Coping with Extreme Floods

A UNU CAPACITY DEVELOPMENT PROGRAM

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Environmental Change Risk management

- Make decisions on environment to guide possible future outcomes
  - Ability to forecast future
  - Ability to compare risks and make decisions

Guiding principles of capacity development

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Guiding principles of capacity development

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- Increase the number of technically competent persons who can grasp state of environment, downscale global information to local scale and make relevant forecasts
- Facilitate customizing global knowledge to meet local conditions and constraints.

Target groups

- Researchers / Scientists
  - Customizing existing knowledge to suit local conditions supported by global experiences
- Professional / Practitioners
  - Introducing new methods, tools, standards
- Administrative / Local government officers
  - Over view of technology and science

Extreme Flood Risk Training

- Motivation
- Background: Regional program
- Expectations

Extreme Flood – What if?

- Informal Discussions in 2002 with Hydro Meteorological organizations officials
- Round table discussion in 2003 at the World Water Forum
- A template to cope up with ‘A flood that go beyond the design levels….’

Initiative on Catastrophic Flood Risk Reduction

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at a Regional Workshop "*Ensuring Flood Security for Sustainable Urbanization in the Asia Pacific Region***", 2003**

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Bangladesh, Cambodia, China, Fiji, India, Indonesia, Lao PDR, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam

How do we prepare?

- Financial and economic recovery
  - Spreading or Swapping the risk
  - Investment in mitigation and preparedness → Loss estimation
- As urban centers grow and develop, there will always be new risks
  - Increased floods, underground space flooding, etc.

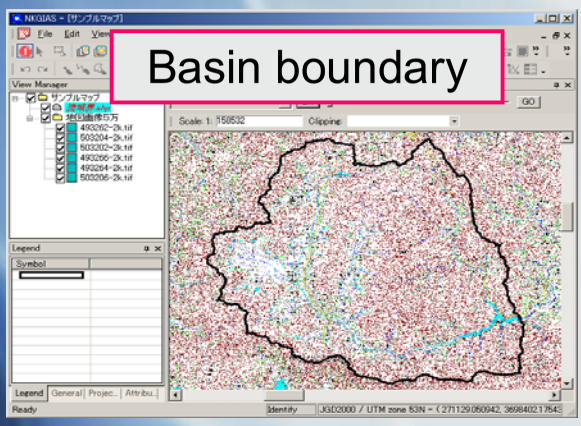
Program

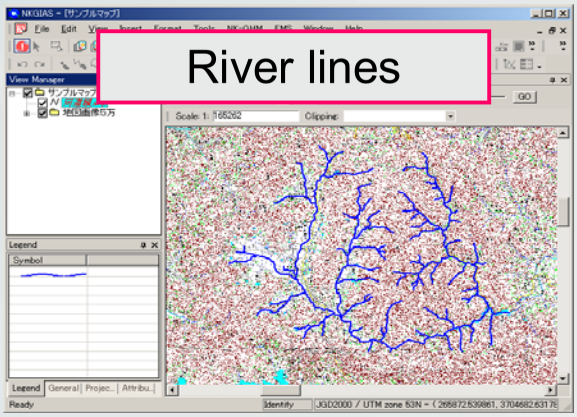
- Phase I (Hands on – 3 weeks)
  - Training on GIS
    - GIS system freely distributed
  - Setting up and application of Rainfall Downscaling and forecasting system (DRF)
  - Setting up Flood inundation modelling and Application (FMS)
- Phase II (Home country 3 months)
  - Transfer to others
  - Model application and verification with historical floods
  - Field survey for data collection
- Phase III(Hands on – 3 weeks)
  - Risk Assessment: Economic losses and people at risk
  - Mitigation measures

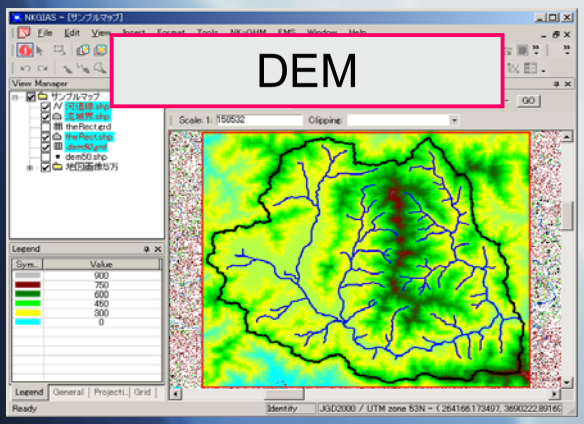
Organizations

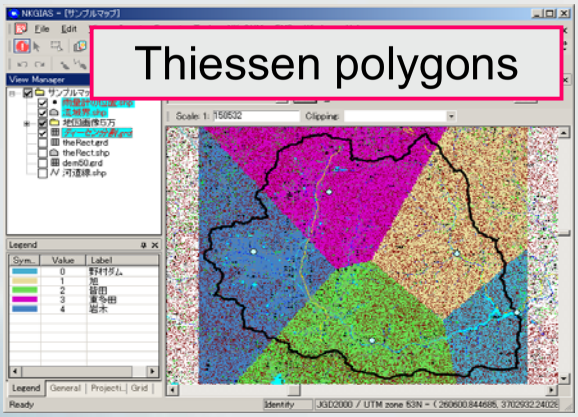
- **Organized by UNU**
  - **Resources from: UNESCO-IHE, Monash University, Australia, Nippon Koei Co., Ltd., AIT, Thailand**
- **Participants –Professionals from a University and the organization responsible for flood control - trainers**
  - **China: Tsinghua University, Beijing Municipality**
  - **Nepal: Institute of Engineering, Department of Hydrology and Meteorology**
  - **Philippines: University of Philippines, PAGASA (Hydro meteorological Agency)**
  - **Sri Lanka: University of Peradeniya, Irrigation Department**
  - **Viet Nam: Institute of Hydrology and Meteorology, Department of Storm Control and Dyke Management**

Various data sets from NK-GIAS

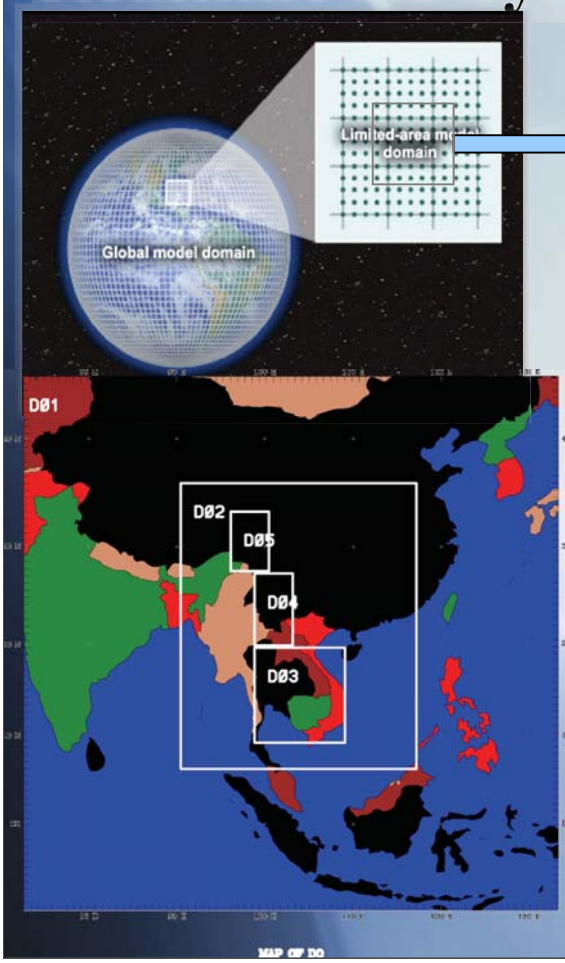


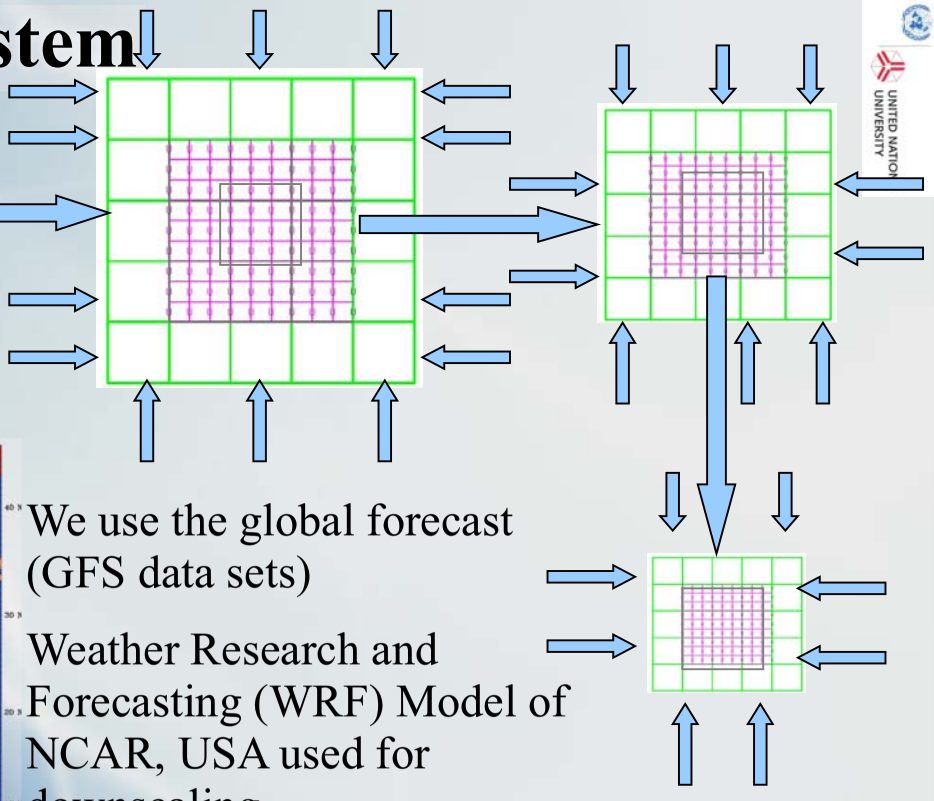






Realtime RF system





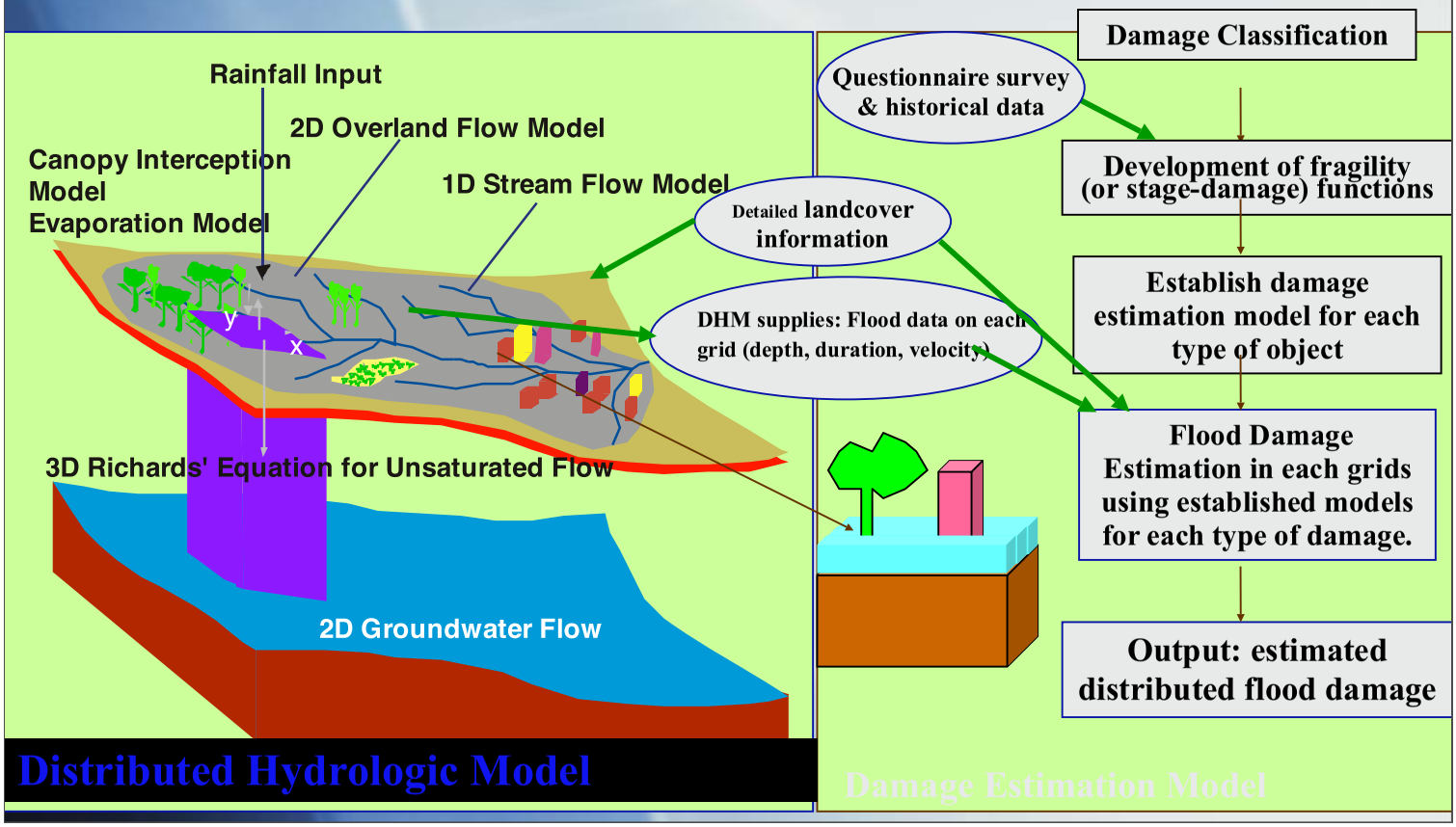
We use the global forecast (GFS data sets)

Weather Research and Forecasting (WRF) Model of NCAR, USA used for downscaling

Automated systems

Use for scenario modelling

Inundation Modeling: Damage Assessment and



Outcomes

- Phase I – Training of trainers on GIS, Rainfall forecasting and Flood modeling
  - A training text book with examples and step-by-step manuals to set up and run models
- Phase II – Develop extreme flood scenarios for each country.
- Phase III – A book on case studies and recommendations
- A Community of researchers and practitioners working on Extreme Floods

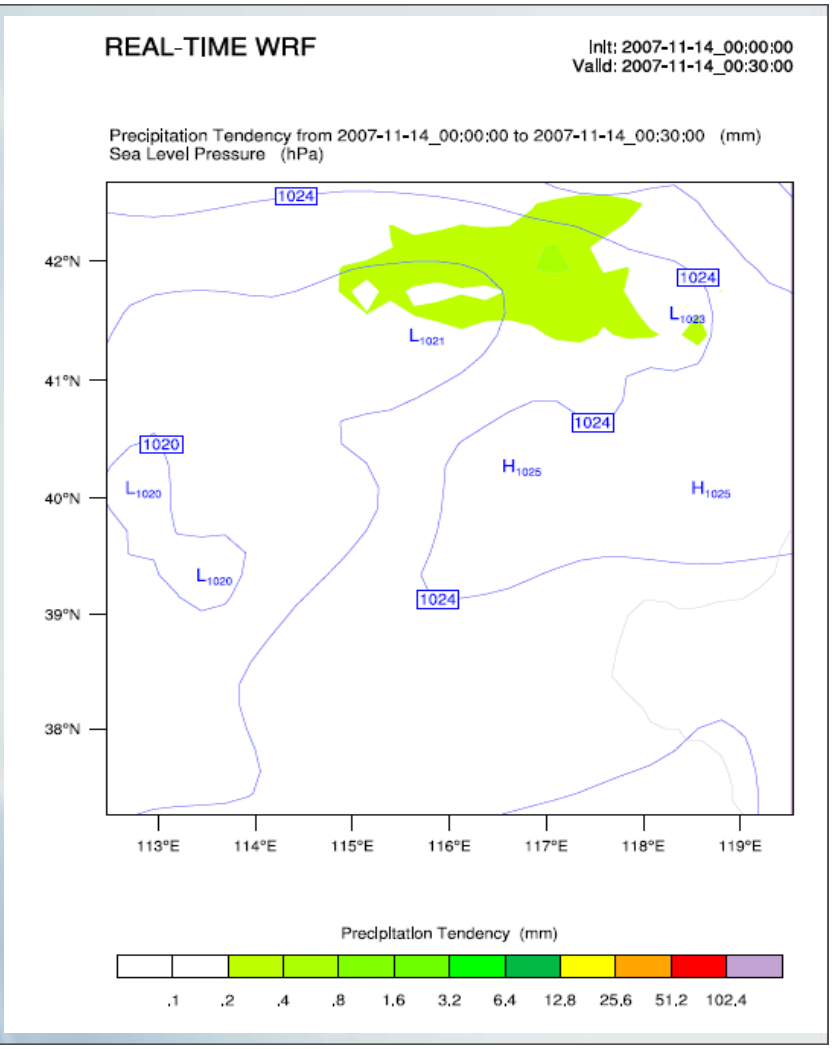
China: Beijing

- For example, on Aug 1st, 2007, the precipitation was about 80mm/h at Anhua bridge . After five days, the another rainfall of 82 mm/h occured at the same place. Rainfall resulted in inundation of 3m on the road.

China

- Location: north of Beijing
- The main branch of Wenyuhe basin
- River length: 23.7 *km*
- Catchment Area: 210 km^2
- Beijing Olympic park is located in this basin
- Designed standard: 20-years

- Output:
  - Precipitation
  - Wind
  - Temperature



Simulation results: Surface Inundation

Observations

- Many participants were interested in operational forecasting.
- Paring of educational and responsible agency participants proved to be very effective
- The module can be divided in to 3 sub modules and delivered according to the needs of each country.

Outcomes

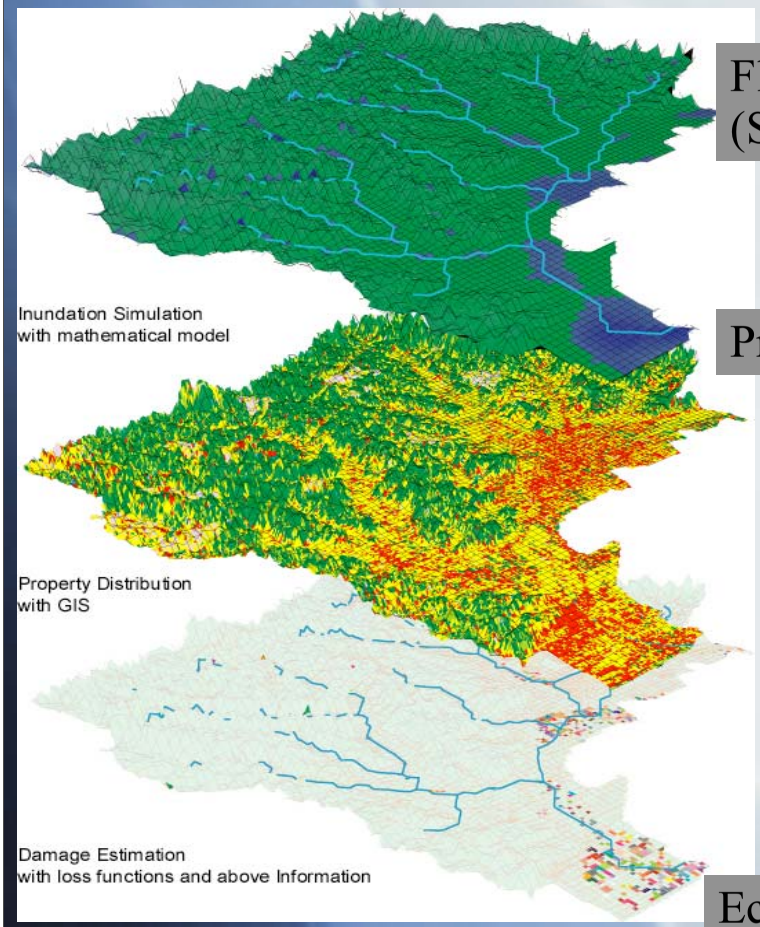
- Phase I – revise and improve the text book with the applications software
- Phase II – Develop loss functions damage estimation methodology: System on WWW
- Phase III – Economic loss estimates. A book on case studies and recommendations
- A Community of researchers and practitioners working on Extreme Floods

Future

- Develop tools to setup city specific 'Environmental change assessment information framework'
  - Climate change response => Estimating weather
    - Downscaling IPCC forecasts for local applications
    - Operational use in flood forecasting - uncertainty estimates
  - Impact of urbanization on environment
    - Floods
    - Heat
    - Stream flow --> water quality
  - Demonstration applications and tools

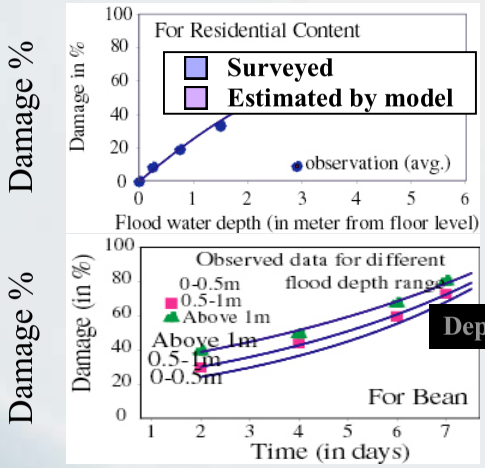
Thank you

for your attention



Flood Inundation (Simulated/Measured)

Property Distribution



Residential building content

Depth

Beans

Time

Economic damage Distribution

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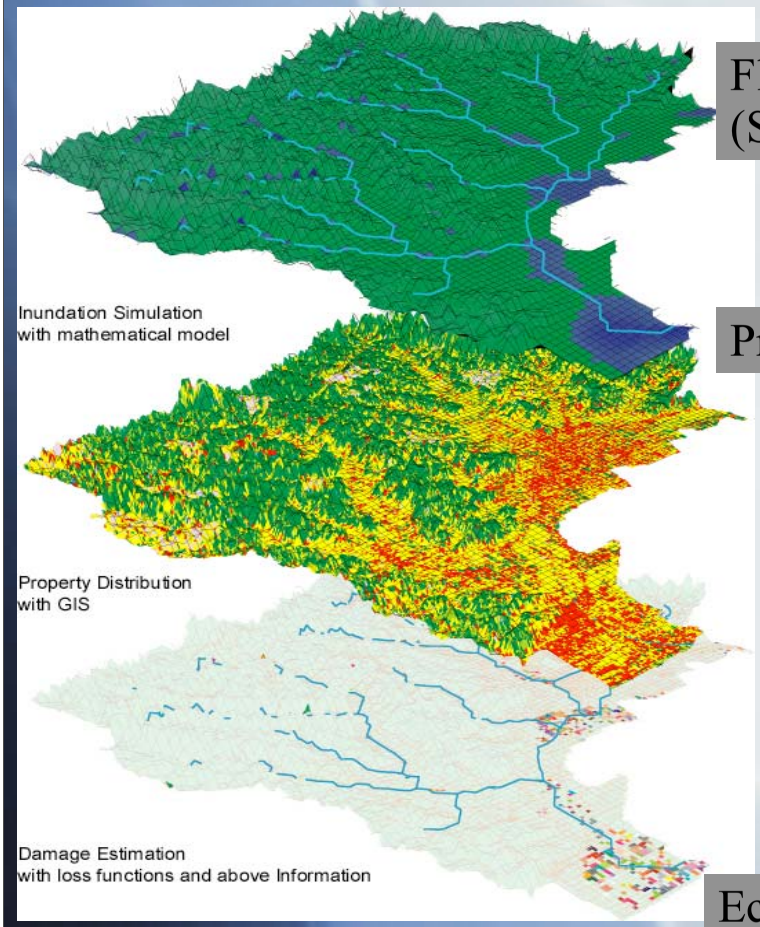
Flood Inundation (Simulated/Measured)



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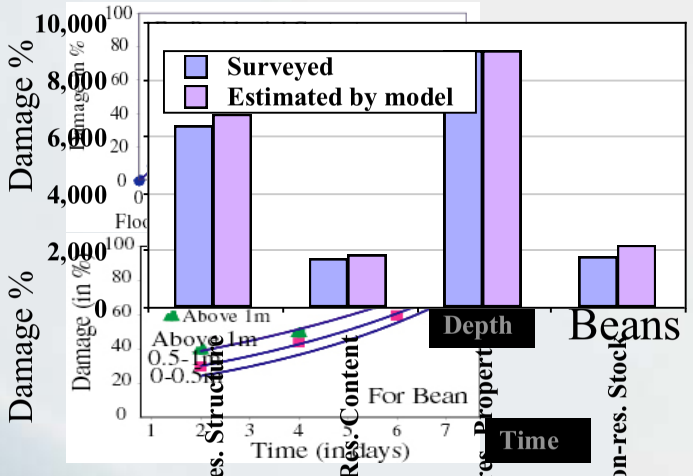

Beans

Economic damage Distribution

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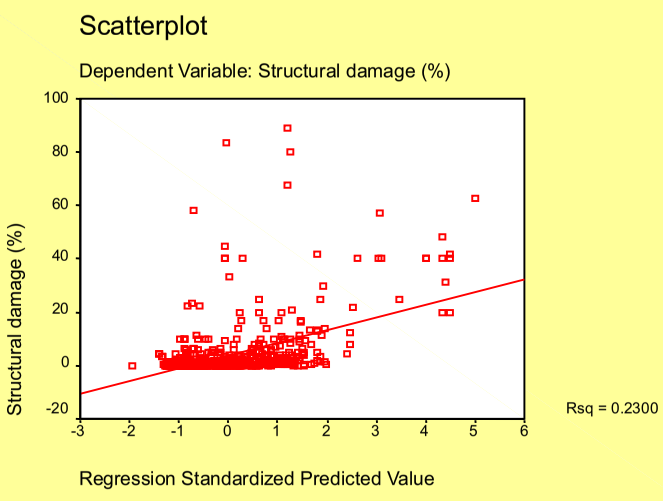
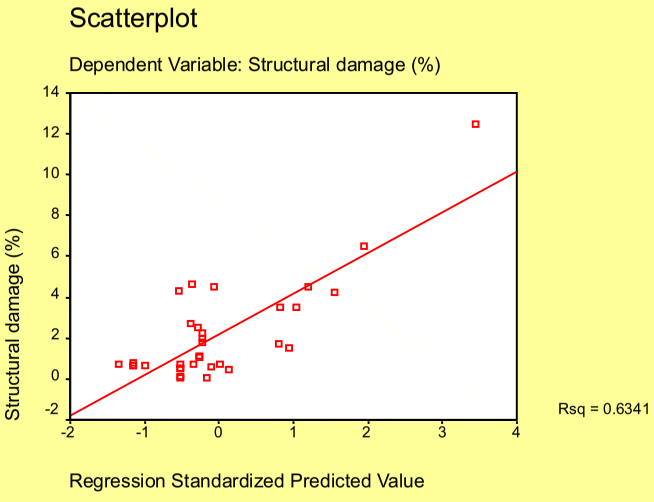
Loss Functions for Structural Damage:



Loss Function for Structural Damage (Industrial Building, Hanoi)



Loss Function for Structural Damage (Residential Building, Hanoi)