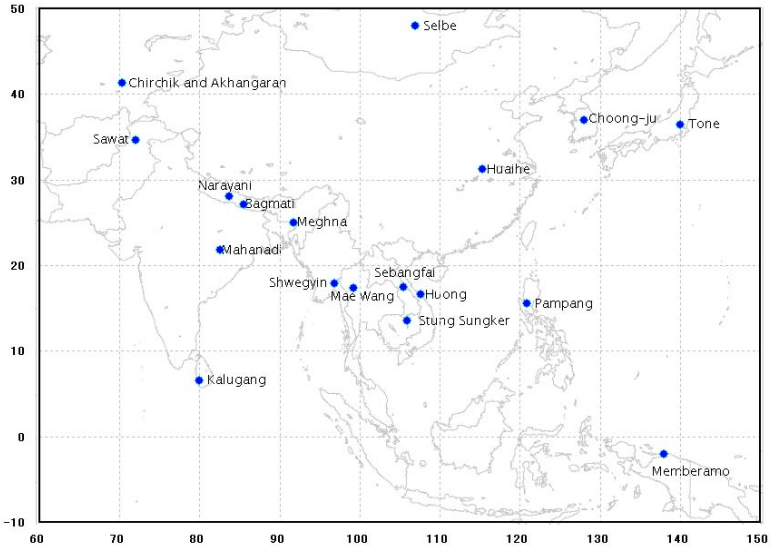
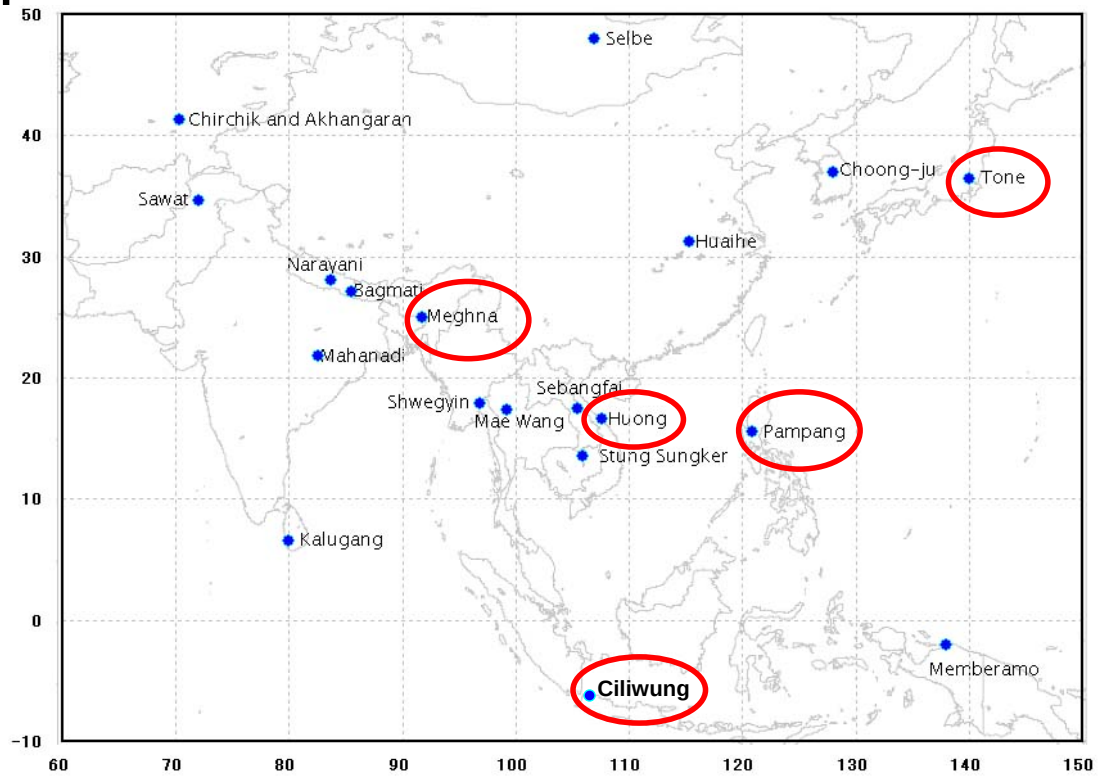
THE UNIVERSITY OF TOKYO

Hydrological Applications on AWCI Reference Basins



Oliver SAAVEDRA
Earth Observation Data Integration and Fusion Research Initiative (EDITORIA)
Department of Civil Engineering

Update on AWCI Reference basins



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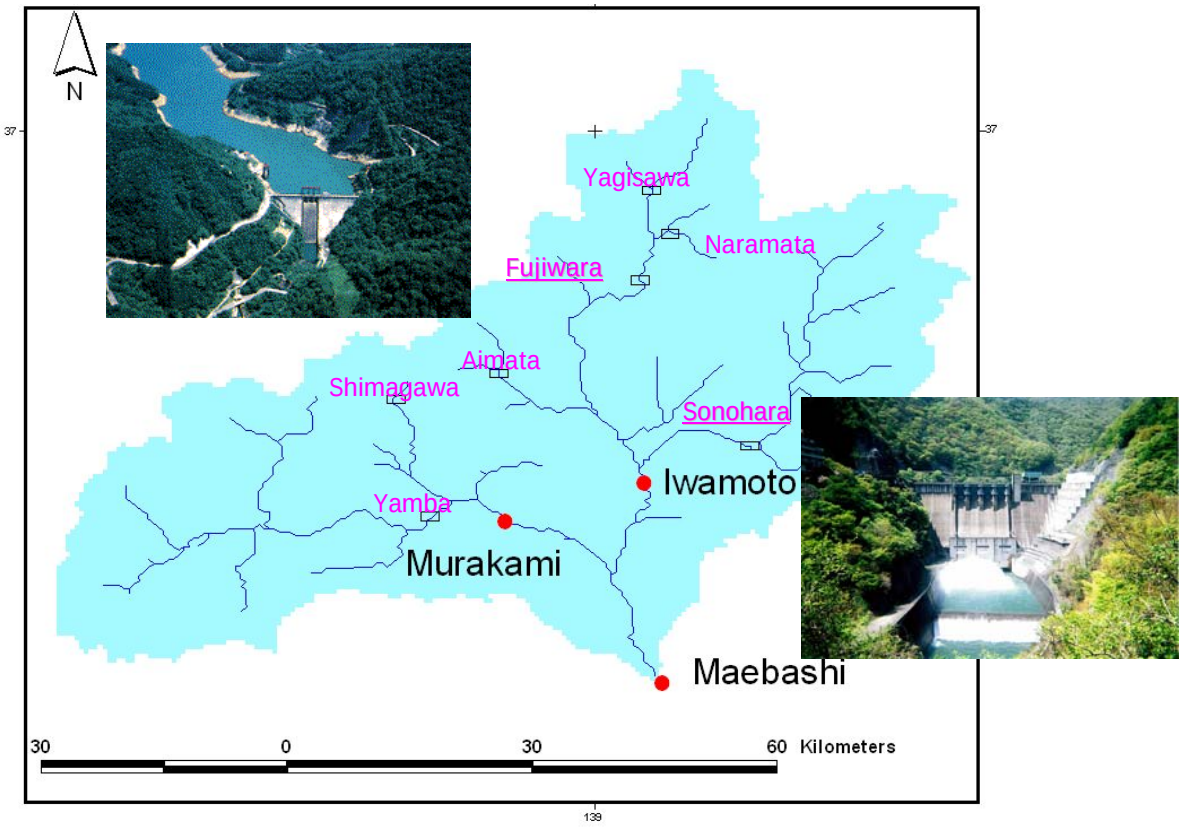
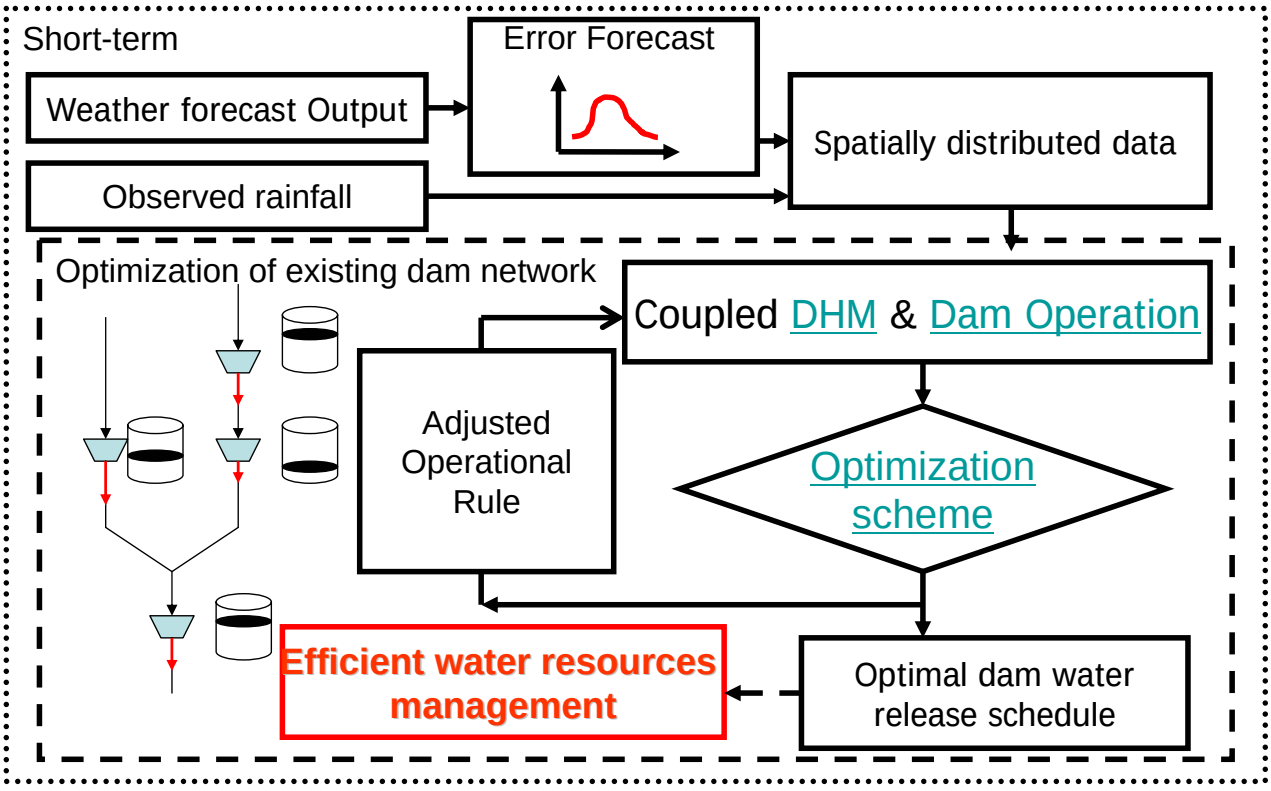
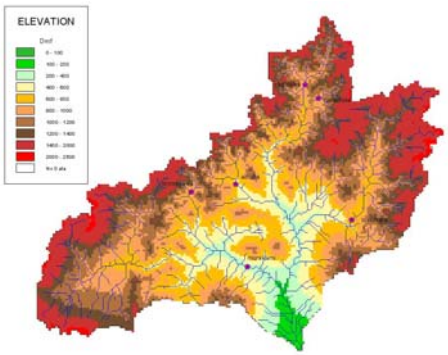
Upper Tone River Basin

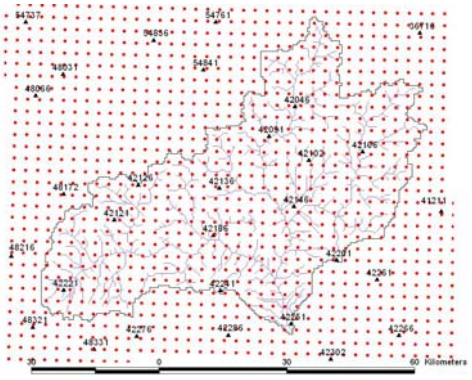


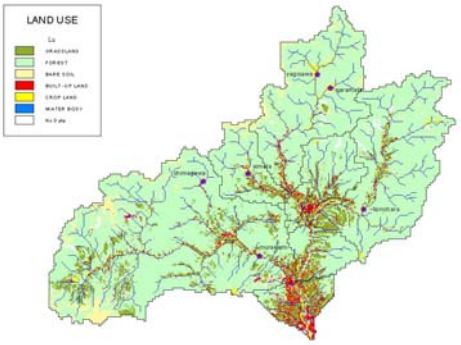
Multipurpose Multi-Reservoir

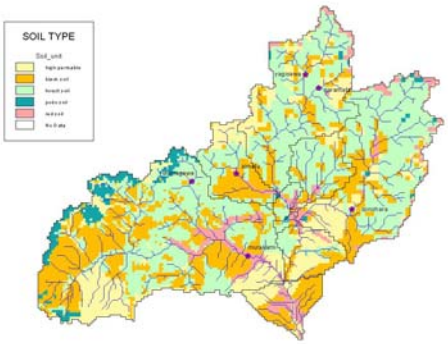


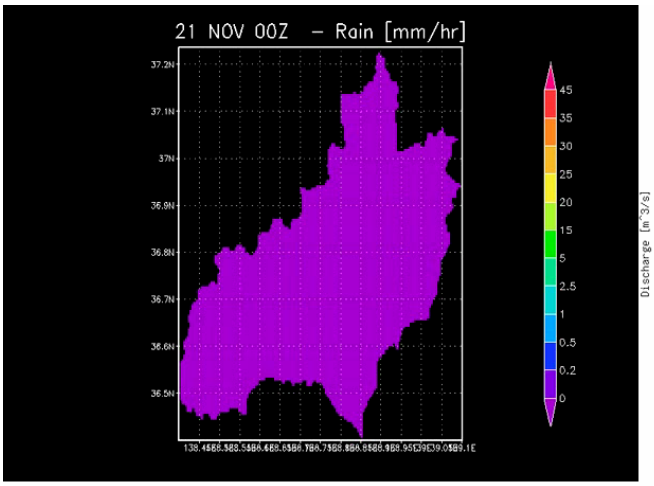
Spatial input data

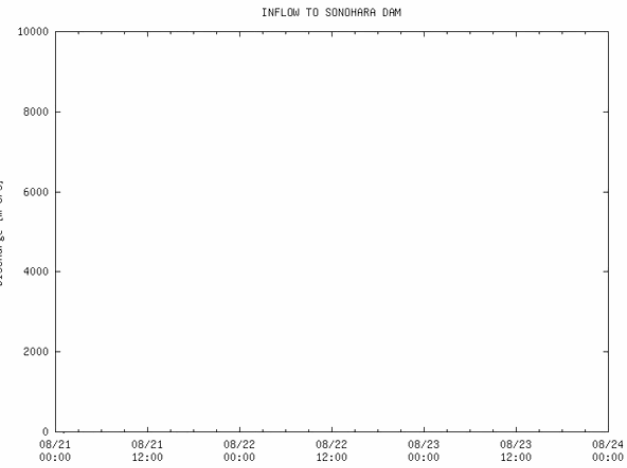


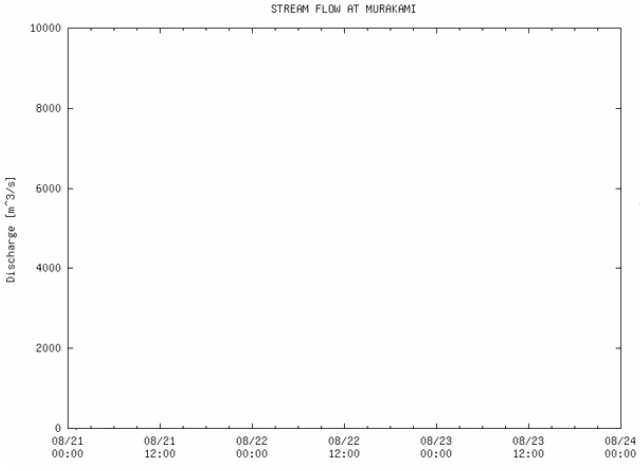


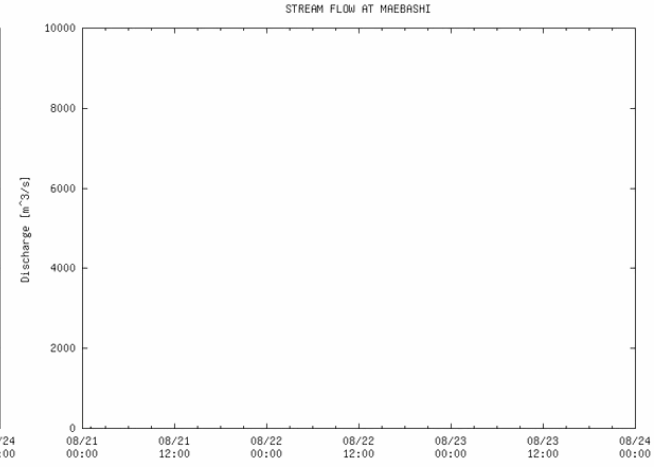




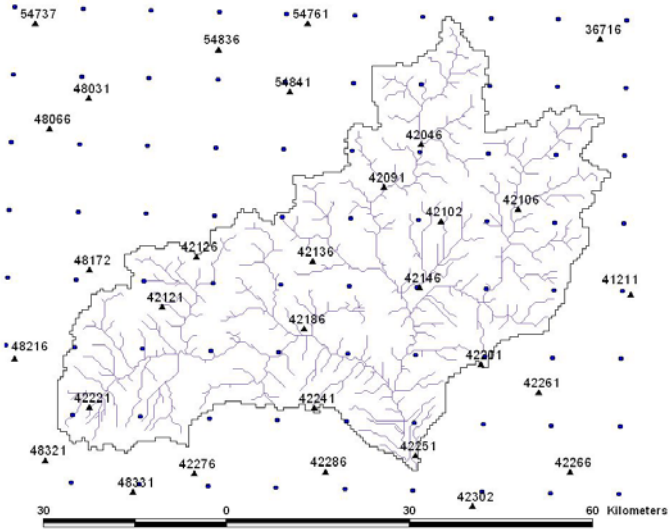






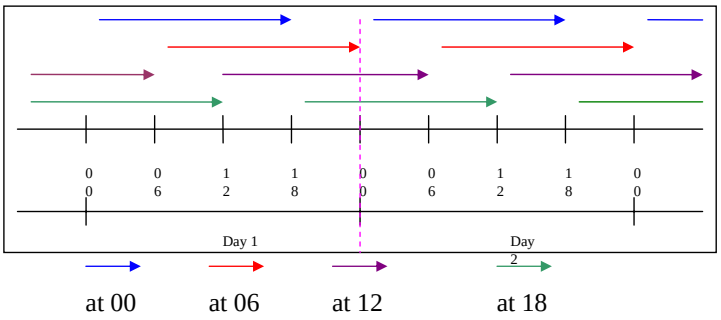


Weather forecast data



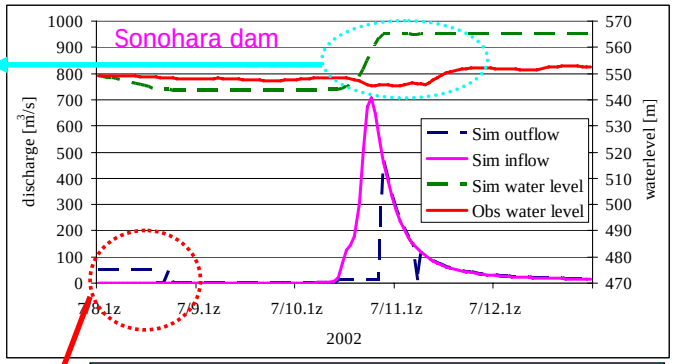
Grid Point Value (GPV)

- Meso-scale (2002/07~)
- 0.125º spatial resolution
- issued every 6 hours
-18 hours lead-time (hourly)

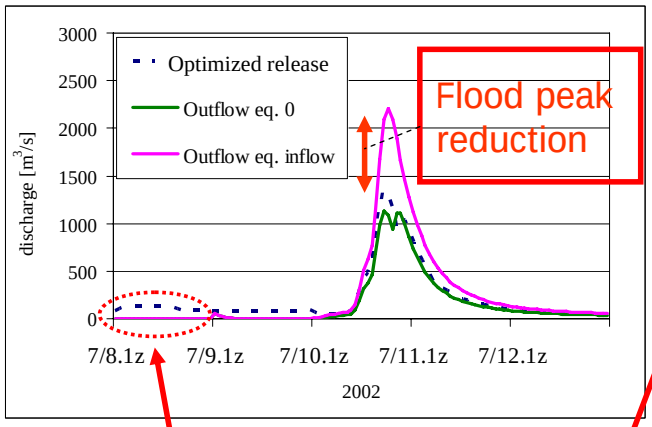


Flood reduction with GPV 7~12

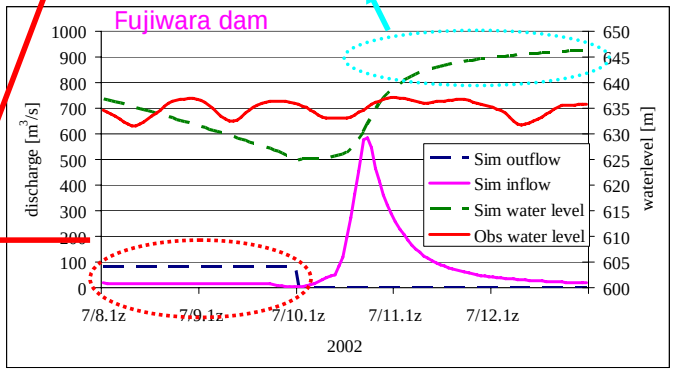
Water is stored until max capacity is reached



Iwamoto gauge



Water level increase due to storage



Peak created due to water release from dams

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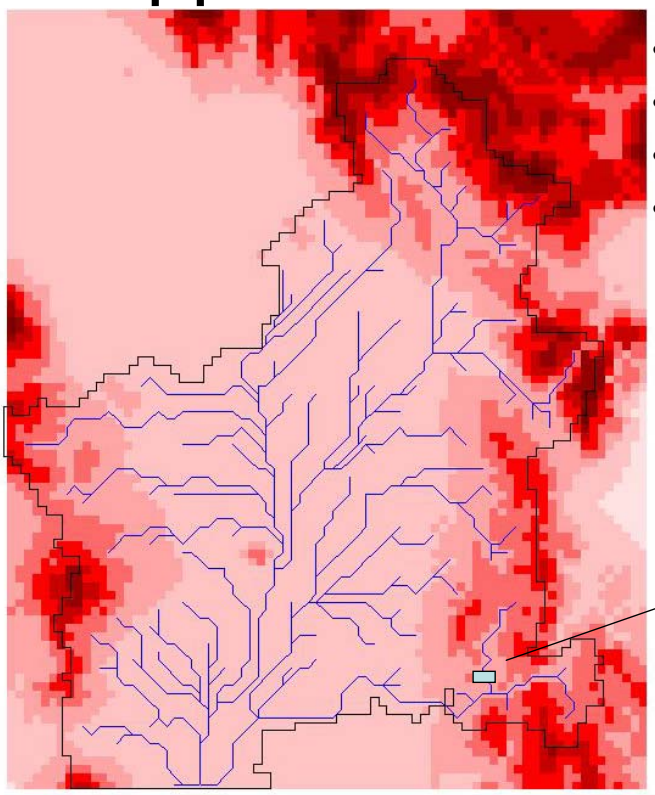
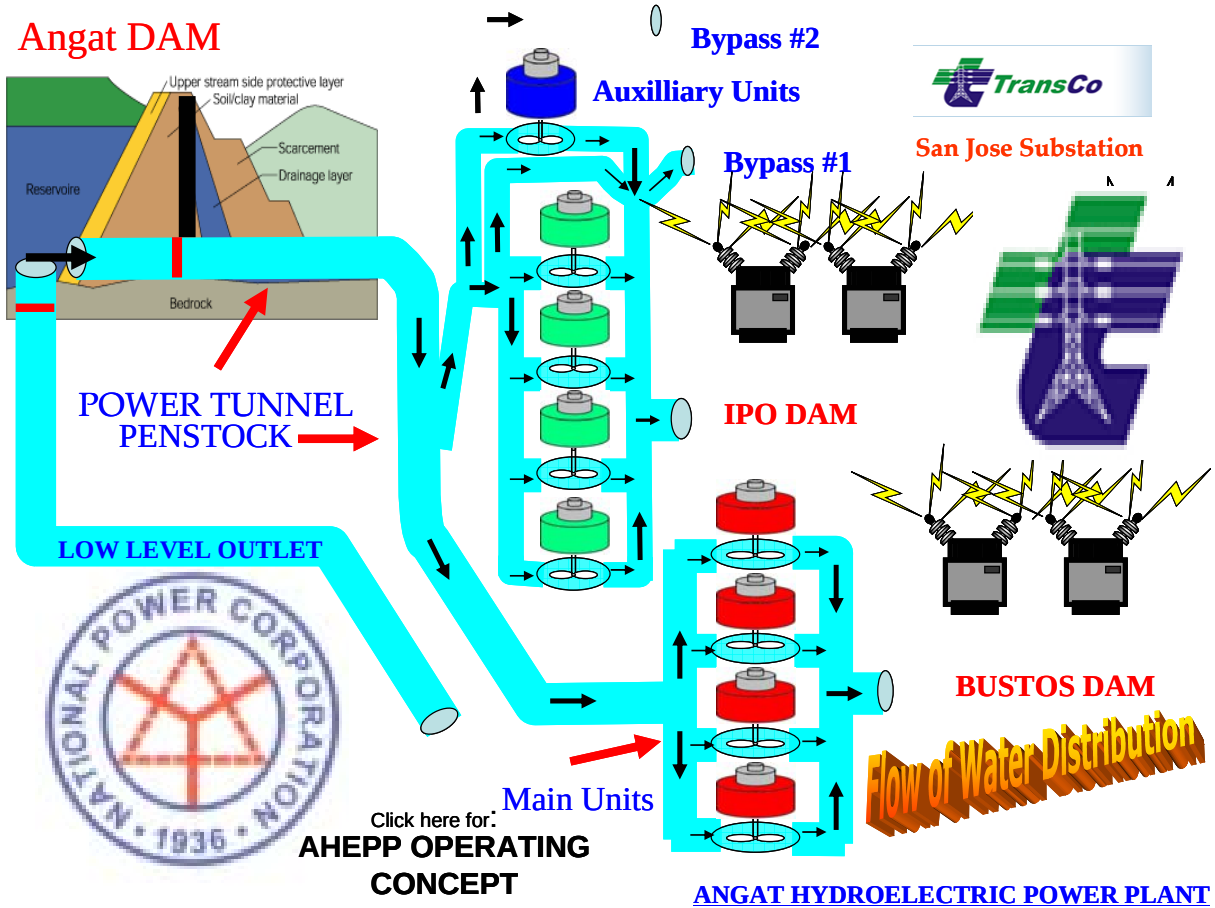
Application on Pampanga River



- Simulated area: 10,000 km^2
- Computing Grid: 1800 m
- Target event: Oct-Dec 2004
- Input Rainfall:
  - Observed
    - TRRM, 3hr, 0.25˚
  - Forecast
    - Global JMA/GPV, 24 h lead every 12 h



Customize of Cost Function

Not only to minimize flood damage
but also to consider future water use and power generation

Flood Control

Angat River Basin has a long history of floods.

serving as a flood control facility of about 63MCM of floodwaters

Maximize {the benefit from water use and power generation}

Minimize {the risk of flood damage}

Water Use

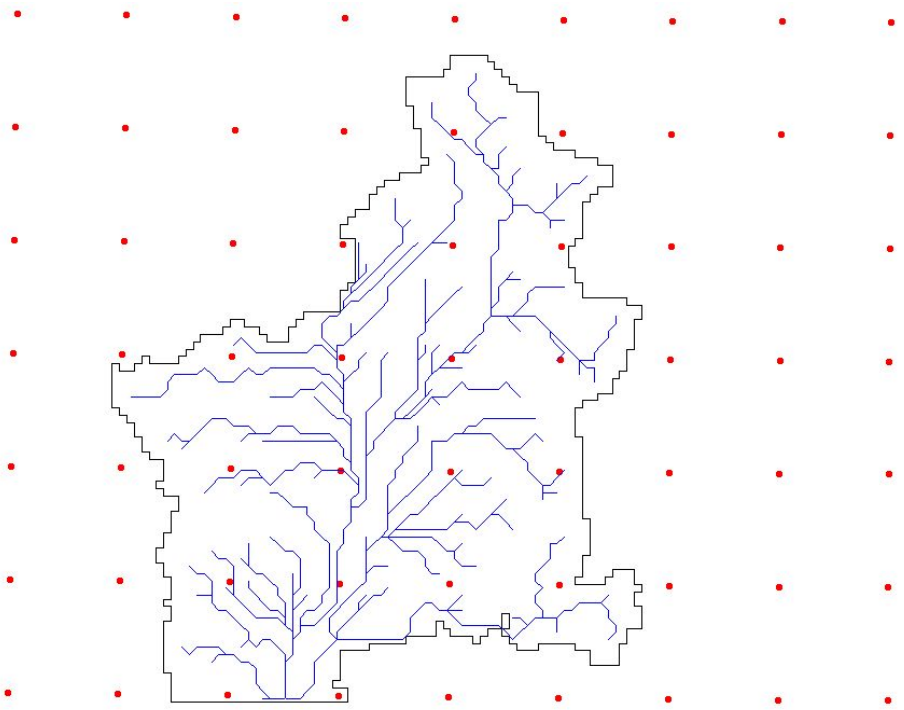
-To supply the domestic and industrial water requirements of residents in Metro Manila (97%)

-To provide irrigation to about 31,000 hectares of land in 20 municipalities and towns in Pampanga and Bulacan

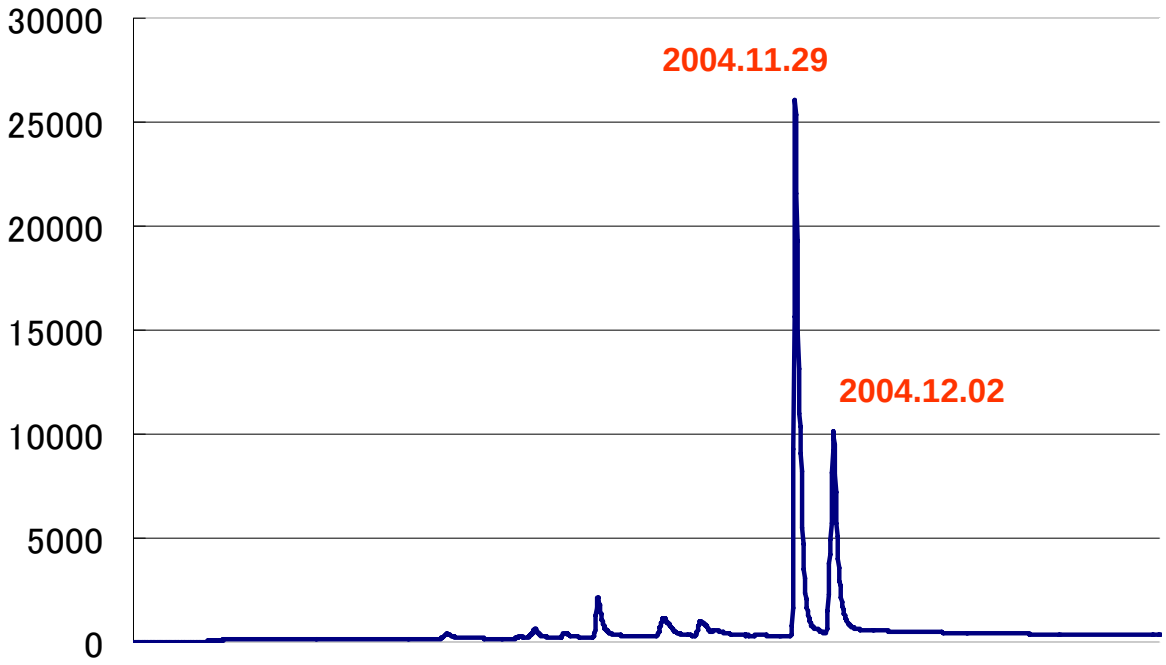
Power Generation

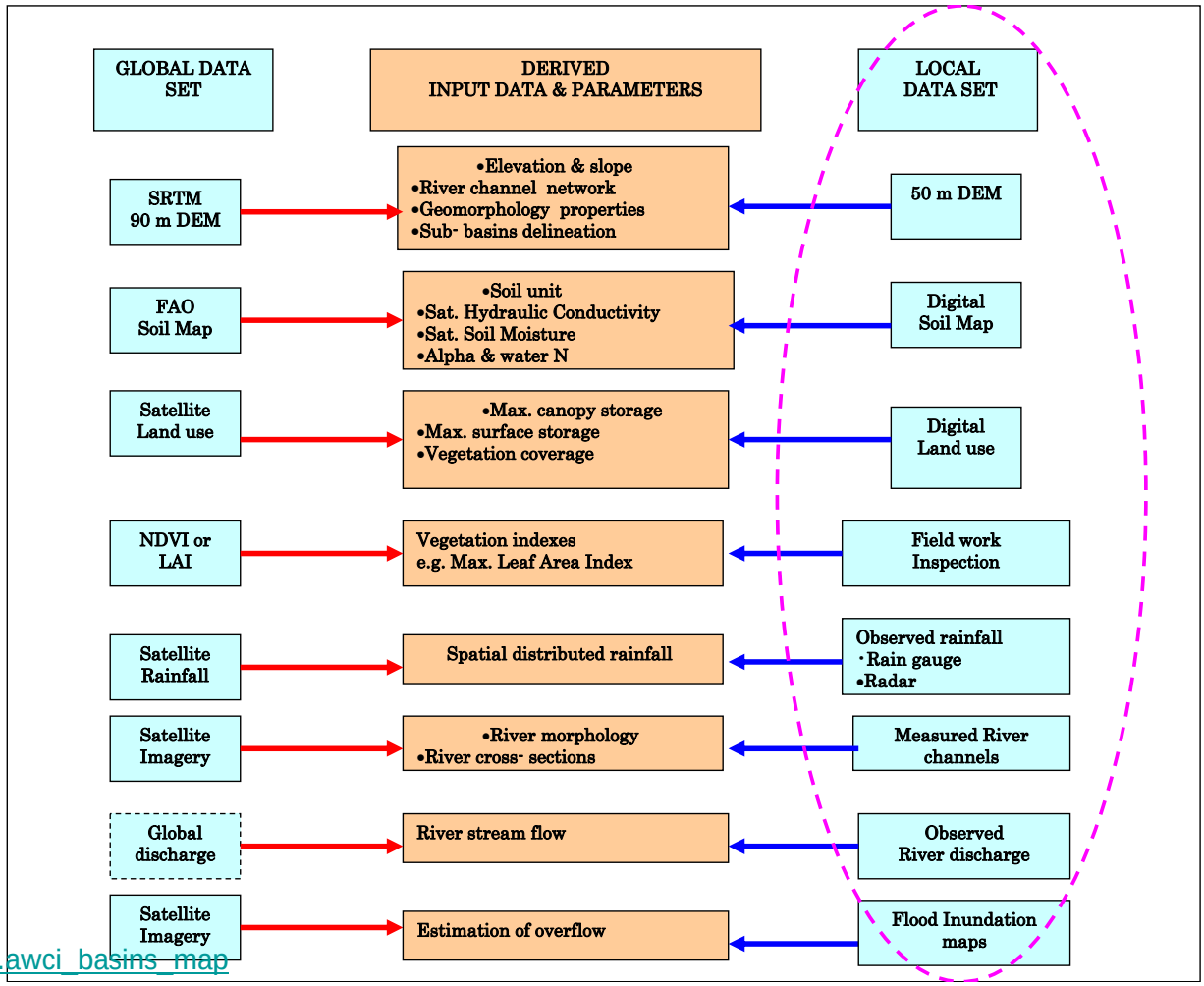
To generate hydroelectric power to feed the Luzon Grid

TRMM rainfall distribution



Simulated Hourly Q at Manila Bay





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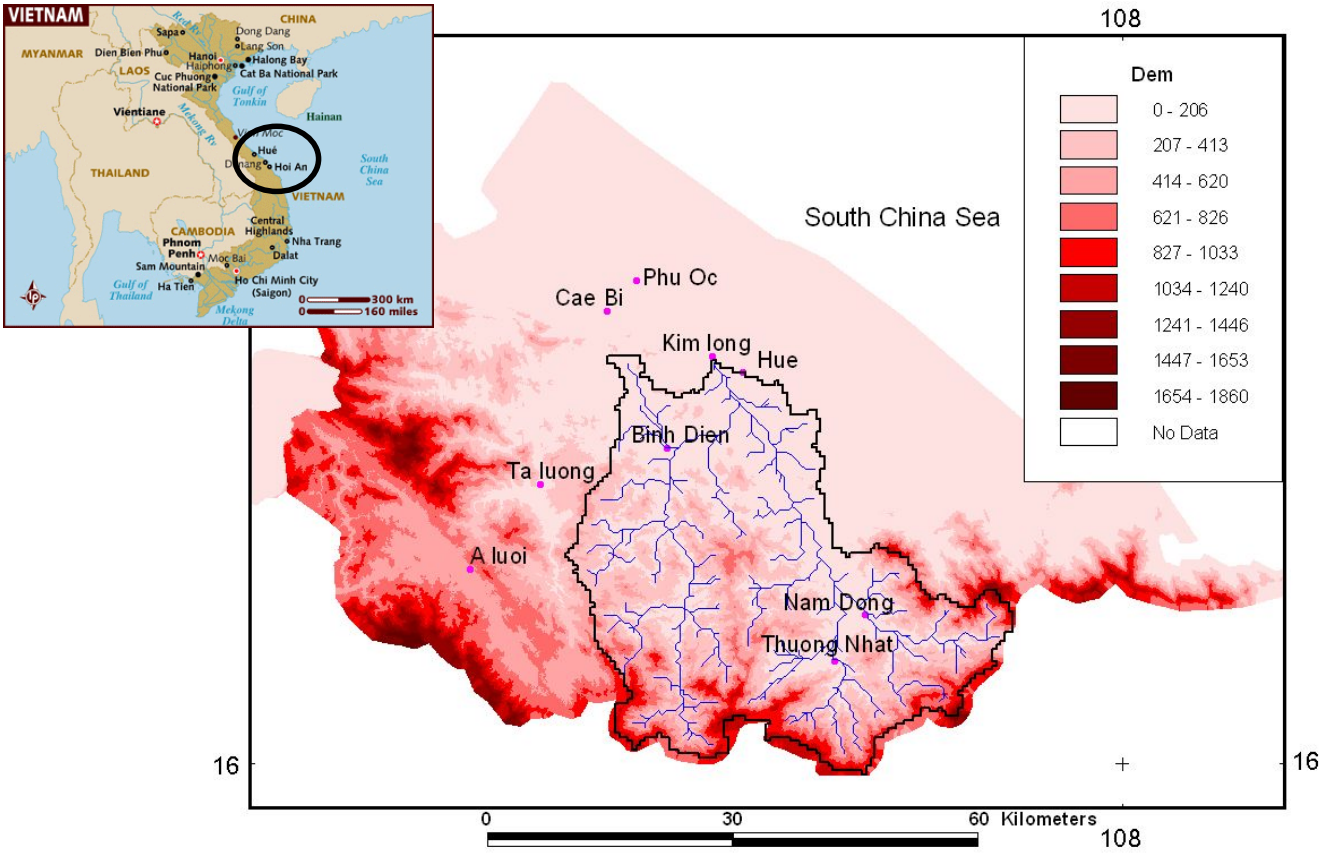
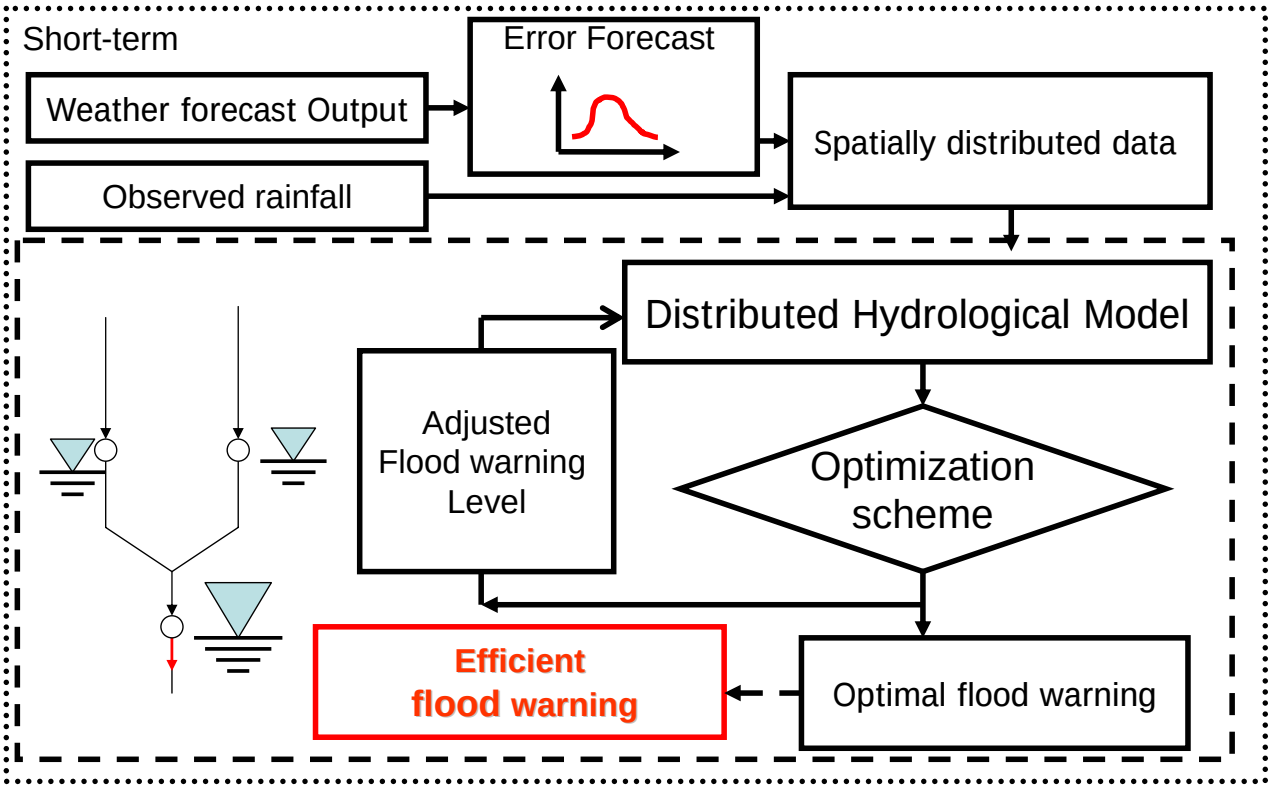
Huong River, Vietnam



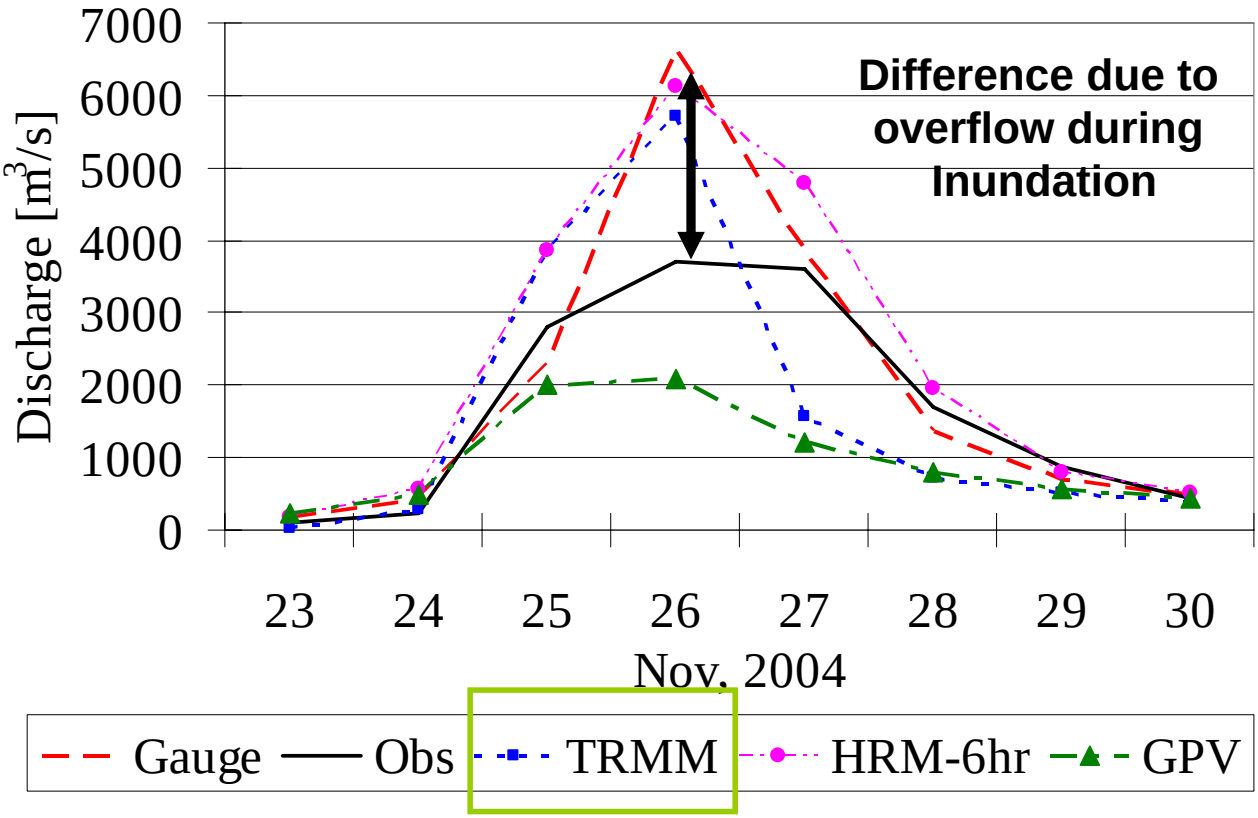
Optimal flood warning



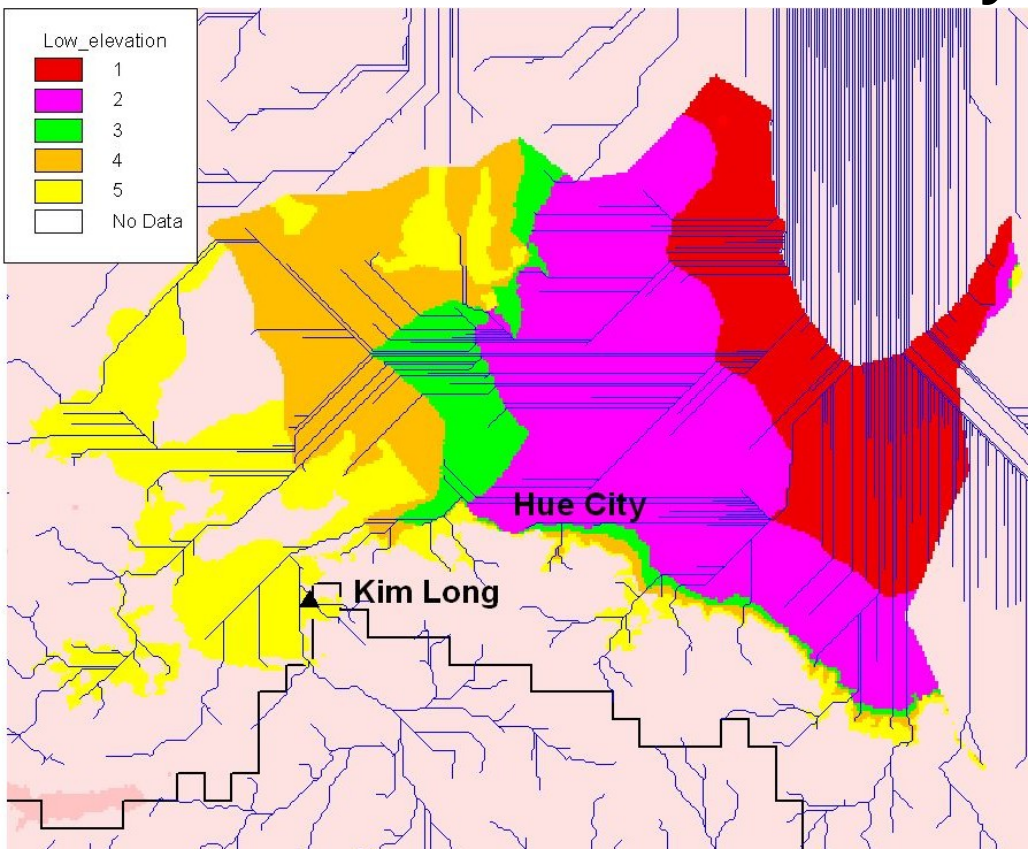
Facts about Huong Model

- Working window: 107.5-107.75E 16.0-16.5 N
- Simulated area: 1500 km^2 down to Kim Long
- Computing Grid: 500 m (from 50 m DEM)
- Target event: 22-26 Nov 2004
- Input Rainfall:
  - Observed
    - Rain gauge network (daily)
    - Global Satellite TRRM, 3hr, 0.25˚
  - Forecast
    - Meso- scale HRM: at hydro-met. stations (24 hr lead time)
    - Global JMA/GPV, 24 hr lead time issued every 12 hours
    - NWPO: UKMO, NCEP
  - Assimilated
    - Clouds microphysics ARPS, IMDAS

24-30 November Simulation



Inundation areas in Hue City



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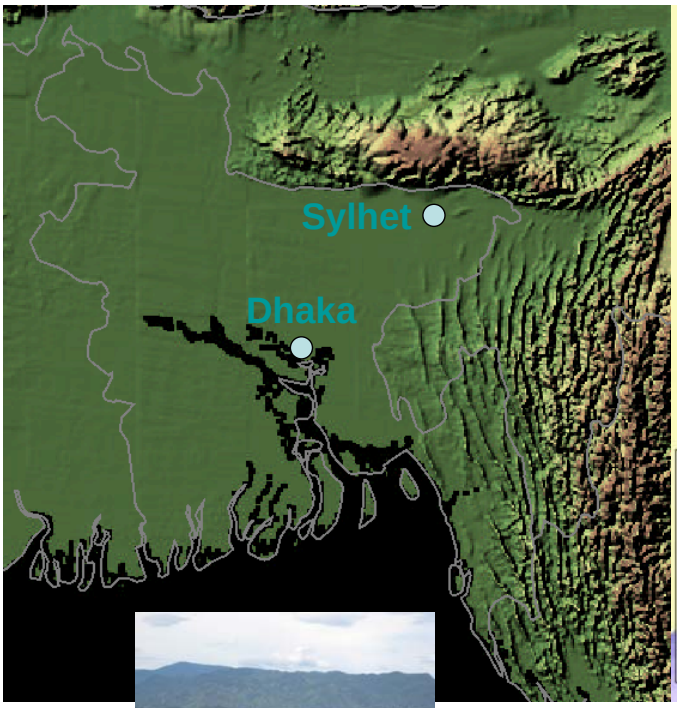
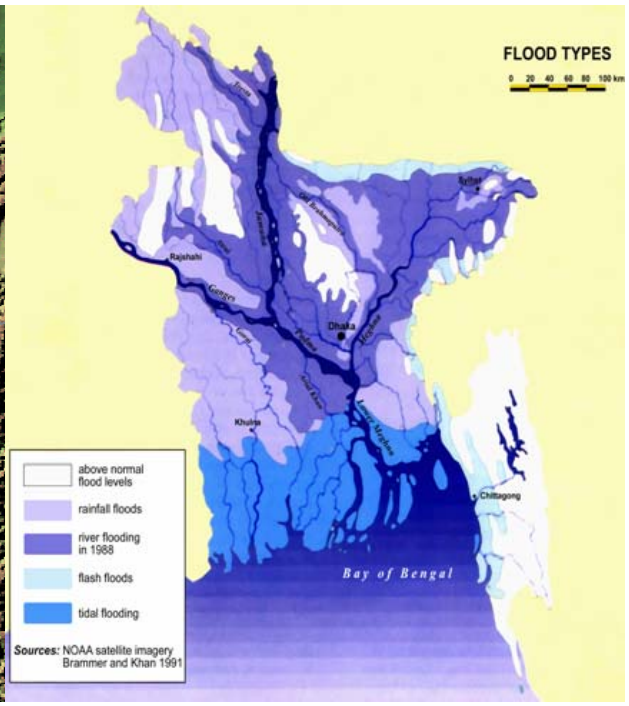
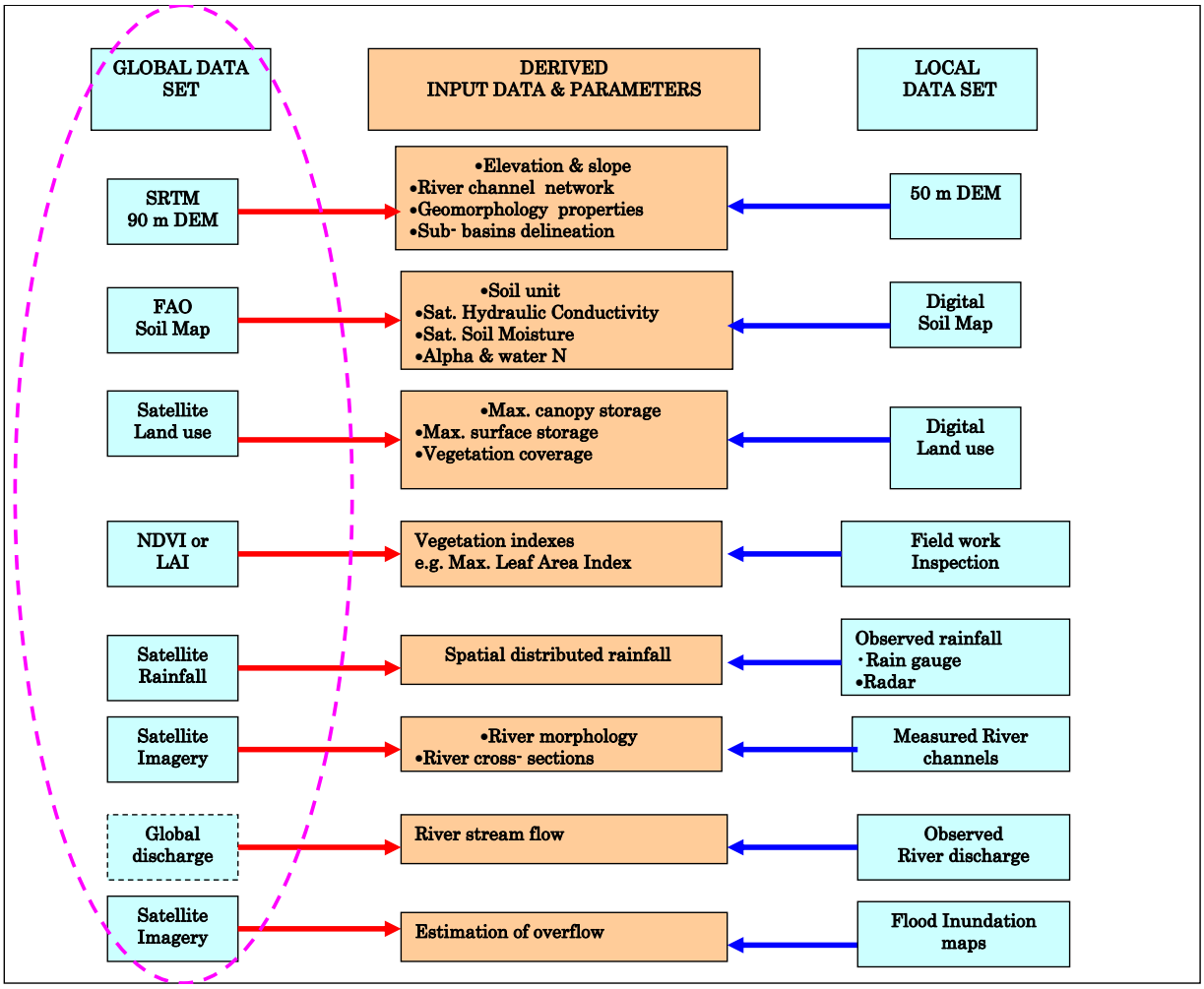
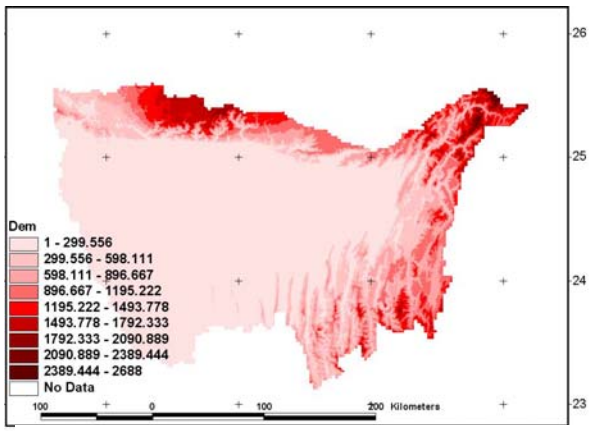
Application on Meghna River

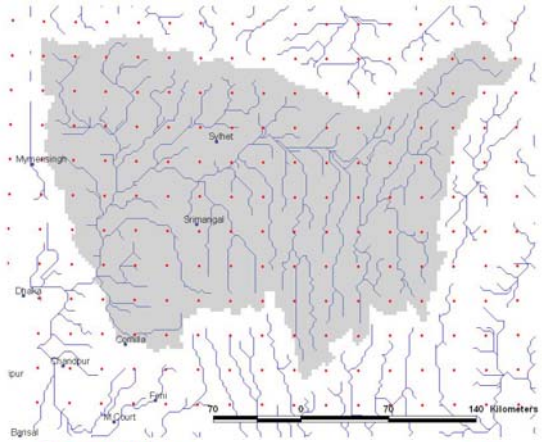


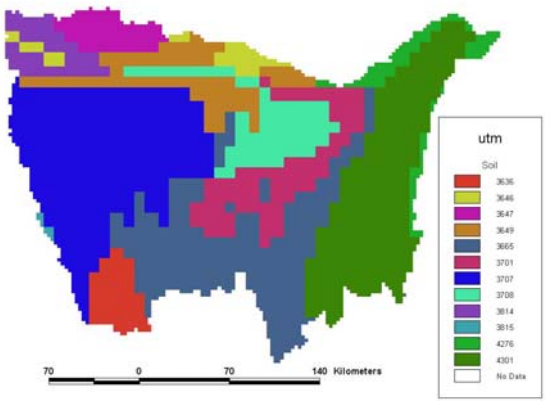


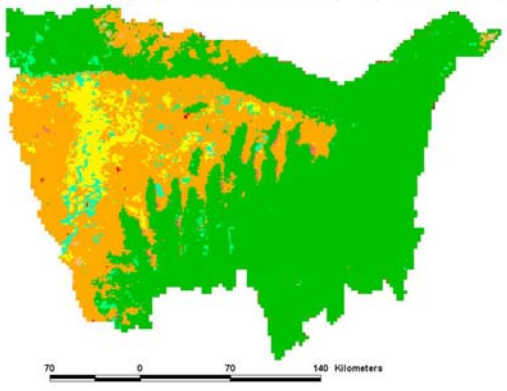


GIS thematic Maps

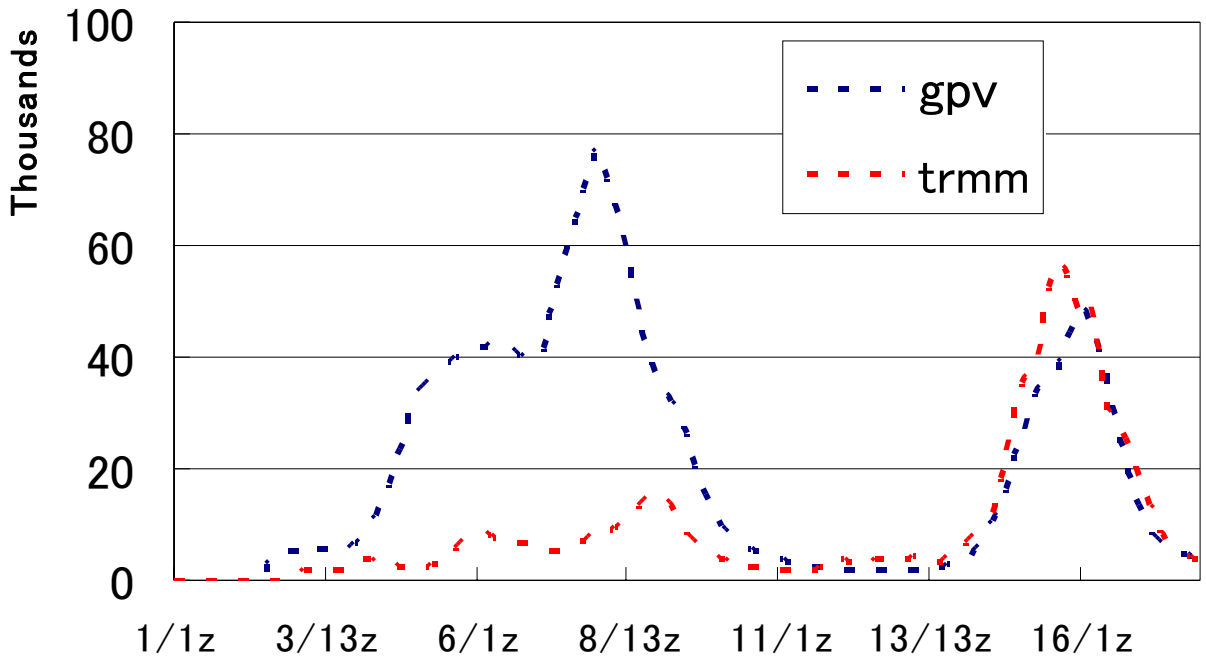








Hourly Simulation Comparison



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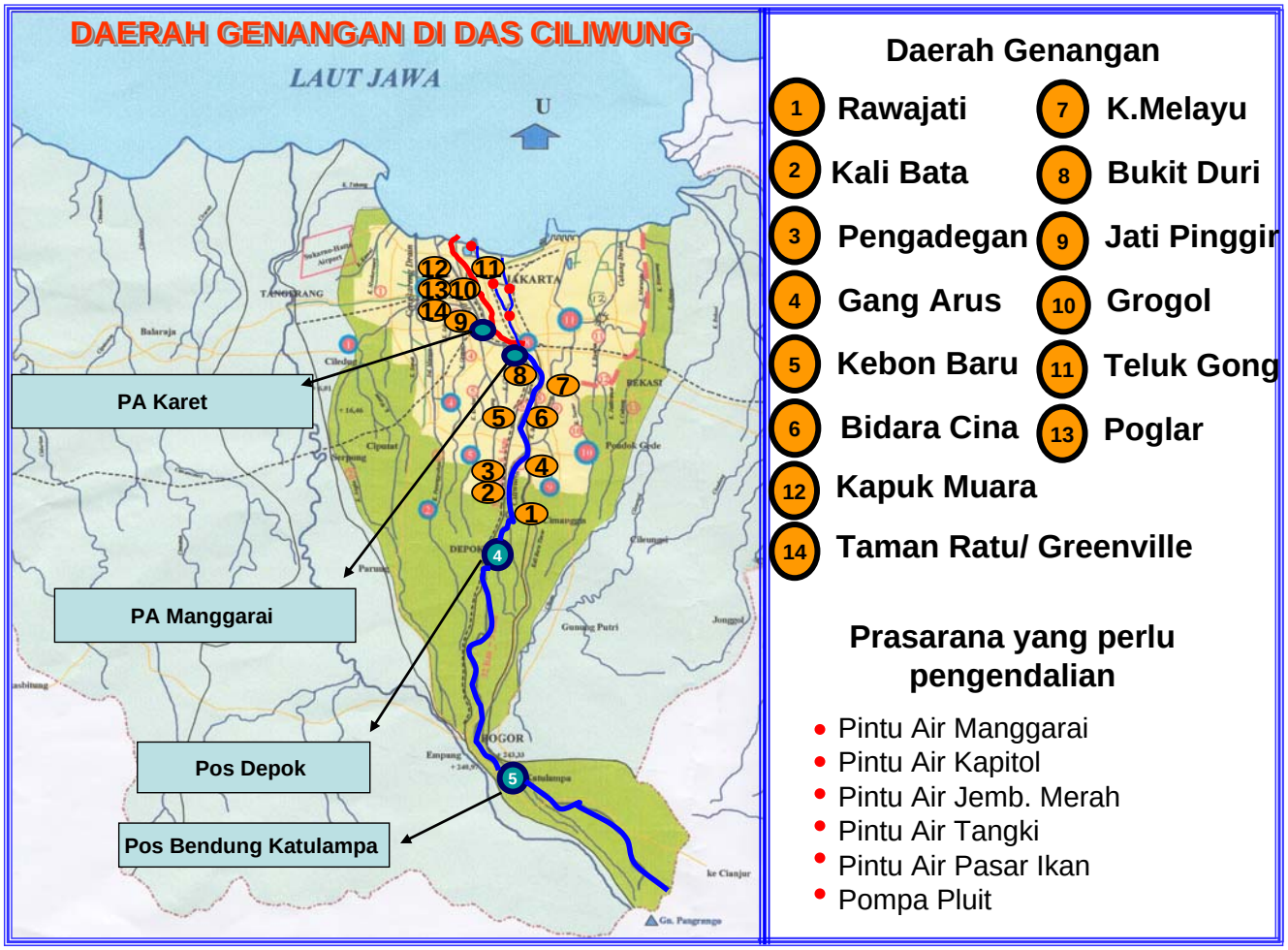
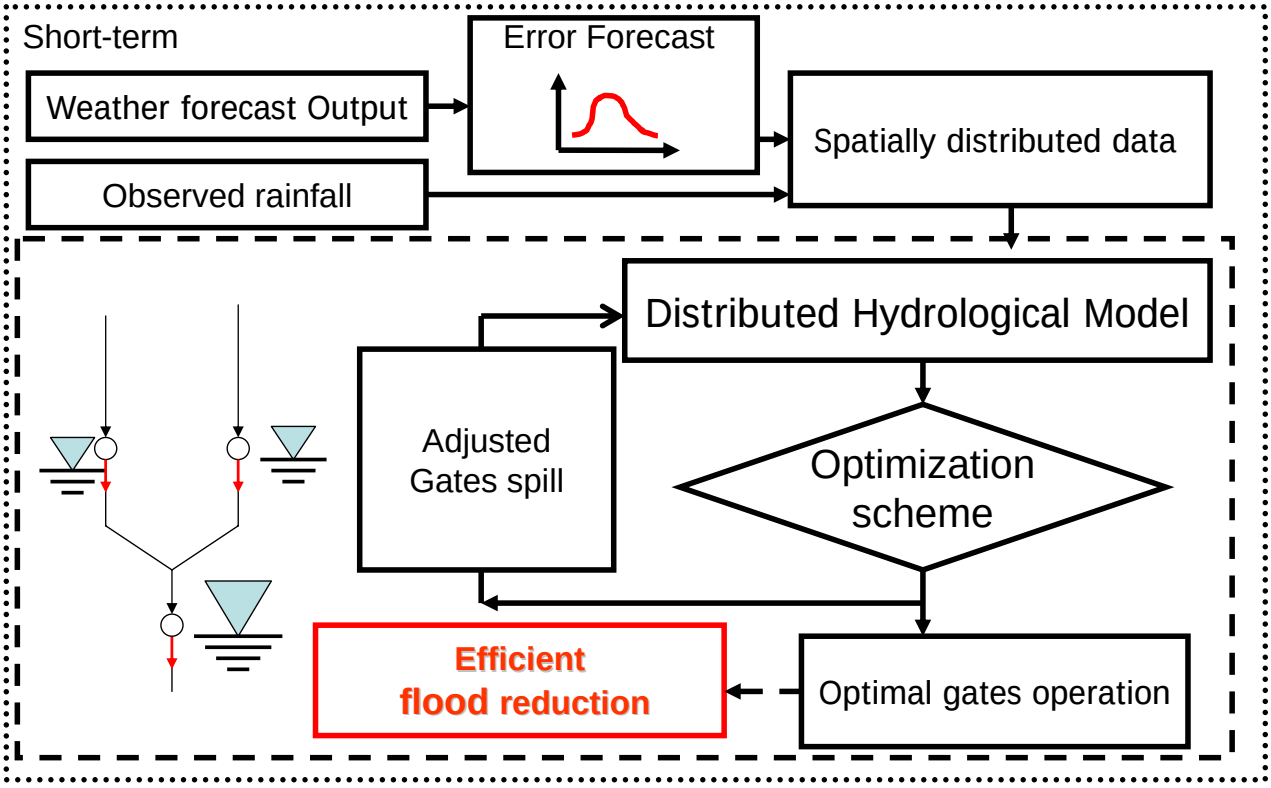


Optimal gates operation



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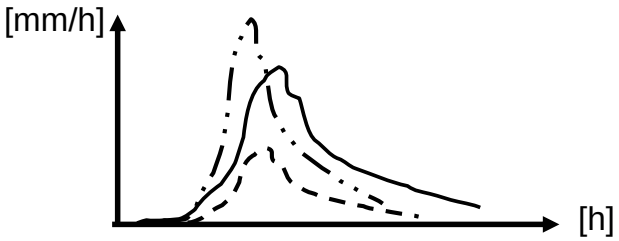
Error forecast Integration to System



$\boldsymbol{x}_{(t)}$ = Forecast_rain$_{(t)}$ - Obs_rain$_{(t)}$

$$weight_{lead\_time} = \frac{1}{\sigma_{lead\_time}} \qquad \sigma_{lead\_time} = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$$

$$MIN.....\{Error = weight * \sqrt{\frac{\sum (Qsim\_gauge - Qopt\_gauge)^2}{N}}\}$$

..back to strategy

OBJECTIVE FUNCTION: Flood reduction & future water use