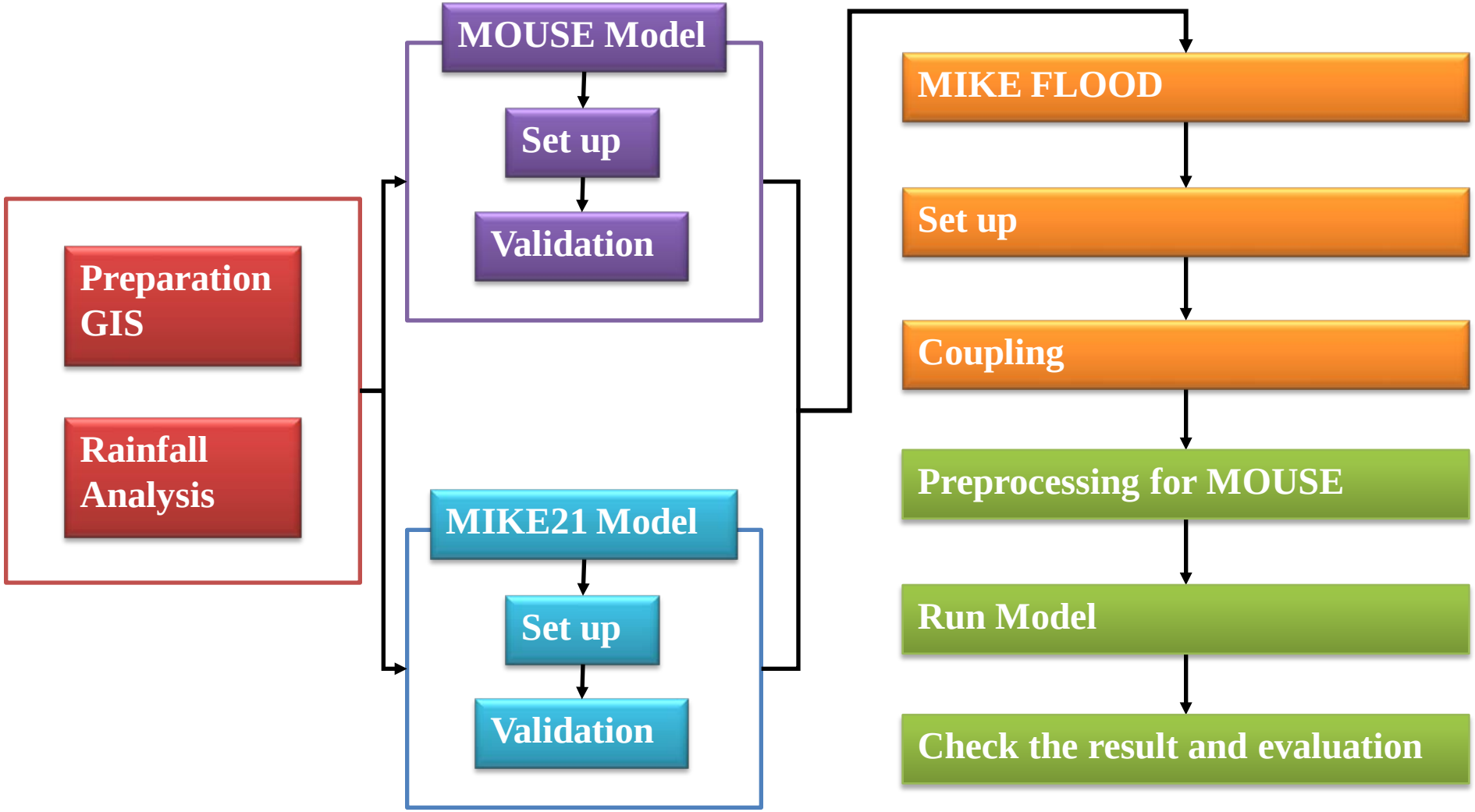
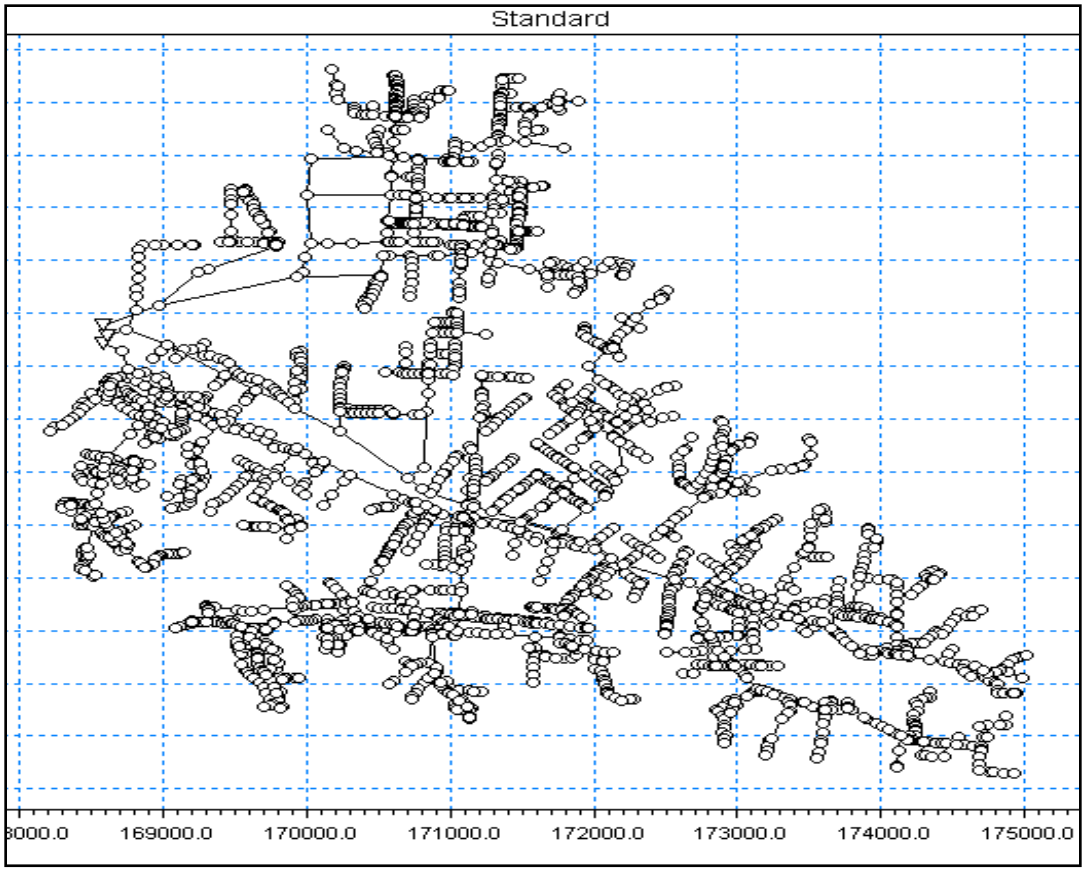
Module 9

Lecture 5: Urban Flood Risk Mapping using MOUSE, MIKE 21 and MIKE FLOOD


Preparation GIS
Rainfall Analysis
MOUSE Model
Set up
Validation
MIKE21 Model
Set up
Validation
MIKE FLOOD
Set up
Coupling
Preprocessing for MOUSE
Run Model
Check the result and evaluation

Urban Drainage Network

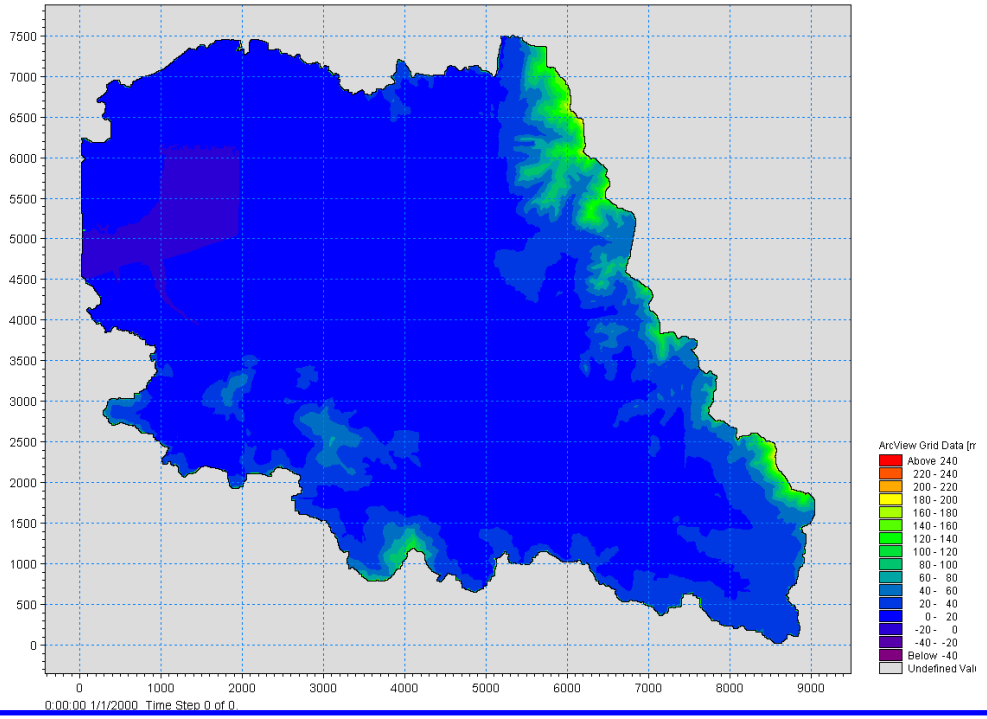
- Import of drainage network into MOUSE
- Setting up Urban Drainage model with MOUSE
- Validation



Urban Drainage Modelling

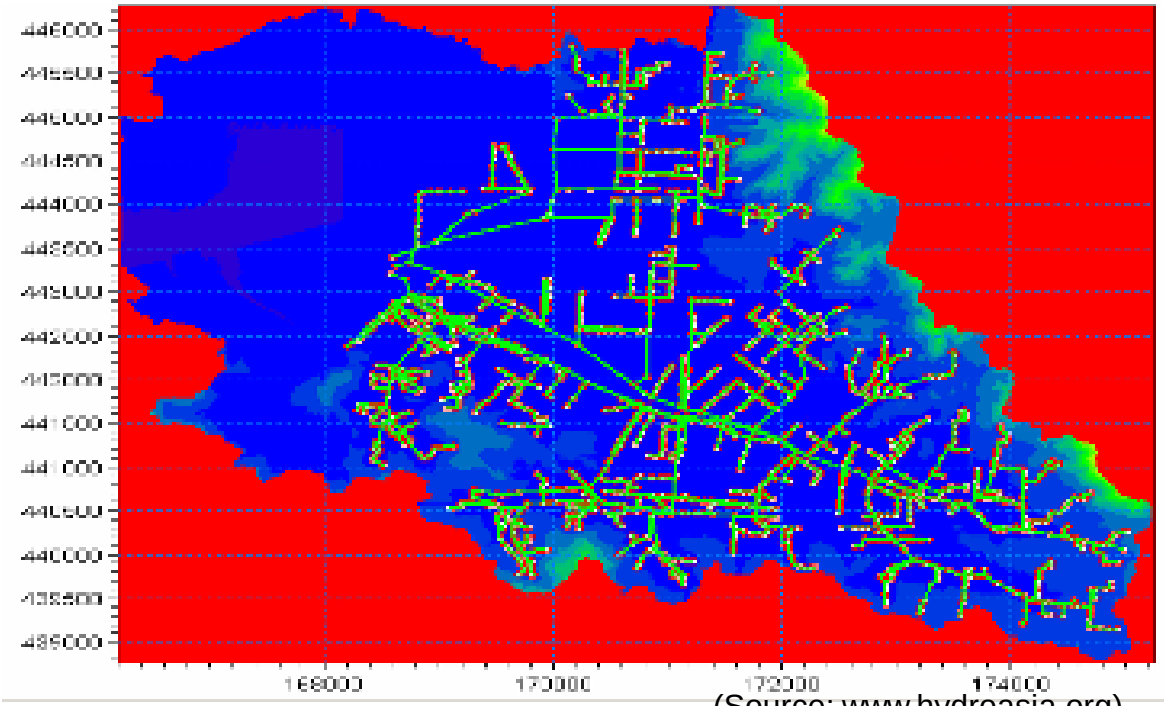
- Import Ascii data-set as bathymetry
- Setting up Urban Bathymetry with MIKE21
- Validation

Option	Value
Time Step	1sec Max Cr=0.4
Grid Size	10m



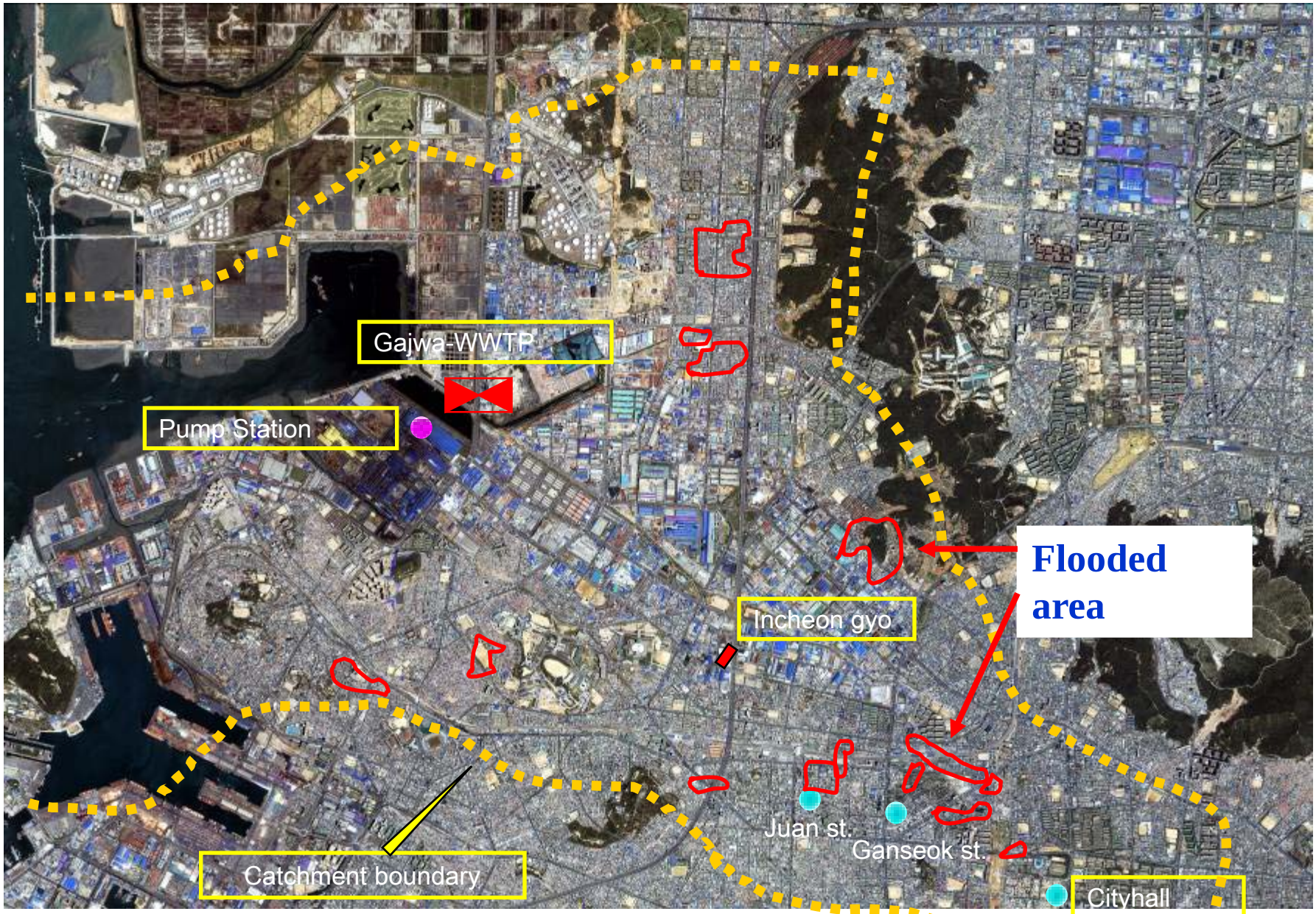
MIKE FLOOD Modeling

- Setting up MIKE Flood model
- Coupling : Link MOUSE Manholes to MIKE21
- Preprocessing for MOUSE Model
- Running Model
- Check the results



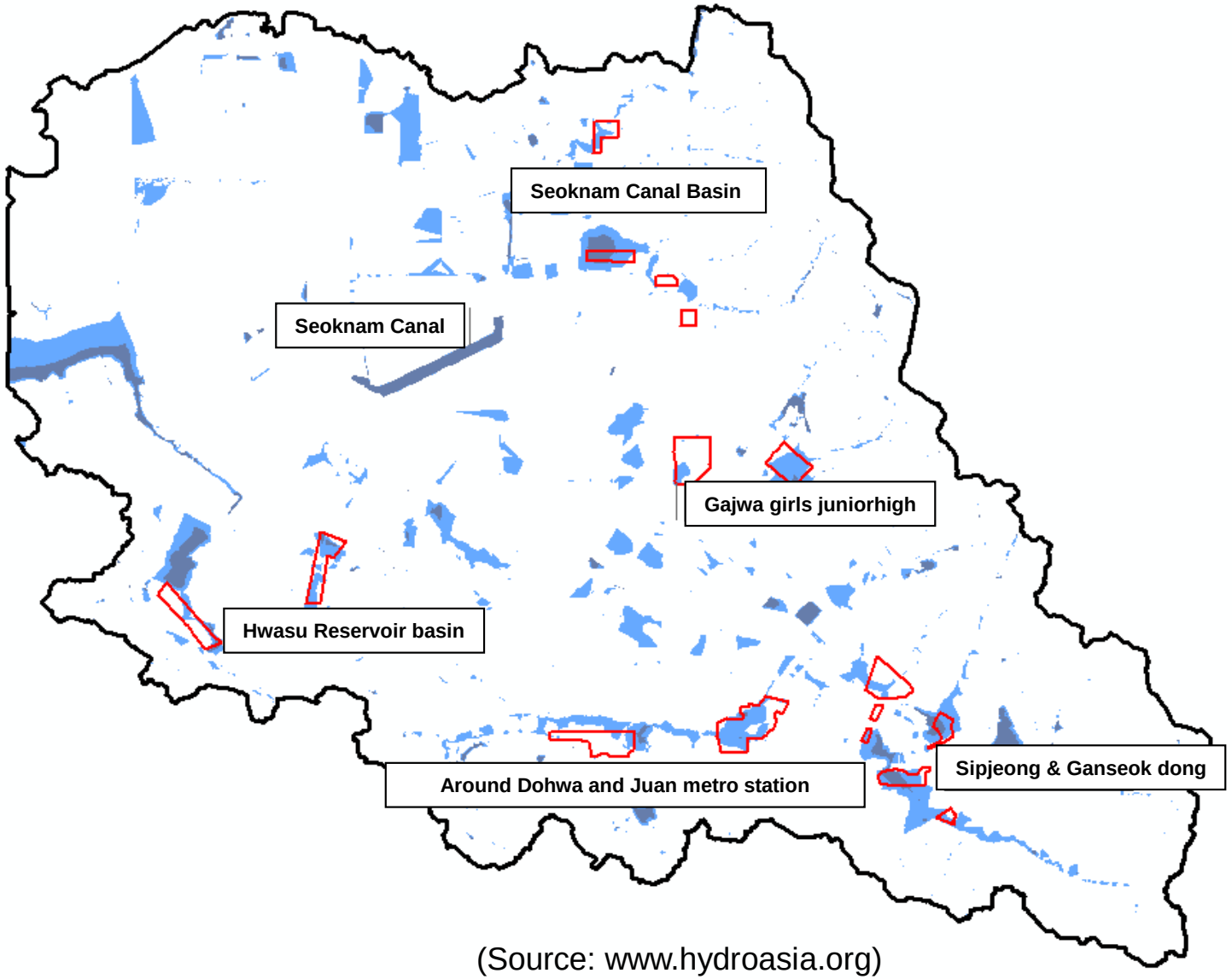
(Source: www.hydroasia.org)

Results Analysis



(Source: www.hydroasia.org)

Comparing the Result (Modeled VS Reported)



(Source: www.hydroasia.org)

Highlights in the Module

❖ Basic elements of hydrologic simulation model

Equations→ govern the hydrologic processes,

Maps→ define the study area and

Database → numerically describe the study area and model parameters.

❖ Strengths of Watershed Models

- ➢ Diversity of the current generation of models
- ➢ Comprehensive Nature
- ➢ Reasonable modeling of physical phenomena
- ➢ Distributed in Space and Time
- ➢ Multi-disciplinary nature

Highlights in the Module Contd…

❖ Deficiencies of Watershed Models

- Lack of user-friendliness,
- Large data requirements,
- Lack of quantitative measures of their reliability,
- Lack of clear statement of their limitations, and
- Lack of clear guidance as to the conditions for their applicability.

❖ Steps in Watershed Modelling

- Model Selection
- Input Data

➔ Agricultural Data, Hydrometeorologic Data, Pedologic Data, Geologic Data, Geomorphologic Data, Hydraulic Data, Hydrologic Data

Highlights in the Module

Contd…

- Evaluation & Refinement of Objectives
- Selection of Methodology
- Calibration & Verification of Model
- Simulations using Model
- Sensitivity Analysis of Model
- Model Validation

❖ **Major Hydrologic Models**

- HSPF (SWM)
- HEC
- MIKE

Text/References

1.Abraham, K.R.,Dash, S.K., and Mohanty, U.C.1996. Simulation of monsoon circulation and cyclones with different types of orography; *Mausam*, 47, 235-248.

2.Bedient et al. “Hydrology and Floodplain Analysis”, 2008.

3.Bhalme, H.N. and Jadhav, S.K. 1984. The southern oscillation and its relation to the monsoon rainfall. *J.Climatol*., 4, 509-520.

4.Bras, R. L., and Rodriguez-Iturbe. 1994. Random Functions and Hydrology, *Dover Publications*, New York.

5.Chow, V. T., D. R. Maidment, and L. W. Mays. “Applied Hydrology*”, McGraw Hill International Editions*.

6.Haan, C. T.. 2002. “Statistical Methods in Hydrology”, 2nd ed., *Blackwell Publishing*, Ames, IA.

Text/References

Contd…

7. Hoskings, J. R. M. and J. R. Wallis. 1997. “Regional Frequency Analysis, An Approach Based on L-Moments”, *Cambridge University Press*, New York.
8. Subramanya K, “Engineering Hydrology”, *Tata McGraw-Hill*.
9. Viessman Jr., W. and G. L. Lewis. “Introduction to Hydrology”, 4th ed., *Harper-Collins*, New York, 1996.
10. Vijay P. Singh, F. and David A. Woolhiser, M. 2002. Mathematical Modeling of Watershed Hydrology, *Journal of Hydrologic Engineering, Vol. 7, No. 4,* July 1, 2002.
11. www.climateofindia.pbworks.com/
12. http://www.crwr.utexas.edu/gis/gishyd98/dhi/mikeshe/Mshemain.htm

Related study materials available through NPTEL

1. Advanced Hydrology (Video Course) by Prof. Ashu Jain, IIT Kanpur

   http://nptel.iitm.ac.in/courses/105104029/

2. Stochastic Hydrology (Video Course) by Prof. P.P. Mujumdar, IISc Bangalore

   http://nptel.iitm.ac.in/courses/105108079/

3. Probability Methods in Civil Engineering (Video Course) by Dr. Rajib Maity, IIT Kharagpur

   http://nptel.iitm.ac.in/courses/105105045/