China water Environment security-Food safty Challenges and Cooperation opportunities

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Contents

1 The safety of water environment in China

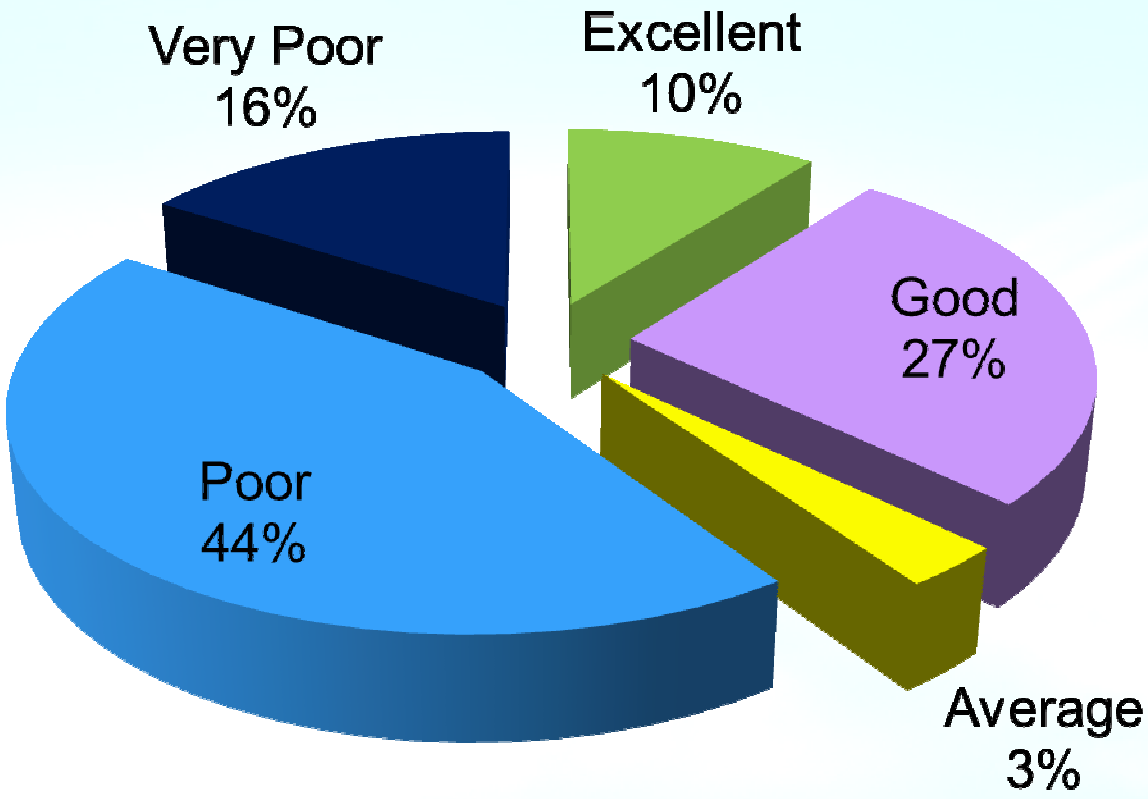
- **Total Mount of Water Resources:** 2795.79 billion M^3
- **Surface water:** 2683.95 billion M^3
- **Groundwater :** 111.84 billion M^3
- **per capita:** ≤ 500 M^3

Seven major rivers in China

1.1 Water environment in China

Five major freshwater lake in China

The groundwater monitoring data in 2013



The Quality of Groundwater

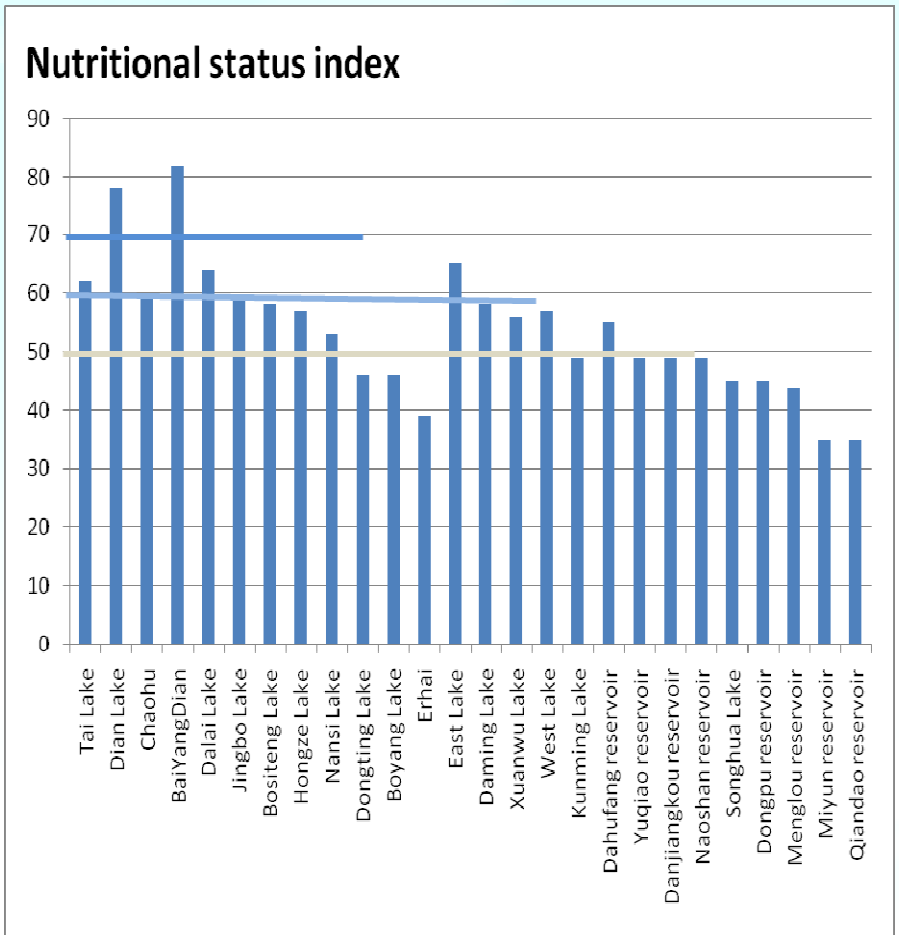
1.2 Characters of water resources in China

- Rich in total water resources volume, but poor in per-capita.
- The regional distribution of water resources does not match with other important resources layout
- Good natural water quality, but some of them was serious polluted
- Serious soil erosion

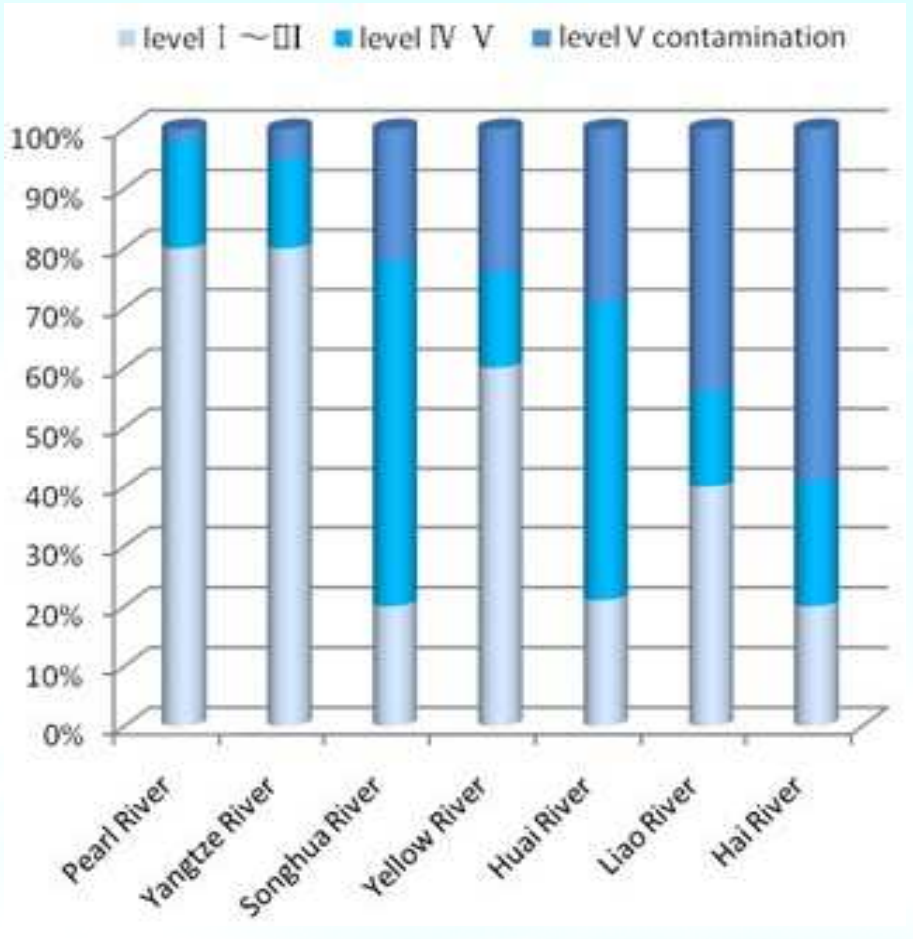
1.3 Shortage of water resources

- **According to the statistics of Ministry of Water Resources, more than 70% rivers and lakes are polluted in different levels. .**
- **Among the Seven key river systems, about 40% are no longer suitable for drinking water resource. It almost amounts to 78% as to the city water.**
- **More than 300 million people are drinking unsafe water in the rural area, about 190 million people are still drinking polluted water.**

The water quality of Seven Key River systems



The nutritional status indexes of key lakes(reservoirs).



Water quality categories of seven water systems.

the major pollutants in the river

Basin	State-controlled monitoring section	Major Pollution Indexes
Songhuajiang	41	Petroleum；Ammonia Nitrogen；COD_{Mn}
Liaohe	37	Petroleum；Volatile Phenol；BOD_5；
Haihe	65	Petroleum；Ammonia Nitrogen；BOD_5
Yellow River	44	Petroleum；Ammonia Nitrogen；COD_{Mn}
Huaihe	86	Petroleum；Ammonia Nitrogen；BOD_5
Changjiang	103	Petroleum；Ammonia Nitrogen
Zhujiang	33	Petroleum；Ammonia Nitrogen；Volatile Phenol
Southeastern rivers	30	Petroleum；Ammonia Nitrogen；Volatile Phenol
Southwestern rivers	17	Lead（Pb）；COD_{Mn}
Northwestern rivers	19	Petroleum

The key harassment program of three lakes

Lakes	Location	Water Quality Classification	Eutrophication Degree
Taihu	Jiangsu	V	Eutrophic
Chaohu	Anhui	V	Mesotrophic
Dianchi	Yunnan	Exceed V	Mesotrophic

Water pollution accidents from 2011 to 2014

- 2011.6, Acid wastewater pollution in Huazhou, Guangdong
- 2011.6, Phenol pollution in Xinan River, Zhejiang
- 2011.7, Manganese pollution in Fujiang River, Sichuan
- 2011.8, Copper and Chlorine overweight in drinking water in Ruichang, Jiangxi
- 2011.8, Chromium pollution in Qujing, Yunnan
- 2012.2, Cadmium pollution in Longjiang River, Guangxi
- 2012.5, Strong alkaline wastewater discharge in Tangshan, Hebei
- 2013.1, Phenylamine leak in Changzhi, Shanxi

- 2013.4, Xanthogenate pollution in Kunming, Yunnan
- 2013.7, Cadmium and Thallium pollution in Hejiang River, Guangxi
- 2014.4, Benzene overweight in drinking water in Lanzhou, Gansu
- 2014.4, Ammonia Nitrogen overweight in Hanjiang River, Wuhan
- 2014.6, Lead pollution in Hengdong, Hunan
- 2014.8, Heavy metal pollution in Shunde, Guangdong
- 2014.11, Arsenic pollution in Chenzhou, Hunan
- 2014.12, Aluminum pollution in Taoyuan, Hunan
- 2014.12, Cadmium pollution in Daxin, Guangxi
- 2014.12, The main rivers detected antibiotics

2 The challenges in terms of food security

China is a populous country, whose demand for water and food is huge. However, the discharge of industrial wastewater and other toxic waste water has polluted the surface and ground water. To a certain extent, it in turn affects food safety (such as rice, crops, vegetables).

China water pollution map

2.1 Impacts of soil and water pollution on food safety

Environmental pollution and food safety are two of the most important issues at present.

Soil and water pollution, in particular, have seriously impacted on food safety which represents an important threat to human health.

Nowhere has that situation been more complex and challenging than in China, where a combination of pollution and an increasing food safety risk have affected a large part of the population.

Water scarcity, pesticide over-application, and chemical pollutants are considered to be the most important factors impacting on food safety in China.

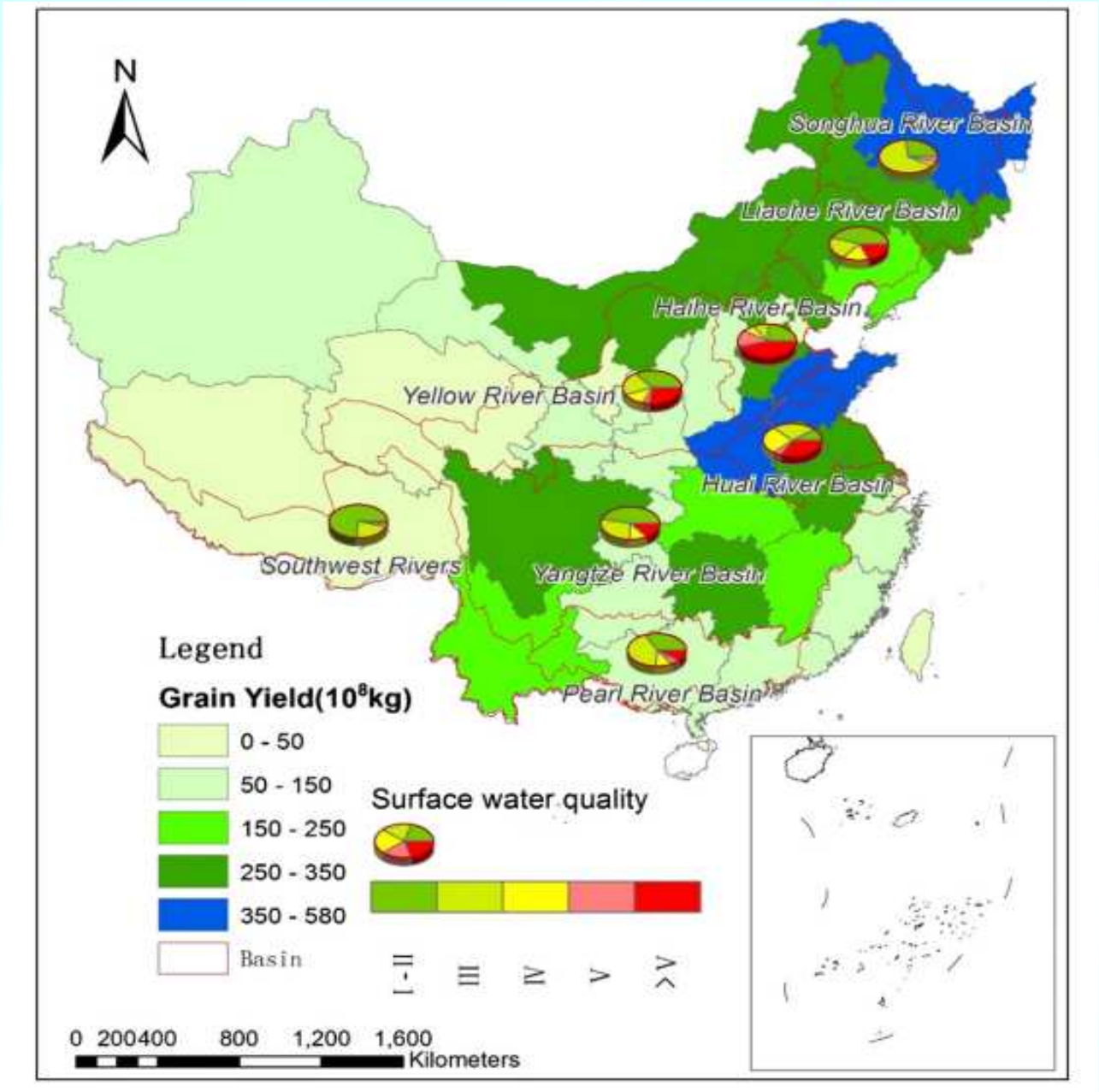


Fig.1 Distribution of water quality and grain yield in 2010

The discharge of sewage (urban and rural) is greater than 60 billion tons each year, and urban sewage treatment rates reaching 90.5% in 2013, while less than 20% for rural areas.
The majority of untreated sewage is directly discharged into rivers and lakes. As a result, the untreated wastewater discharged into surface water caused water pollution in some basins significantly, some of the water is unsuitable for drinking and even irrigation.

Generally, surface water pollution is more serious in the Northern China than in the Southen China, especially in Haihe River, Yellow River and Huaihe River Basins (Fig. 1).

2.2 Pesticide and food safety

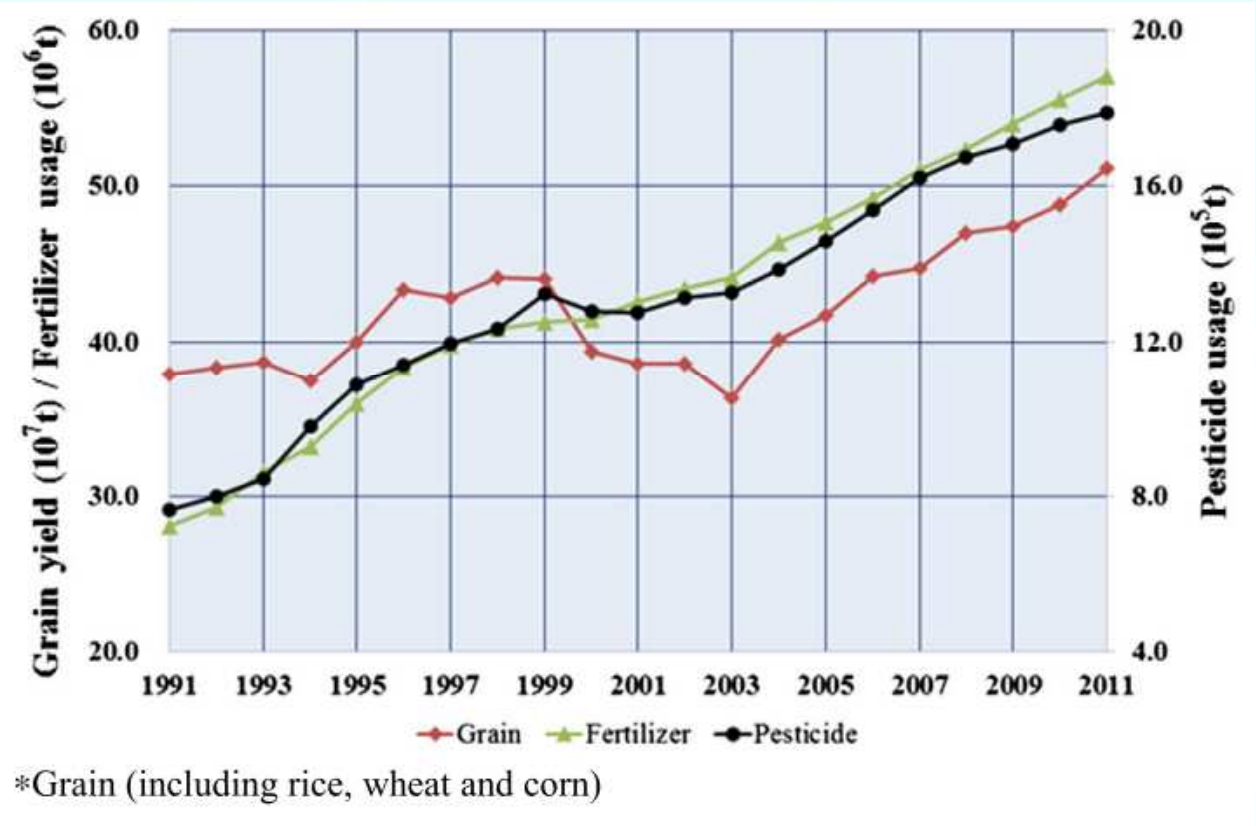


Fig. 2.Temporal trend of grain yield, usage of pesticide and fertilizer in past two decades.

The use of pesticides has made a significant contribution to growth in agricultural productivity. As shown in Fig. 2, the total application of fertilizer and pesticides has increased almost linearly by time, and might be double over the past two decades.

2.3 Heavy metals in crops

It has been estimated by MEP in 2006 that grain yields have decreased by 10 million tons due to soil contamination, and another 12 million tons of food were found to contain high residues of pollutants, which has resulted in more than 20 billion RMB Yuan of direct economic Loss.

In 2002, the Rice Product Quality Inspection and Supervision Center under the Ministry of Agriculture, conducted a test on the rice safety covering the whole Chinese market. The results showed that Pb is the most concerning heavy metal found at levels exceeded the national standard residue concentrations in rice in about 20.4%, followed by Cd in 10.3%.

Table 1

Cd concentrations in soil and rice from farmland in different regions (1992–2013).

Area	Cd in soil (mg kg^{-1})	Cd in rice (mg kg^{-1})	pH
Xingtang, Hebei	4.78	0.5	7.8
Shenyang, Liaoning	4.09	0.1–0.4	6.5
Dayu, Jiangxi	1.95	0.07–1.55	5.2
Guangxi 1	16.0	0.95	4.9
Guangxi 2	10.0	0.30	5.2
Guangxi 3	3.6	0.19	5.0
Middle Hunan	8.30	1.29	–
Lanzhou, Gansu	9.69	0.72	–
Guangzhou, Guangdong	6.67	0.80	–
Yunnan	1.52	0.64	–
Zhejiang	6.69	1.17	–
Yanghe River, Hebei	1.56	–	8.46
Coastal area of Southern Bohai Sea	0.14	–	–

Serious heavy metal contamination events

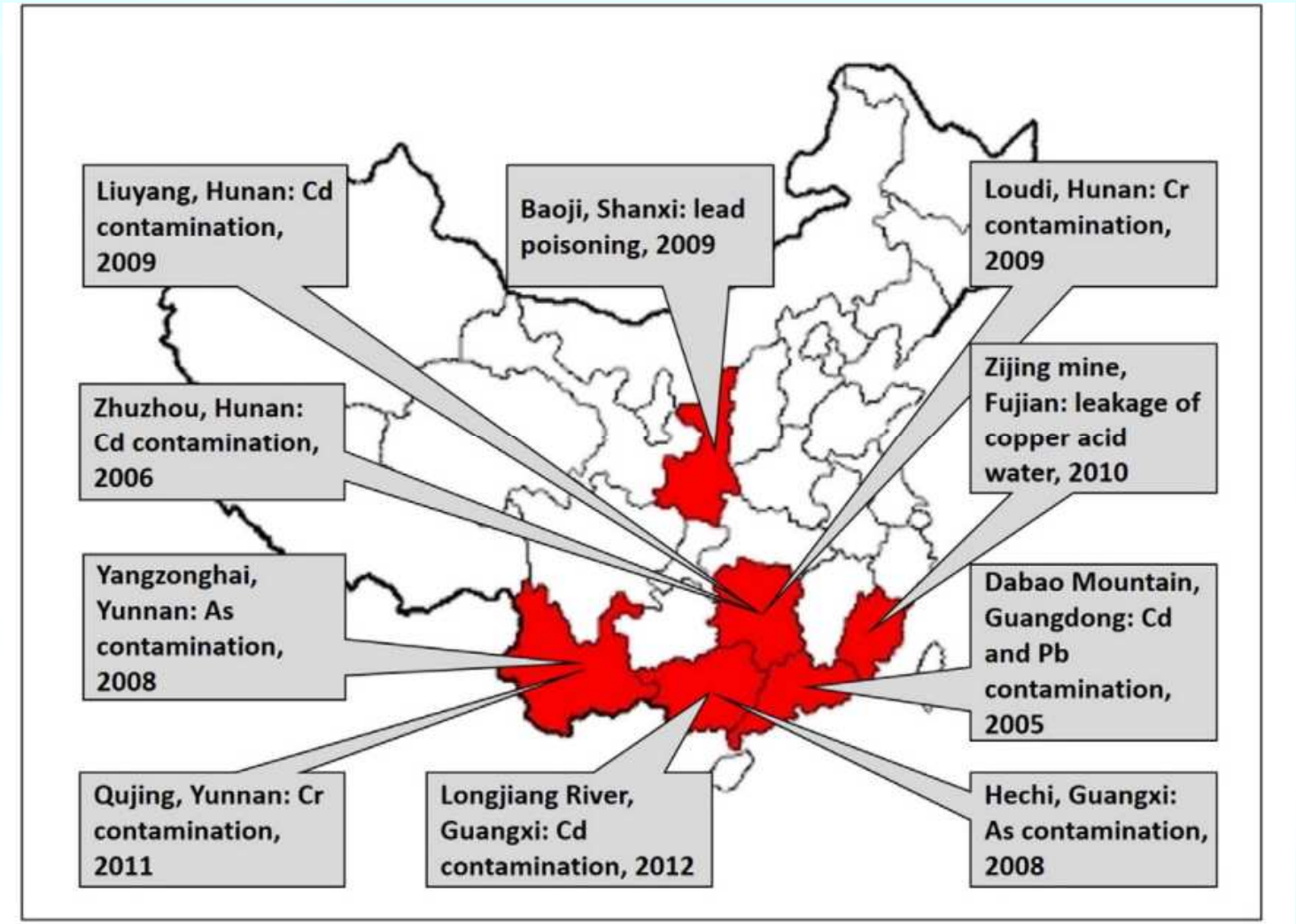


Fig. 3.Ten most severe heavy metal contamination events in the past ten years.

2.4 Pollution related health risks in food production bases

There is a close relationship between the locations of China's major rivers and that of cancer villages (Watts, 2008). Cancer villages tend to cluster along the major rivers and their tributaries, especially in rural areas. Fig. 4 demonstrates that cancer villages in China are mainly located in the Haihe River Basin, mid-lower Yellow River Basin, Huaihe River Basin, mid-lower Yangtze River Basin and Pearl River Delta.

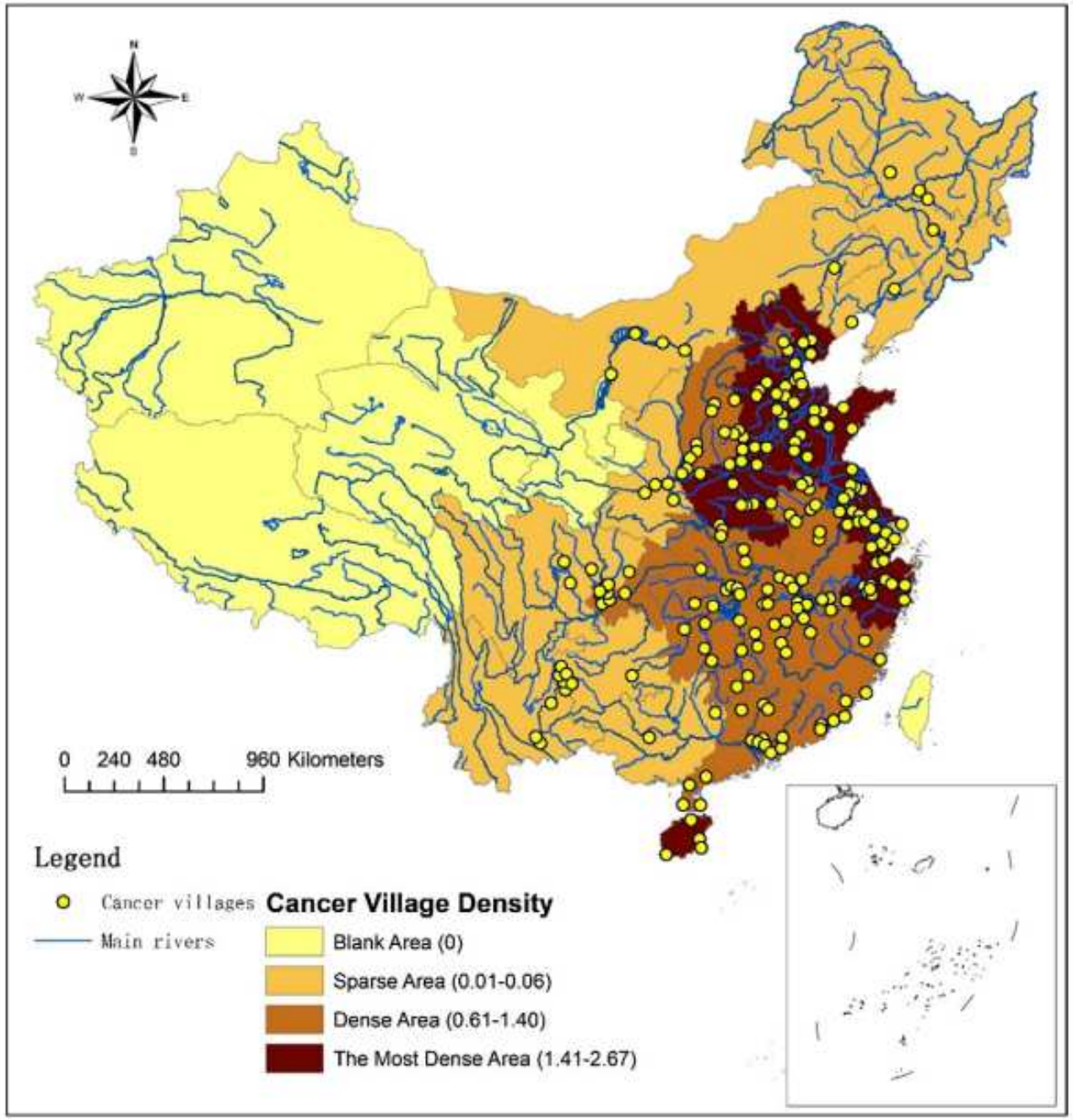


Fig. 4. Distribution of cancer villages and major rivers in China

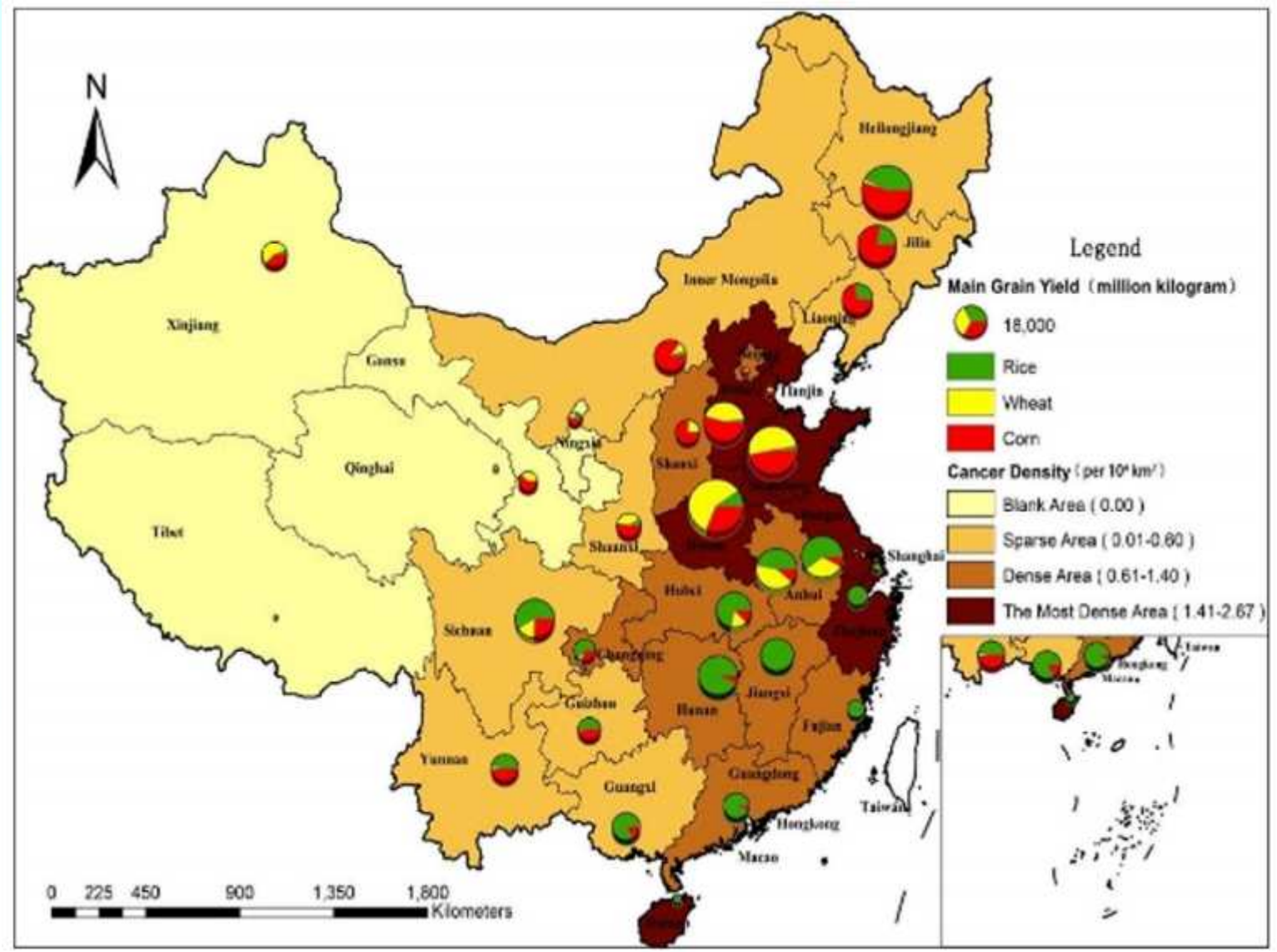


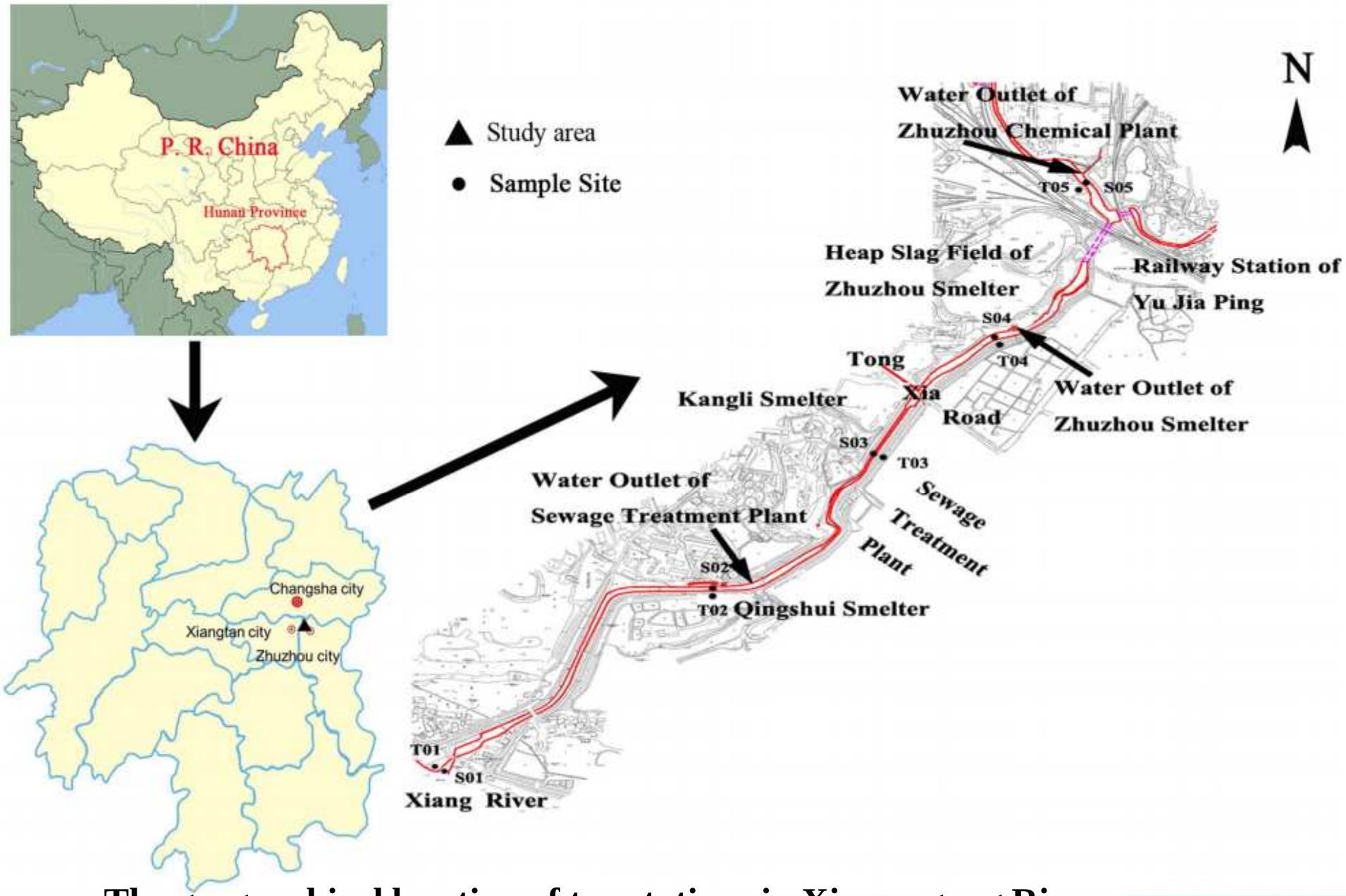
Fig. 5.Distribution of cancer villages and main grain yield in China.

Comparing the distribution of grain production in different provinces with that of cancer villages, the results show that the areas with high morbidity from cancers are located in China's major grain producing areas (Fig. 5). The locations of dense cancer villages in Jiangsu, Anhui, Jiangxi, Hunan, Hubei and Guangdong provinces coincide with the major rice producing areas in China. The major wheat producing areas in Hebei, Henan, Shandong and Jiangsu are also the areas of most densely distributed cancer villages.

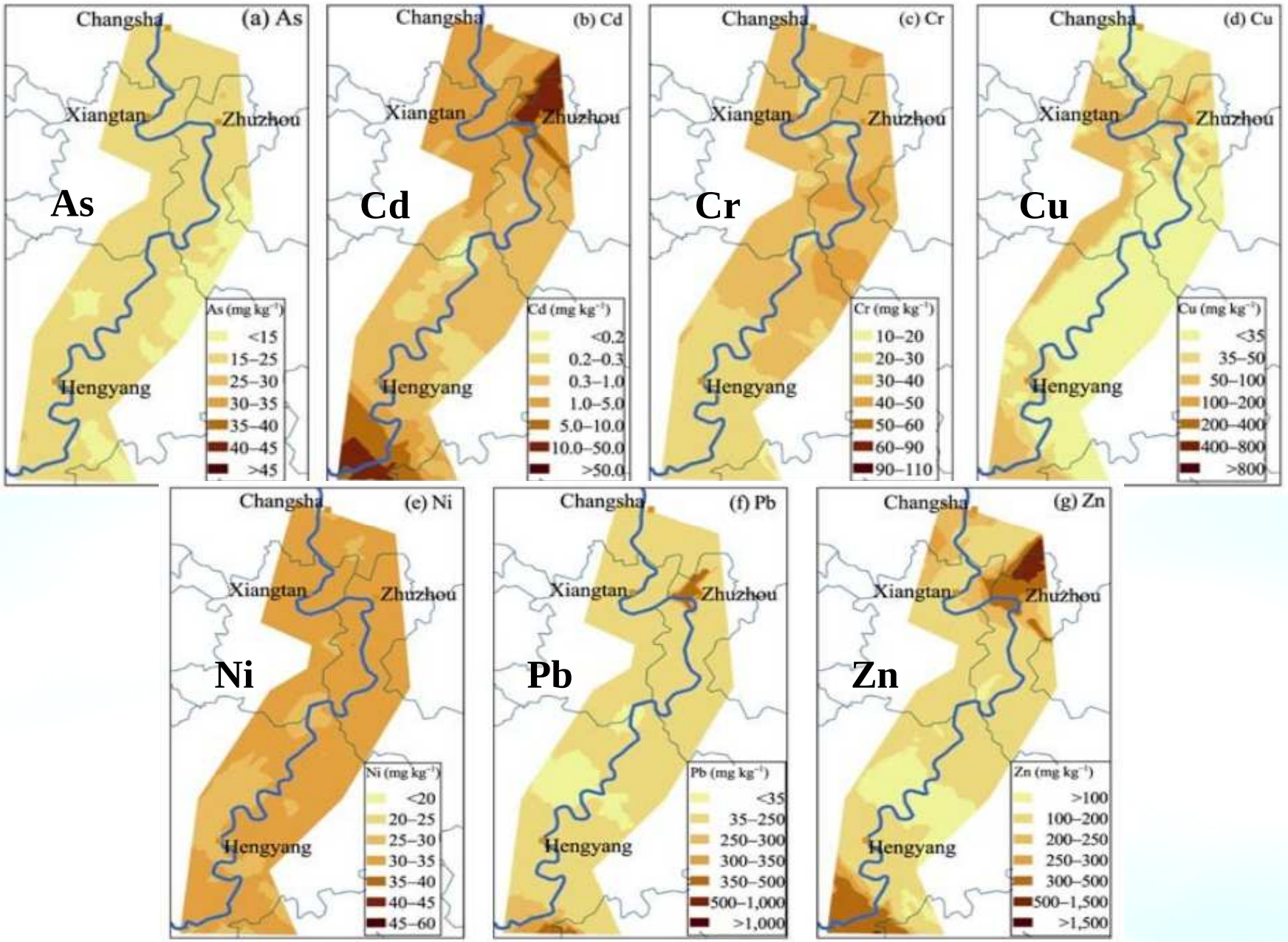
3 Heavy metals-containing wastewater in Hunan Province

It is well known that there are abundant reserves of non-ferrous metals in Hunan Province (Nonferrous metal Village), and most ores for mining, mineral processing, non-ferrous smelting and precious metals are located in the Xiangjiang Valley.

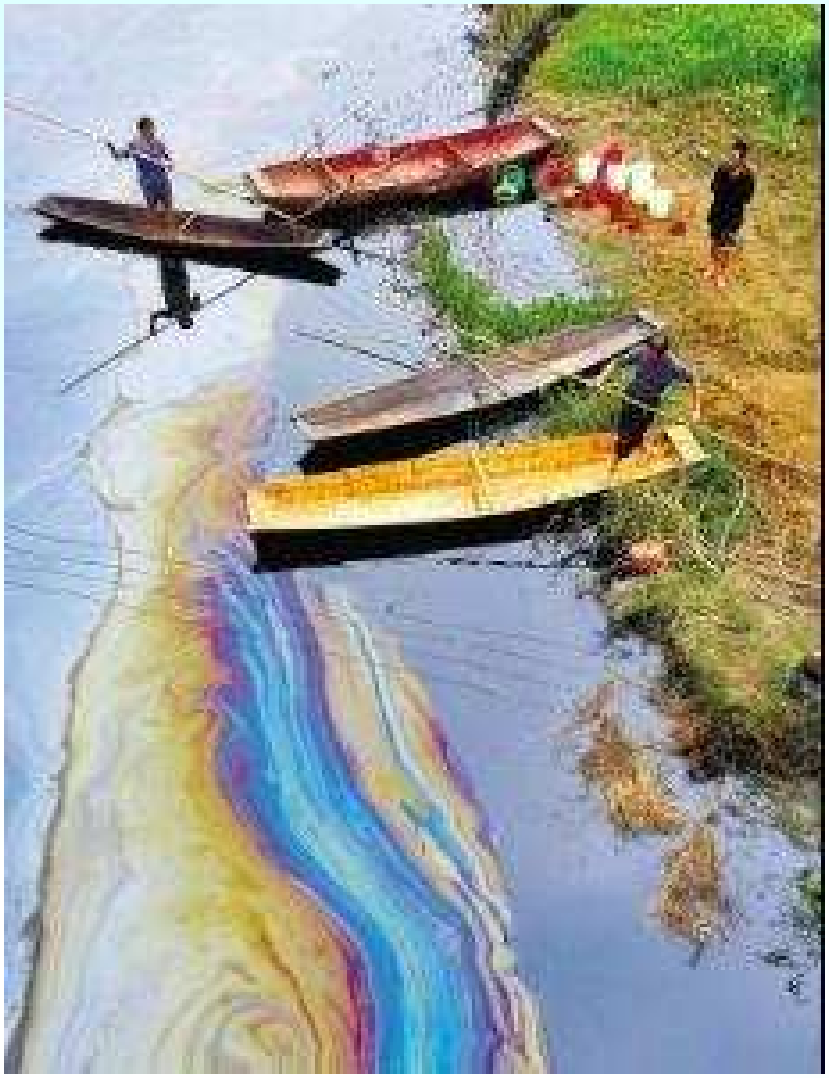
The pollution treatment in this area was emphasized in The Chinese Government’s 12th Five-Year Plan for Xiangjiang River Water Environmental Pollution Control.



The geographical location of ten stations in Xiawangang River (a part of Xiangjiang River).



Spatial variation maps of the heavy metal distributions in the soils from the midstream and downstream of the Xiangjiang Valley (2012)



Cadmium Pollution in Liuyang, Hunan, 2009

More than 1300 children suffered from Pb poisoning

Pb pollution in Wugang, Hunan, 2009


As Pollution in Shimen, Hunan, 2014. The As concentration in the exceed the standard 1000 times. Nearly half of the local village people suffered from As poisoning, 157 persons die from As poisoning.

4 Cooperation opportunities

- **4.1 Policy support**
- **4.2 Cooperation fields**
- **4.3 Cooperation partners**

4.1 Policy support

In April 16th, China State Council officially issued the "Action Plan for Water Pollution Prevention and Control", referred to as the "Water Ten", a list of preventing and controlling water pollution of 10 items, 35 policy goals, 238 specific measures.

After several rounds of modification,water pollution control action plan will take a strong supervisory on sewage treatment, industrial waste water.Strict anti-pollution will become the "new normal".

4.2 cooperation fields

Being a regional organization specializing in science and technology cooperation and a public non-profit international organization, the Center expects to unite related governments, universities, institutions and high-tech enterprises.

On one side, the Center is to strengthen regional collaborations and facilitate the establishment of a long-term partnership among Asia-Europe water resources research institutes; to develop research network and create synergies through cooperative research, in a bid to jointly address common concerns about water use and water environment governance.

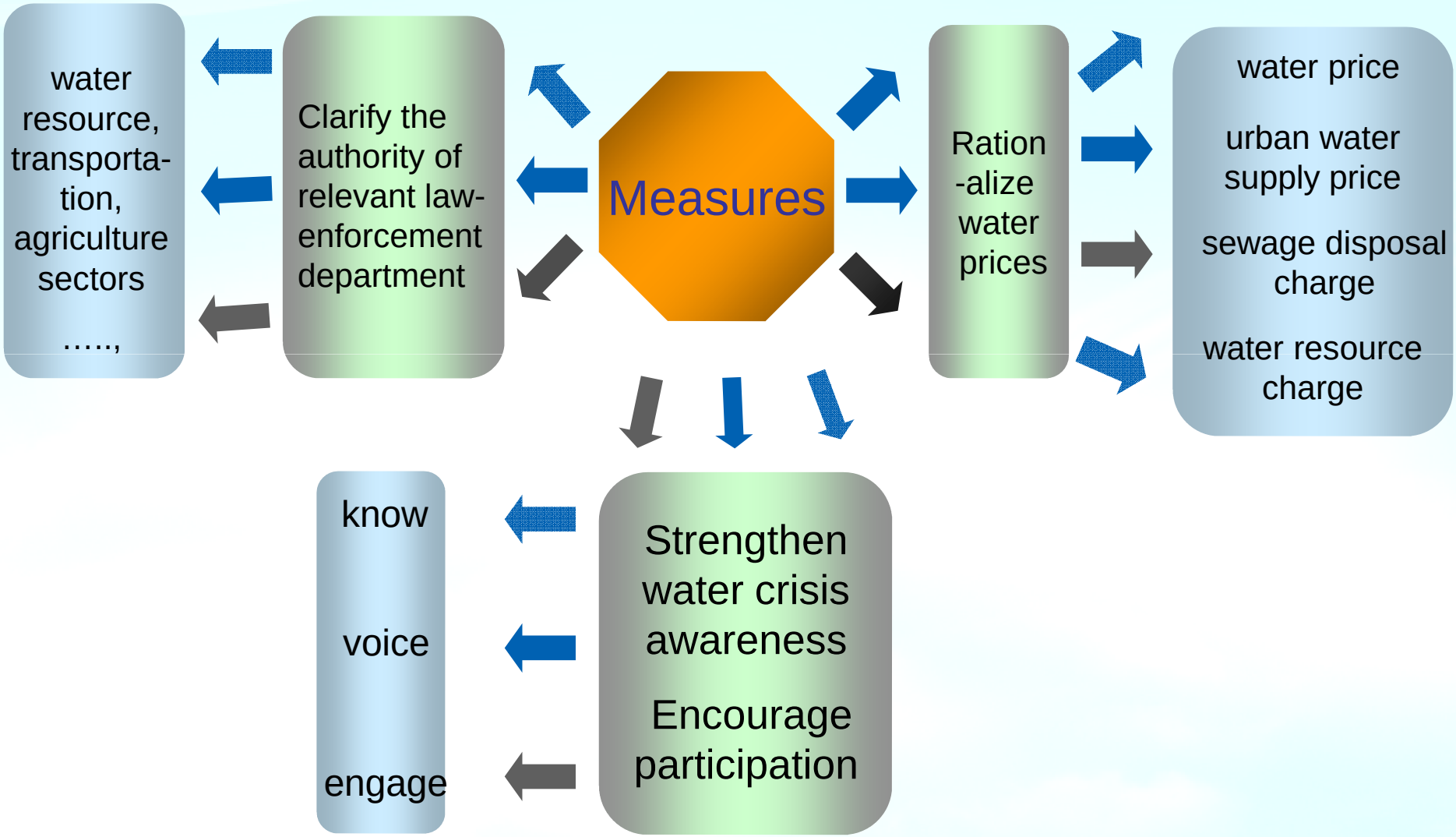
On the other side, it is to submit policy recommendations and technical consultations to ASEM as well as Asian-European states and governments on sustainable water use and integrated management, strategic planning and action plans, etc.

4.3 Cooperation partners including:

- The ASEM Water Resources Research and Development Center
- Local governments
- Universities
- Institutions
- High-tech enterprises

The ASEM Water Resources Research and Development Center is officially founded in Changsha, Hunan, China in 2011, and it is a permanent research and development organization in water S&T cooperation under the framework of ASEM mechanism.

Supporting policies and safeguard measures



4.4 Cooperation priorities

The first: Scientific, technological and cooperative research with local governments, universities and research institutions in China. Cooperation with experts and scholars via implementing joint research projects, aiming to improve China water environment.

The second: Cooperation with the department of environmental protection and control technology in the area, and with relevant institutions, enterprises and industries.

The third: Introduction of advance technologies, management experience and talents from Europe.

THANK YOU

FOR YOUR ATTENTION!