EWC 461: River Engineering and Flood Management

3 Credit Hour

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Lecturer

Department of EWCE

Lecture-10

Flood Forecasting and Warning System

Syllabus of Sec-A: 2.0 Credit

- Behavior of alluvial rivers
- River channel pattern and fluvial processes
- Aggradations and degradation
- Local scours
- River training and bank protection works
- Navigation and dredging of sediment movement in river channels
- Bed form and flow regimes
- Case studies

Syllabus of Sec-B: 1.0 Credit

- Flood and its causes
- Flood process in urban and rural area
- Flood management measures: structural and non-structural measures such as dams, reservoirs
- Diversion channels and floodways
- Improvement of channel capacity by dredging
- Land management, Flood proofing, Flood zoning, Flood hazard mapping
- Flood forecasting and warning, Flood damage assessment

Course Outcome (CO)

CO1	Be able to explain the relationships of river planforms with the river Morphological parameters
CO2	Be proficient in calculating and estimating sediment distribution and sediment load of a river
CO3	Be able to apply different engineering perceptions to estimating the scour depth.
CO4	Be familiar with different bank protection and river training work and understand the dredging and navigation processes
CO5	Apply knowledge of flood processes and management strategies to analyze and assess flood risk.

Reference Books

- Any book on Flood Management and Mitigation
- **Water Resources Engineering by R. K. Linsley, J. B. Franzini, D. L. Freyberg and G. Techobanojlous**
- Fluvial Processes in River Engineering (1992) by H. H. Chang
- **Flood Control and Drainage Engineering, Fourth Edition, S.N. Ghosh**
- Urban Flood Management; by Chris Zevenbergen (Author), Adrian Cashman (Author), Niki Evelpidou (Author), Erik Pasche (Author), Stephen Garvin (Author), Richard Ashley (Author)
- Flood Risk: Planning, Design and Management of Flood Defence Infrastructure, By: Paul Sayers
- Vulnerability and Adaptation to Climate Change in Bangladesh: Processes, Assessment and Effects by MD Aboul Fazal Younus
- **Flood Action Plan**

What is Flood Forecasting

- Flood forecasting is the use of forecasted precipitation and stream flow data in rainfall-runoff and streamflow routing models to forecast flow rates and water levels for periods ranging from a few hours to days ahead, depending on the size of the watershed or river basin.

What is Flood Warning

- Outcome of flood forecasting is a set of forecast time profiles of channel flows or river levels at various locations
- "flood warning" is the task of making use of these forecasts to make decisions about whether warnings of floods should be issued to the general public or whether previous warnings should be rescinded or retracted.

Role of flood forecasting in flood management

- Save human lives and reduce material damage.
- Provide information to water management agency, local or municipal authorities, transport & communication operations & emergency services.
- Gives property owners, floodplain residents and responsible authorities time to respond to a flood threat before flooding occurs.
- Forecasting, based on mathematical modeling, allows converting the information on the past-to-present rainfall, river flow, status of moisture and snow cover into a river flow forecast (discharge, stage and inundated area) for a future time horizon.

Limitations of flood forecasting

- In mountain basins
- Every storm is different and rivers react differently
- too many uncertainties
- Involved to give specific times for peak levels more than two to six hours ahead.

Data Requirement

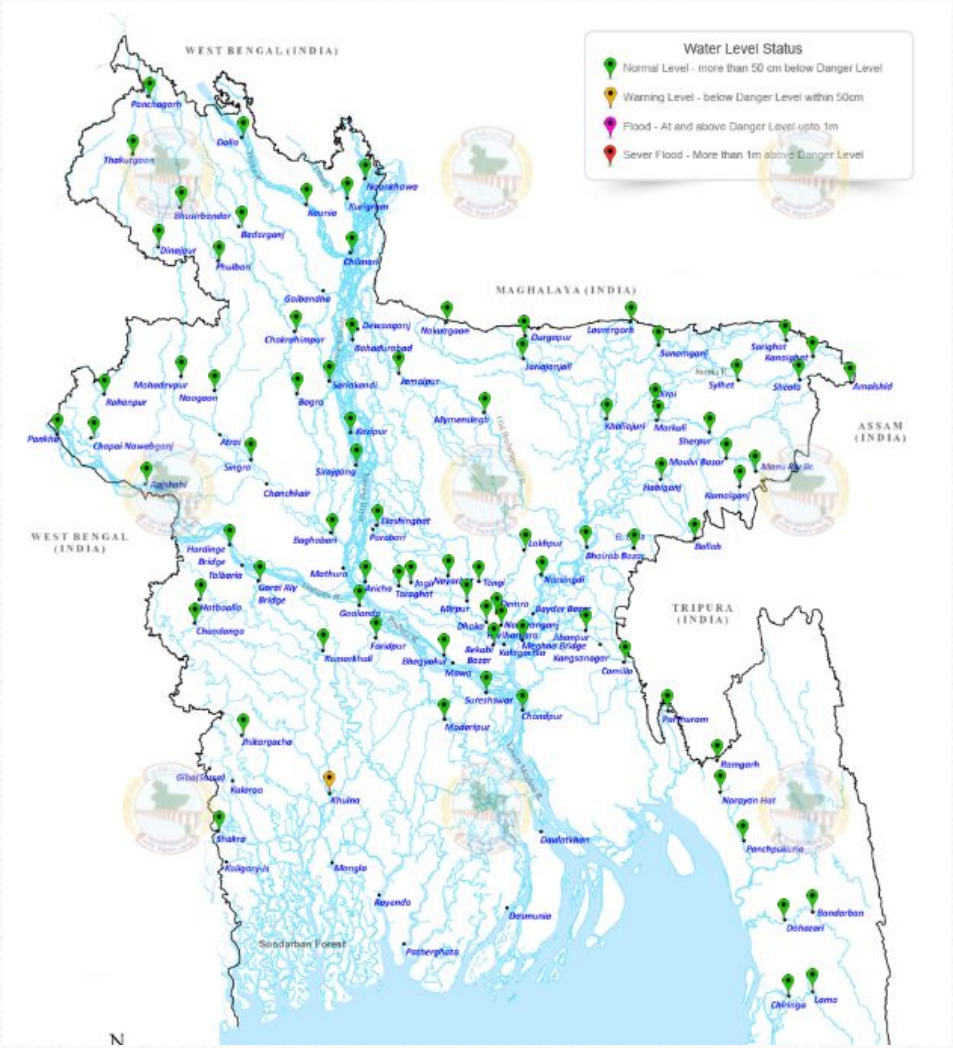
- Hydrological
- Morphological
- Topographical
- Other Information and Data

Hydrological Data

- Discharge and Water level
- Stream gauge







Water Level Status at Various Stations of BWDB

Meteorological Data

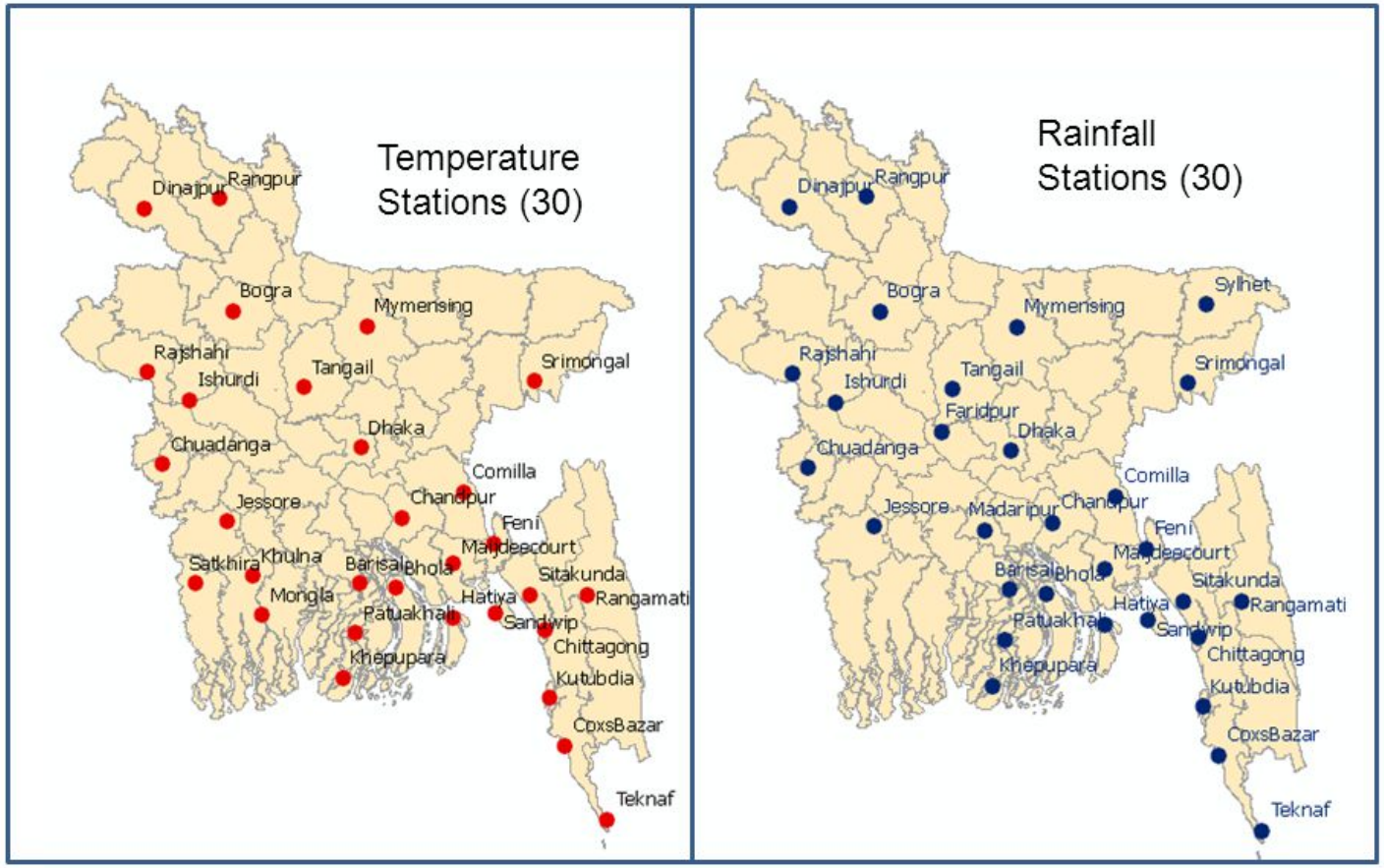
- Rainfall intensity and duration
- Rain gauge and satellite data
- Temperature data
- Historical data and future prediction



Meteorological Data

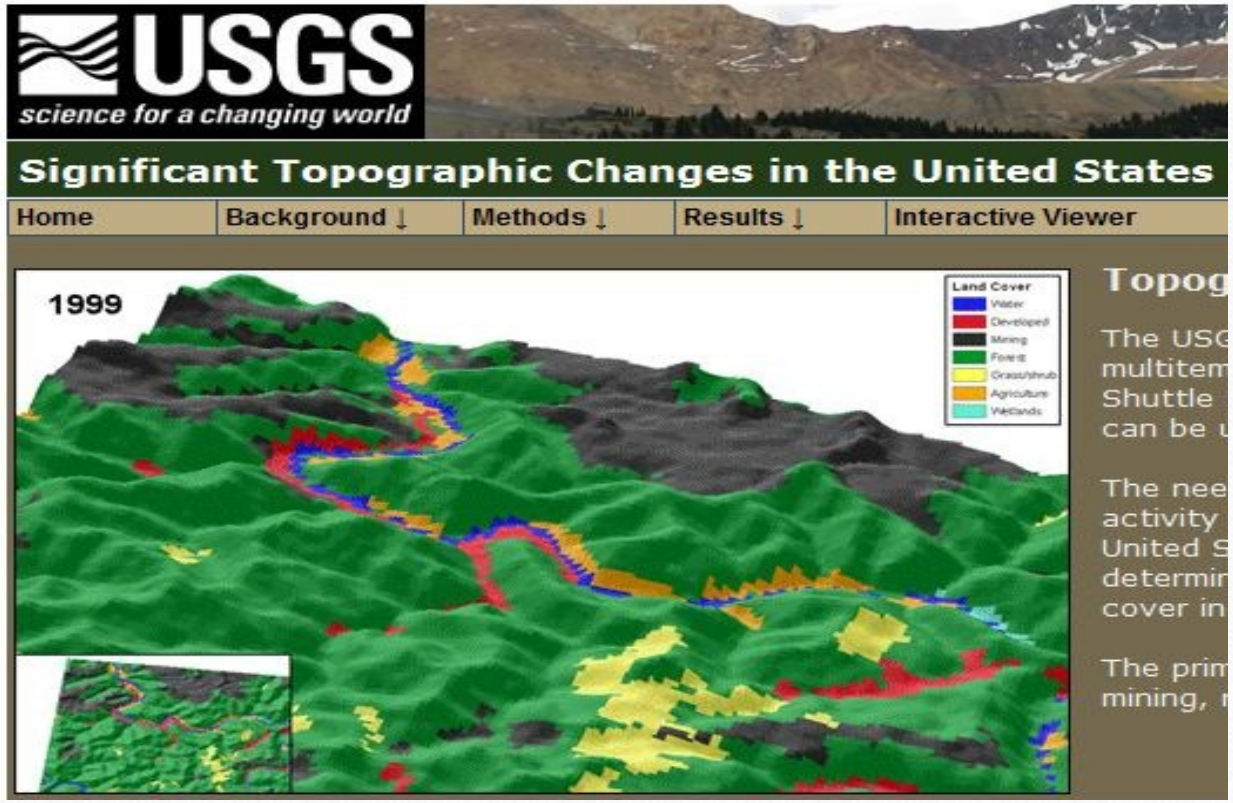


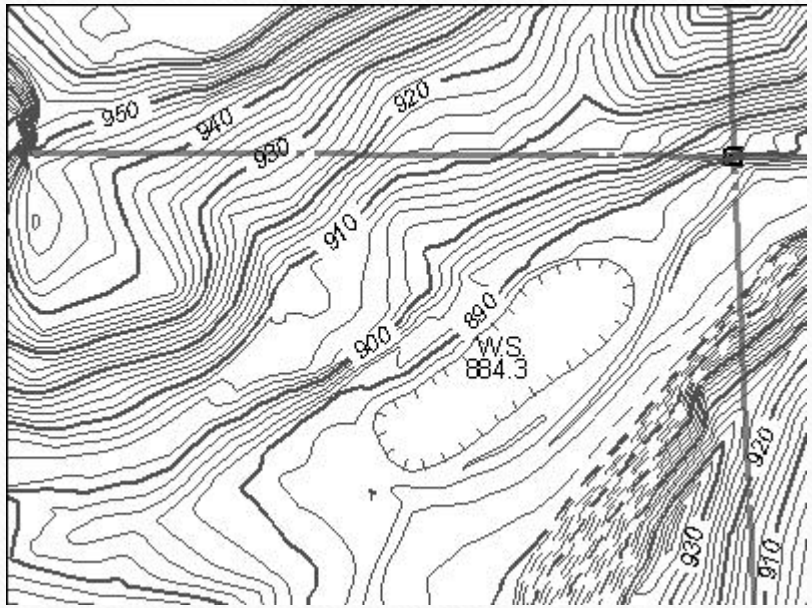
Location of BMD Stations

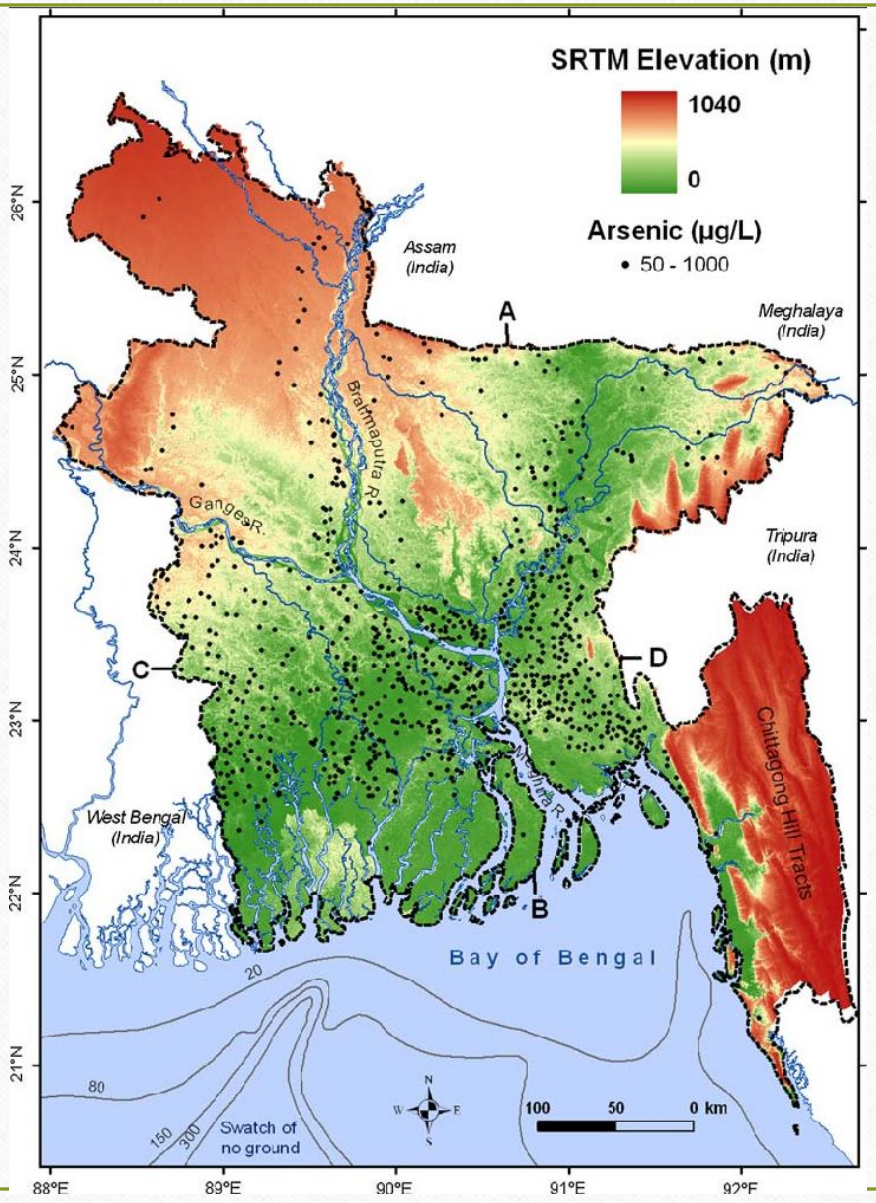


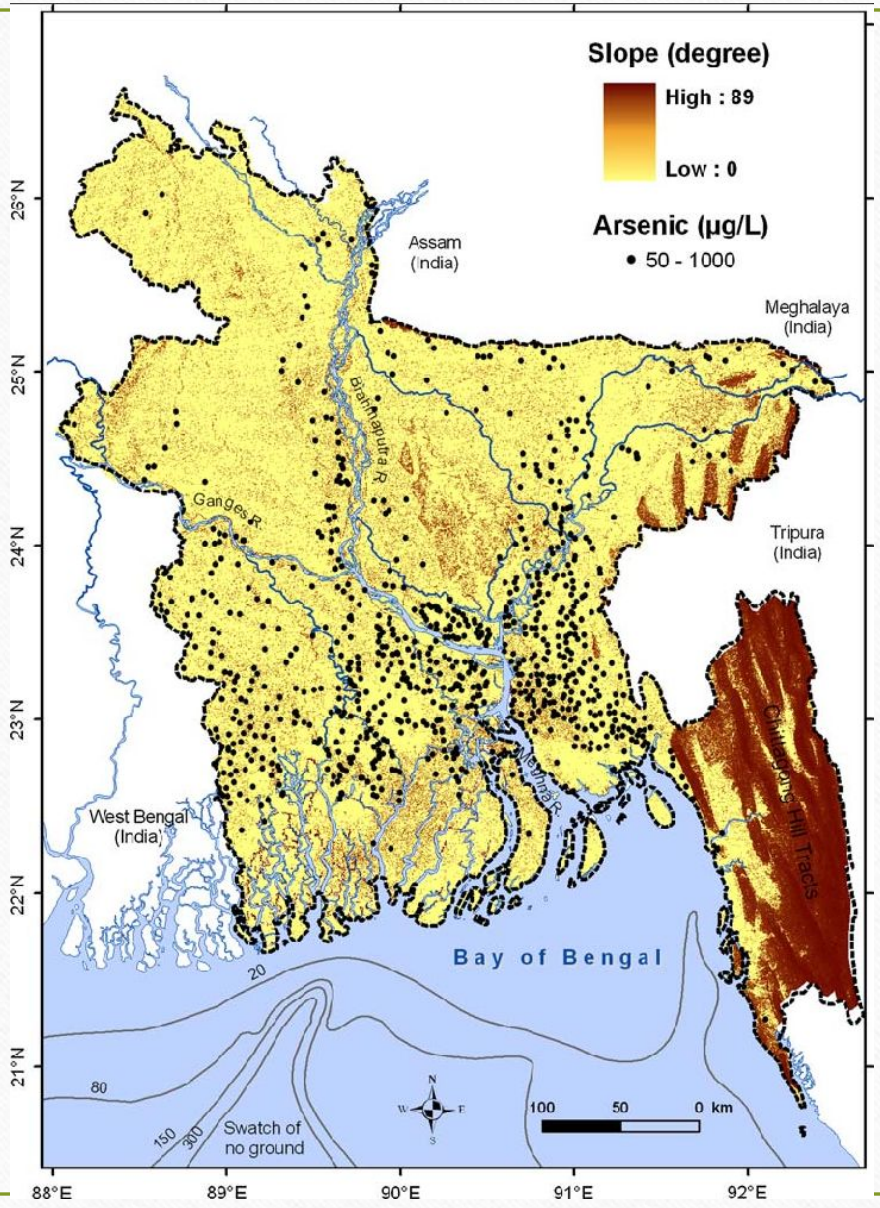
Topographical Data

- Surface elevation of the Earth



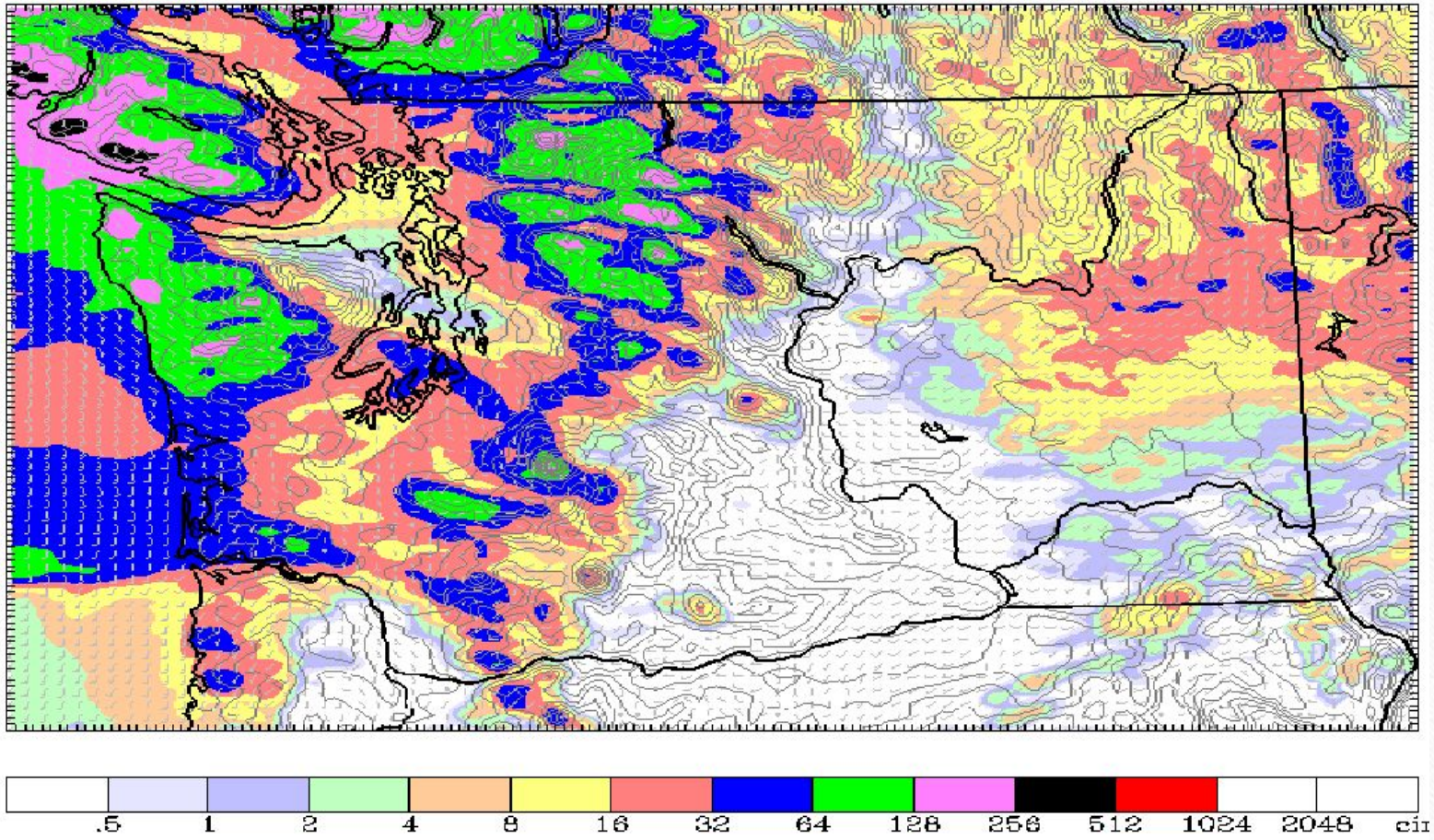



SRTM Elevation (m)
1040
0
Arsenic (µg/L)
• 50 - 1000
Assam (India)
Meghalaya (India)
Tripura (India)
West Bengal (India)
Brahmaputra R.
Ganges R.
Chittagong Hill Tracts
Bay of Bengal
Swatch of no ground
A
B
C
D
100 50 0 km
26°N
25°N
24°N
23°N
22°N
21°N
88°E
89°E
90°E
91°E
92°E


Slope (degree)
High : 89
Low : 0
Arsenic (µg/L)
• 50 - 1000
Assam (India)
Meghalaya (India)
Tripura (India)
West Bengal (India)
Brahmaputra R.
Ganges R.
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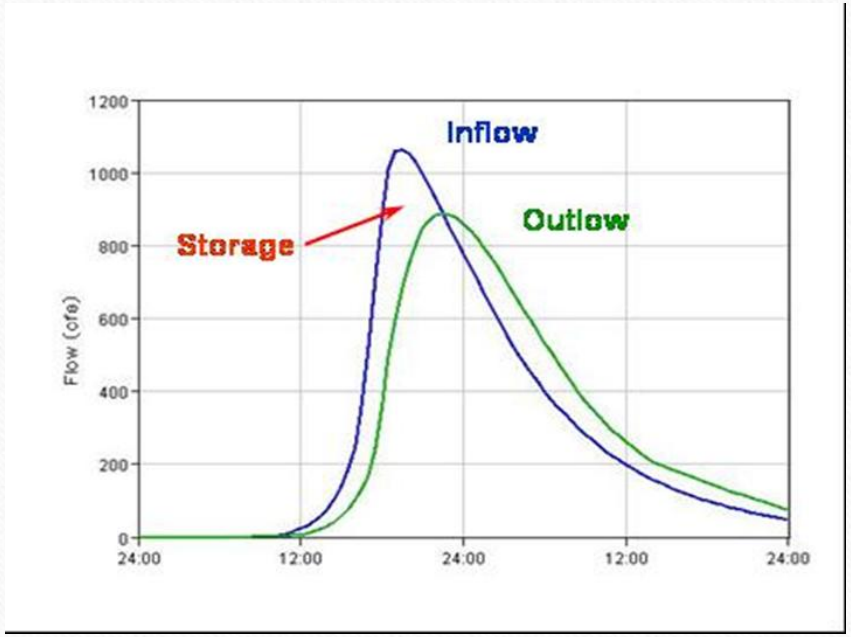
Types of Flood Forecasting Model

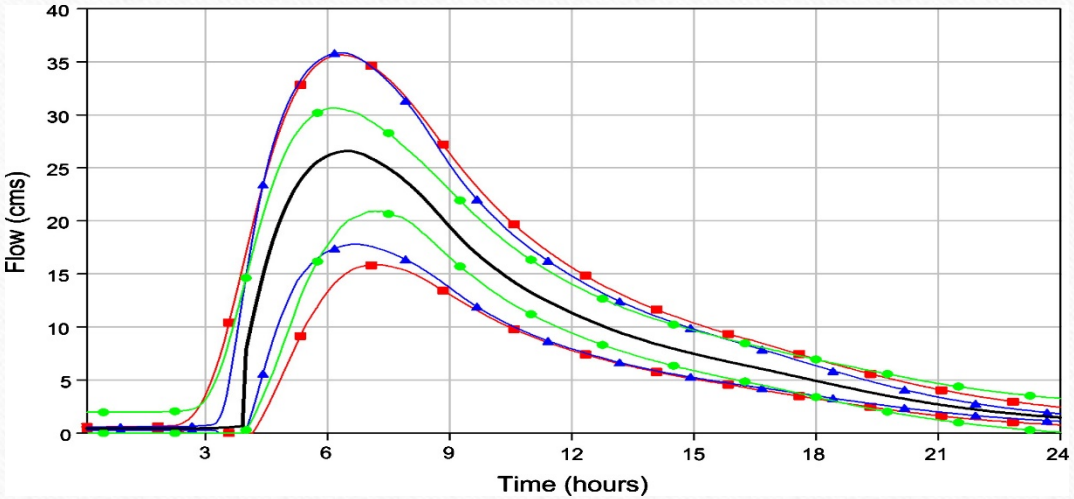
- Precipitation Driven Catchment Models



Types of Flood Forecasting Model

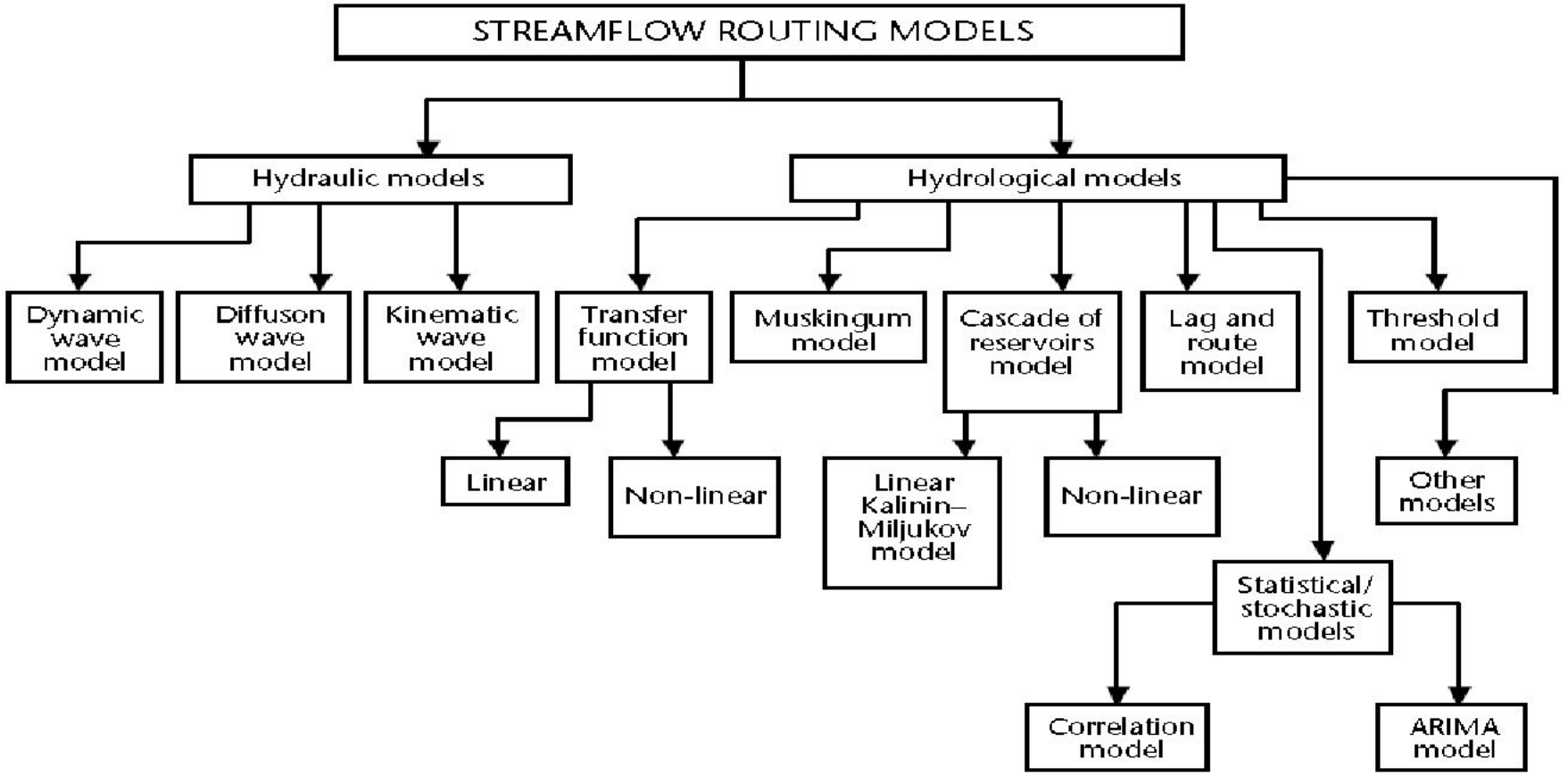
- Routing Models





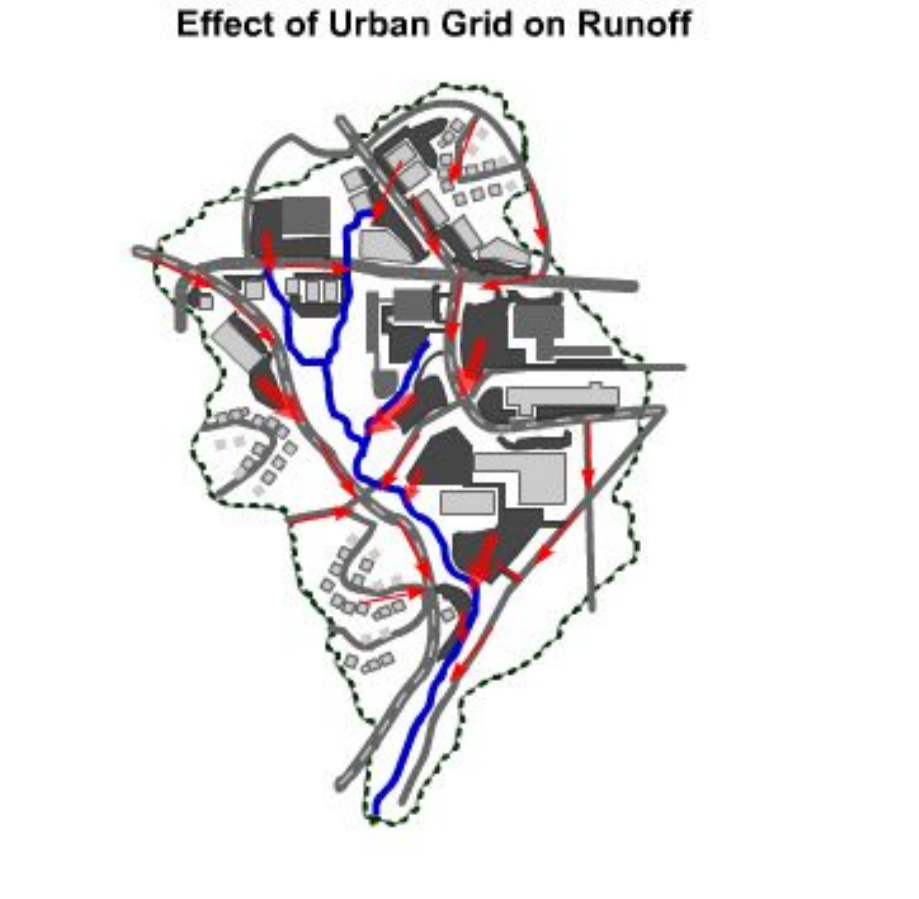
Types of Flood Forecasting Model

- Combined Catchment and Routing Models



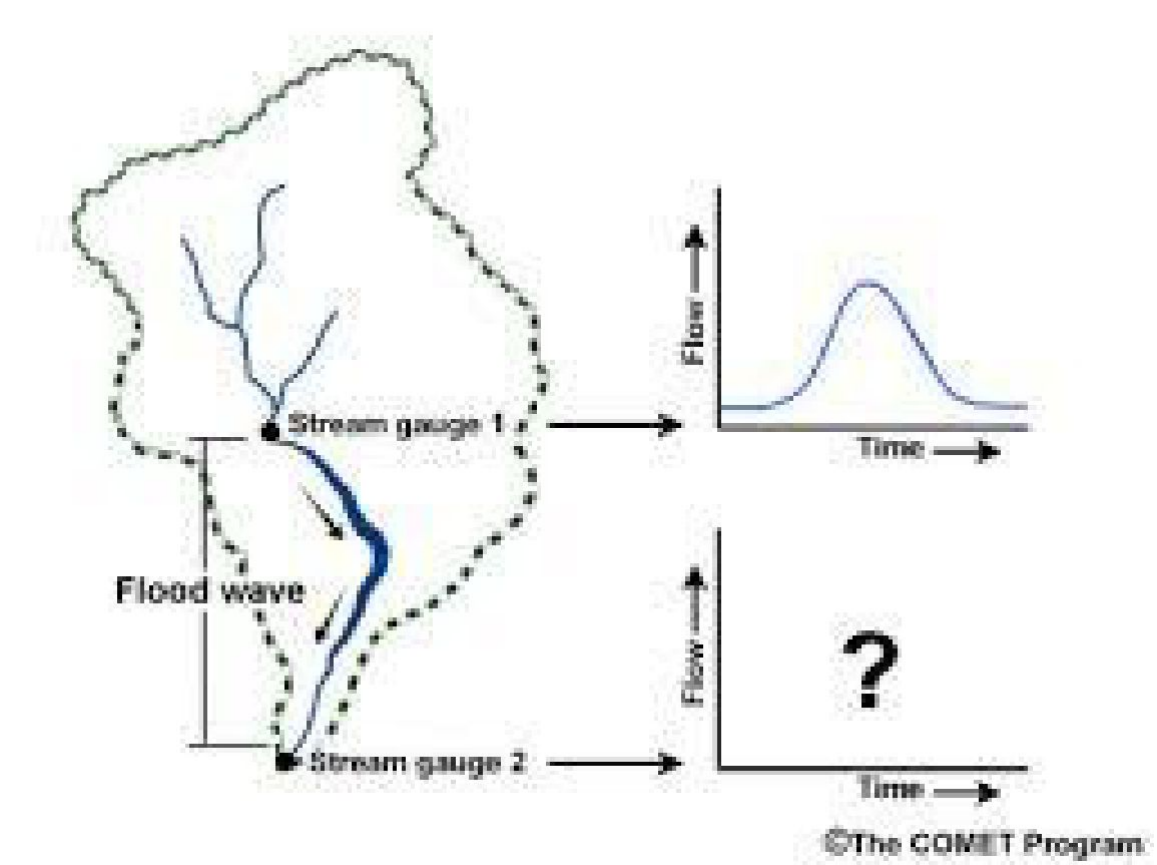
Types of Flood Forecasting Model

- Special Case Models



Modeling and Correlation Technique

- Upstream and Downstream River Level Correlation



Modeling and Correlation Technique

- Rainfall and River Level Correlation

