Influence of urbanization and economic development on Yangtze River intertidal zone sediment

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Concentrations of selected heavy metals in surface sediments from 26 sites within the Yangtze River estuary intertidal zone were studied to understand the environmental impact due to urbanization and economic development in Shanghai, China. The sediment samples were collected between 2004 and 2005 during several sampling events. We found that heavy metal concentrations in surface sediments (0-5 cm) ranged from Al: 40803-97213 mg kg^{-1}; Fe: 20538-49627 mg kg^{-1}; Cd: 0.12-0.75 mg kg^{-1}; Cr: 36.9-173 mg kg^{-1}; Cu: 6.87-49.7 mg kg^{-1}; Mn: 413-1112 mg kg^{-1}; Ni: 17.6-48.0 mg kg^{-1}; Pb: 18.3-44.1 mg kg^{-1} and Zn: 47.6-154 mg kg^{-1}, respectively. Metal enrichment factors (EF) suggest that individual metal contamination (e.g., Cd, Cu) exists in some localized areas that could be caused by the local point sources. However, the study shows that heavy metals in the intertidal zone are mainly from natural weathering processes in general.

The sediments characteristics of the tidal zone in Tianjin

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36 surface sediments in the tidal zone had been positioned and sampled, and the grain size had been analyzed by the integrated methods. The results showed that the surface sediments in the tidal zone consisted of silty fine sand, fine sand-silt-clay, silt-clay-fine sand, fine sandy silt, fine sand-silt, silt and fine sand. They gradually became coarse grain from the shore to the subtidal zone. Horizontaly, the surface sediment grains changed from coarse to fine between Luju River and Duliujian River. The reason was the outline of the shore changes the water current by building the shore bathing place. Vertically, the sediments were coarse at the bottom and fine at the upper part, because the coastal freeway had been built and the coastal line was retreated to the sea. These characters were closely related to the mankind activity and the water current changing.

Pollution induced water shortage in the Yangtze River Delta: chances and challenges for wetlands as treatment system

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• Introduction

The Yangtze River Delta is one of the world largest river deltas in the world. It includes the whole Shanghai metropolitan region, southern Jiangsu province and northern Zhejiang Province, with an area of 99,600km2(about 1% of China), and a population of 74 million (about 6% of China). It is one of the most rapidly developing zones in China, even in the world. In 2007, the GDP of this area reached 4667.2 billion Yuan, which accounts for 18.9% of the whole country, with an increase speed of 15%.

The annual average precipitation in this delta is about 1100mm. Yangtze River brings nearly 1000 billion m3 water discharge every year. Therefore, it is "rich" in water theoretically. But, with the quick economic development, pollution induced water shortage has become the "bottle neck" for further economic development in this region.

• Pollution induced water shortage in the Yangtze River Delta

High economic growth rate has attracted large amount of labour flow from outside of the region. Therefore, the real population size is far higher than the registered number. Most of the labours are hired by small enterprises all over the area, such as spinning and dyeing companies, chemical plants, paint factories, and feedingstuff factories, etc. Due to lack of efficient waste treatment facilities and scattered distribution pattern of these small enterprises, water pollution has become a serious problem. The occasional pollution water discharge from upper streams further deteriorates the situation.

Most of the lakes in this delta experience eutrophication problems nearly every year during warm and hot seasons. In 2007, the average total nitrogen and phosphorous in Tai Lake reached 4.0 and 0.13 mg/L, respectively (Hu, 2007), which resulted in the devastating algae blooming in May. Most of the lake water belong to class level IV, V,

or even worse, according to the National Water Quality Standard (GB3838-2002). Although strict environment protection strategies have been implemented by the central and local governments, the level of N and P remains high due to lack of removal techniques in the water treatment plants, as well as long term accumulation in the sediments. Rivers and canals are even worse, especially in the urban sections. Water body is black and smells bad, and therefore belong to level V or worse. In the Northern Zhejiang Province, 84% of the river water is not suitable for drinking. In the catchment of Tai Lake, 80% of the rivers are polluted, with 60% of the water undrinkable. The major pollutant species are BOD5, COD-Mn and volatile phenol (Chen 2001, Wang 2002). Inland water pollution has resulted in the "red tide" and low oxygen area in the coastal area of East China Sea. Habitat for some rare fish species has been destroyed or fragmented at the estuary of the Yangtze River. Pollution induced water shortage will not only smother the life in water, but also smother the economic growth in the Yantze river delta, if measures are not taken in time.

- **Chances for wetlands as treatment system**

The southern part of the Yantze River Delta is famous for its low land with plenty of water and has gained the name of "Shui Xiang", which means "land of water" in Chinese. It has numerous lakes and ponds with criss-crossing rivers and canals connecting them. The main functions of the lakes/rivers in the Yantze River Delta are for water regulation against flooding and drought, water supply for agriculture, industry and drinking, or aquaculture. Many water plants, such as water bamboo (Zizania latifolia), lotus (Nelumbo nucifera), water shield (Brasenia schreberi), and chufa (Eleocharis tuberosa) etc., are harvested as vegetables for the local people. Paddy field is another type of artificial wetland that has existed here for thousands of years. There is a great potential for using wetlands as "treatment system" for cleaning up the water in this region. Several demonstration projects on wetland treatment systems have been launched and showed the possibility of water purification with wetlands. A total area of 200 km2 wetland parks have been built in the delta in the last 3 years, for the protection and demonstration of importance of wetland functions. The local people are willing to clean up the lakes and rivers after so many years of tolerance of spoiled water. But, establishing new wetlands specially dedicated for water purification is difficult because the land is very intensively used in this region.

- **Challenges for wetland treatment system development**

Although the wetlands in the Yantze River Delta occupying almost 80% of the area, and being used for thousands of years, the idea of using wetlands as treatment system for polluted water has rarely been taken into account, especially in those wetlands used for aqua-/agricultural products. How to make full use of the wetlands in this region and convince the local people to accept the idea of using their paddy fields and lakes/canals for water purification remains a challenge. The main problems concerning the use of wetlands as treatment system include: Will it increase the cost, or lower down the benefit from wetland outputs? How to deal with the biomass if strong nutrient absorption species are introduced while they have lower economic value? What if secondary pollution happens caused by concentration of heavy metals by wetland species? How to deal with the increasing waste water from economic development in the future? Or, all in one question: Is it possible to use the existing wetlands as treatment system to solve the "Pollution induced water shortage" problem in the Yangtze River Delta? And How?

- **References**

Chen W.R., 2001. Strategies on sustainable use of water resource in the Yangtze River Delta. China Water & Wastewater, (3): 25-28. (in Chinese)

Hu, W.P., 2007. Tai Lake algae blooming is a sudden breaking out due to multi-factors. Science Times, 2007-6-12. (in Chinese)

Wang, S.N., 2001. Water resource of Shanghai. Shanghai Water, (2): 1-8. (In Chinese)

The Changjiang sediment flux/load into the Seas: measurability and predictability

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This paper challenges the credibility and predictability of sediment flux/load of the Changjiang River entering the seas in the past decades. The assumption of the study is that missing suspended sediment concentration (SSC) during peaking flood period is much likely, while considering the historical observational method (30-50 times a year) applied to Datong