OUTLINE OF IRTCES ACTIVITIES

The International Research and Training Center on Erosion and Sedimentation (IRTCES)

Content

I. Introduction of IRTCES

Inauguration Ceremony of IRTCES (1984,China)

First established Category II water-related centers under auspices of UNESCO

- Resolution of the 22nd Session of UNESCO's General Conference (1983, Paris)
- Agreement between the Chinese Government and UNESCO (1984)
- The Ministry of Water Resources is the governmental executive agency.

Inauguration Ceremony of IRTCES (1984,China)

Mr. Amadou Mahtar M'Bow, the DG of UNESCO and Ms. Qian Zhengying, the Chinese Minister of Water Resources, attending the Inauguration Ceremony of IRTCES

UNESCO-IRTCES Agreement Signing Ceremony(2005, China)

- Beijing, Nov. 30, 2005
- Mr. Wang Shucheng, Minister of Water Resources, P. R. China and Mr. Mr. Koïchiro Matsuura, Director General of UNESCO signed the Agreement Between China and UNESCO Concerning IRTECS

- **The renewed agreement reiterated the objectives and responsibilities of IRTCES, defined the relationship between IRTCES and UNESCO, and confirmed the leading role of IRTCES in the field of international research on sedimentation.**

Functions of IRTCES

IRTCES is a category II centre under the auspices of UNESCO

Functions

1. to promote the scientific research on erosion and sedimentation (including sediment transport theory, fluvial/coastal and reservoir sedimentation, sedimentation engineering, soil erosion, soil and water conservation, environmental and ecological impacts of sedimentation);
2. to provide technical advisory services and to create a mechanism for the exchange of scientific and technical information on the results of research among experts in various countries;

Functions of IRTCES

3. to act as the Secretariat for the International Sediment Initiative, including hosting and coordinating the implementation of projects relevant to sediment, sustainable water management and water environment and ecology;

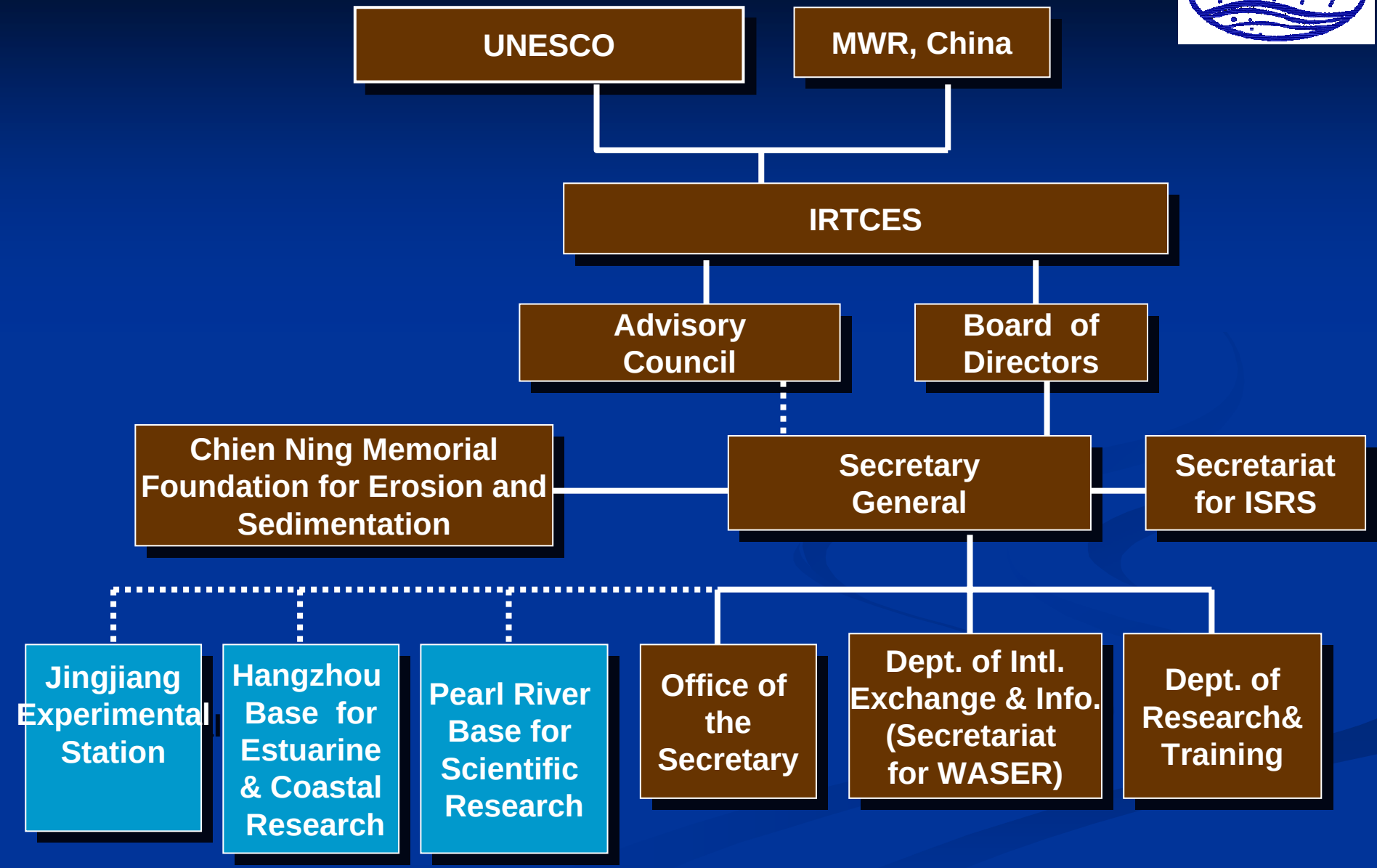
4. to coordinate international cooperative research activities and to establish laboratory and research centres in order to provide facilities for laboratory and field work for the experts from other countries;

5. to organize international training courses, symposia or workshops on special subjects and international study tour and lecturing activities.

Functions of IRTCES

1. serve as the permanent secretariat for the International Symposium on River Sedimentation
2. publish the scientific journal *International Journal of Sediment Research* and other relevant publications;
3. serve as the permanent Secretariat of the World Association for Sedimentation and Erosion Research;

FRAME


UNESCO
MWR, China
IRTCES
Advisory Council
Board of Directors
Chien Ning Memorial Foundation for Erosion and Sedimentation
Secretary General
Secretariat for ISRS
Jingjiang Experimental Station
Hangzhou Base for Estuarine & Coastal Research
Pearl River Base for Scientific Research
Office of the Secretary
Dept. of Intl. Exchange & Info. (Secretariat for WASER)
Dept. of Research& Training

STAFF STRENGTH














20 members

- 8 Professors
- 6 Senior Engineers / Associate Professors
- 1 post doctoral fellow
- 5 support staff
- including 7 staff with PhD degree

FACILITIES AND EXPERIMENTAL BASES

- **The Office Building** has a floor area of 4300m^2, consisting of offices, guesthouses, meeting rooms and a conference hall.
- **The Conference Hall** is equipped with advanced conference services, modern audio and video facilities and a computer management system.

FACILITIES AND EXPERIMENTAL BASES

Three bases for experimental studies, training and international co-operative projects.

- **Jingjiang Experimental Base in 1996**
- **Hangzhou Base for Estuarine and Coastal Research in January 1999**
- **Pearl River Base for Scientific Research on Dec. 14, 2005.**

ACHIEVEMENTS

- In the past 2 decades, Chinese government has supported IRTCES with resources and financial input.
- Especially under the leadership of Ministry of Water Resources, P. R. China and UNESCO and with the support worldwide, IRTCES has conducted bilateral and multilateral collaborative research and training.

Chinese Premier Li Peng and Pakistan Premier Benazir Bhutto attending the signing ceremony of the memorandum between IRTCES and the Pakistan Commission of Water Resources (Dec.1993）

ACHIEVEMENTS

- IRTCES has conducted 100 research and consulting programs, organized 43 training courses with a total 2100 trainee from 33 countries, sponsored and co-sponsored 84 symposia and workshops and organized over 130 technical tours.

ACHIEVEMENTS

- IRTCES serves as the permanent Secretariat of the *International Symposia on River Sedimentation*, *International Conference on Estuaries and Coasts* and *World Association for Sedimentation and Erosion Research*, it is also responsible for the publication of the International Journal of Sediment Research, China Gazette of River Sediment and many other publications.

ACHIEVEMENTS

- IRTCES is also responsible for the management of Qian Ning (Ning Chien) Memorial Prize for Erosion and Sedimentation.
- After over 20 years' development, IRTCES has drawn recognition from sediment experts, won reputation worldwide and become one of the important partners of UNESCO in China.

Research Projects (International)

IRTCES has conducted 100 research and consulting programs, most of the research was funded by UNESCO, UNDP, WMO and the German government , and Japanese government, and Chinese goverment

- State-of-the-art of studies on soil erosion and its control in Loess areas in China （UNESCO）
- Research on water resources management （UNESCO）

Analysis on peculiarities of the “92.8”flood event in the lower Yellow River（UNESCO）

- Application of GPS in reservoir sediment measurement（UNESCO）
- Shixia Small Watershed Management Project（UNESCO）
- IHP(fourth term)（UNESCO）
- Study of the protection on White Crane Ridge in the Yangtze River（UNESCO）
- Database of major rivers in China（UNESCO）
- Strategic measures for water management in the Fenhe River Basin（UNESCO）
- River mouth water management strategies for sustainable development of the region along the Bohai Bay of China (phase I & II)（UNESCO）
- Effect of watershed management on the reduction of sediment and runoff in the Jialingjiang River（UNESCO）
- On the 1998 flood in the Yangtze River Basin

Research Projects (International)

- 21st century strategies for mitigation of flood disaster in China （UNESCO）
- Strategy research on the comprehensive management and the sustainable development of the reservoirs on heavily sediment-laden rivers in North China （UNESCO）
- The variation in runoff and sediment load of the Yellow River（UNESCO）
- Strategy for integrated management of the Weihe River watershed （UNESCO）
- Support for sustainable development of the Yellow River Delta（UNDP）
- Sediment movement in unsteady and non-uniform flows in open channels (VW Foundation of Germany)
- Research on marine hollows （Sino-Japanese Joint Research）
- Study on the feasibility of a sediment budget for the Liwagu hydropower station in Malaysia （Malaysia）
- On erosion and sediment（WMO）
- Sediment-water-pollutant interactions in estuarine and coastal waters with particular reference to the Bohai Bay and deep Bay（Hong Kong）
- Construction of Warping Dams and Its Effects on Environment, Economy and Society in Loess Plateau Region in China (2004)
- Case Study on the Yellow River Sedimentation (2005, 2006)
- Yellow River Sedimentation (2005)
- Sediment Management and Wetland Conservation at Yellow River Mouth（2006)
- Integrated Physical and Ecological Management of Rivers – with Particular Reference to the East River—Phase II (2007)
- ……

Research Projects (Domestic)

IRTCES has performed more than 50 projects on sedimentation, soil and water conservation, and environmental engineering.

ORGANIZATION, COORDINATION AND PARTICIPATION IN DOMESTIC PROGRAMS

- Organization, coordination and participation in the national program of "Sediment Research for the Three Gorges Project" under the leadership of the Sedimentation Panel of the Three Gorges Project Construction Commission, the State Council of China.
- Coordination and participation in the study of "Variation in Runoff and Sediment Load of the Yellow River", a program of the Ministry of Water Resources of China.
- Organization, coordination and participation in the Major Research Project of the National Science Foundation of China (NSFC) and the Ministry of Water Resources "Mechanism of River Sedimentation Disasters and Control and Mitigation Strategies"


三峡工程泥沙专家组人员合影


"十五"三峡工程泥沙研究课题交流会


建设中的三峡大坝

←三峡泥沙试验模型

TRAINING (International)

- Since 1985, IRTCES has organized 20 training courses

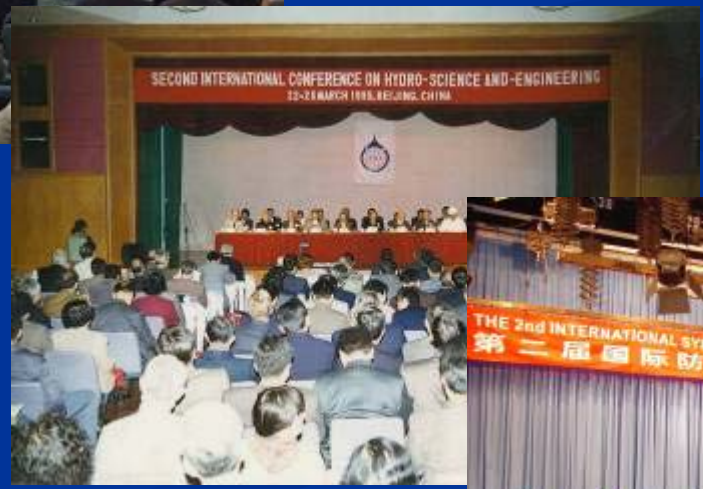
- Training on water resources for DPRK Engineers (2002)
- Mongolian Engineers Training (2002)
- International training course on sedimentation engineering in Pyongyang (2003)
- International Training course on river sedimentation and flood control (2003)
- International training on landslide and debris flow in Pyongyang (2004)
- Research study under UNESCO fellowship programme No. 303-1b(DPRK) (2004)
- International Training Workshop on Watershed Eco-Environment and Water Resources Management (2005)
- Flood Forecasting and preparedness at DPRK(2006)
- Advanced training workshop on reservoir sedimentation management (2007)

TRAINING

International Training Workshop on Watershed Eco-environment and Water Resources Management Beijing, Sept. 11-19, 2005

INTERNATIONAL SYMPOSIA /WORKSHOPS

- IRTCES has organized or co-organized 46 international symposia, workshops and seminars



Conferences

- 3 international conferences and 1 domestic conference (2002~2007).

① 10th International Symposium on River Sedimentation
Aug. 1-4, 2007, Moscow, Russia

② Ninth International Symposium on River Sedimentation
Oct. 18-21, 2004, Yichang, China

③ International Conference on Estuaries and Coasts
Nov. 9-11, 2003, Hangzhou, China

④ National Workshop on Advanced Sediment Measurement Techniques
November 23-25, 2005, Zhengzhou, China

INFORMATION EXCHANGE

- IRTCES exchanges data and information with 60 domestic institutes and 84 institutes from 48 countries throughout the world.
- The library of IRTCES has 50,000 books, and 125 periodicals.
- IRTCES constructed and maintained International Network on Erosion and Sedimentation (http://www.irtces.org)

PUBLICATIONS

- Publication of the quarterly journal of the *International Journal of Sediment Research* began in 1986. Papers published in this journal are included in the Engineering Index (EI).
- IRTCES began publication of the Gazette of River Sediment in China in the year 2000. The data extend from 2 rivers to 11 rivers
- From time to time, IRTCES edits and publishes Chinese or English publications, including IRTCES circulars and monographs, proceedings, and lecture notes of training courses.

ISI Technical Secretariat (cont.)

ISI Steering Committee Core Member Meeting

(May 26, 2006, Beijing)

- The meeting is a symbol that the ISI Secretariat was formally put into operation, and IRTCES takes responsibility as the ISI Secretariat.

ISI Technical Secretariat (cont.)

ISI URL： http://www.irtces.org/isi/

ISI WebPages

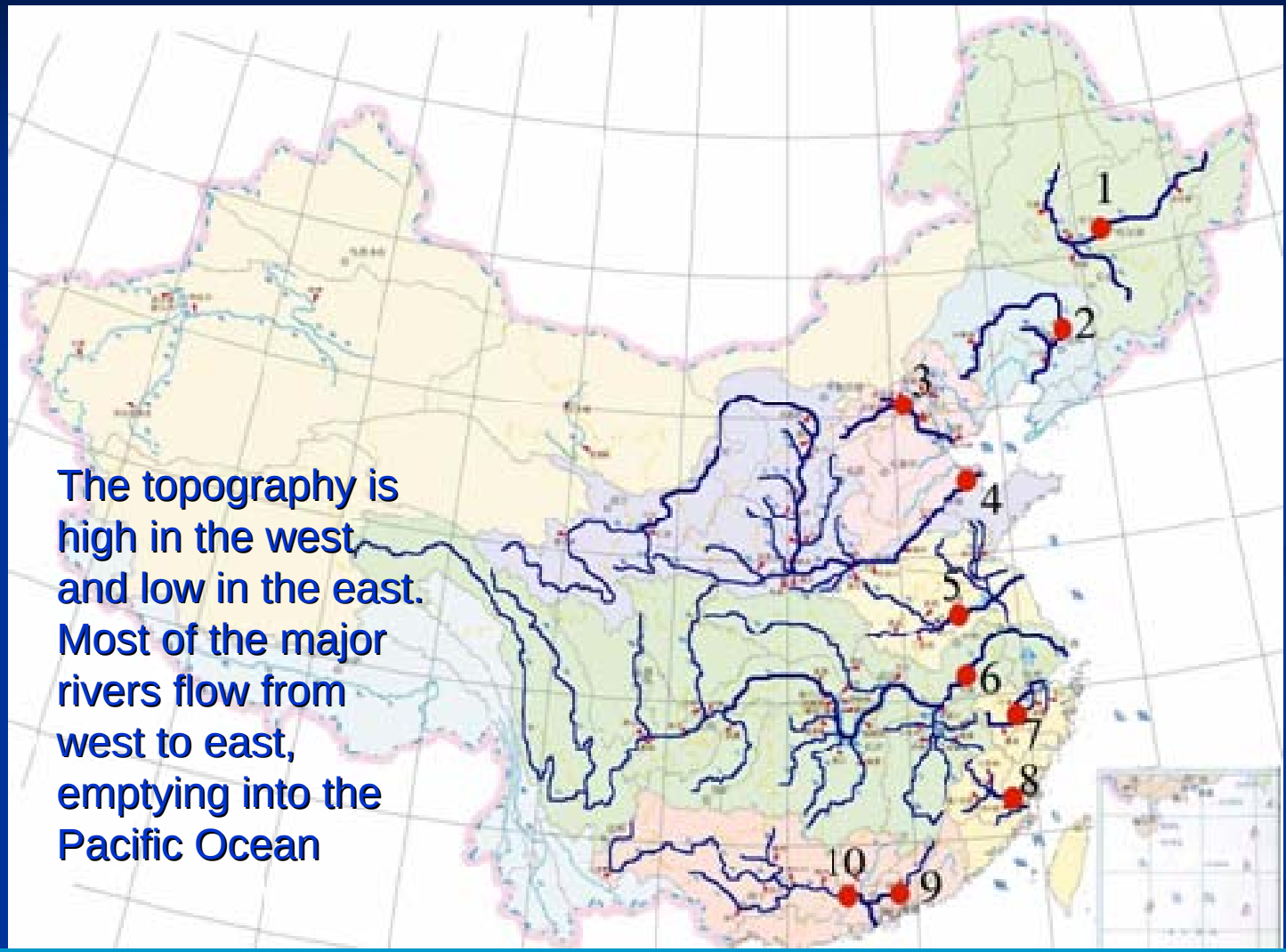
News, events and information are updated regularly

Ⅱ. CHANGES IN WATER AND SEDIMENT LOAD, AND RIVER CHANNEL SEDIMENTATION IN CHINA

- Changes in water and sediment load

Changes in water and sediment load

- General situation of major Chinese rivers



The topography is high in the west and low in the east. Most of the major rivers flow from west to east, emptying into the Pacific Ocean

1. Songhua River 2. Liaohe River 3. Yongding River4. Huanghe River5. Huaihe River 6. Changjiang River 7. Qiantang River 8. Minjiang River 9. Dongjiang River 10. Xijiang River

Changes in water and sediment load

- Most of the territory is in the northern temperate zone and subtropical zone. East-Asian monsoon is the principal factor affecting the climate.

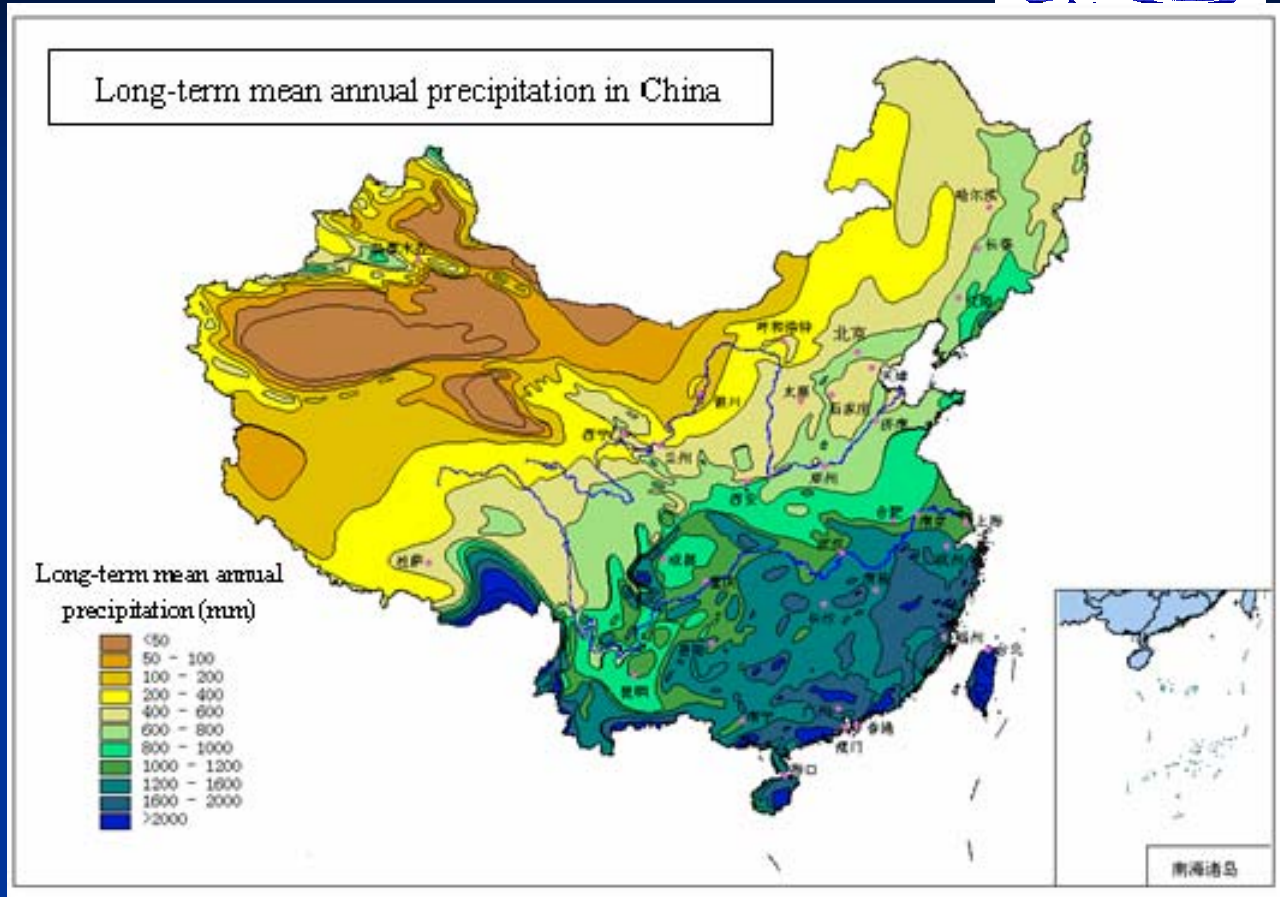


Fig. Long-term mean annual precipitation in China

The mean annual precipitation is as high as over 1500 mm in the regions along the southeastern coast and decreases gradually toward inland, reaching less than 50 mm in northwest

Changes in water and sediment load

- As for erosion rate , the Huanghe River is the largest, the Changjiang River is the second, and the Songhua River is the smallest.
- As for the sediment concentration, the Huanghe River still stands on the top, the Liaohe River becomes the second, and the Changjiang River stands third.
- Annual runoff of rivers in the south and southeast like the Changjiang, Pearl, Minjiang Rivers are stable, while rivers in the north like Huanghe, Liaohe Rivers show declining trend.
- Annual sediment load of almost all Chinese major rivers show decreasing trend.

Changes in water and sediment load

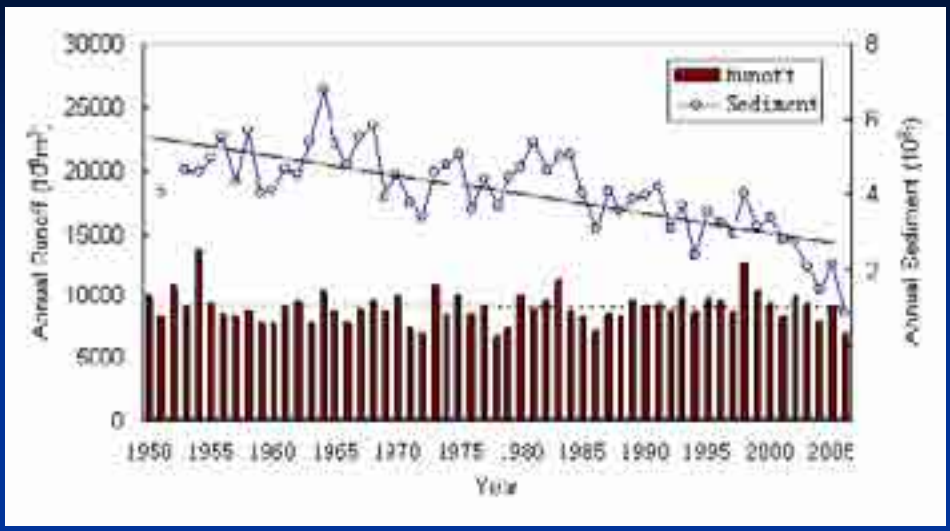


Fig. Changes of annual runoff and annual sediment loads at Datong Station, Changjiang River

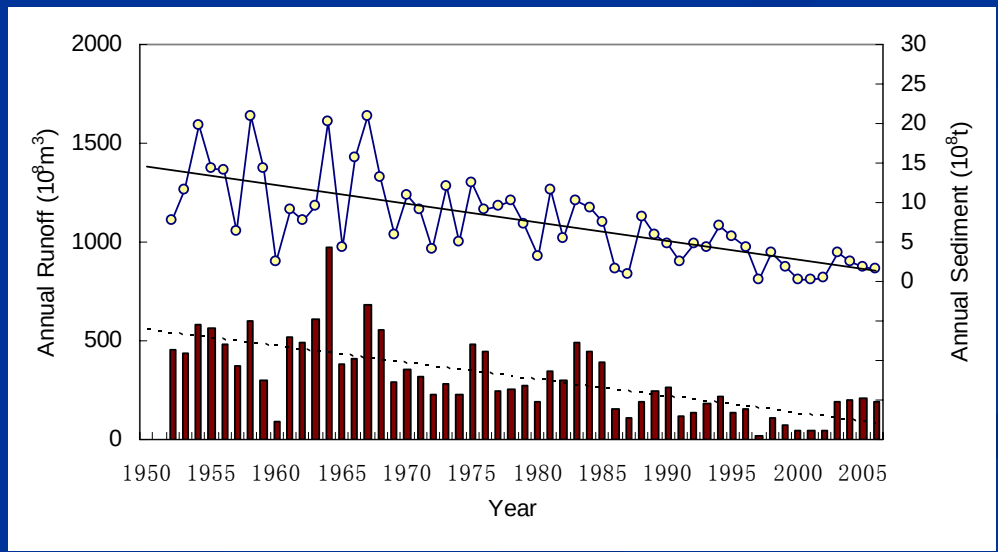


Fig. Changes of annual runoff and annual sediment loads at Lijin Station, Huanghe River

- River channel sedimentation

Yellow River

With full length of 5464km. It carries an enormous amount of yellow earth and sand(1 billion tons/year). 10% - deposited in the channels; 40% - transport into the sea; 50% - deposited in the delta. → create 1 – 2 km2/year new wetland.

Yellow River

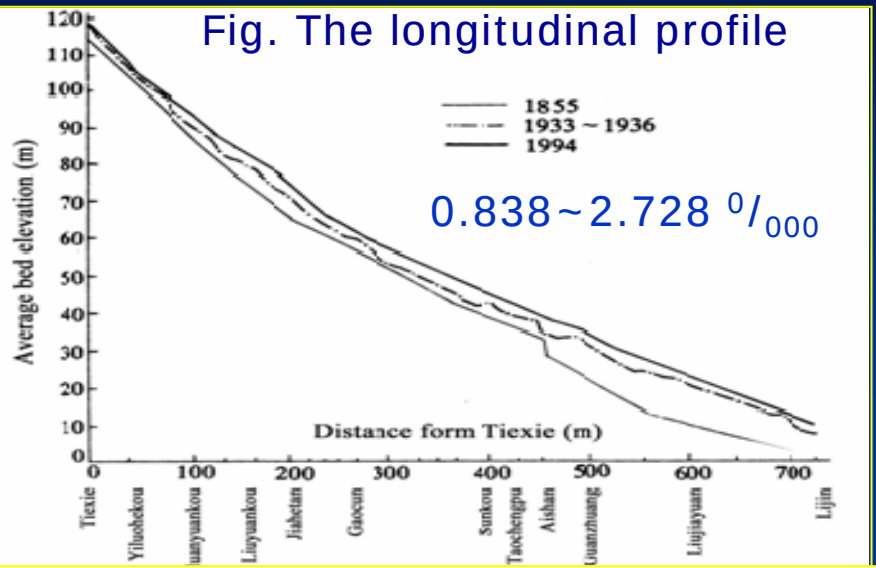
The Lower Yellow River (Menjing ~ Lijing), an alluvial channel, has a total length of 800km and an area of about 4000km^2

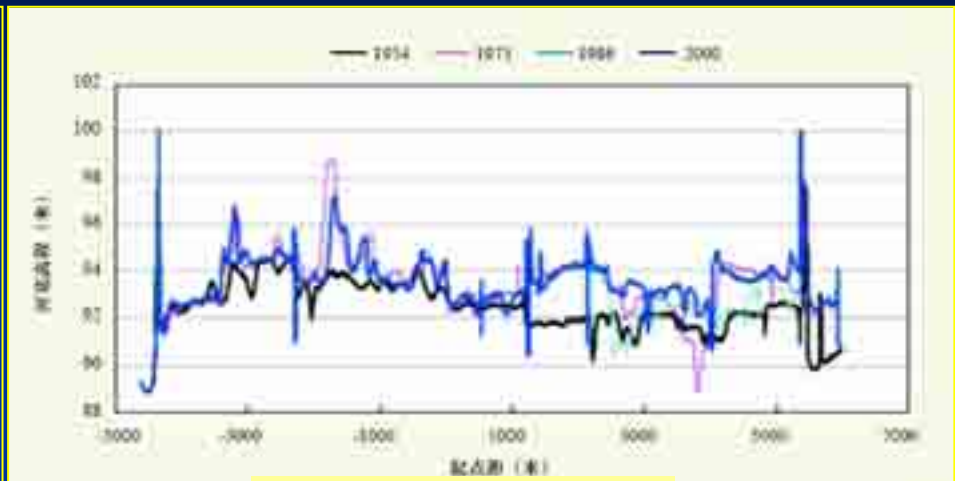
Its average annual deposition amount is 0.2 billion t, being in a state of continuous deposition and rising of the channel bed, resulting in channel shrinkage and reduction in flood discharging capacity .

•wide and shallow channel of the Lower Yellow River.

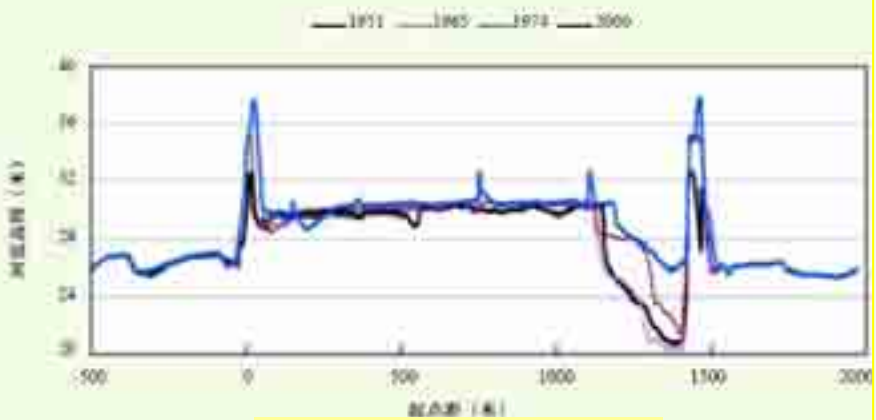
Yellow River

Fig. The longitudinal profile

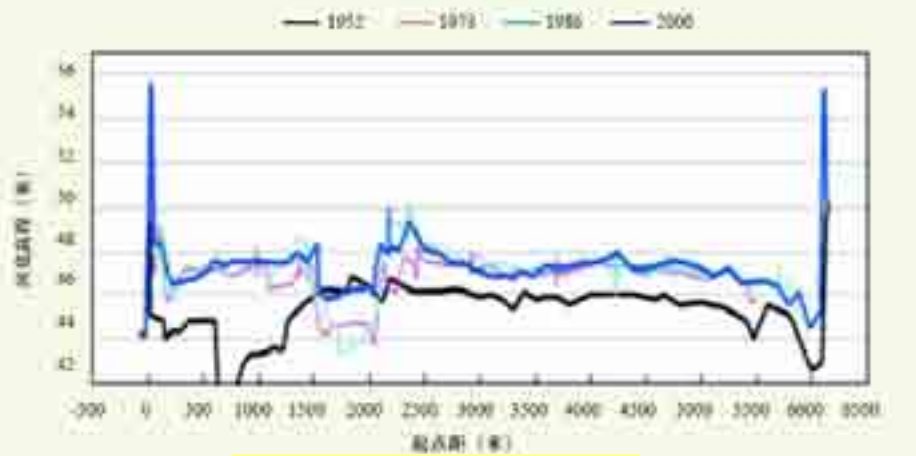




C.S. Huayuankou



C.S. Luokou



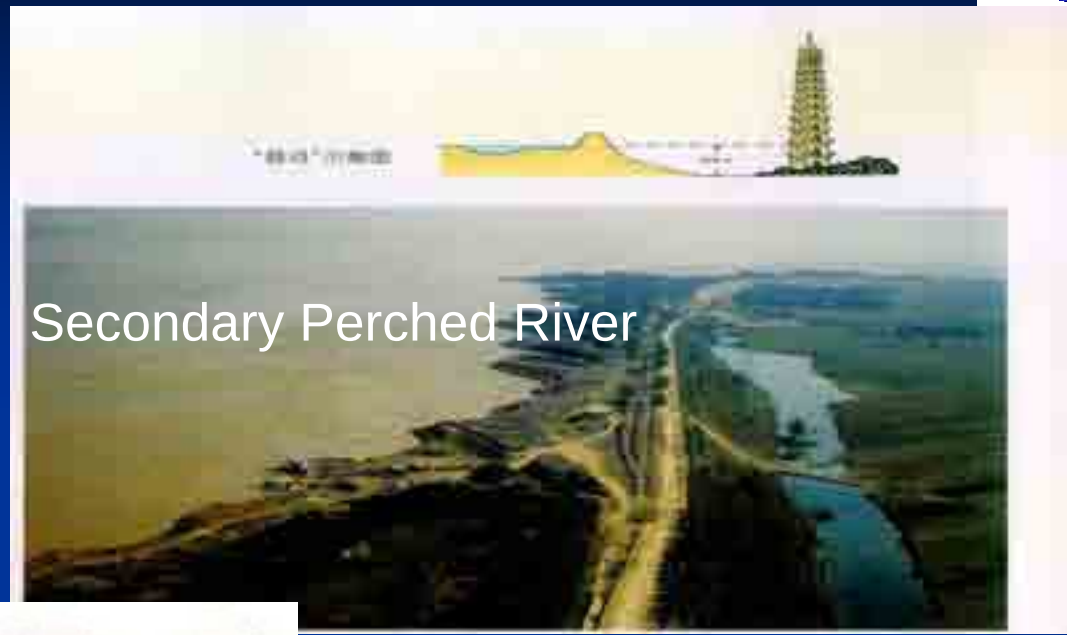
C.S. Sunkou

Meandering Reach

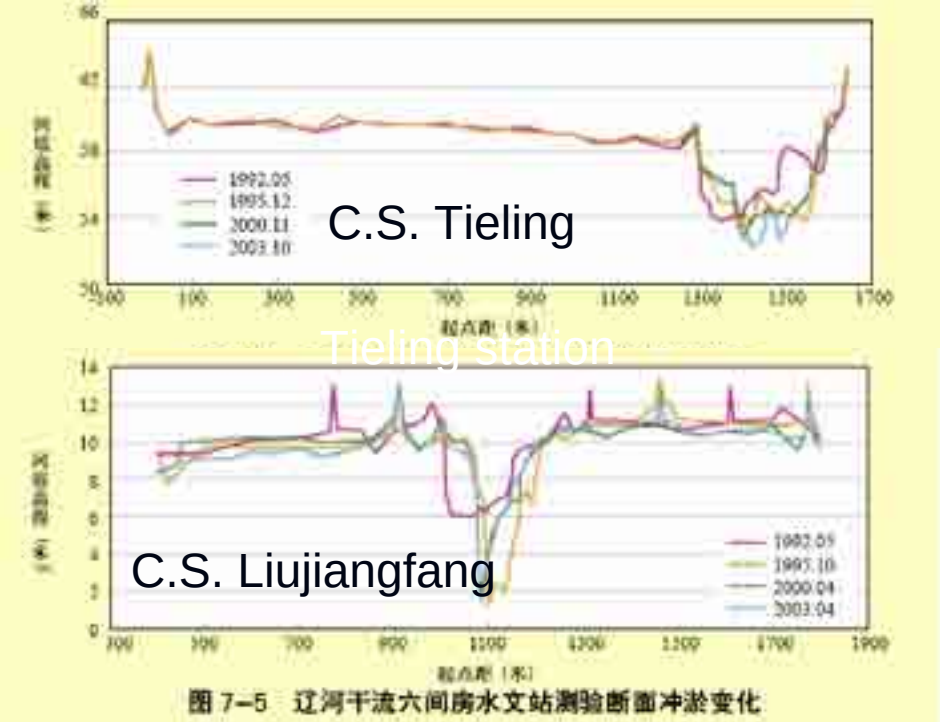
Wandering Reach

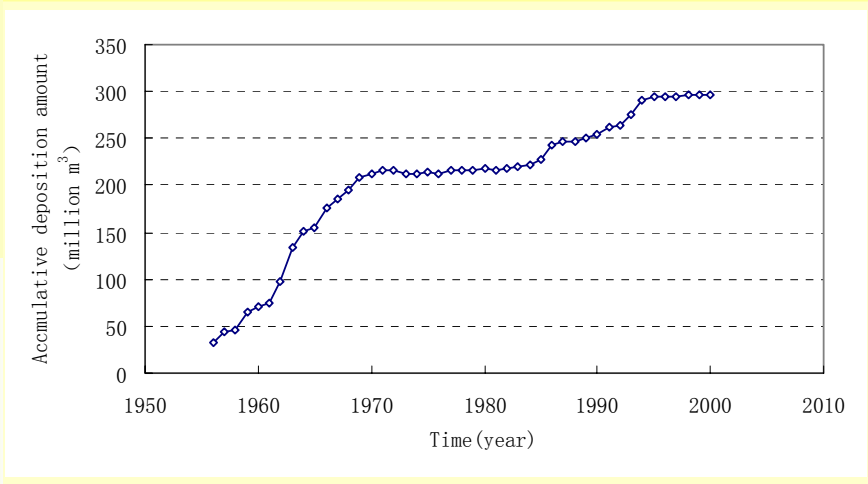
Yellow River

- The channel bed is generally 3 to 5 m higher than that of the ground behind the levees, the maximum 10 m.



Liaohe River





Accumulated erosion & deposition in the lower river

The floodplain of the lower Liaohe River, is 2~4m higher than the ground outside the dike. A perched river has been formed.

Ⅲ. RIVER BASIN SEDIMENT MANAGEMENT IN CHINA

River Basin Sediment Management

- **Current Policy (for the Yellow RIVER)**

The policy "Intercepting flood runoff and sediment load in upper basins, discharging them into the sea and warping and diverting them to both banks for bringing benefits“, which is sometime shortly called as five-words policy: intercepting
regulating
discharging
warping
dredging.

River Basin Sediment Management

Soil and Water Conservation

- Comprehensive management on small watershed

- Engineering measures: slope-land works (terraces) and gully works(check dams)

- Vegetation Measures :afforestation, artificial pasture and closing off the natural hill

- Cultivation Measures: soil improvement by deep plough, rotation of fodder and crops, crop interplant and contour tillage

River Basin Sediment Management

- Speeding up Construction of Dam System in Gullies : the runoff and sediment load discharging from slope land will be intercepted and reserved.

- Non-tillage and Afforestation and Artificial Posture on Steep Slope-lands: The erosion modulus of steep slope farmlands might reach 30 t/ km. So, the goverment forbid tillage on the slope-lands with slopes more than 25, where the cultivated farmland should be return to afforestation or artificial pasture.

Construction of reservoir in gorge reaches

- The reservoir, constructed on the gorge reach of a heavy sediment-laden river, with operation of " Storing clear water and discharging mudflow" could form a deposition terrain with a deep main channel and two high deposition flood plains,

which can be reserved for a long time and could be used for flood control, irrigation and power generation.

River Basin Sediment Management

Integrated Regulating Runoff and Sediment Load by Reservoirs

- Regulating the unfavourable combination of runoff and sediment load by reservoirs and to change their uneven distribution both in time and space to increase capacity of sediment transport.

Regulation by reservoirs

River Basin Sediment Management

- **Warping Saline-alkali Lands and Raising and Widening Levees along the Banks**

  - Diversion sluices for diverting water

  - Warping on large scale saline-alkali lands outside the levees have been developed by using the turbid water

  - Making use of diverted sediment load to deposit the dike-footings along the levees

River Basin Sediment Management

Dredging for Mitigating Sediment Deposition in River Channel

- Dredging was combined with the engineering measures of raising and widening levees.

IV. Proposal of future strategies

Proposal of IRTCES

- Research work: carrying out pioneering research work
  - Optimal Use and Apportionment of Runoff and Sediment Resources
  - Research on global changes in water and sediment load .etc.
  - Integrated management on small watershed
- Database: ISI database, construction of global sediment database
- Training course: carrying out training course such as water resources management and flood control, watershed eco-environment water resources management , reservoir sedimentation management
- International research cooperation ,etc.

V. Closing remarks

Closing remarks

IRTCES will actively take part in activities organized by NARBO.

IRTCES welcome all of you to participate in our activities

THANK YOU!
Welcome To Beijing!