

# Flood Risk Mapping in China

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# Key points

- **Large-flood Events in China**
- **Macro-scale Region Flood Risk Assessment**
- **Micro-scale Region Flood Risk Assessment**
- **Practice of Flood Risk Mapping**

## I. Large-flood Events in China

### General concept of flood disasters in China

- **Before 1949:** Flood disaster occurred once in every 2 years
- **After 1949:** Annually, 9.3 million ha. of farmland inundated, 3,700 people killed each year



# Major River Basins in China

Song-Liao River Basin

Yellow River Basin

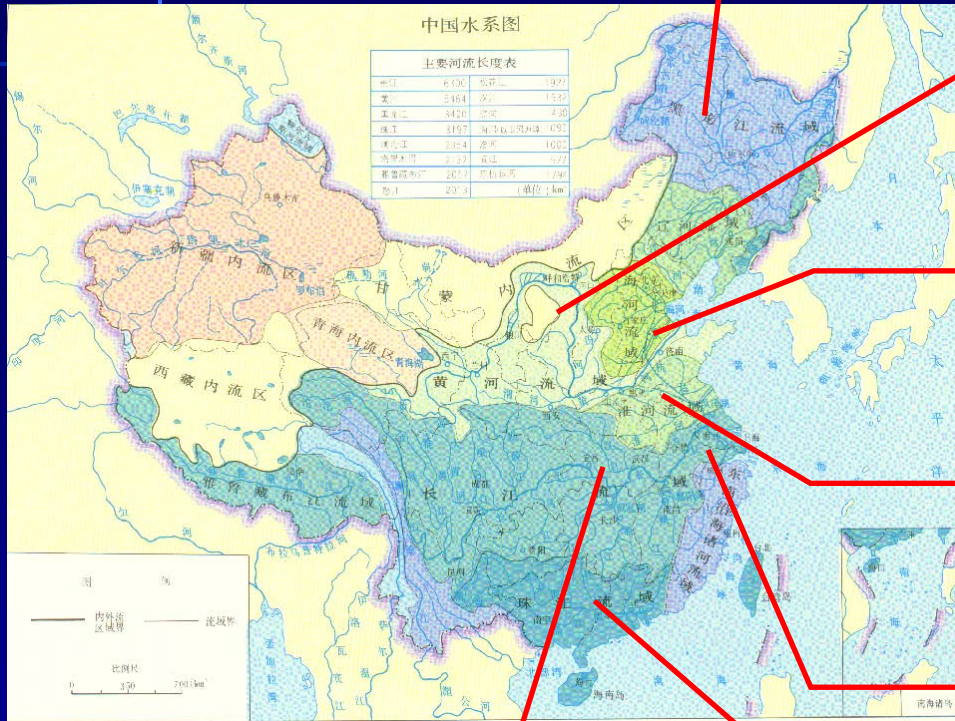
Haihe River Basin

Huaihe River Basin

Taihu Basin

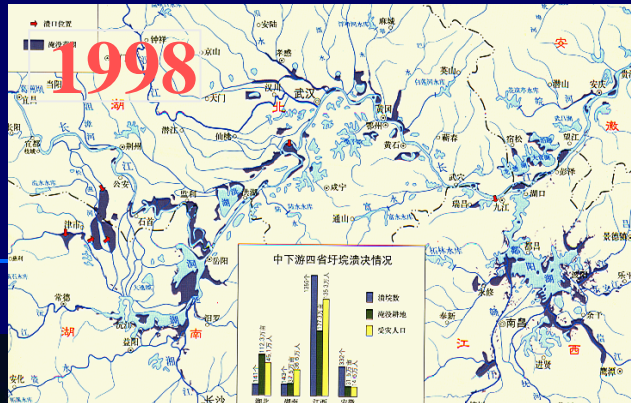
Yangtze River Basin

Pearl River Basin





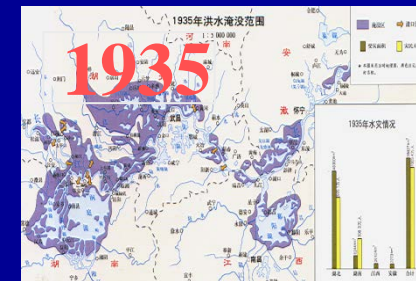
# I. Large-flood Events in China



1954年长江 淮河大洪水



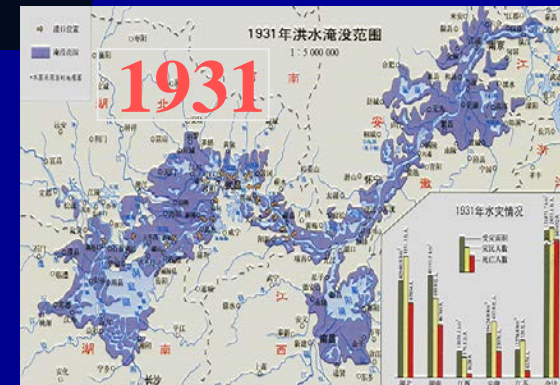
Yangtze River Basin



洪水暴发  
家园被毁



1931年长江 淮河大水



Flood hitting China

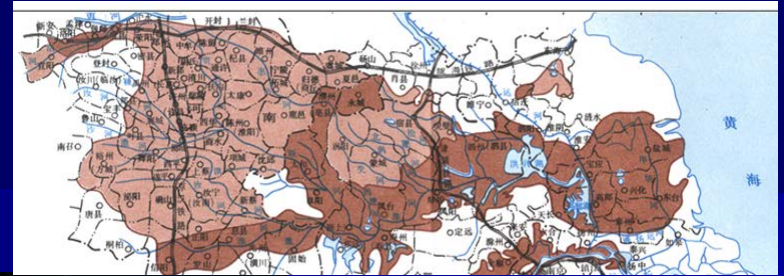
# I. Large-flood Events in China

## Yellow River Basin

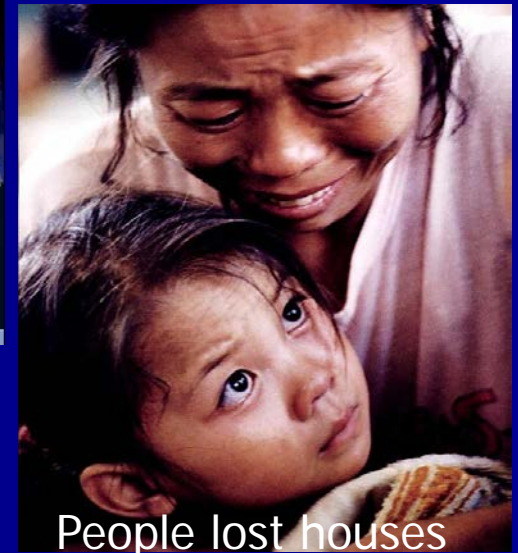
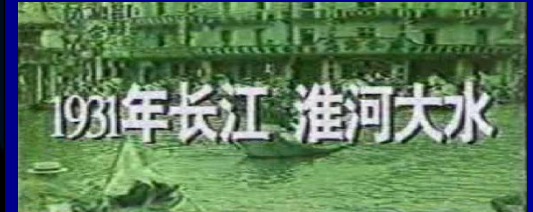




## I. Large-flood Events in China



# Huaihe River Basin



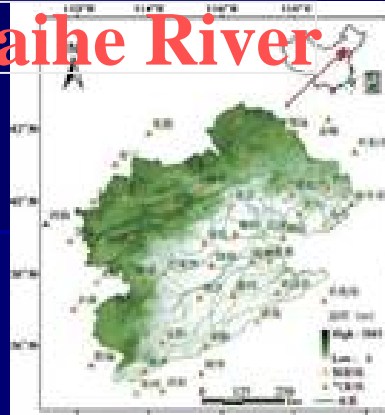
## People lost houses

# I. Large-flood Events in China

## Songhua River



## Haihe River



## Pear River



1932年松花江大水

1939年海河大水

1915年广州大水

Houses inundated

1963年海河大水

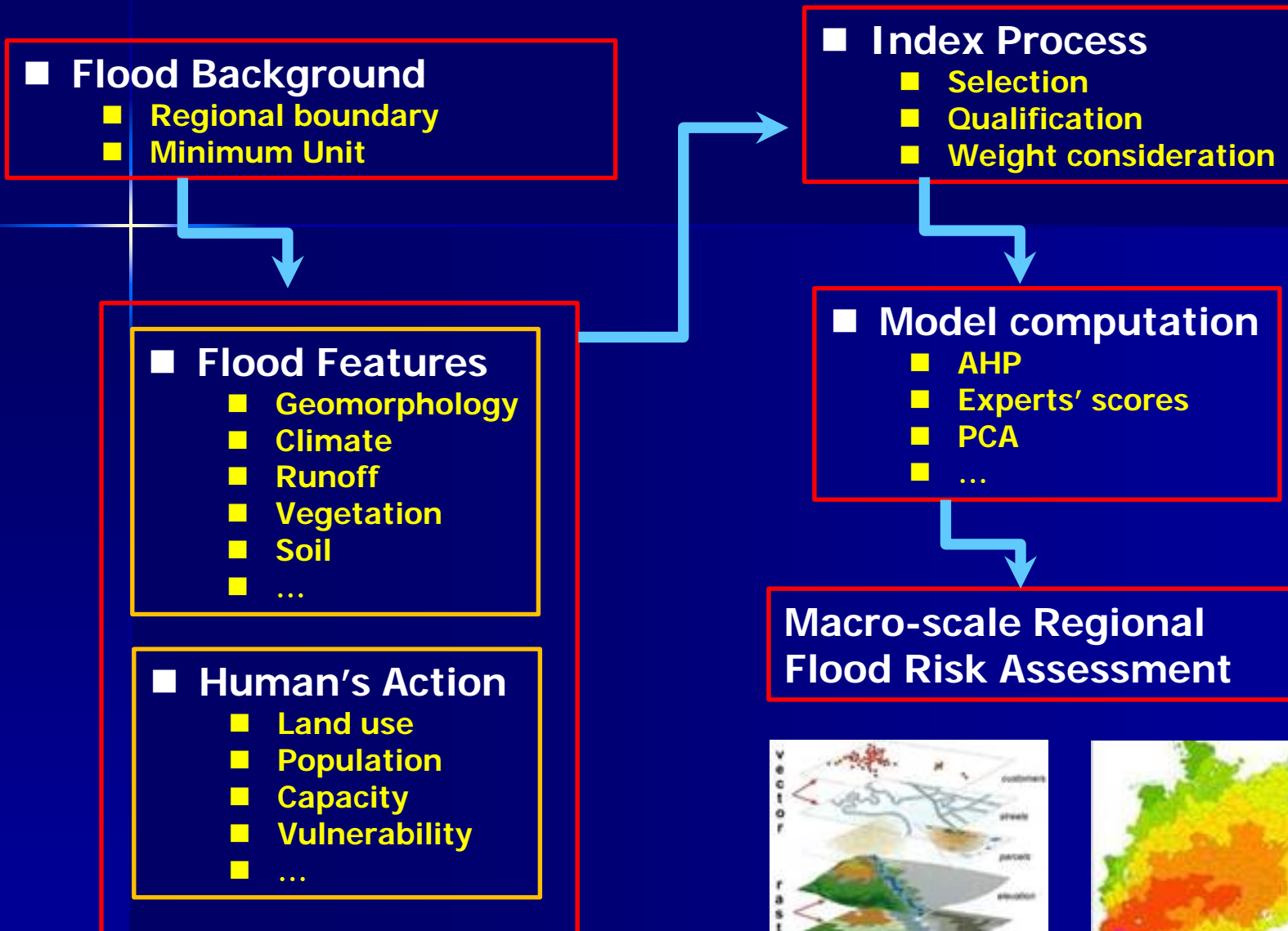
1994年珠江大水



## I. Large-flood Events in China



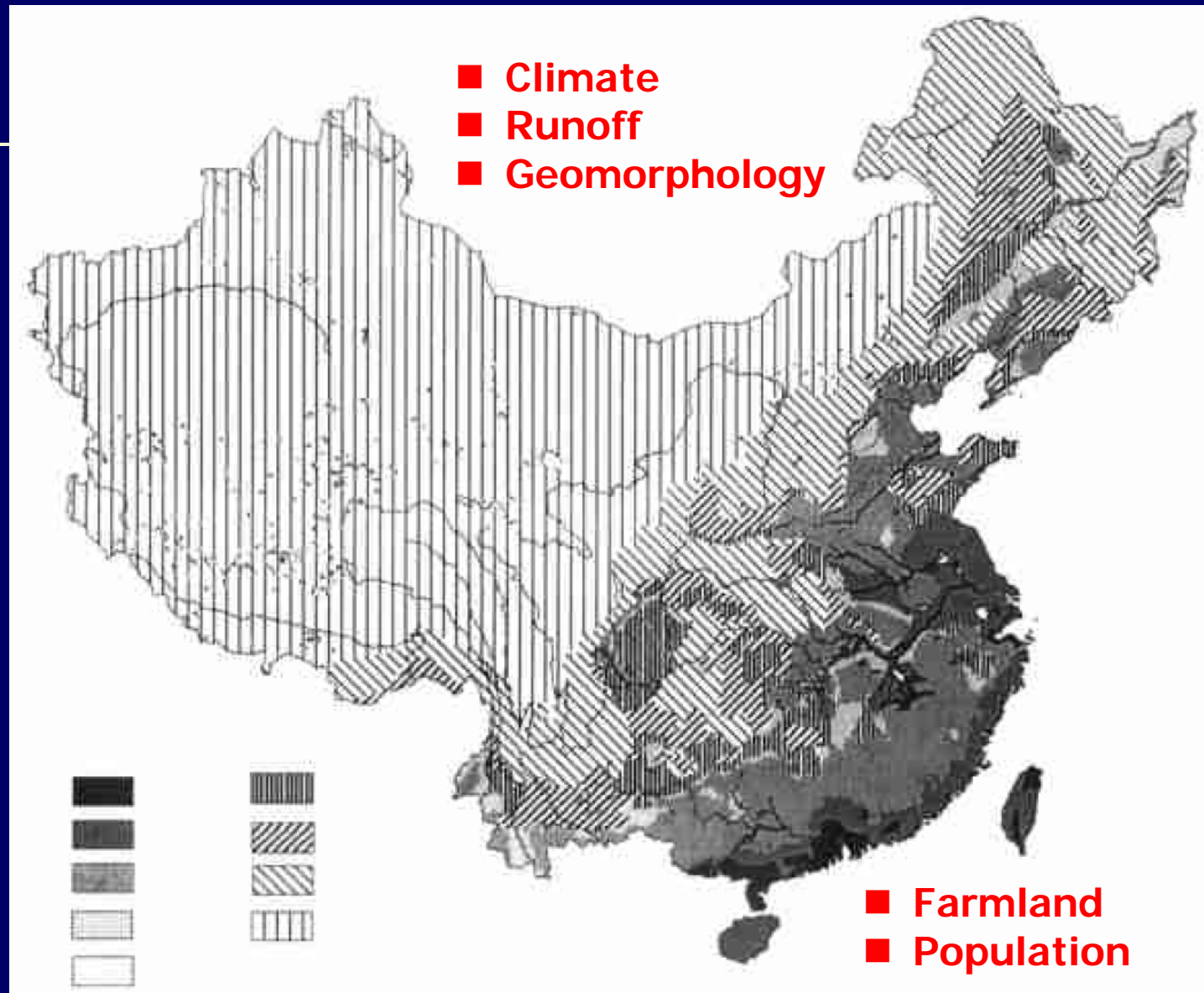
## II. Macro-scale Region Flood Risk Assessment





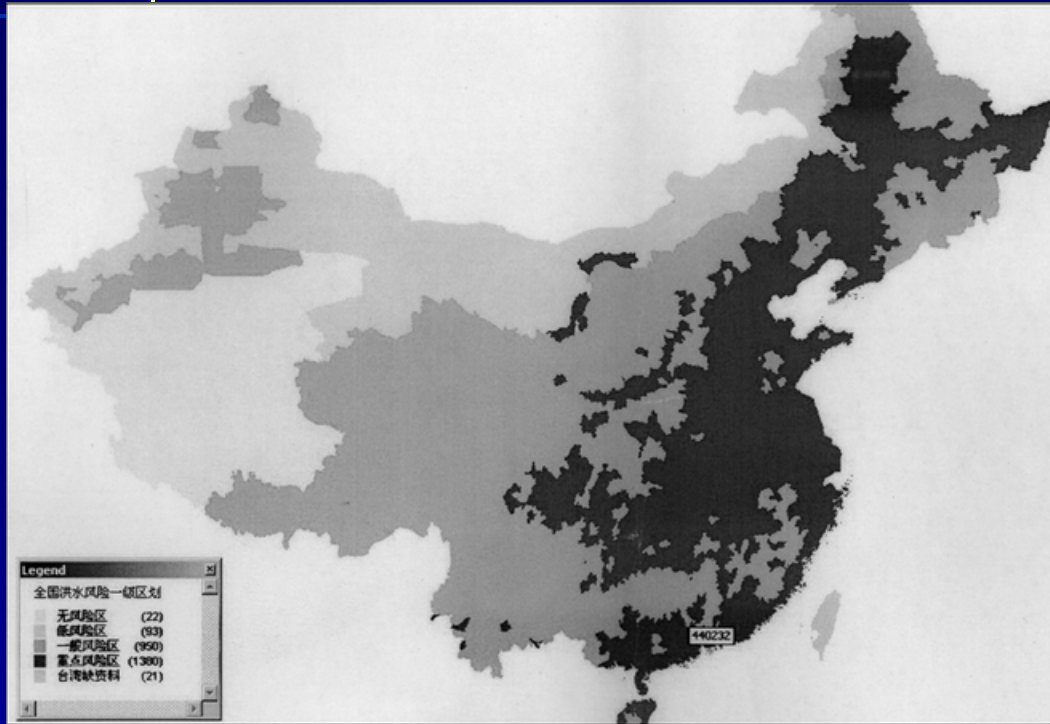
## II. Macro-scale Region Flood Risk Assessment

Xingnan Zhang, et al, 1999



## II. Macro-scale Region Flood Risk Assessment

Xuming Tan, et al, 2004



### ■ Physical

- Hydrology
- Geomorphology

### ■ Society and Economy

- Population
- GDP
- Area of Farmland

### ■ Flood Disaster

- Frequency of Flood Events
- Maximum Flooded Area

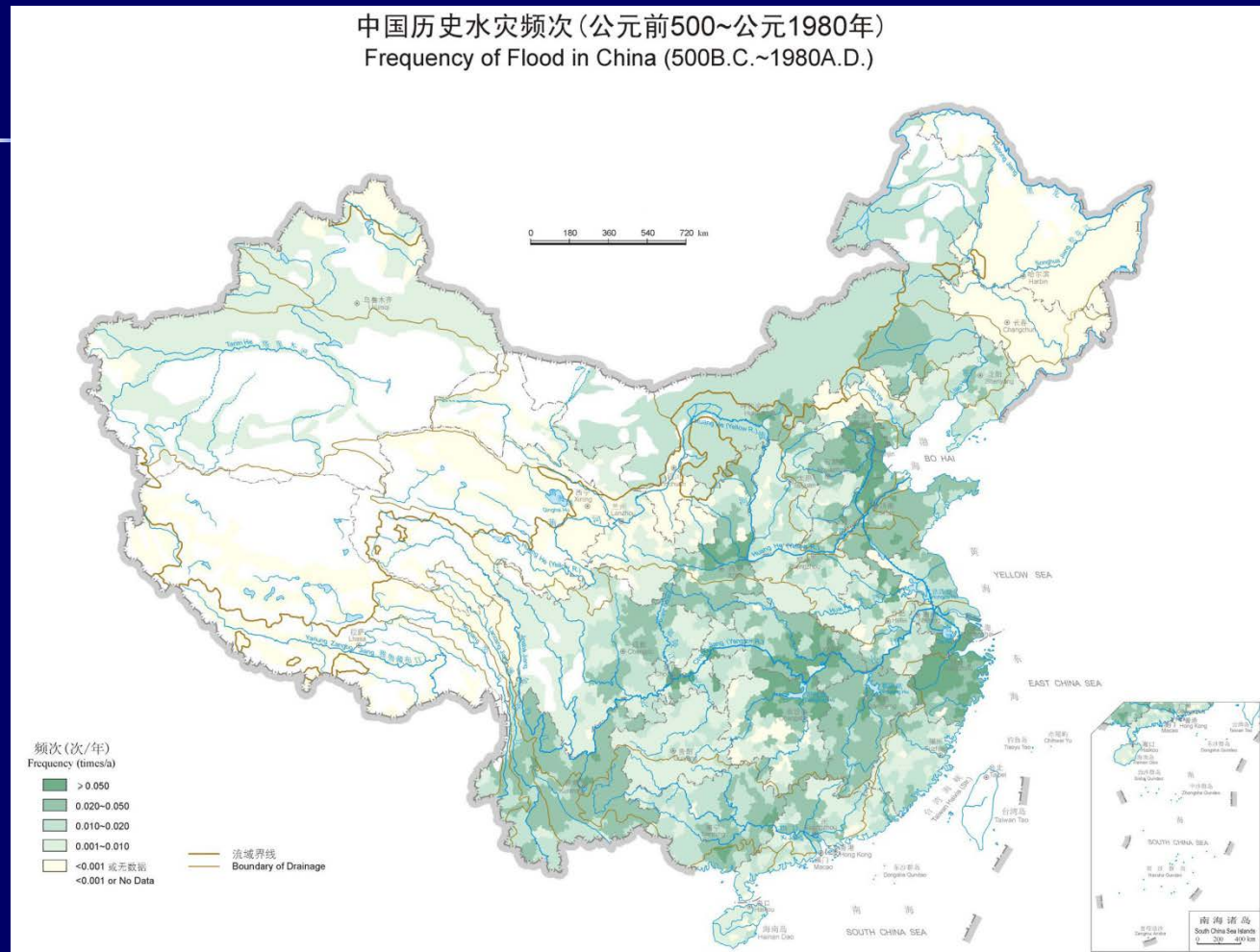
### ■ Capacity

- Standard of Flood Control



## II. Macro-scale Region Flood Risk Assessment

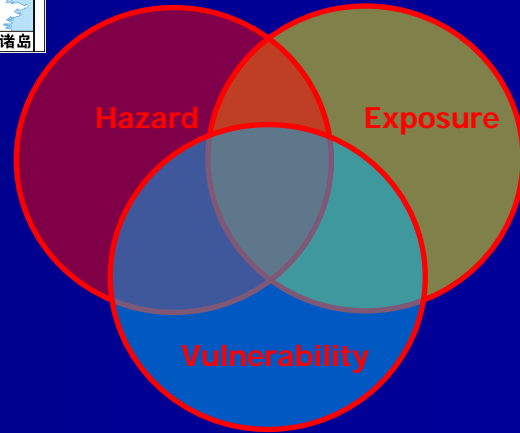
Peijun Shi, et al, 2008



■ Frequency of Flood Events

# II. Macro-scale Region Flood Risk Assessment

Xiaotao Cheng, et al, 2011



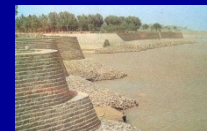
## Micro-scale Region Flood Risk Assessment



# Flood Risk Mapping ...

## ■ Basic spatial information

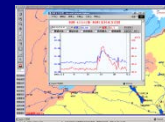
## ■ Structural measures



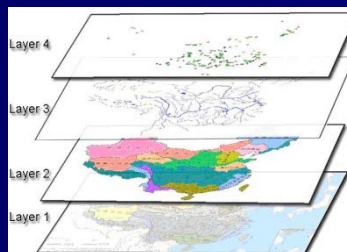
## ■ Risk information



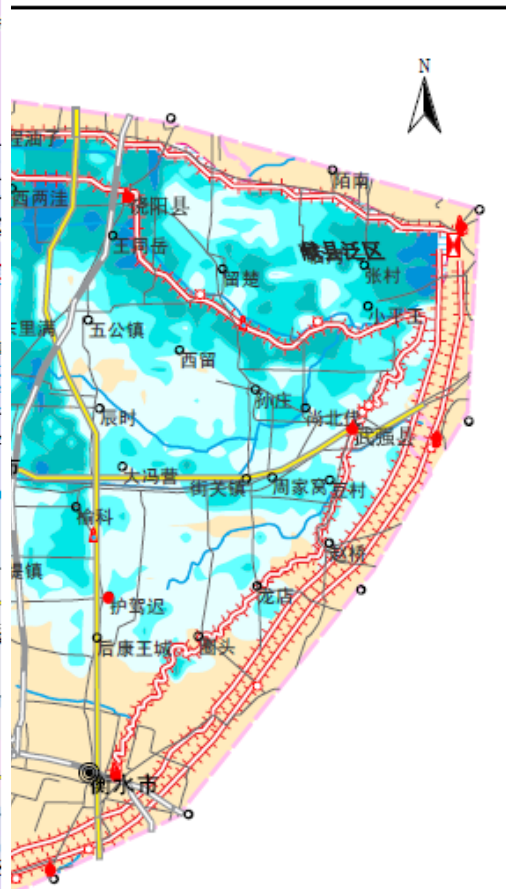
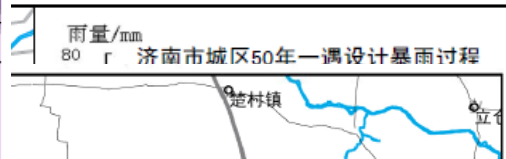
## ■ Nonstructural measures



## ■ Scenario description



# III. Micro-scale Region Flood Risk Assessment



主管单位	海河水利委员会
编制单位	河北省水利水电勘测设计研究院
编制时间	2010-8
发布单位	
发布时间	



### III. Micro-scale Region Flood Risk Assessment

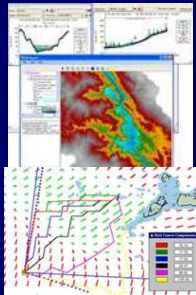
- Flood Background
  - Regional boundary

- Flood Hazard
  - Inundation area
  - Water depth
  - Duration
  - Velocity

- Hydrological Analysis



- Hydraulic Analysis

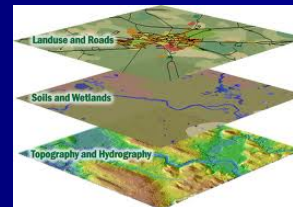


- Flood Mark Analysis



- Vulnerability
  - Land use
  - Population
  - Economy
  - Flood control capacity
  - ...

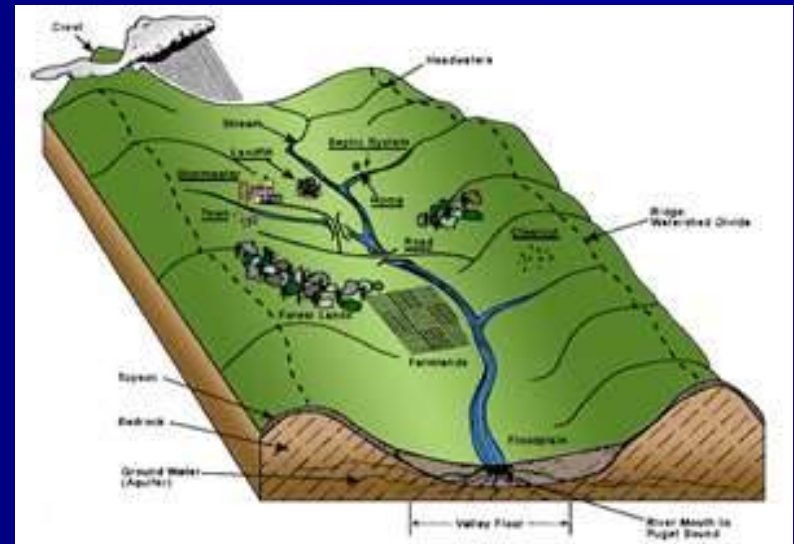
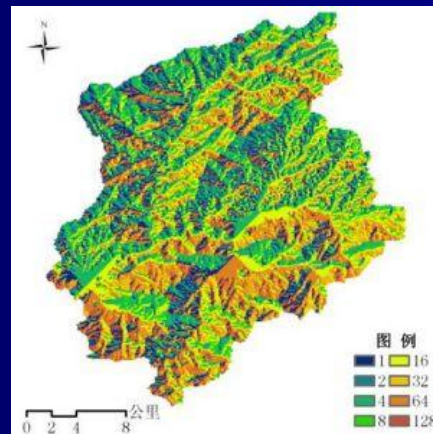
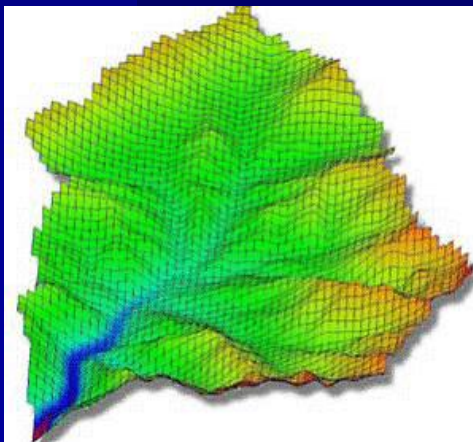
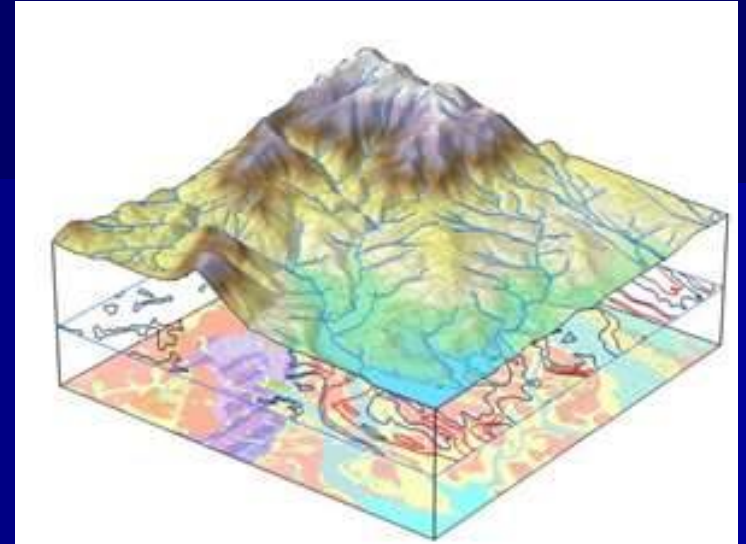
Micro-scale  
Region Flood  
Risk Assessment



### III. Micro-scale Region Flood Risk Assessment

## Hydrologic Analysis

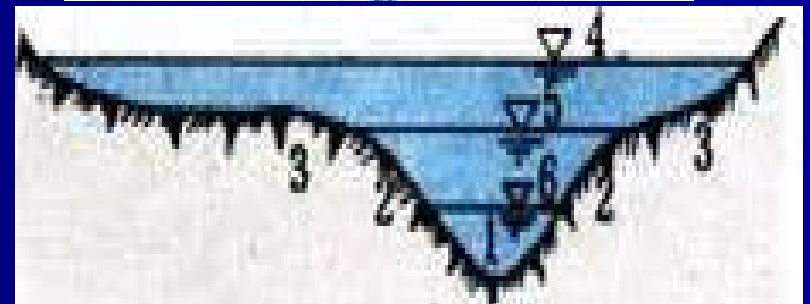
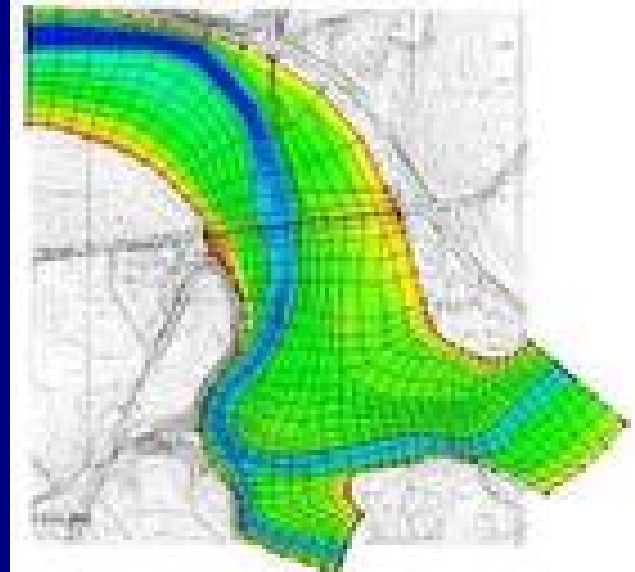
- Frequency of flood events
- Hydro features of a basin system
- Basin and river geomorphology
- Land-cover



### III. Micro-scale Region Flood Risk Assessment

## Hydraulic Analysis

- Flood modeling
- Index values
  - Max water depth
  - Max velocity
  - Duration
  - Arrival time





### III. Micro-scale Region Flood Risk Assessment

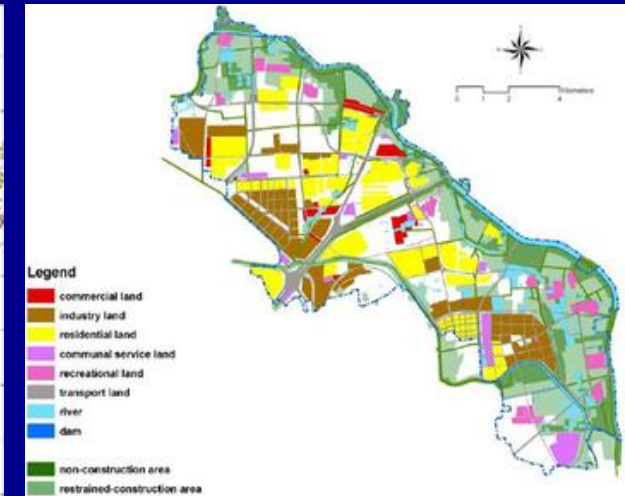
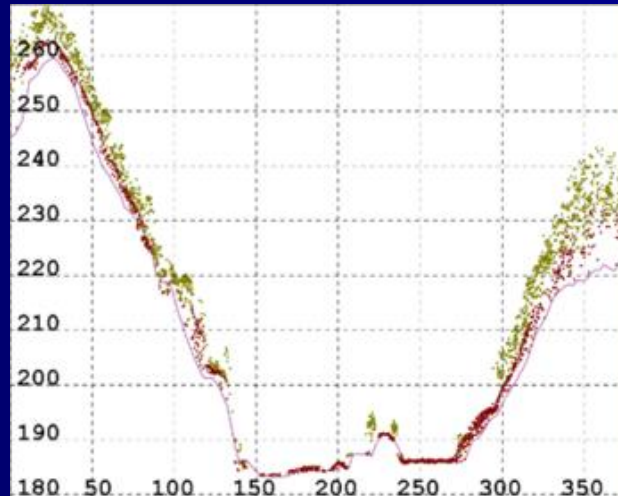
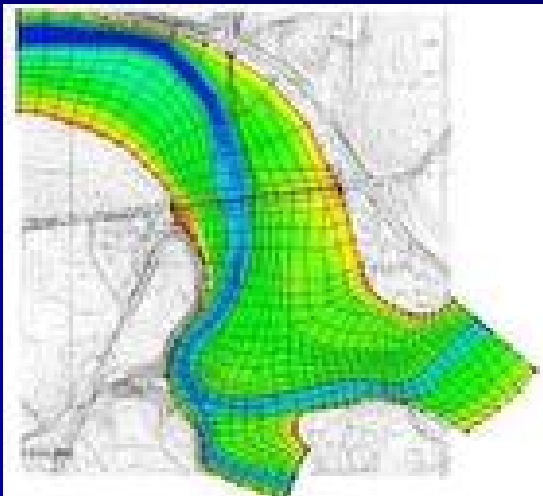
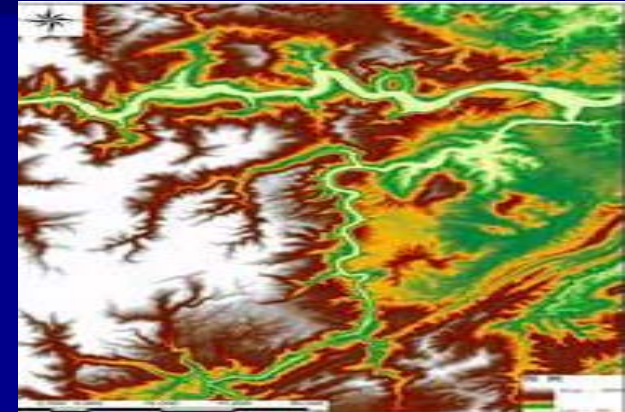
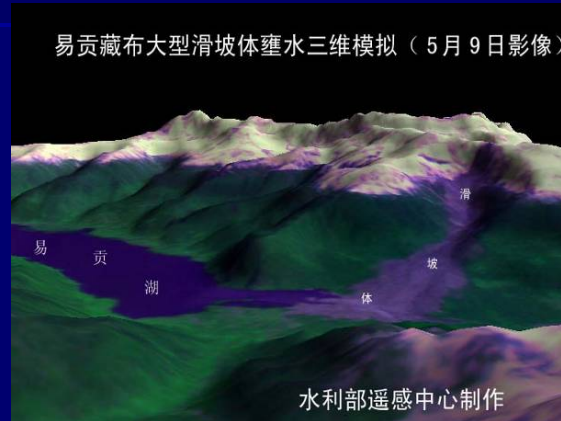
## Information:

### ■ Elevation

- DEM
- Contour

### ■ Roughness

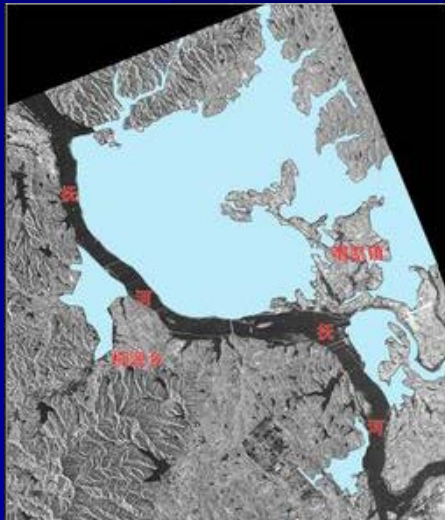
- Landuse



### III. Micro-scale Region Flood Risk Assessment

## Flood Mark Analysis

- Simple, effective and objective



**Flood  
once  
reached  
here**

### III. Micro-scale Region Flood Risk Assessment

## How to determine flood risk level

**Flood Hazard**

High

Medium

Low

IV

VII

IX

II

V

VIII

I

III

VI

Low

Medium

High

**Vulnerability**

**Flood Risk Level**

Very high

High

Medium

Low

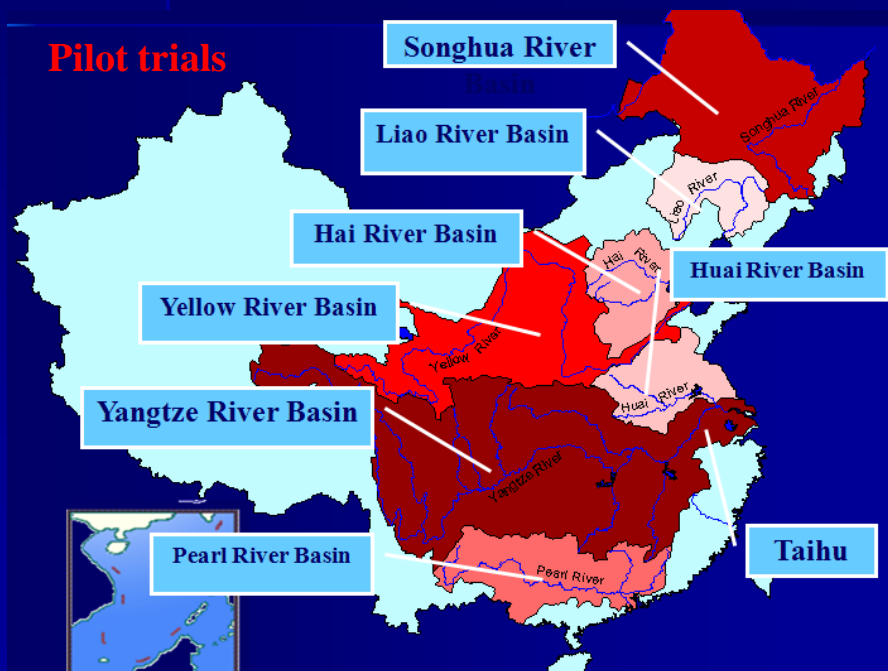
Very low



## IV. Practices of Flood Risk Mapping

# Flood Risk Mapping Project

- Pilot trials in major river basins (2005-2007)
- 1<sup>st</sup> Phase (2008-2010)
- 2<sup>nd</sup> Phase (2011-present)



## IV. Practices of Flood Risk Mapping

# Outputs

- Rivers: 18
- Detention basins: 14
- Reservoirs: 8
- Cities: 13



## IV. Practices of Flood Risk Mapping

### ■ *Guideline for Flood Hazard Mapping*

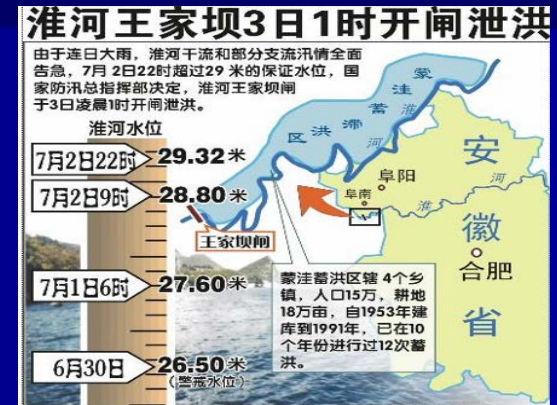
### ■ *Technical Specification for Flood Hazard Mapping*



**Riverine flood**



**Flash flood**



**Detention basin flood**



**Urban flood**



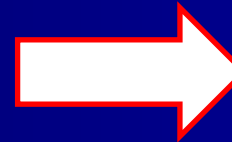
**Dam failure flood**



**Typhoon flood**



## ❑ Share international experiences



**Flood  
Disaster  
Mitigation**

**Thank you!**