

WATER QUALITY IN SHANGHAI

Combining citizen science and land use data to identify drivers of eutrophication in the Huangpu River system

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The study combined three-years of data gathered by trained citizen scientists on the Huangpu River in Shanghai, China with satellite-acquired land cover data to understand the drivers of changing water quality in the expanding Shanghai urban area. Results showed that upriver catchment conditions strongly modify river dynamics while typical urban impacts e.g. first flush and impermeable land cover have limited influence. It also showed that in-stream vegetation has a positive effect on water quality. *Zhang et al. (2017) Sci Total Environ. 584-585:651-64*

Aims

By combining data gathered by trained citizen scientists on the water quality data of Huangpu River with satellite based land use mapping, the study focused on:

- Examining temporal and spatial variations in water quality of the high urbanized areas of Huangpu River
- Analyzing the relationships between environmental conditions (local and catchment scale land use and ecological conditions) and the river water quality; and
- Evaluating scale effects of land use on river water quality and supporting sustainable water management of urban rivers.

Approach

Between 2013 - 2016, about 400 citizen scientists made regular measurements on the first Saturday of every month at selected sites along Huangpu River. Ecosystem conditions and water quality data from 31 sites monitored by citizen scientists (199 datasets) were uploaded directly to the FreshWater Watch platform.

Scale effects of different land use on water quality were determined using satellite data to explore land use composition at different distances from the river banks and sampling sites. Population density and sampling day precipitation were provided by World Population Project and Global Precipitation Climatology Project, respectively. The relationship between water quality, land use, river ecosystem conditions, climate and related environmental drivers were explored.

Impacts

The treatment rate in 2015 in urbanized area of Shanghai has been improved to reach 90%. However the overall water quality of the river has not improved. Elevated nitrate concentrations and elevated turbidity were present in most sites and throughout the year. A larger scale (integrated catchment) focus on nutrient management is needed. Furthermore this research indicated that increases in local naturalized wetland areas should be considered.



Key results

- Highest average nitrate concentrations (≥ 6 mg/L) occurred during the summer rainy season indicating an increased inflow of this dissolved nutrient.
- High turbidity values (≥ 150 NTU) occurred in winter when river discharge was lowest, indicating an increase in the concentration of particulates in the river at low flow.
- Local scale land use and ecological conditions did not have a strong relationship on water quality. Results showed that up-catchment conditions influence river water quality dynamics.
- The one exception was the positive impact of in-stream vegetation on dissolved nitrate points. The presence of aquatic vegetation such as emergent, floating or submerged plants was associated to improved river conditions.

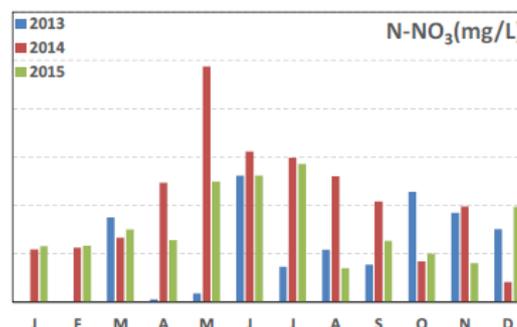


Figure shows monthly nitrate dynamics in Huangpu River.