

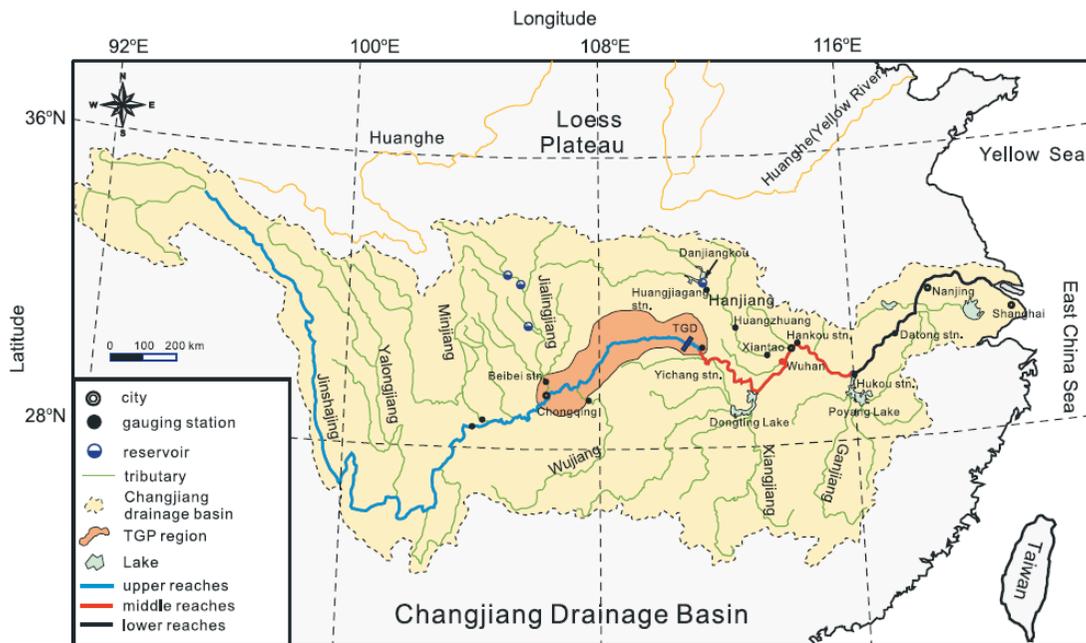
Recent Environmental Changes in the Yangtze Estuary, China: Anthropogenic Influence

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Yangtze River

Length : ca. 6300 km,
Basin area : ca. $180 \times 10^4 \text{ km}^2$
Sediment load :

$4.33 \times 10^8 \text{ t/yr}$ (1950-2000)

The Yangtze Estuary:

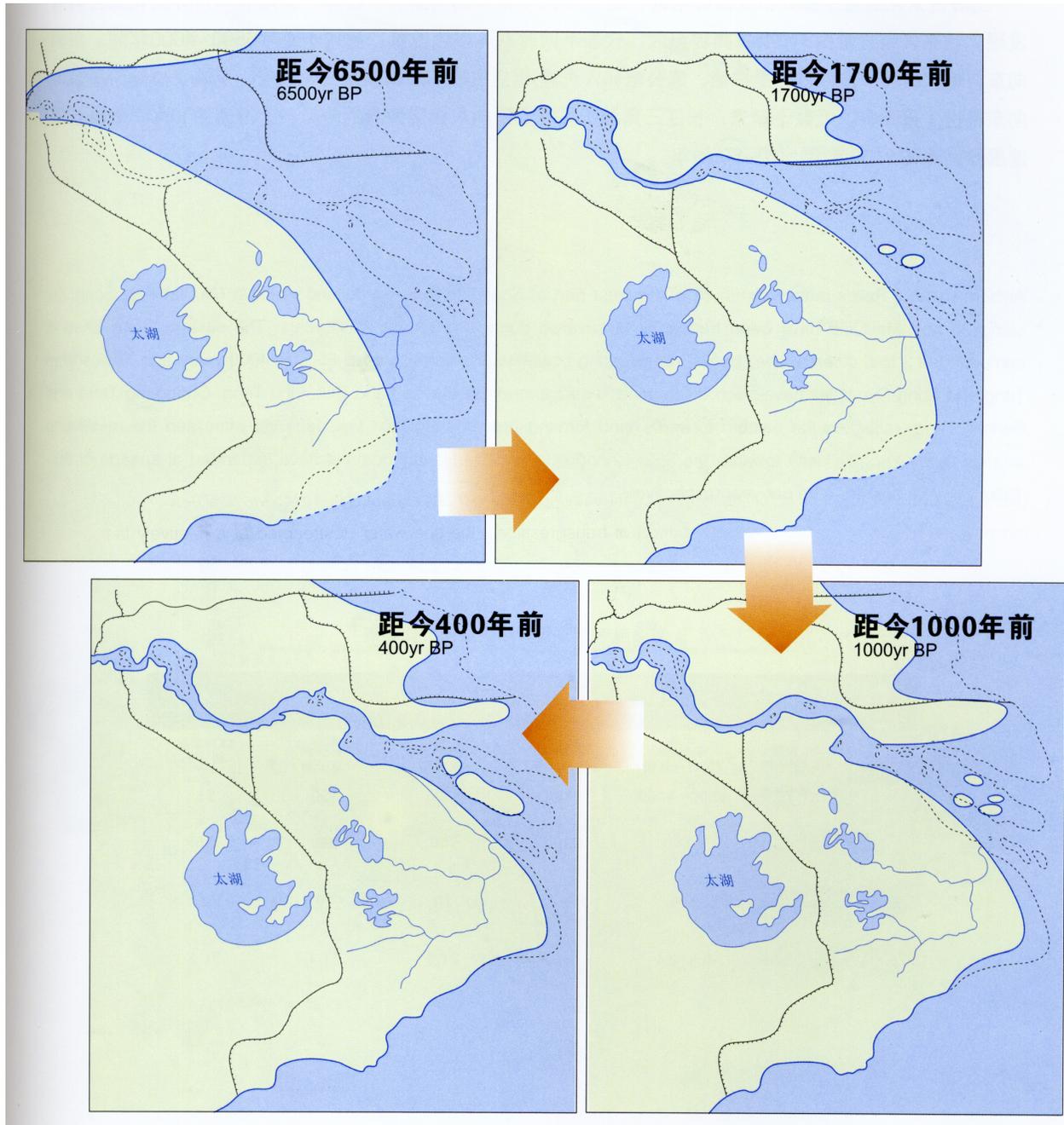
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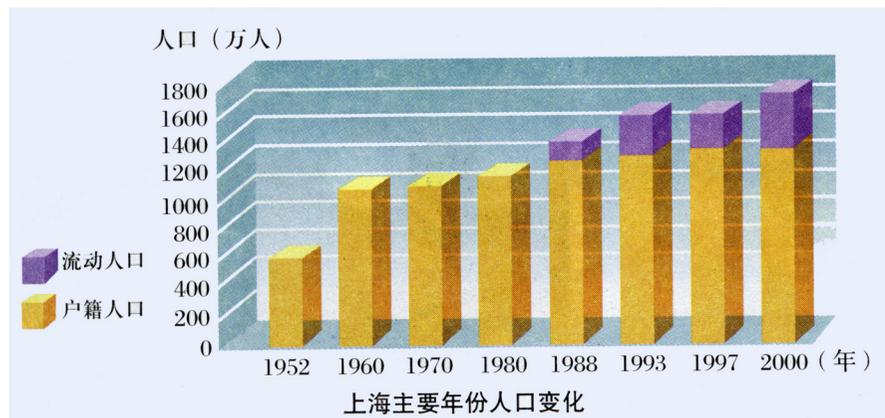
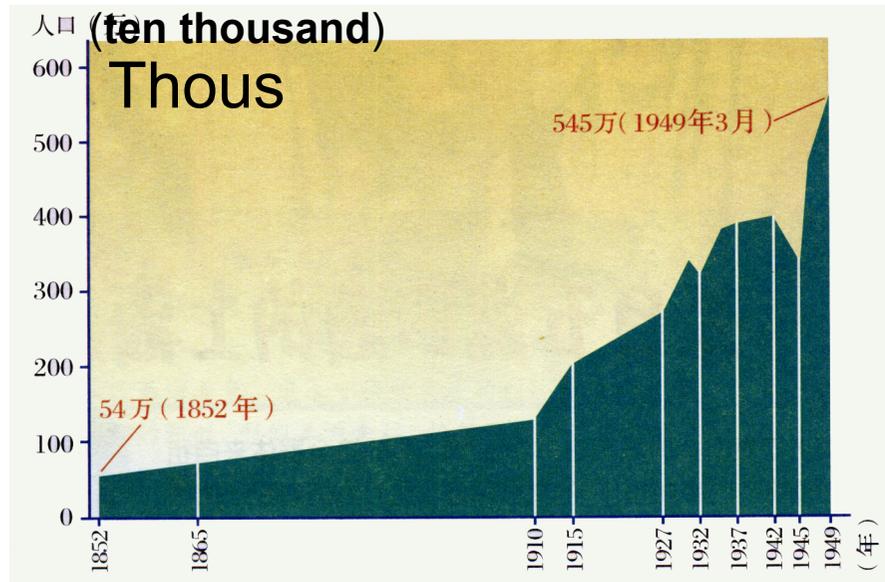
The city of Shanghai
is linked to the
Yangtze Estuary





Evolution of the Yangtze Estuary

Population changes in Shanghai



Year 2005: 17.78 million
Year 2009: 19.21 million

The Shanghai City depend on the Estuary:

Water (max. demand >10 million m^3)

Land (industrial, residential, agricultural...)

Harbour

Toursim

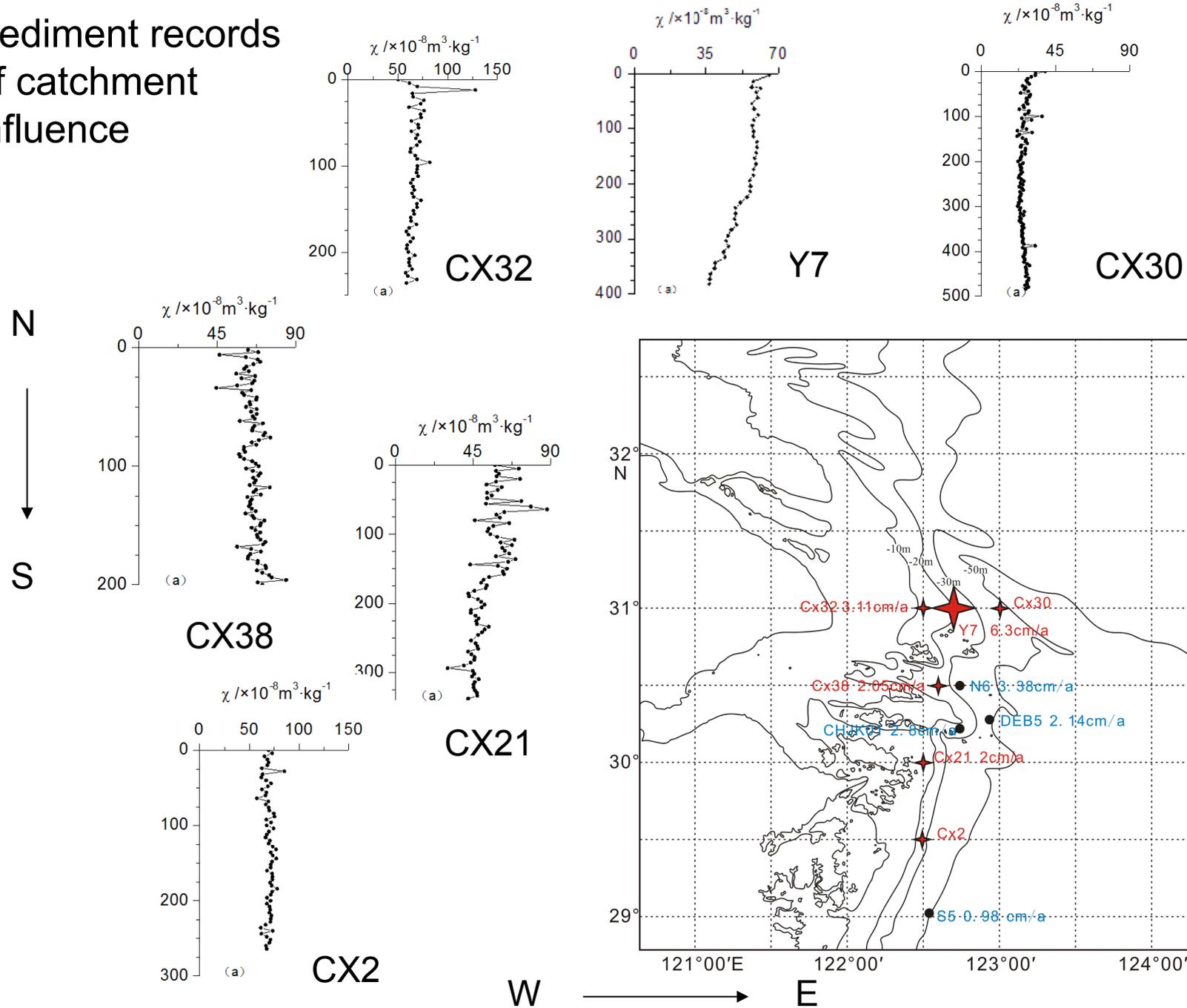
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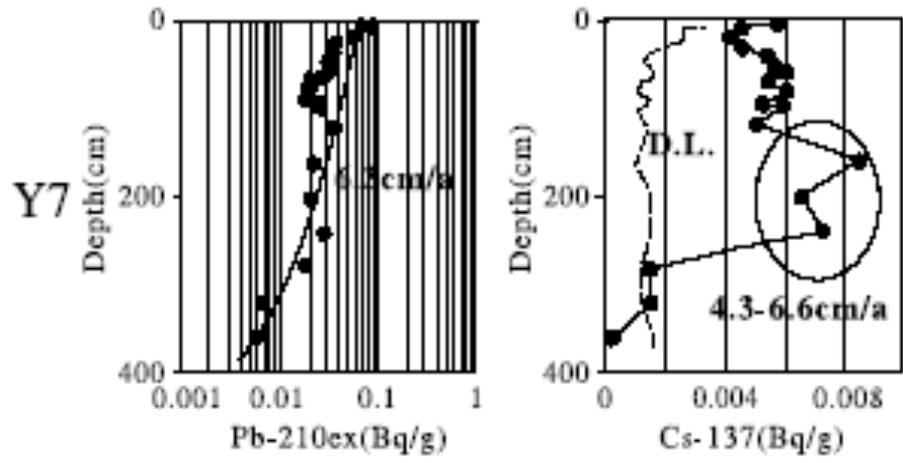
The availability of such resources rely on the
Basin-wide human-environment interactions

*e.g., fresh water and sediment delivery from
the Yangtze have been significantly altered*

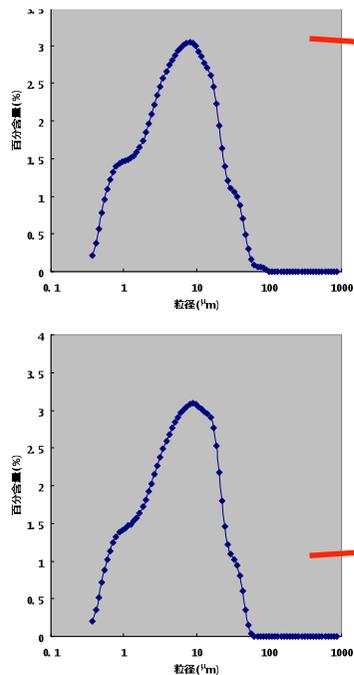
- Evidence of catchment influence on the estuary
- Local human activities on the estuary
- Ecological and economic Chongming Island

Sediment records of catchment influence

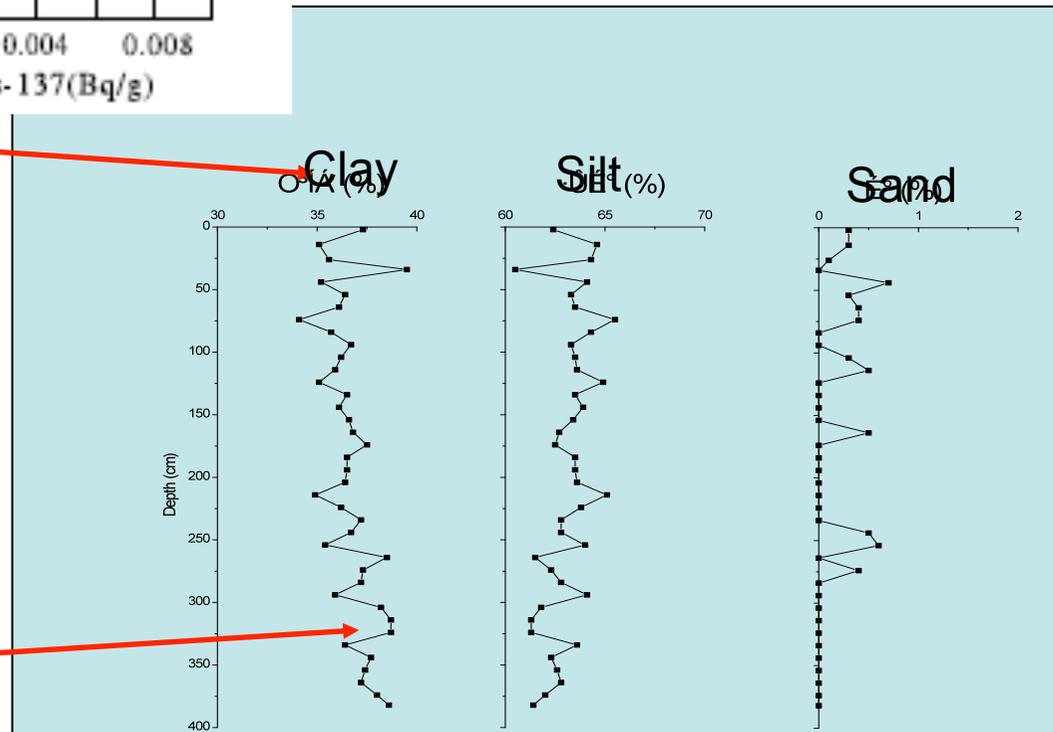




High sedimentation rate, ca. 6.3 cm/yr

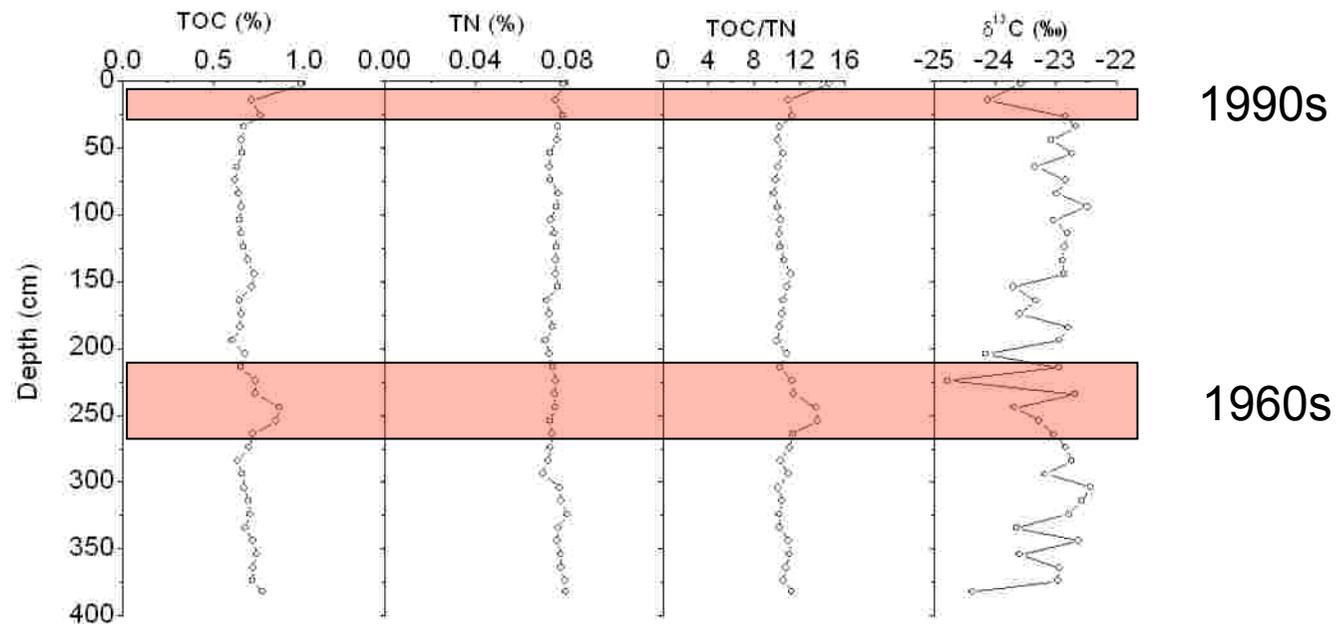


Particle size distribution



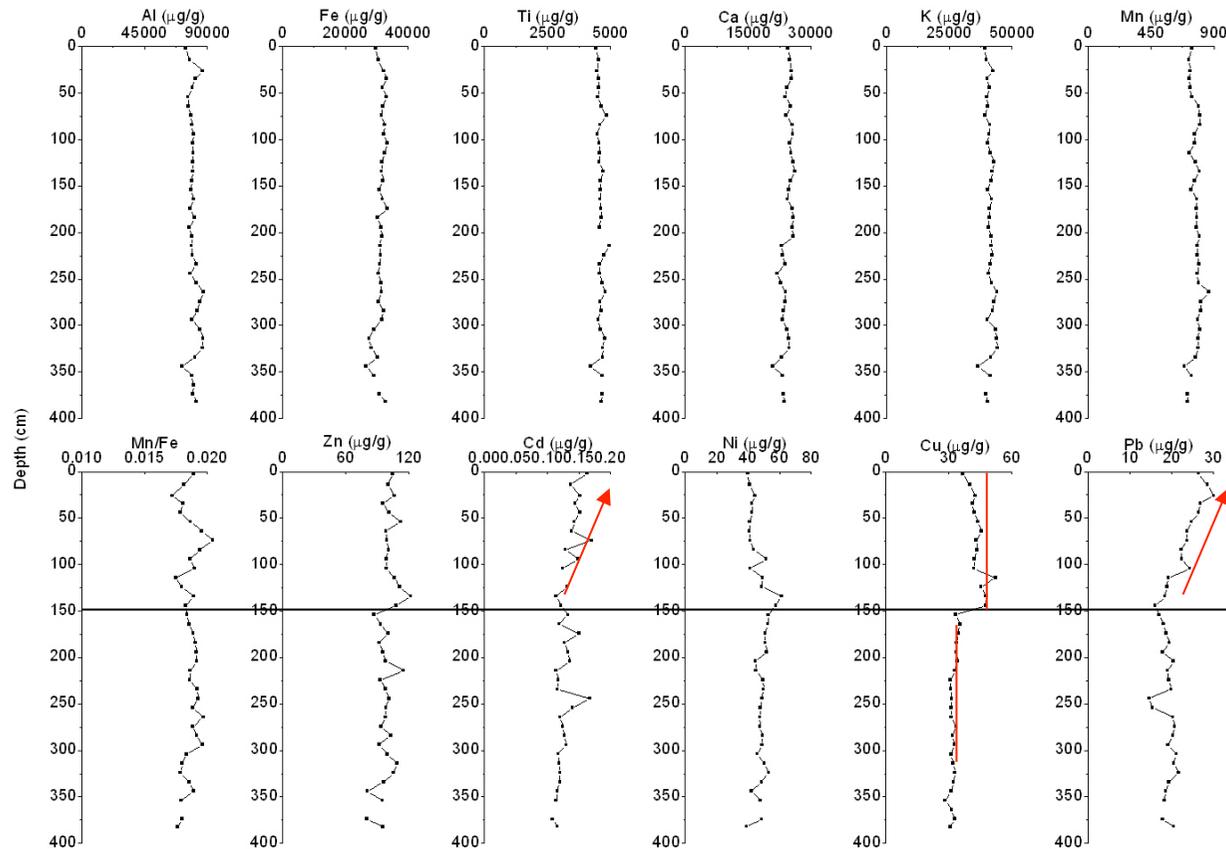
Relatively homogeneous particle size composition, dominated by silty clay

Core Y7

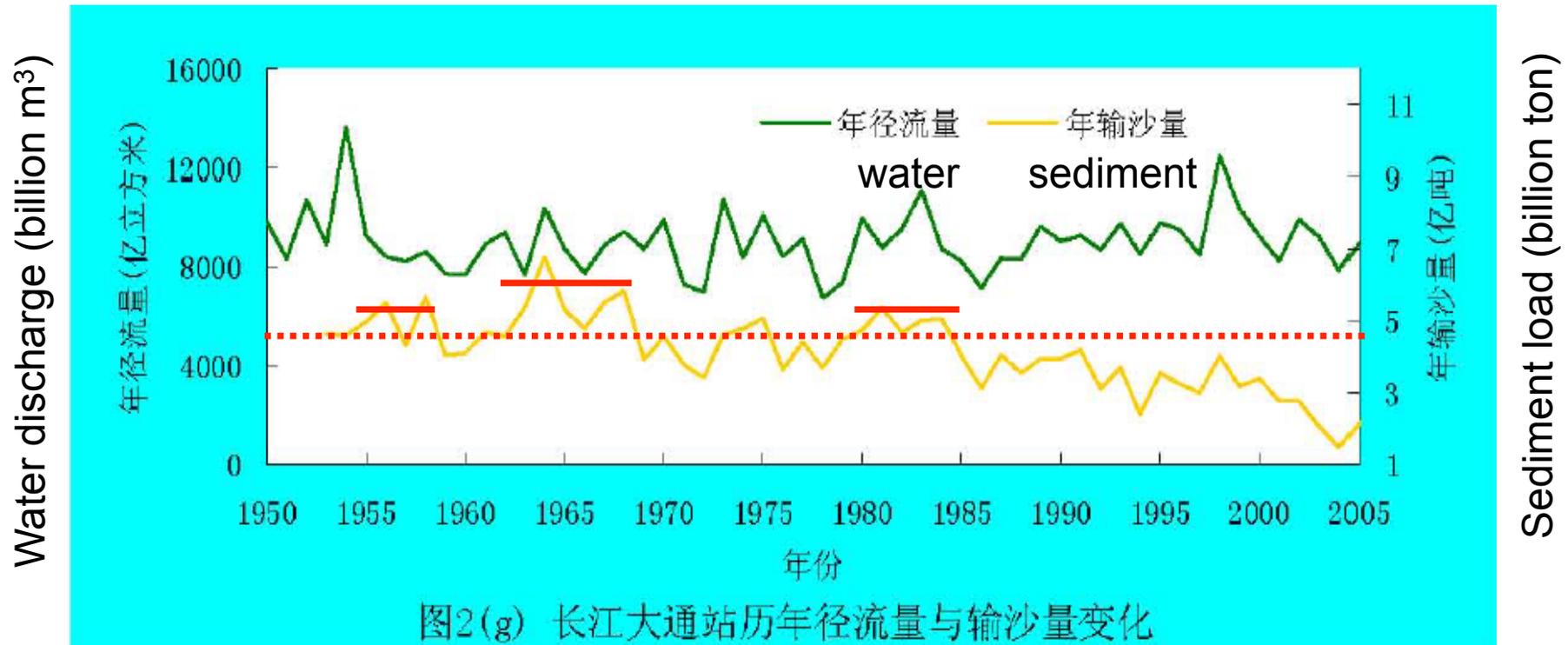


Increased terrestrial organic matter input in the 1960s, possibly due to deforestation in the catchment related to the Great Forward Leap (1958-1960)

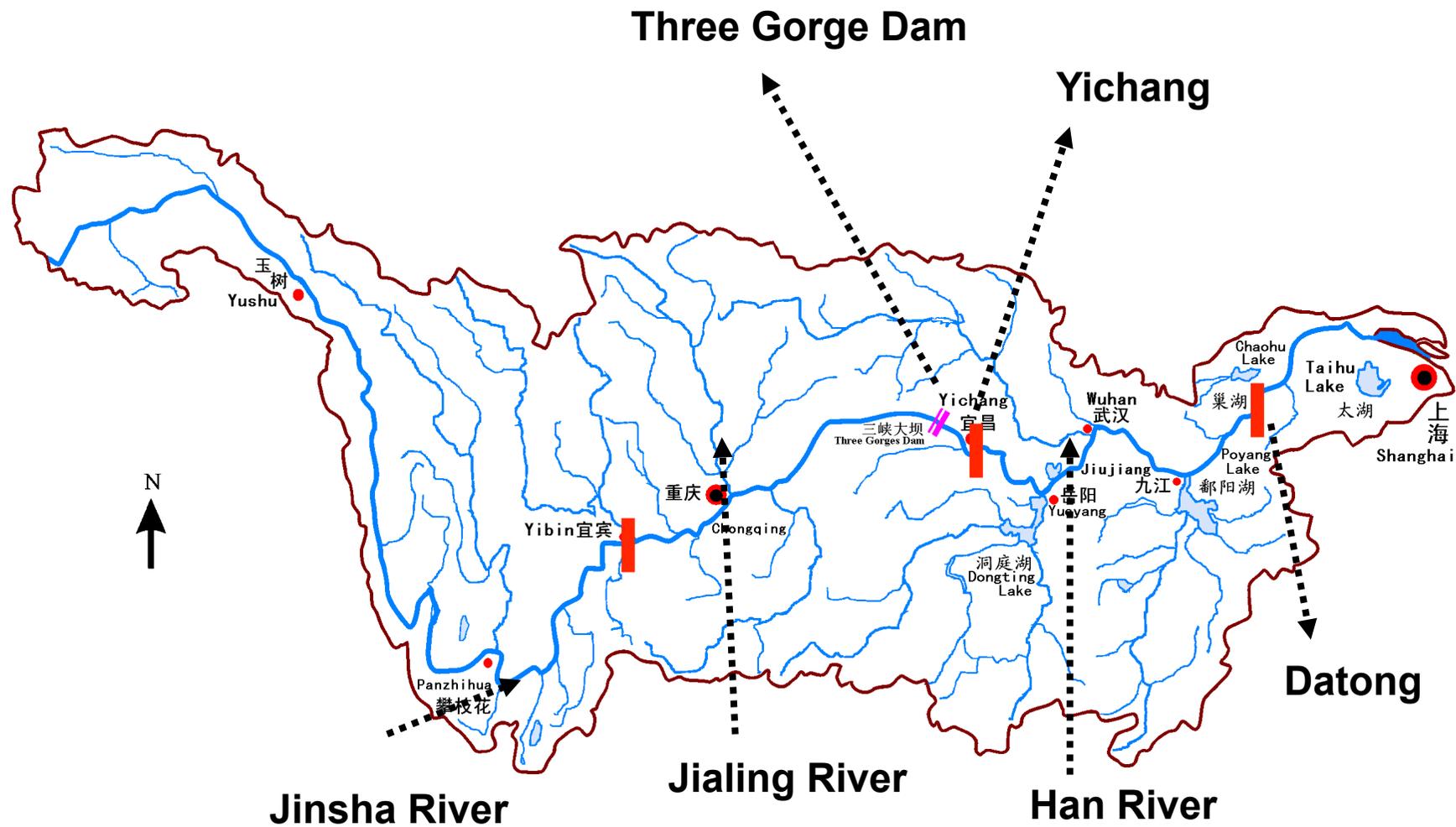
Homogeneous chemical composition as indicated by major elements, and increases of trace metals Cu and Pb starting from 150 cm (1980s) depth are clear, possibly related to the Open and Reform started since 1979.

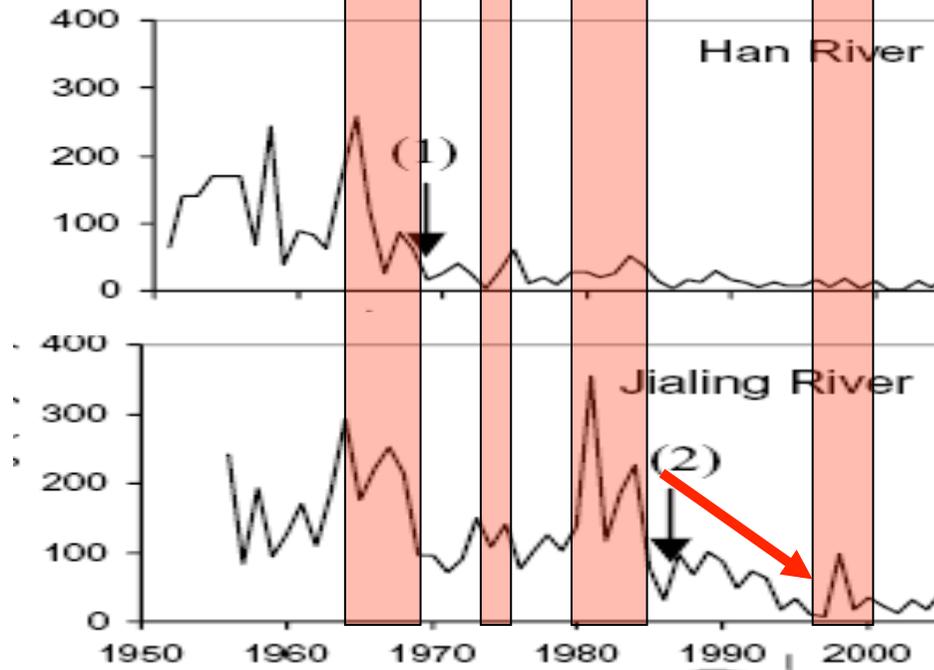
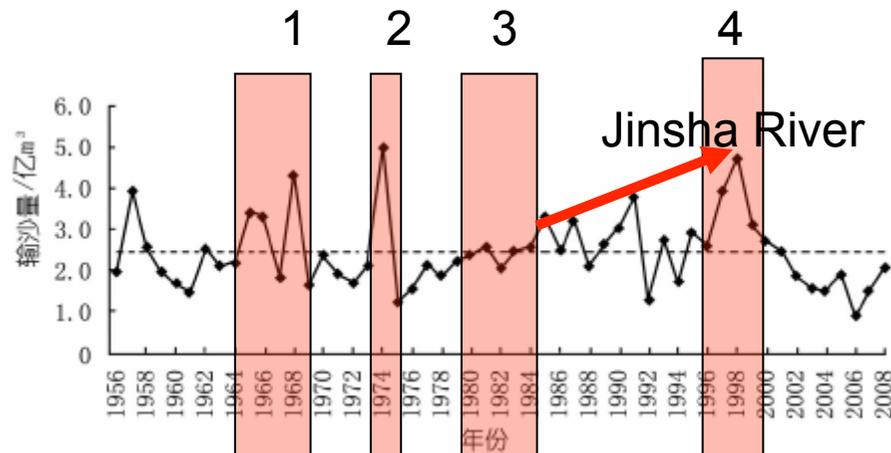


Peak of sediment discharge of the Yangtze River in the 1960s



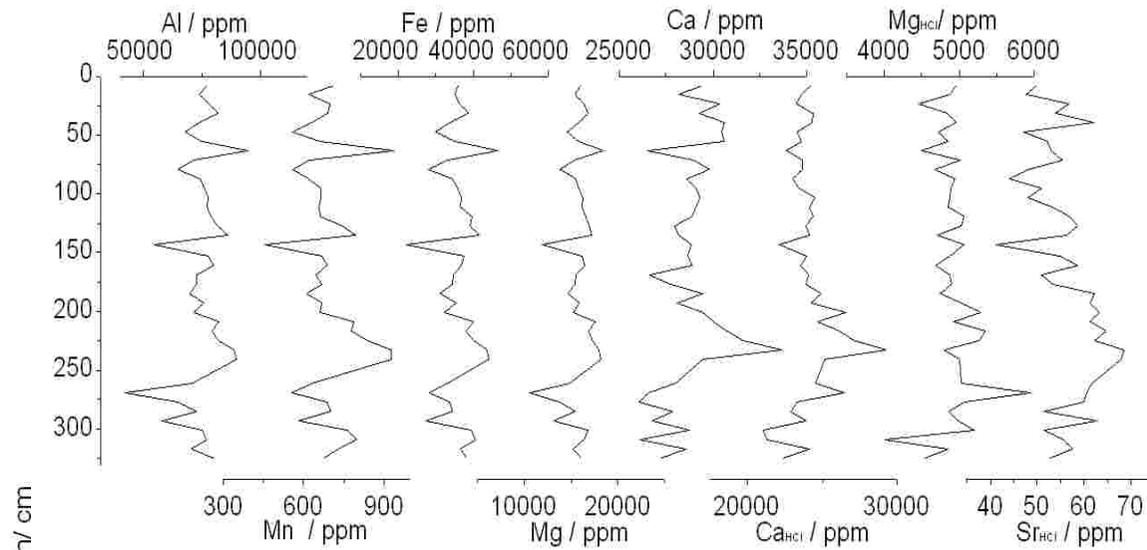
Sediment load at the Datong (the lower Yangtze Reach) hydrological gauge station



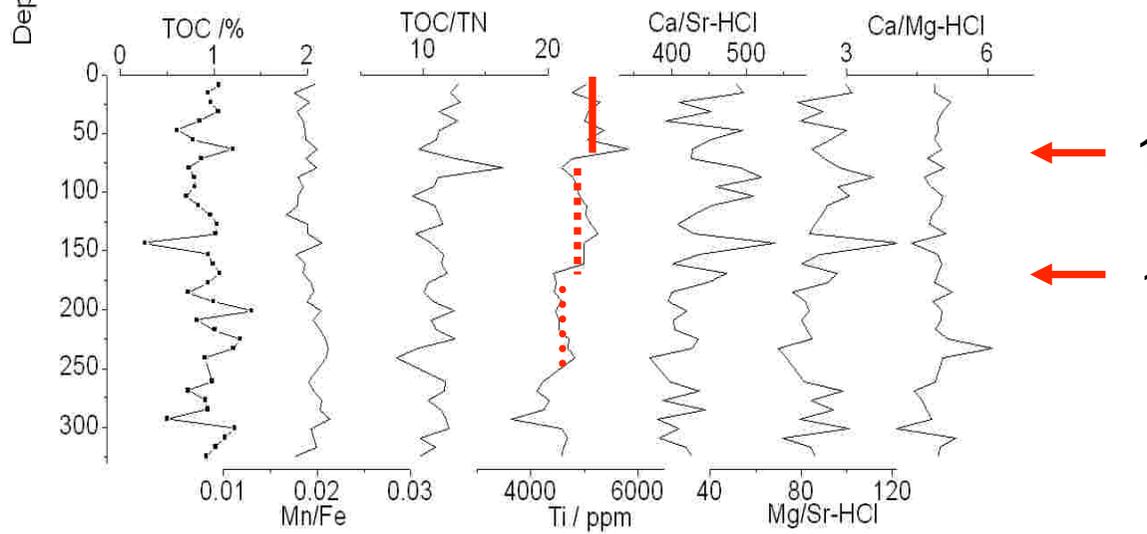


Temporal variations of sediment discharge for the major tributaries of the Yangtze River

Geochemical composition difference among the tributaries (e.g., Jinsha R. shows highest Sedimentary Ti content) enable tracing temporal estuarine sediment source variations



**Core CX21: ca. 2 cm/yr
 Significant change of Ti,
 at ca. 1975 and 1920,
 possibly indicating
 provenance change**



← 1975
 ← 1920



Three Gorge Dam closure in 2003

What's the impact on the estuary?

Yangtze

River

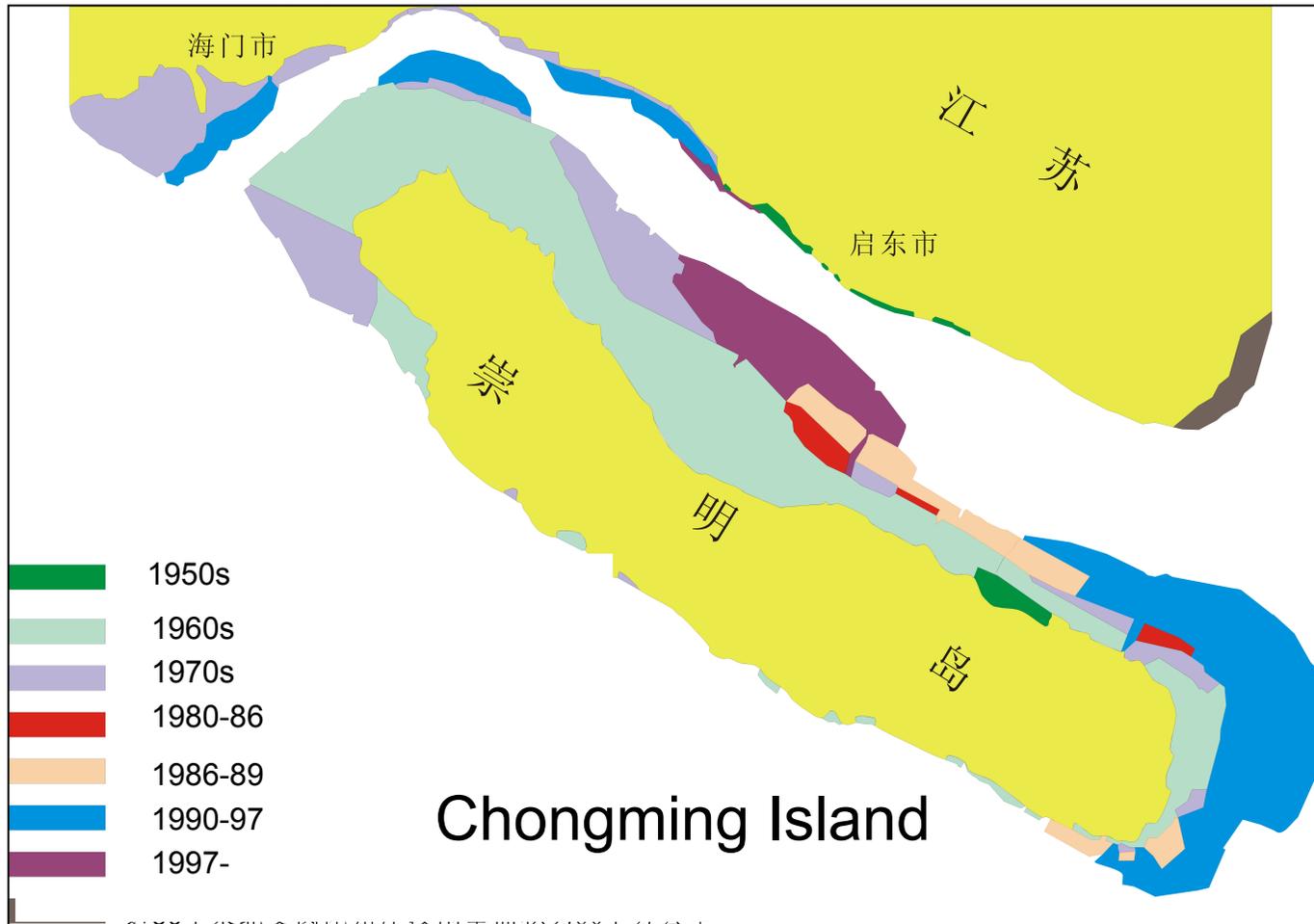
- Improved management of water resources
- Increased water for:
 - People
 - Industry
 - Agriculture
 - Energy
- Reduced risk from extreme flows and floods
- Loss of riverine habitat and lifestyle

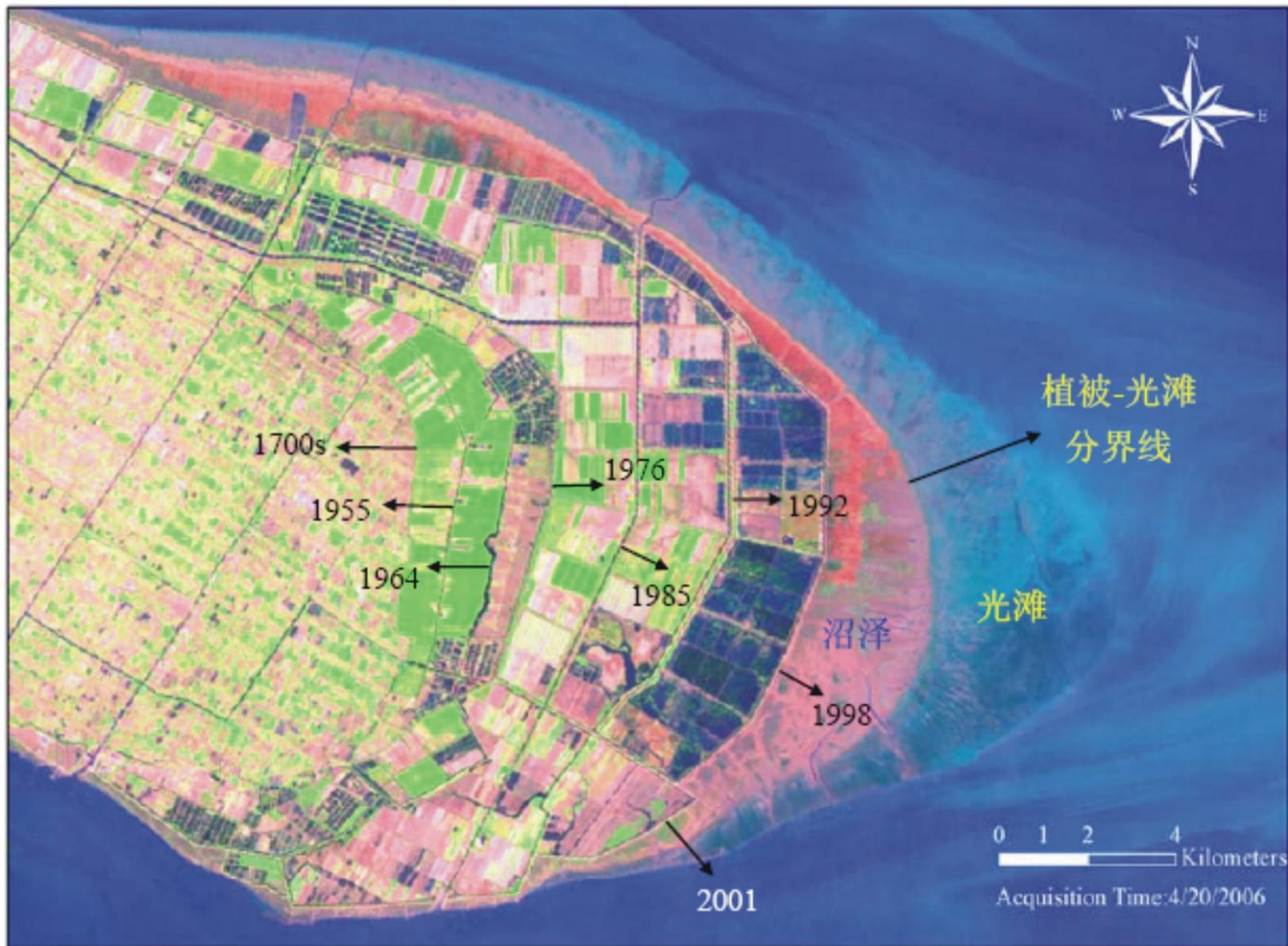
Coast

- Reduced river discharge
- Reduced sediment load
- Changing coastal ecology/habitats
- Increased coastal erosion (reduced deposition)
- Increased risk of coastal inundation
- Compromised water supply

Local influence

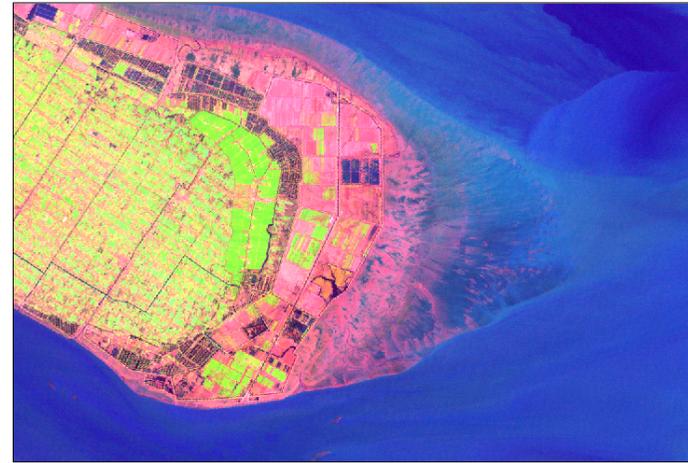
Dramatic land reclamation on Chongming Island in the 1960s







1990.12



1997.04



2000.06



2005.12

The Qingcaosha Reservoir

It will provide 7.2 million cubic metres of fresh water per day
The Shanghai water authority would like water from the Yangtze to eventually account for 60% of the city's water supply. It currently accounts for about 30%





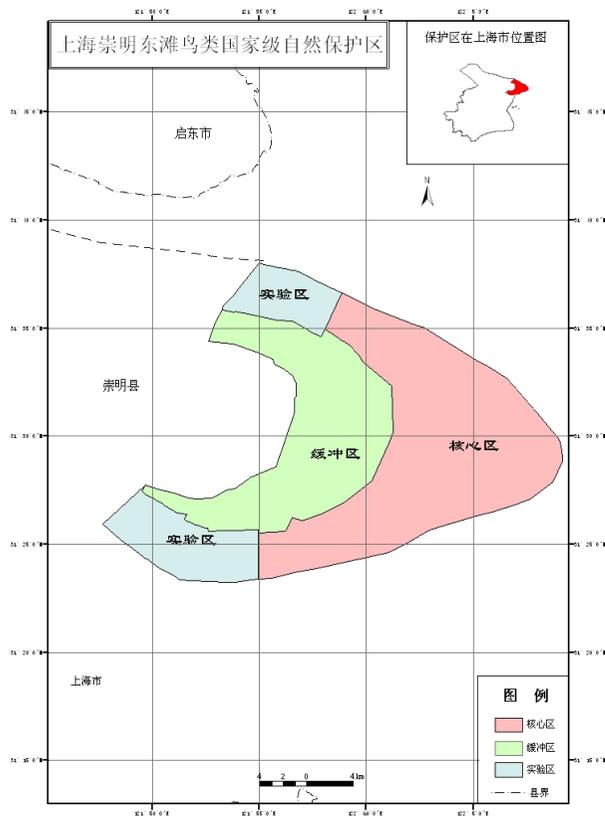
**The country landscape on the
Chongming Island**

Area: 1328 km²

Population: 0.7 Million



Bare Flat



Reclamation vs. Conservation
Economy vs. Ecology

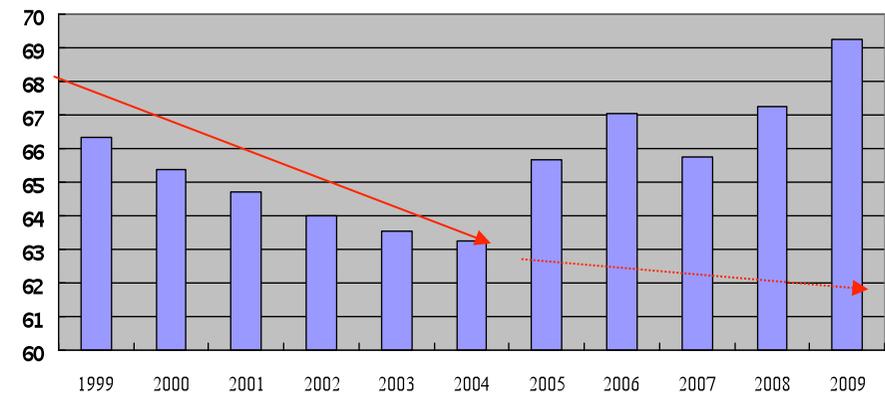
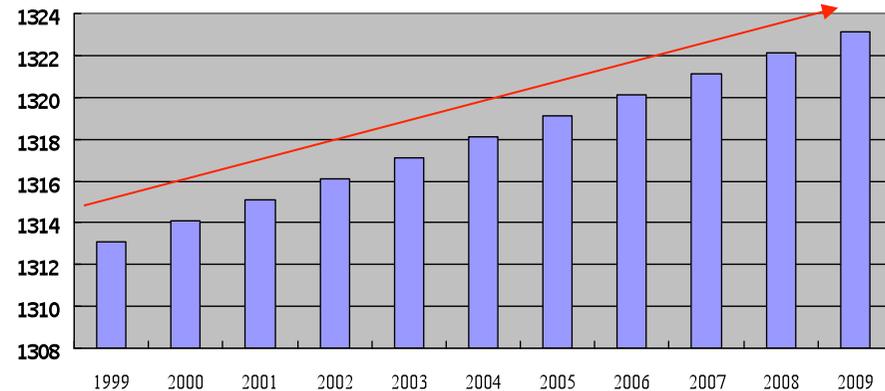
Driver: urban expansion

National Bird Reserve at the eastern end of the Chongming Island

Chongming Island

- Slow economic growth
 - Agriculture dominated
 - Isolated from the City center
-
- Farmer's income (2009)
Chongming: 8, 556 RMB
Qingpu: 10,676 RMB
Shanghai: 12,324 RMB

Population change ($\times 10^4$) for Shanghai (upper) and Chongming (lower)





Tunnel and bridge in operation
in 2009

A ecological Island ?
Economy development?

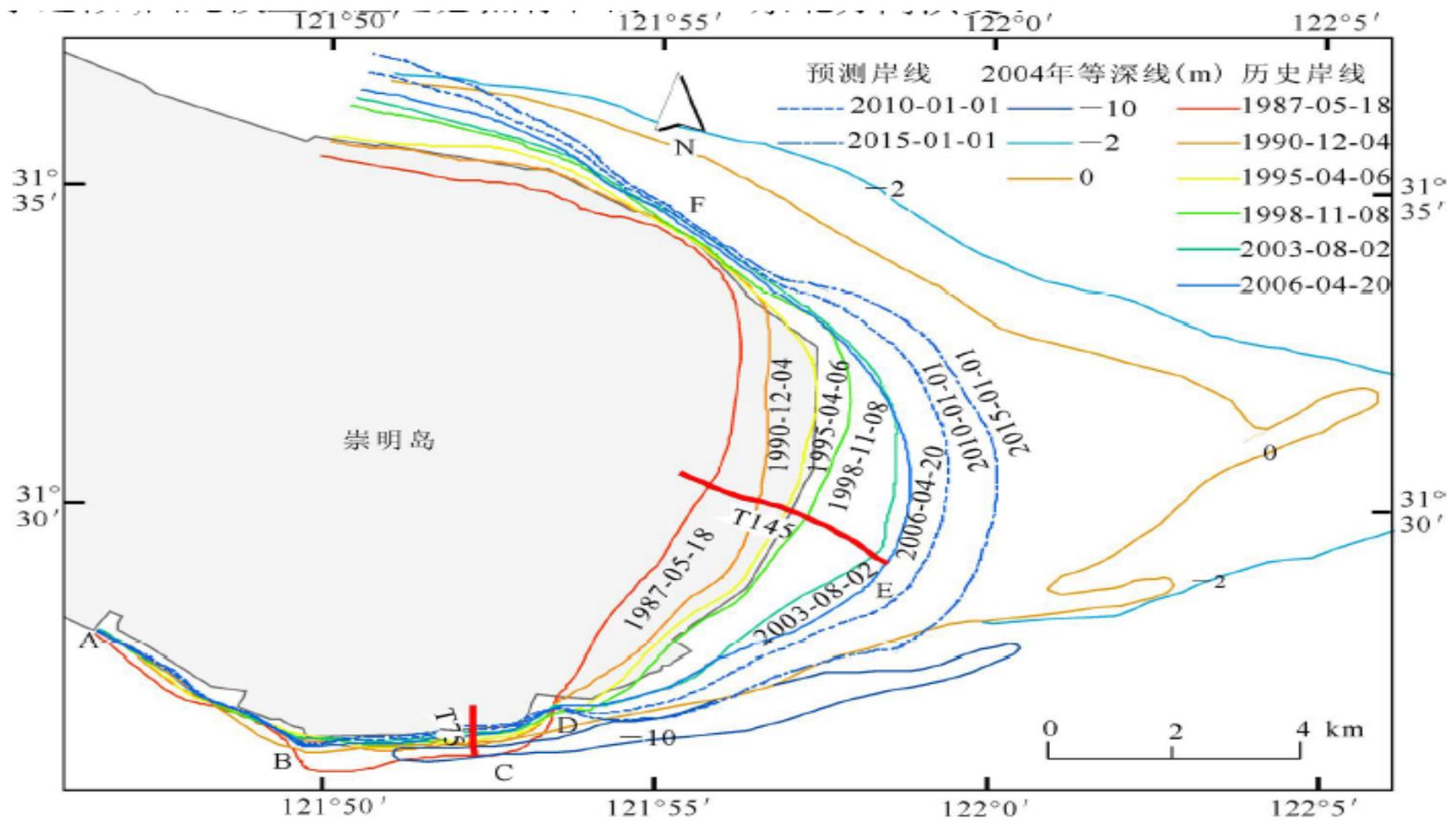


Summary

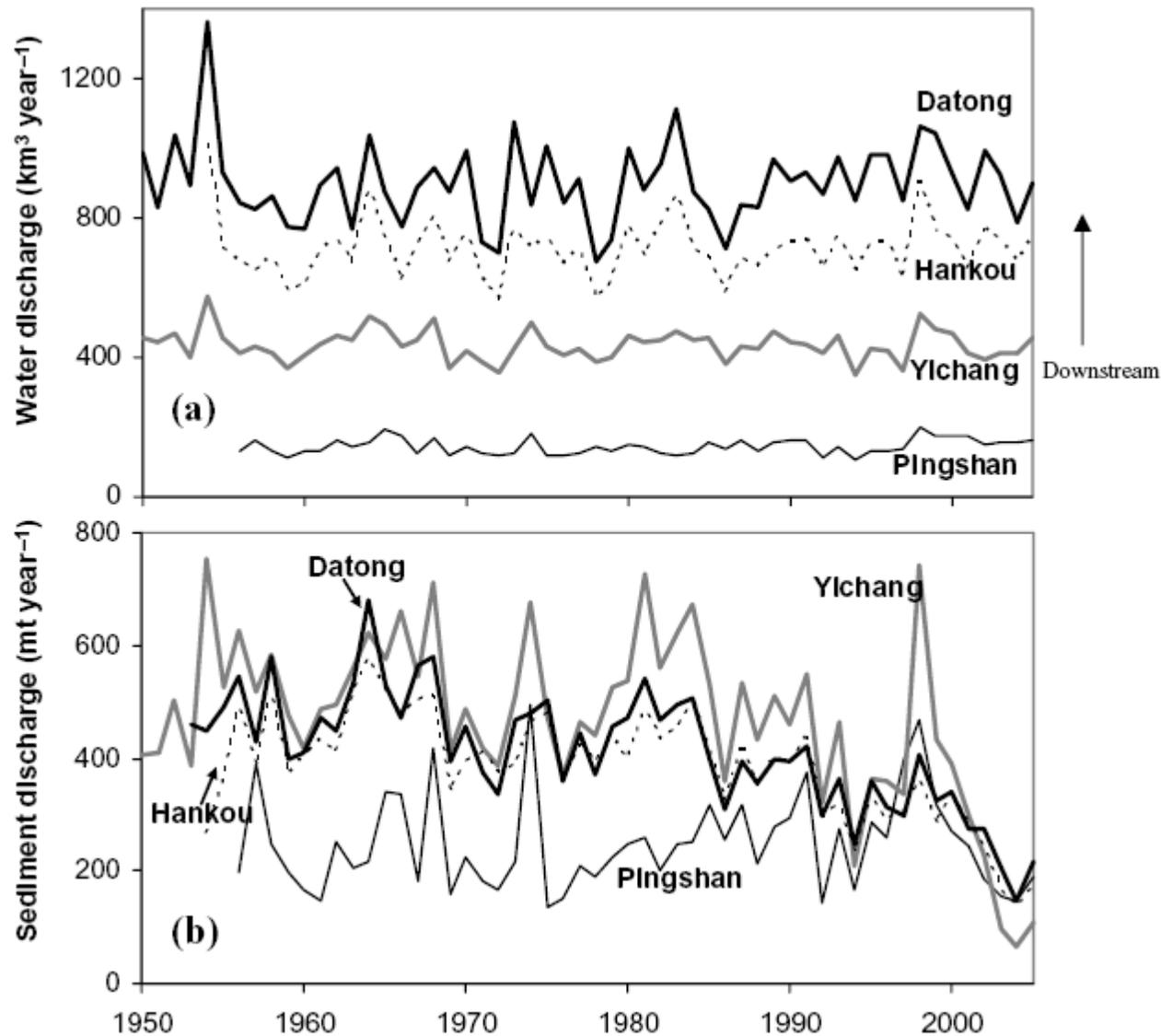
- Significant human activity on the Yangtze Estuary from both the basin and local sides
- Means needed for evaluating (economic) the consequences for inter-regional balancing of gains and losses
- Balance between ecological and economical sustainability

Thanks for your attention.





Li et al., 2010



Temporal variations of water discharge (a) and sediment discharge (b) in upper (Pingshan and Yichang), middle (Hankou) and lower (Datong) reaches of the mainstem Yangtze River, 1950–2005 (*Xu et al., 2007*)