Flood Risk Management Case Visit in Malaysia

- An overview of Hydrodynamic Flood Forecasting Operation and Simulation

National Flood Forecasting and Warning Centre (PRABN)
Department of Irrigation and Drainage, Malaysia (JPS)
Hydrodynamic Flood Forecasting Model

What do we expect?

- Capable of modelling complex condition
- Capture near to real catchment condition
- Extended flood forecasting lead time / response
- Accurate & informative flood warning dissemination
- Skilled and experienced flood forecaster

Kuala Krai, 2014
Forecasts at a glance..

Early warning sign

- Scent
- Hearing
- Vision

Modern day flood forecasting

- Numerical Weather Prediction (NWP)
- Radar Rainfall
- Observed Rainfall

- NWP / GFS - Forecast (up to 7 days)
- Radar - Nowcast
- Observed Rainfall - Hindcast

N.H.M.Ghazali & W.H.Azad, 2018
Key Components of Hydrodynamic Flood Forecasting

1. Rainfall and Catchment Information
   How much rain is likely to fall and what are the possible catchment losses?

2. Hydrologic Process
   Convert rainfall into runoff at discrete locations in the catchment

3. Hydraulic Process
   Convert catchment surface runoff into river discharge through a stream and on a floodplain (forecast flood levels)

4. Flood Outcomes
   The possible impact of the forecast flooding & warning dissemination to various stakeholders to manage/plan flood emergency operations

Flood Model Simulation
Overview of NaFFWS Components

1. Input Data
2. Model Simulation
3. Output

Hindcast
- Rainfall
- Water level
- Reservoir operations

Nowcast
- Radar rainfall
- GFS rainfall forecast
- NWP rainfall forecast

Forecast

Gateway

Database

Modelling System

Dissemination
- Email
- SMS
- Web
- App

Sg.Kelantan
Sg.Terengganu
Sg.Pahang

Modified after HRW, 2018
Daily Flood Forecast Operation

Weather Satellite Imagery (IR) Himawari - 28/12/2018

Flood forecaster will monitor possible storm event based on weather satellite imagery provided by MMD website & windy.com

http://bencana.met.gov.my/bencana/satellite.html
PRAB System: Input Data

NWP Forecast Rainfall Data (MMD) 31/12/2018 – 6/1/2019

Spatial rainfall data (NWP/GFS/Radar) & telemetry gauge rainfall as the main data input to the model
1

PRAB System: **Input Data**

Flood forecaster will monitor observed / nowcast radar data & gauged rainfall / water level data (telemetry) based on MMD website & publicinfobanjir

![Image](https://api.met.gov.my/static/images/swirl-latest.gif)

![Image](http://publicinfobanjir.water.gov.my/)

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**Observed 08:40am Thursday 03Jan2019**

**Observed 08:40am Thursday 03Jan2019**
PRAB System: Model Simulations

Telemetry Radar NWP GFS

JPS Forecast Data Center (FDC)

Run Time Origin of 2D Flood Model

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PRAB System: Result Output & Interpretations

Target Point Alerts
- In the floodplain

Forecast water level at telemetry station shows possible heavy storm event 7 days in advance

Key Forecast Point Alerts
- In the river
Interpretation of possible flood event by forecaster, *State Hydrology Officer* (PHN) and PRABN Operation Director before dissemination of flood warnings.
PRAB System: Alert & Warning Dissemination

Disseminate flood warning to NADMA and related stakeholders via email, WhatsApp, etc.

Monitor the possible flood event & update flood warning if necessary (time to flooding, extend of floods, & list of possible flooded area)
Way Forward

Flood Forecasting Model Coverage (Completion in 2022)

41 main river basins
Conclusion

- Flood forecasting model as a tool → Alerts can be generated automatically, but still need human touch & forecaster soft touch and experience;

- Forecast rainfall data need to be updated and recalibrate with gauge rainfall data → to improve the forecasted rainfall data before being used as input to the flood forecasting model;

- Updating of hydrodynamic flood models and model fine-tuning → continuous process.
Thank You