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Assessing Nitrogen Flux In The Yangtze River: Sources And Scenarios

Zhongyuan Chen [1] and Hao Xu [1,2]

(1) East China Normal University, 200062 Shanghai, China
Telephone: 86-21-62232706 Email: z.chen@ecnu.edu.cn
(2) Telephone: 86-21-62232706 Email: dmhxu85@163.com

This study gives a thorough assessment of the occurrences of dissolved inorganic nitrogen (DIN) in the Yangtze water in the past half century. The results have shown that nitrogen fertilizer, a major DIN source, has been replaced by domestic sewage in the last decade, which has driven dramatically up DIN loads in the Yangtze water. DIN concentrations showed a rapid increase from <0.5 mg L-1 in the 1960s to nearly 1.5 mg L-1 at the end of the 1990s. Since then DIN has remained steady at ca. 1.6 -1.8 mg L-1. A significant relationship between the historical DIN record at the downstream-most gauging station and N sources in the Yangtze River basin is established using principal components analysis. This allows us to apportion DIN loads for the year 2007 (the most recent year of DIN measured data available) to various N sources, listed here in order of weight: sewage (0.391 million tons); atmosphere (0.358 million tons); manure (0.318 million tons), N-fertilizer (0.271 million tons). Therefore, we estimate that a DIN loads of 1.339 x 106 t was delivered to the lower Yangtze and its estuarine water for that year. We established scenarios to predict DIN concentrations in the lower Yangtze at 10 year intervals to 2050. For a dry year (20,000 m3s-1) DIN concentrations would range from 2.2 – 3.0 mg L-1 for 2020 – 2050. This far exceeds the 2.0 mg L-1, defined by the Chinese National scale as the worst class for drinking water source. The scenario results suggest that upgrading the sewage treatment systems throughout the basin will be an effective way to help reduce DIN concentrations to less than 2.0 mg L-1 in the lower Yangtze. This would save Shanghai megacity from the increasing threats of heavily polluted water sources, where >23 million people are at present dependent for 70% of their freshwater intake from the Yangtze estuary.