Abstract:

Non-point source (NPS) pollution contributes significantly to water environment deterioration in China. NPS pollution in China has the unique characteristics of strong intensity and composition complexity. First, more than 50% of its 1.3 billion people are rural. Sewage from the rural households is discharged either without or only with minimal treatment. Second, China is plagued with serious agricultural pollution due to improper application of fertilizers and pesticides. Finally, there lack sufficient disposal and recycling of rural wastes.

Lake Tai is the third largest freshwater lake in China. While accounting for 0.4% of its land area and 2.9% of its population, the Lake Tai basin generates more than 14% of China's GDP. Unfortunately, accompanied with the fast economic development is serious water pollution in the region. The lake is becoming increasingly eutrophied and has suffered from serious cyanobacterial blooms.

Tremendous investment has been made to mitigate water pollution conditions in the basin. But, the trend of deteriorating water quality has yet to be reversed. At least two factors contribute to the dichotomy between huge investment and limited results. First, the majority of the efforts have been limited to engineering approaches. Second, the complex hydrological regime of the basin may aggravate the impacts of various pollutant sources. Using the Yincungang canal, one major tributary to the Lake Tai, as an example, we discuss our work on both hydrological and socio-economic factors affecting the water quality of the canal, as well as the grand challenges of coupling hydrological systems and socioeconomic systems in the region.

1. Complex Non-point Pollution Sources in China













- >Non-point source pollution contributes significantly to water environment deterioration in China.
- Sewage from dispersed rural households are discharged without or only with minimal treatment.
- >Improper fertilizer application and pesticide use is widespread in Chinese agriculture.
- ➤There lack sufficient disposal of rural wastes such as crop straws and animal manure.

Incorporation of Complex Hydrological and Socio-economic Factors for Non-point Source Pollution Control: A Case Study at the Yincungang Canal, the Lake Tai Basin of China Xiaoying Yang, Xingzhang Luo, Zheng Zheng (Department of Environmental Science and Engineering, Fudan University, Shanghai, China)

2. Algae Bloom and Worsening Environment in the Lake Tai Basin



3. Study of Pollutant Concentration Along the Yincungang Canal



COD Observations

TN Observations

➤Lake Tai was a scenic place abundant with fish and rice. >Lake Tai provides multiple services such as water supply, navigation, flood control, fishery, and tourism.

► Lake Tai is increasingly eutrophied and has suffered from frequent algae blooms.

≻In 2007, a severe algae bloom in the lake caused a drinking water contamination crisis, leaving 4.43 million people without safe drinking water in Wuxi City.

- Yincungang was excavated in the 1970's as a flood pathway from Lake Ge to Lake Tai.
- >Yincungang ranks 1st in pollutant load to the Lake Tai, accounting for 20.1% of NH_3 -N, 19.7% of TP, and 17.8% of TN load.
- ➢ In April and June of 2010, two high-density snapshot samplings were conducted along the Yincungang canal.
- COD and TN has different spatial and temporal patterns between April (low-flow) and June (high-flow).







stribution of Annual

litrogen Fertilizer Use (Kg N/ha) by Crop



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> The difference is due to the difference in dominant pollution sources and hydrological conditions.

- >Agriculture contributes significantly to nitrogen load.
- \succ Inflow from the other canals imposes significant impact on the water quality in Yincungang.

4. Study of Fertilizer Use in the Lake Tai Region



circular river network dendritic river network

➢ Farmers in 15 villages in the Lake Tai critical zone were randomly selected for interview.

>There are widespread fertilizer misapplication and highly variable application rates among farmers.

➢ Results reveal the ignorance of BMPs, the extinction of traditional organic fertilizers, the lack of expert guidance, and pervasive misconceptions about fertilizer.

5. Challenge Ahead

Complex hydrological conditions in the Lake Tai region:

- Stream networks are dense and circular, cut through by many man-made canals
- Flow direction is influenced by wind, rain, and human dredging and drainage activities
- How to couple complex hydrological systems with socioeconomic systems in the region?