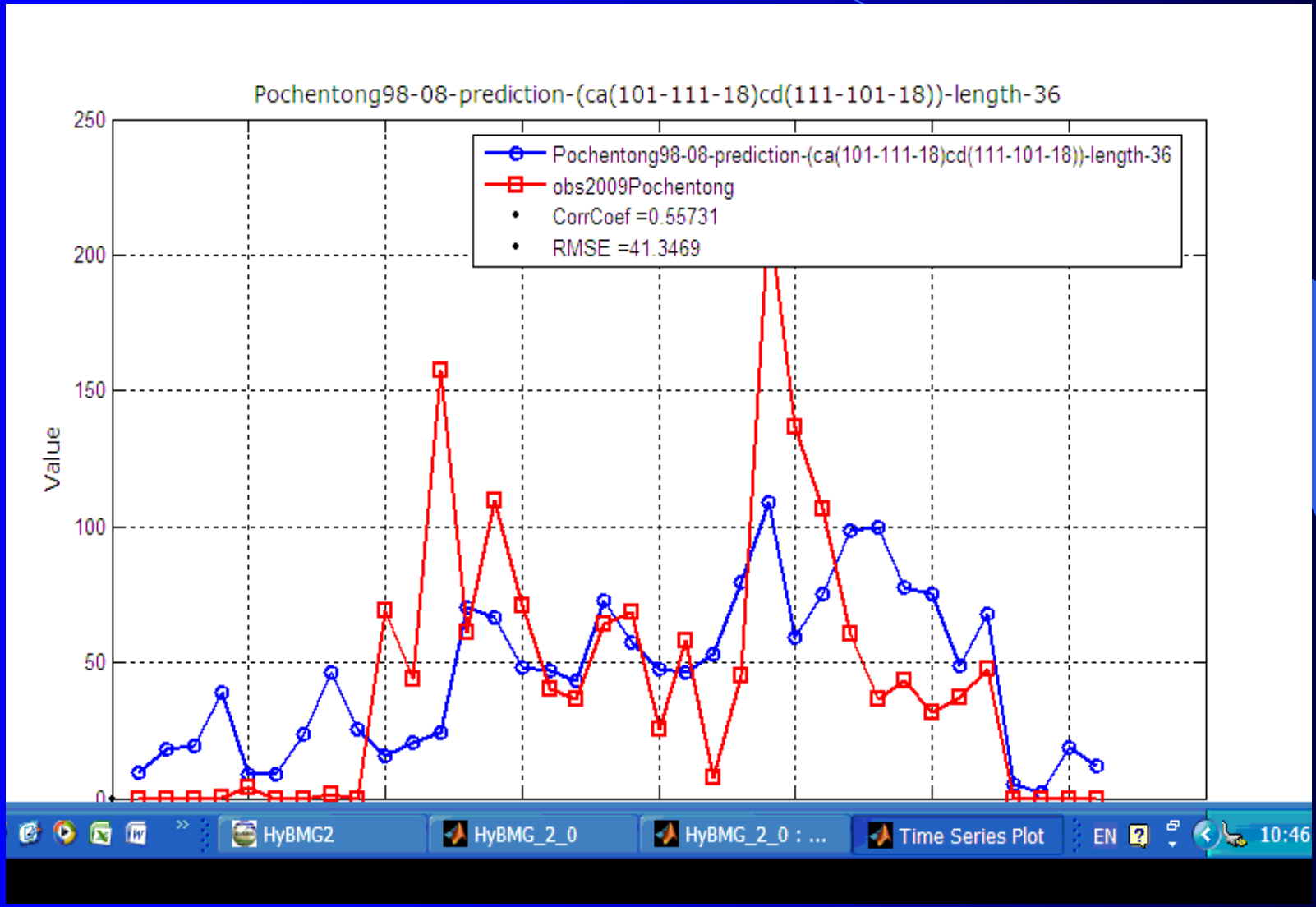
- -HyBMG method is time series for 10 days rainfall forecast and consists of three techniques:
- 1- ANFIS (Adaptive Neuro Fuzzy Inference System)
- 2 WAVELET and
- 3 ARIMA (Auto Regressive Intergrated Moving Average)

10-day Rainfall Prediction (mm) at Pochentong station by using Hy BMG 2.0.7

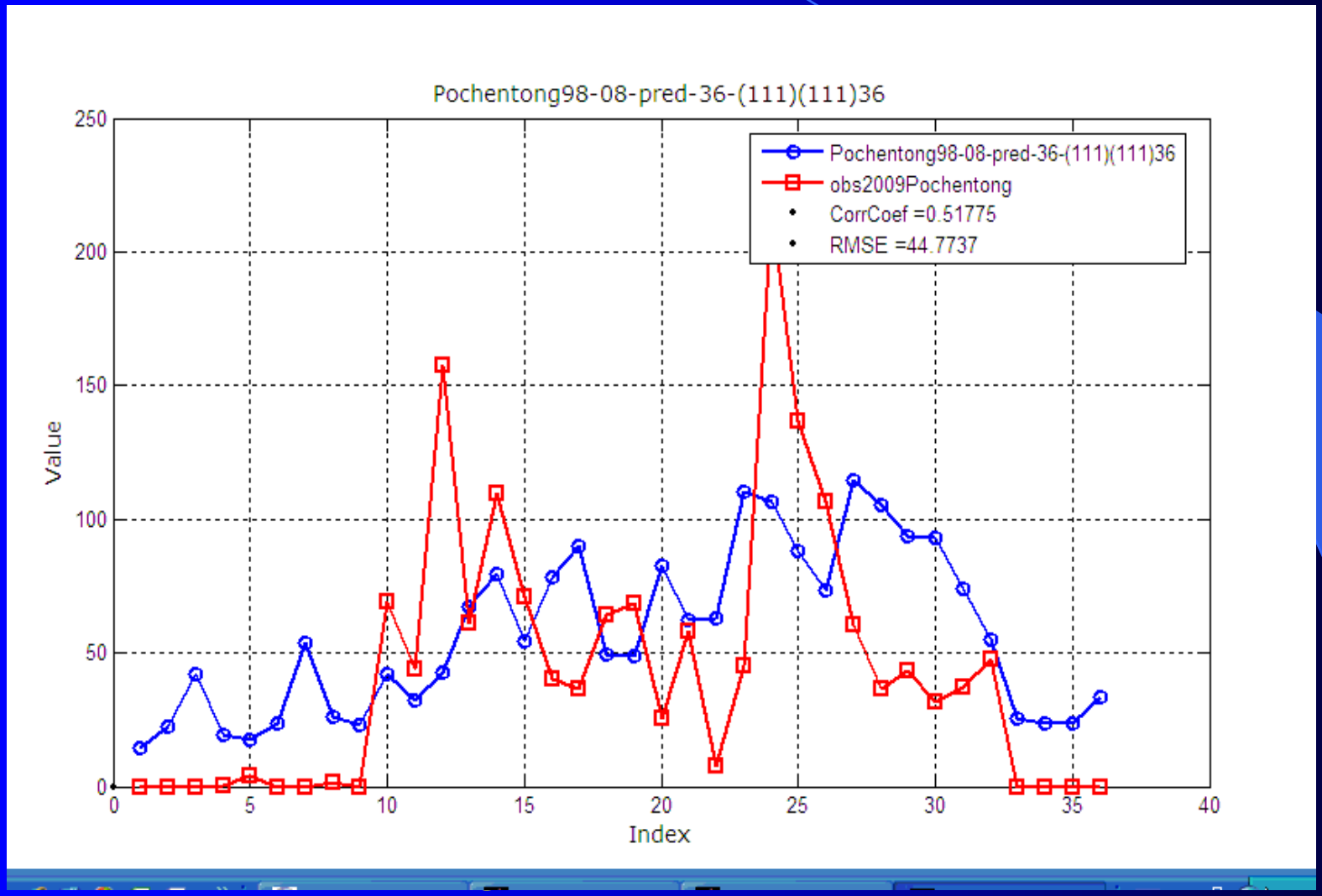
Estimated with ANFIS model



10-day Rainfall Prediction (mm) at Pochentong station by using Hy BMG 2.0.7
Estimated with Wavelet method



10-day Rainfall Prediction (mm) at Pochentong station by using Hy BMG 2.0.7
Filtered by ARIMA



CAMBODIA METEOROLOGICAL DEPARTMENT

- Five offices in DOM
- Total Staff: 57
- - 5 masters degree (Russia)
- - 4 engineers
- - 29 Technicians
- - 11 primary technicians a
- - 8 unqualified staff

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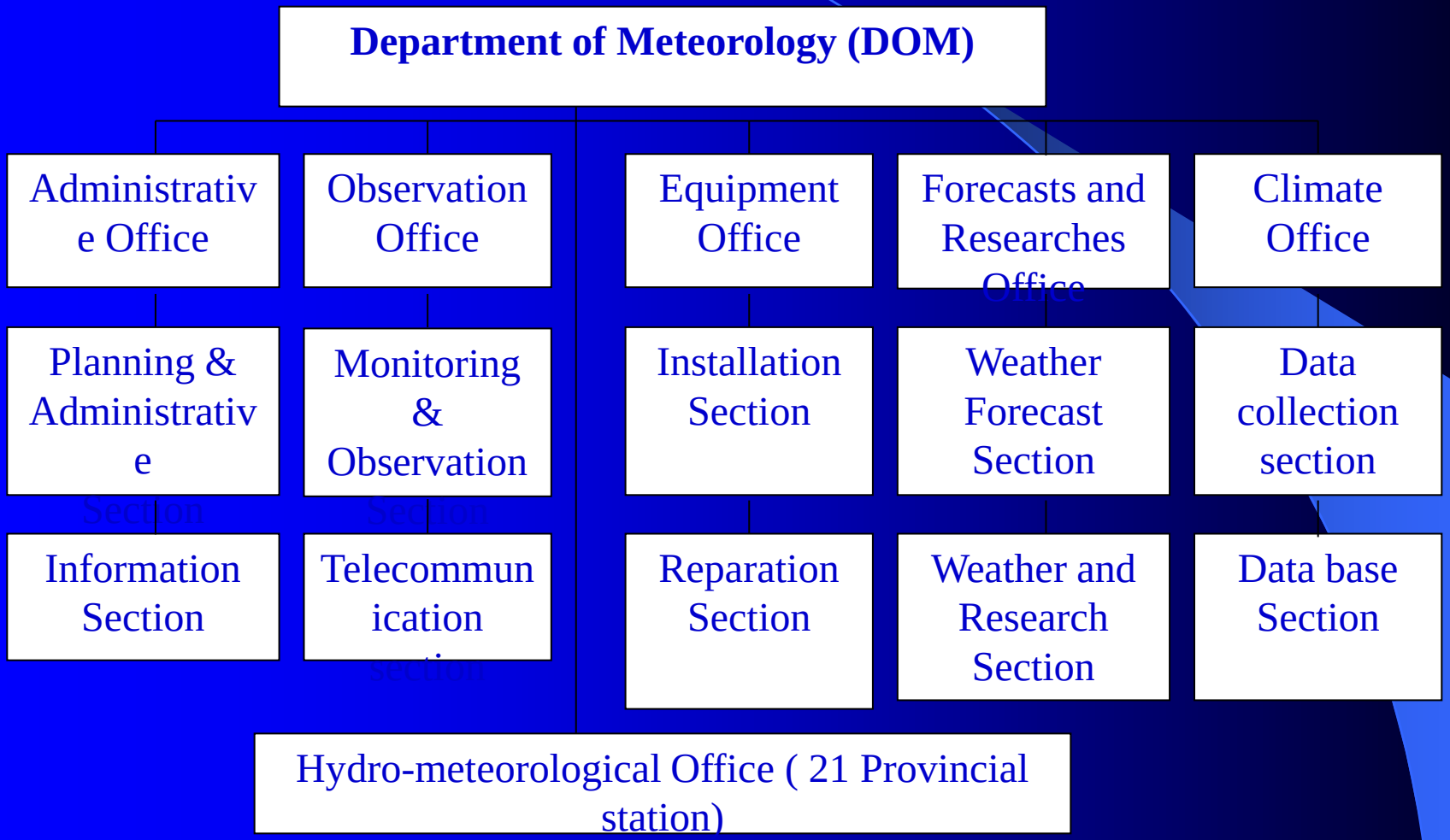
Phnom Penh, CAMBODIA

Organization Structure of DOM



Activities of Department of Meteorology

DOM Main Mandates:

- Install and manage the weather monitoring network throughout Cambodia
- Monitoring weather condition happening in the region
- Issue the weather forecast and provide warning on weather condition to relevant ministry and public via media
- International and regional cooperation in data information sharing, researches and training.

9 AWS

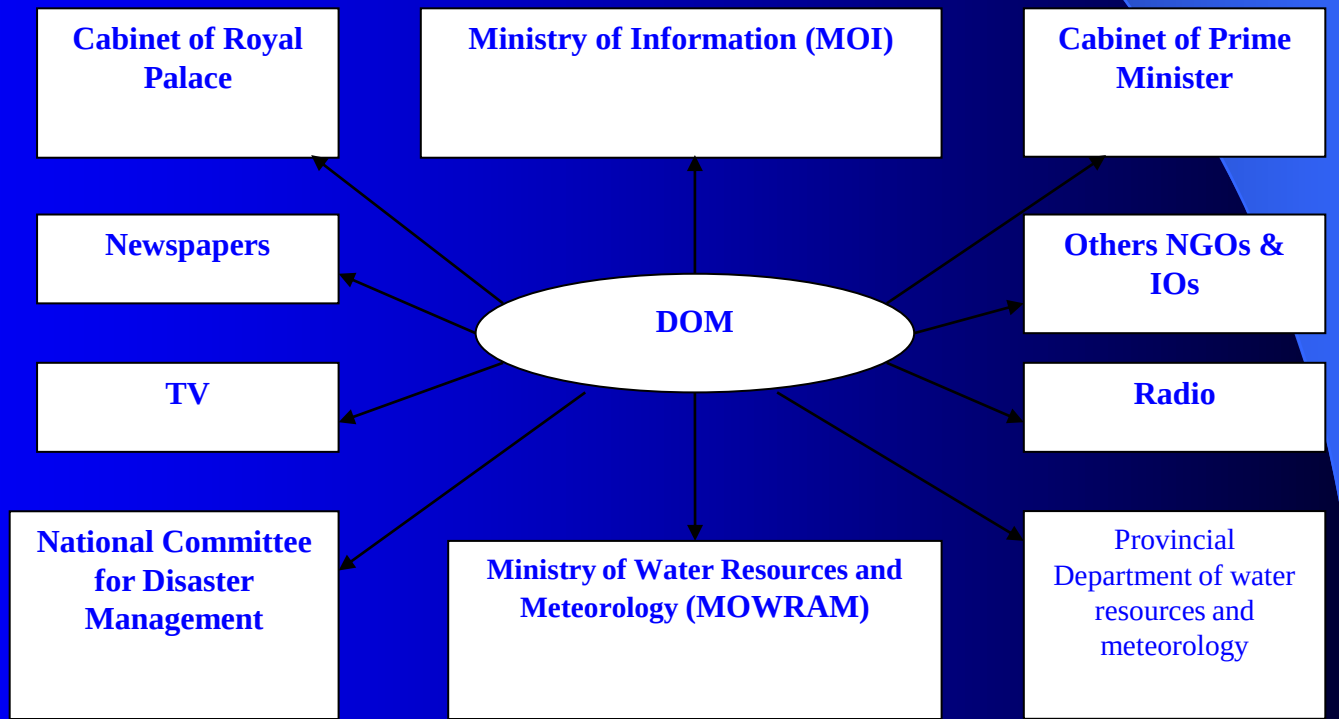
15 synoptic stations

124 rain gauges

- One GTS switching system (2008) form Jica
- One MTSAT Satellite(2008) from Jica

Responses to Disaster events in Cambodia

- the Department of Meteorology and the Department of Hydrology and River Works are responsible for producing and weather and flood forecasting.
- All weather information and flood warning are daily sent to various relevant agencies:



Severe Weather Forecasting Demonstration Project (SWFDP) for Southeast Asia(RAII)

- -The SWFDP for Southeast Asia is being developed for Cambodia, Lao PDR, Thailand and Viet Nam
- - the SWFDP will enhance:
  * the capabilities of these countries in the Global Data-processing Forecasting System (GDPFS) and the Public Weather Services (PWS)
  * increasing availability, and developing capacity to use existing Numerical Weather Prediction (NWP) and Ensemble Prediction Systems (EPS) and contribute to disaster risk reduction.

United Nations for International Strategy for Disaster Reduction (UNISDR) Project

- Form 14- 18 June 2010 Philippine Meteorological Society dispatched two ladies delegates to visit Cambodia, Department of Meteorology and other agencies. The purpose of this project:
- - To strengthening Meteorological and Hydrological Services in South East Asia
- - Project Area 5 countries: Cambodia, Indonesia, Lao PDR, Philippine and Viet Nam.

- Organized by: UNISDR
- Technical Suport: World Meteorological Organization(WMO)- WMO Regional Office Disaster Risk Reduction Programme
- Financial Support: World Bank
- Project duration: 5 years

THANK YOU!