Integrated Water Resources Management in South and South East Asia III

China and related Countries

Four Basic Contents of IWRM

1. Policy/legal framework
   - Government policies
   - Water legislation
   - National & Int. co-operation

2. Institutional framework
   - Level of action
     (State/Regional/Local...)
   - Management boundaries
   - Capacity building

3. Management instruments
   - Water allocation rules
   - Regulations, tariffs
   - Economic tools

4. Infrastructure
   - Management of floods and droughts
   - Multi-purpose storage
   - Water quality and source protection
Socio economic background

Projected population/water availability

National Water Availability per Capita 1952-2050

Socio economic background
Background and problems

- Vast land with relatively low population
- 1/3 of total territory but very low production with irrigated agriculture
- Unfavorable climatic conditions
  - Frequent drought, floods, uneven rainfall
- Serious environmental problems
  - Water pollution, desertification, ecological degradation
China, known problems

China’s water resources assessment

Precipitation: 6 200

Total evaporation 3 480
Soil water 4 200
Runoff 2 700
Ground water 676
To sea and inner lakes
China, known problems

Sandstorm Swept over Northern China

China, Infrastructure

Beijing City
China, known problems

Very recent Chinese example:

Severe drought hits China region
By Shirong Chen, China editor, BBC News

Severe drought is hitting China’s south-west region and in some places it is the worst drought for a century. More than 60 million people are affected and it is estimated that billions of dollars worth of crops are now ruined.

The Chinese authorities have mobilised the armed forces to help get water to local people. Large areas of south-west China have not had proper rainfall since October last year.

Chinese media have published pictures of parched land with deep cracks, villagers queuing at water distribution points and school children drinking what looks like muddy water.

In Guizhou province, many distillers of Maotai - the national alcohol drunk at banquets - have stopped production due to a shortage of spring and tap water.

Asia’s biggest waterfall, Huangguoshu, has been reduced to a trickle. More than 90% of the rivers and reservoirs downstream have dried up.

http://news.bbc.co.uk/go/pr/fr/-/hi/asia-pacific/8587516.stm
Published: 2010/03/25 15:25:34 GMT
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Very recent Chinese example:

Huangguoshu Waterfall

Problem: un-closed circle!

Figure 1  Circulation of water through the hydrological cycle (National Aeronautics and Space Administration, 1984)
Shall we blame El Nino, La Nina or global warming?
The largest inland river in China, running 2,179 kilometers.
It is also the fifth largest river in the world.
Total surface water is about 25.673 billion m³, with 5 million people.
Irrigation area: 19 million Chinese acres, the domestic animal amounts to 12 million.

<table>
<thead>
<tr>
<th>Basin area:</th>
<th>1,152,447 km²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population density:</td>
<td>10 people/km²</td>
</tr>
<tr>
<td>Urban growth rate:</td>
<td>-</td>
</tr>
<tr>
<td>Large cities:</td>
<td>2</td>
</tr>
<tr>
<td>Total fish species:</td>
<td>14</td>
</tr>
<tr>
<td>Fish endemics:</td>
<td>3</td>
</tr>
<tr>
<td>Threatened fish species:</td>
<td>0</td>
</tr>
<tr>
<td>Endemic Bird areas:</td>
<td>1</td>
</tr>
<tr>
<td>Ramsar sites:</td>
<td>0</td>
</tr>
<tr>
<td>Protected areas:</td>
<td>21%</td>
</tr>
<tr>
<td>Wetlands:</td>
<td>16%</td>
</tr>
<tr>
<td>Arid:</td>
<td>61%</td>
</tr>
</tbody>
</table>

Forest: 0%
Cropland: 2%
Cropland/Irrigated: 74%
Developed: 1%
Shrub: 31%
Grassland: 5%
Barren: 61%
Loss of original forest: 66%
Deforestation rate:
Endangered species: 0%
Large dams: 0
Planned major dams: -
Tarim River, basic facts

Table 4  Decade mean discharge from four source rivers of the Tarim River (×10^3 m^3)

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean Runoff</th>
<th>Max Runoff</th>
<th>Min. Runoff</th>
<th>Ratio Max/Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>1957–1959</td>
<td>216.0</td>
<td>250.6</td>
<td>185.4</td>
<td>1.35</td>
</tr>
<tr>
<td>1960–1969</td>
<td>217.6</td>
<td>266.0</td>
<td>176.8</td>
<td>1.50</td>
</tr>
<tr>
<td>1970–1979</td>
<td>255.8</td>
<td>275.5</td>
<td>195.3</td>
<td>1.41</td>
</tr>
<tr>
<td>1980–1989</td>
<td>216.8</td>
<td>238.6</td>
<td>186.2</td>
<td>1.38</td>
</tr>
<tr>
<td>1990–1999</td>
<td>241.9</td>
<td>304.1</td>
<td>182.3</td>
<td>1.67</td>
</tr>
<tr>
<td>平均</td>
<td>224.9</td>
<td>304.1</td>
<td>176.8</td>
<td>1.72</td>
</tr>
<tr>
<td>2004–2001</td>
<td>261.9</td>
<td>304.1</td>
<td>234.2</td>
<td>1.30</td>
</tr>
<tr>
<td>2001</td>
<td>266.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig.  Total discharge (a) and discharges for four selected mainstream gauges during the year 1957—2000.
Problem: un-closed circle!

Figure 1  Circulation of water through the hydrological cycle (National Aeronautics and Space Administration, 1984)
Second example: Shiyang River Basin
Deforestation and overgrazing

Upstream

Excessive use of water

Middle reach
Desertification & degradation

Downstream
Air temperature, precipitation, and runoff over the years from 1956 to 2000.

Incoming water amount and the discharge from the Hongyashan reservoir.
Incoming water amount into Hongyashan reservoir (Unit: 10^9 m^3)

Yellow River / Yangtzi River

China, Infrastructure
Climate

- Precipitation: 200-700 mm/year
- Pan evaporation: 850-1600 mm/year
- Total runoff: 58 billion m³ (57% - upper reach)

Statistics of Yellow River Dry-up at the Lower Reaches during last three decades in last century

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<tr>
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</thead>
<tbody>
<tr>
<td>Drying years</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Total drying days</td>
<td>86</td>
<td>105</td>
<td>821</td>
</tr>
<tr>
<td>Longest drying interval in a year</td>
<td>21 days (1979)</td>
<td>36 days (1981)</td>
<td>226 days (1997)</td>
</tr>
<tr>
<td>Average drying length (km)</td>
<td>242</td>
<td>256</td>
<td>392</td>
</tr>
</tbody>
</table>
Identified water problems, Yellow River Basin

- Regional groundwater depletion
- Wetland aggravated
- Farming land salinization due to mismanagement.
- As many as 8,000 aqueous plants withered
- Reduced biodiversity
- Drinking water supply unsecure
- Large economic loss in agriculture and industries

Reasons For River Dry-up

- Unreasonable utilisation (withdraw water almost free in same cases);
- Lack of integrated management;
- Man-made or induced damage of ecological system;
- Average rainfall in the catchment reduced by 10-40% after a decade due to the global climate changes
Conclusion

• Floods
  • Make interventions to prevent soil erosion in the Loess Plateau
• Droughts
  • Improve water use efficiency by upgrading irrigation methods and implement water recycling systems
• Biodiversity
  • More conservation projects like wetland restoration
• Water quality
  • The legislation and regulations needs to be improved and enforced
• Keep implementing IWRM at all levels
  • YRCC was awarded the Lee Kuan Yew Water Prize 2010 at the Water Week in Singapore

Water Transfer From Yangtze River to Northern China
China, Infrastructure

Potential Benefits of Inter-basin Water Transfer

- An area of 1.06 million square km with 310 million population to be benefited
- 50 billion cubic meters water from flooding Southern part to the dry North each year. Equal to creating a new Yellow River
- Crop production in Northern China will rise by 40%
- Industrial production will increase by $10 billion per year from water transfer benefits
- Improving ecosystem in Northern China
- Per-capita quantity of water consumption in urban areas will increase 2-3 times

General Layout of South-to-North Water Diversion

Since the earlier study on South-to-North Water Transfers started in 1950s, the following general layout of South-to-North Water Transfers has been worked out: three water transfer projects, i.e. Western Route Project (WRP) and Middle Route Project (MRP) and Eastern Route Project (ERP) will divert water from upper, middle, and lower reaches of Changjiang River respectively, to meet the developing requirements of Northwest and North China.

The layout is suited to three topographic terraces of the continent of China. Situated in highest Qinghai-Tibet Plateau, WRP can control whole Northwest and North China, but only divert water for Northwest in upper and middle reaches of Huanghe River due to the limited water quantity in the upper reach of Changjiang River. Passing the west of the third terrace, NRP will divert water from middle reach of Changjiang River and its tributary, Hanjiang River, and the water can now by gravity to the most parts of Huai-Huai-Hai plan. Passing the east of the third terrace, ERP will pump water north due to its lower diversion location.
Three Gorges Dam Project

Location: Sandouping, Yichang, Hubei province
Height: 181 meters
Expected investment: 203.9 billion renminbi (US$24.65 billion)
Number of migrants: 1.13 million
Installed power generation capacity: 18.2 million kilowatts
Functions: Flood control, power generation, improved navigation

Construction timetable (source: China Daily Business Weekly):
1993-1997: The Yangtze River was diverted after four years in November 1997
1998-2003: The first batch of generators will begin to generate power in 2003 and a permanent ship lock is scheduled to open for navigation the same year.
2004-2009:

Fund sources:
The Three Gorges Dam Construction Fund
Revenue from Gezhouba Power Plant
Policy loans from the China Development Bank
Loans from domestic and foreign commercial banks
Corporate bonds
China’s Ten Strategic Countermeasures from MWR

1. Strengthening the unified management of water resources 加强水资源的统一管理

2. Relying vegetation rehabilitation in the arid and semi-arid areas mainly on cordon off the land and on returning the farmlands to grasslands or stopping grazing for grassland recovery. 干旱和半干旱区植被建设以封育为主，退耕休牧还草

Ten Strategic Countermeasures

3. Combating desertification to be focused on preventing desertification of the existing farmlands, grasslands and woodlands. 防沙治沙的重点是防治原有耕地、草地、林地的沙化

4. Strengthening the position of agriculture as the foundation and increasing the financial input for agriculture and animal husbandry. 加强农业的基础地位，增加对农牧业的资金投入
Ten Strategic Countermeasures

5 Ensuring the balance of grain supply and demand in adaptation to the local conditions.
因地制宜地保证粮食供需平衡

6 Developing the industrial and mining enterprises to be carried out with pushing ahead urbanization.
按节水高效防污的方针，合理发展工矿业，积极推进城镇化

Ten Strategic Countermeasures

7 Expediting the economic development to be conducted simultaneously with implementing stringent pollution control.
在加快发展经济的同时，坚决防治污染

8 Implementing the population policy of lower birth rate and faster well-off livelihood for eradicating poverty.
实施明确的人口政策，消除贫困
Ten Strategic Countermeasures

- 9 Undertaking the early-stage work duly for building the west route south-to-north water transfer project. 抓紧前期工作，建设南水北调的西线工程
- 10 Establishing the coordinated inter-departmental mechanism of the eco-environmental rehabilitation in the northwestern region. 建立西北生态环境建设的部门协调机制

Legal and Institutional Framework

- 1970s: Water legislation of water resources in China focused on construction and management of flood control, agricultural irrigation and drainage.
- 1990s: Law for Water and Soil Conservation, 1991; Law for Flood Control, 1997; The Law for Water Pollution Control, 1984-1996
- Four level admin: National, provincial (including municipalities directly under the central government and autonomous regions), county/city and township/village.
- The highest administrative authority is the State Council. Under the State Council there are functional organizations such as committees and ministries.
Legal and Institutional Framework

- MWR is in charge of the unified administration of water resources throughout the entire country. MWR is linked vertically to water resource departments in each of the provinces, which have comparable responsibilities to MWR at the provincial level.

- Six commissions for inter-provincial river basins (Songhua, Liao, Hai, Yellow, Huai, Yangtze and Pearl) and one Lake Commission (Taihu lake) under the direct administration of MWR.

Institutional framework

Graphs showing the infrastructure investment on water and investment on wastewater treatment.
Questions to be asked again:

1. Water Availability
2. Water Quality
3. User Conflicts
4. Water Treatment

Summary points for China

The Background

China's great challenges in the water sector have been studied broadly in recent years. There is a common understanding of the importance of water resources management in the country, and much effort is put into projects to improve the situation. However, one aspect of water management has systematically been missing - the international dimension and significance of China’s activities on the transboundary rivers. The momentous political and ecological questions and problems that China has with its neighbours with regard to several major river basins are almost completely been left out from the analyses.
Backbone of the problem:

- Little information has been available on China’s management of transboundary rivers.
- The country is a significant player in water resources management in South and Southeast Asia – several great international rivers originate from China.
- Chinese society has been opening gradually to the outside world – open discussion both inside the country and with neighbouring countries has hitherto been difficult.
- China’s willingness to cooperate in the management and development of water resources has been minimal so far, and the reasons behind this have not been clear.
- The plans China has, and is expected to have, for transboundary rivers have significant impacts on the livelihoods of the neighbouring countries.

The rivers of interest in terms of their geographical situation, international character, and great importance to the riparian countries:

- Lancang-Mekong
- Salween
- Irrawaddy
- Brahmaputra
- Red River
Summary points

Findings: (1)

The term IWRM was recognized and it does appear in the government’s official definitions and regulations. But it was admitted that the concept is still virtually unused in China. It only seems to exist in theory, and in most cases, the implementation is very poor or entirely lacking. As the term is not commonly understood or used in China, it is not realistic to expect it to be practised at the international level. Serious problems seem to exist in both integrating different forms of water use and integrating the activities of different governmental structures. The lack of cooperation between bureau’s representing different fields, as well as different levels in the governance, makes it very challenging to know who is really responsible for which decisions and consequences. Additionally, overlaps occur when coordination and flow of information is seriously insufficient.

Findings (2):

There is great pressure in China to develop the watersheds to support the economic development. China has been accused of not negotiating with its neighbouring countries when planning and executing projects. China for its part argues that the impacts that the projects have over the borders are mainly positive, and thus no wider negotiation is required.

Two examples: a) Lancang-Mekong: a cascade of Relevance and eight large dams and the improvement of navigation. b) Salween and Irrawaddy rivers development.
Summary points

Findings (3):
The status of the cooperation looks different depending on the point of view. First, it was noticed that the official Chinese side wants to give an impression that the level of cooperation is high, and that Chinese activities bring mutual benefit. An alternative to the official truth was revealed as well. The importance of the water projects for China is so great that the possible negative impacts on neighbouring countries may not be taken seriously into account. Third, the lack of resources and finances hamper the cooperation.

Findings (4):
Assumed factors influencing the way that China cooperates. The basic assumption was that the level of China's international cooperation in the water resources management has been relatively low, due to following factors:

- Structure of Chinese society and politics - central administration and China as a superpower
- Historical factors - relationships between the countries
- Strong economic development and pressure to develop further – the necessity of the projects targeted to water resources development
- Challenges inside the country and resources required to solve them - there is a shortage of capacity, and international issues may have a low priority
- Lack of adequate benefit - what China would really achieve through increased cooperation.
Summary points

Findings (5):
The will for international cooperation seems to have two entirely different sides – the knowledge and understanding on one side and the state of reality on the other. The problem is not the ability of Chinese researchers to understand the challenges and cures of the transboundary questions. But something strange happens between positive initiatives and proposals, and their implementation. On one hand the importance of the outside image forces the Chinese at least to suggest the good ways, but on the other hand, the government has a minimal will to allocate resources to the matter in reality.

Summary points

Findings (6):
Finding the positive driving forces for China is an important step in pushing the countries to more close interaction. The attention in the findings is focused mainly on the economical factors related to Southeast Asia, China’s opening policy, and increasing participation in the international community, as well as public participation. These factors seem to be the most significant ones, direct economical benefits getting the highest position. There are some people and NGOs in China who want stronger cooperation and concern for the impacts on neighbouring countries. However, as public participation is a very recent issue in China, the NGOs are still too weak and lack the skills required to influence government decisions effectively.
## Summary points

### Conclusions?

Whether China cooperates more in the future on water resources management remains a question that will greatly affect the development of the entire region.

China’s needs for international economic cooperation are strong. However, when it comes to more contradictory topics such as the use of water resources, the willingness to share the country’s benefits seems to diminish remarkably.

However, it is natural for any nation to prioritise its own welfare, and China is just doing the same. The point is to find rules for the game that enable all players, both small and big, to win. There must be something to be gained for the one that enters into an agreement.

The necessary conditions for cooperation must be identified - mutual benefit for all the participants. It is difficult to give sustainable development a high priority when developing the national economy is the most critical factor for many of the area’s developing countries’ welfare. Even for the Asian development miracle China, the benefit of cooperation manifests itself mainly in the form of economic driving forces. If these forces cannot be identified, it is difficult to move towards more comprehensive international water resources development and management.