WATER ENVIRONMENTAL MONITORING ANALYSIS

SYSTEM FOR THE TAI LAKE

Hong ZHANG
zhanghong@njnu.edu.cn

Nan JIANG
njiang@njnu.edu.cn

Yuhong ZHOU
zhouyuhong-03@163.com

Wei ZHANG
zhwsweet@tom.com

Feng NI
babyfish20012001@yahoo.com.cn

Key Laboratory of Virtual Geographic Environment, Nanjing Normal University, Nanjing, Jiangsu Province, P.R.China 210046

Abstract

Tai Lake basin is located in the core area of delta area of Yangtze River, one of the most developed regions of China. It's the third largest freshwater lake of China, and one of the largest freshwater lake in the Middle and lower reaches of Yangtze River. The problem of environment pollution of Tai lake is getting worse along with the rapid development of Chinese economy. It is faced with serious water environment pollution as the large amounts of industrial wastes, pesticide, and chemical fertilizer are keeping inflowing into Tai lake. Consequently, the event of blue green algae outbreak in 2007 caused enormous losses, hundreds of thousands people's water security were seriously affected. As part of water environmental pollution control of Tai lake, we have been developing Water environment monitoring analysis system. The objective is to visually reveal present water environment situation and tendency by integrating environmental data analysis methods and thematic mapping models to make decision support to

local governments and agencies.

Keywords: Environmental Thematic Mapping; WebGIS, Spatial Analysis

Introduction

As a consequence of urban development and population growth, water environmental problem over the years have been critical. The adverse environmental effects include industrial wastes, pesticide and chemical fertilizer etc. It shows that environmental conditions will worsen in Tai Lake area in the immediate future if protection method were not conducted effectively. Therefore, the highest priority is to protect ecology environment and improve water resource quality of the Tai Lake. However, the major issue for the department concerned is how to manage water environment effectively, and take actions for environmental protection.

There are considerable advantages in incorporating environmental information management in environmental protection. It can enable the analysis of the mass data collected in environmental monitoring and statistics make decision support and provide better public service. An efficient way is to develop environmental information management system based on Internet to publish environmental protection information via Web service technology, to reveal the environmental qualities. This paper focuses on internet based environmental protection management for environmental quality query and analysis. The objective of this research is to develop a platform to coordinate WebGIS, database, Internet/Intranet, Client/Server and environmental analytic methods for the Tai Lake environmental protection. The functionalities of the system consists of information sharing via Web publish, integrated environmental analysis and thematic information visualization.

Approaches

The Water Environmental Monitoring Analysis System (WEMAS) application (Figure 1) is designed to provide a platform through which environmental management activities to support environmental protection operations can be conducted. WEMAS is developed by collecting monitoring data of water environment quality over the past twenty years, integrating and analyzing all the existing data by either manual or auto collection, and dynamically generating web-based thematic maps. Methods and tools have been developed to support (1) water quality estimate of rivers in and out of Tai Lake; (2) pollutant concentration distribution and gross calculation; (3) time series analysis of water quality; (4)

time series analysis of pollutant of Tai lake; and (5) MODIS data queries and comparative analysis of time series.
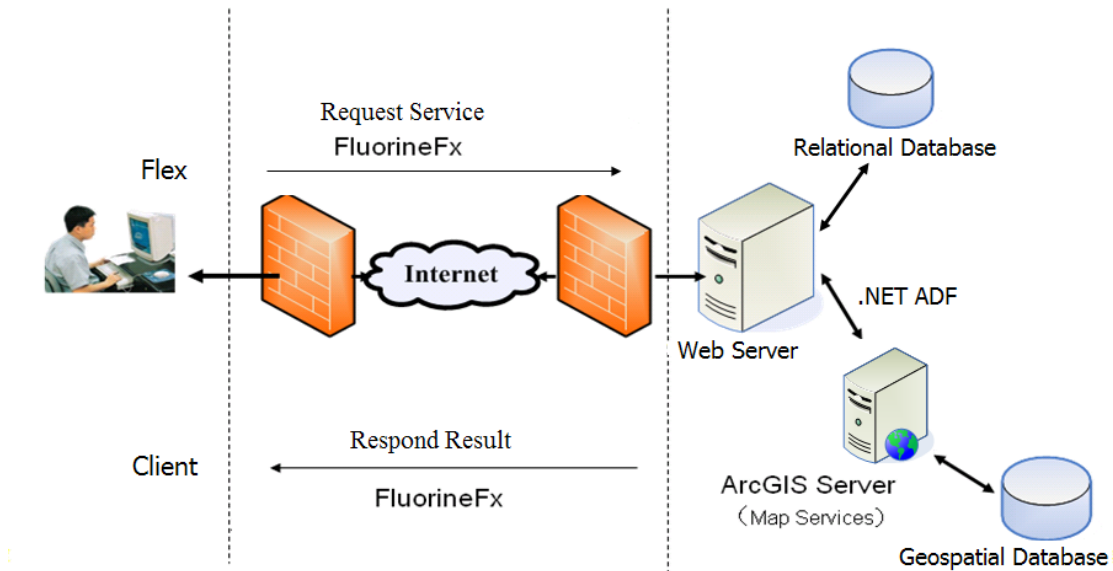

Figure 1 WEMAS Architecture

In our demonstration, we will focus two components of the system. The first part is the database construction including basic layers of rivers, lakes, residents, roads, enterprises, contours, boundaries etc, and thematic layers of the Tai Lake monitoring points, blue-green algae monitoring points, drinking water sources, rainfall measuring points, groundwater monitoring etc. The other part is to develop B/S based environmental query and analysis system, consisting of water quality query, drinking water and ground water quality query, RS images query. The results can be visualized by different colors according to classification standard of environmental quality. The query modes are diverse. The users can inquire about the information by multiple index and single index, by time modes etc.

Applications

The water quality grades analysis module of the Tai Lake is shown in Figure 2. It provides users to inquiry about water quality grades of the Tai Lake with options of time and environmental factors. The search results are shown in the thematic map presenting water quality grades, the pie chart expressing percentages of the water quality grades of the Tai Lake,   and the histogram chart depicting the monitoring value of each point with selected environmental evaluate factors.
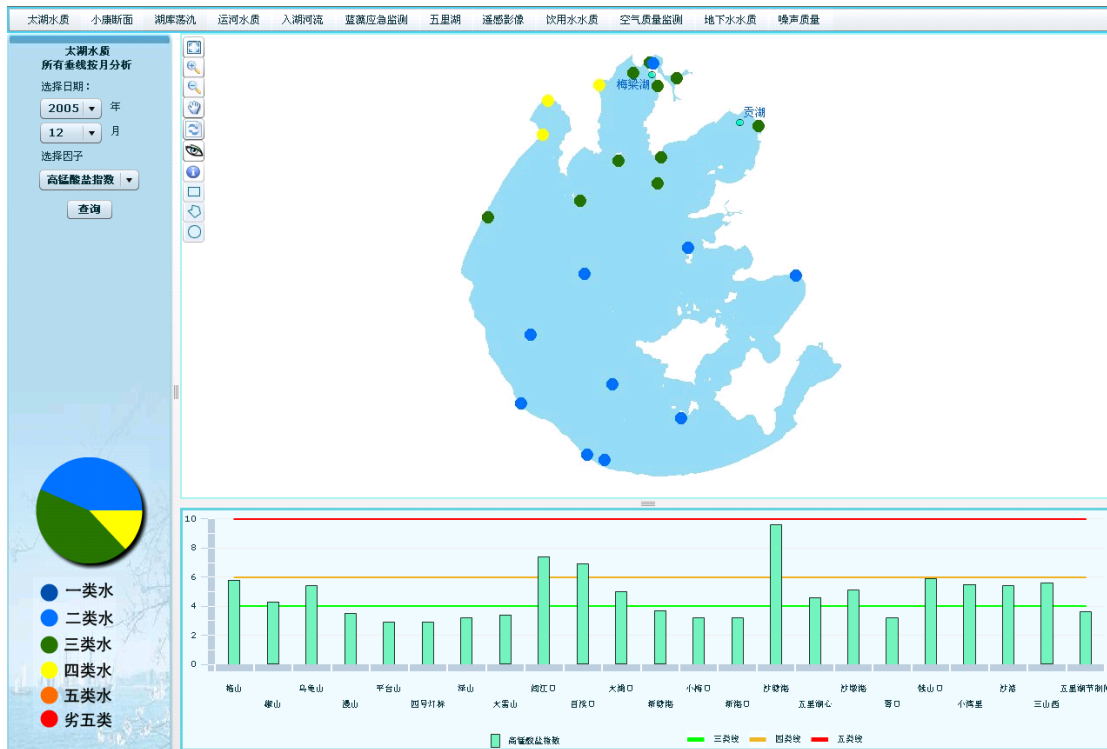
Figure 2 the Tai Lake water quality grades analysis module

The water quality water quality trend surface analysis module of the Tai Lake is shown in Figure 3. The multiple maps shaded with different colors describe change of water quality trend surfaces of the Tai Lake at different time periods. The pie chart shows percentages of the area for water quality grades of the Tai Lake. The histogram chart in the bottom shows the proportion of area for water quality grades at different time periods.
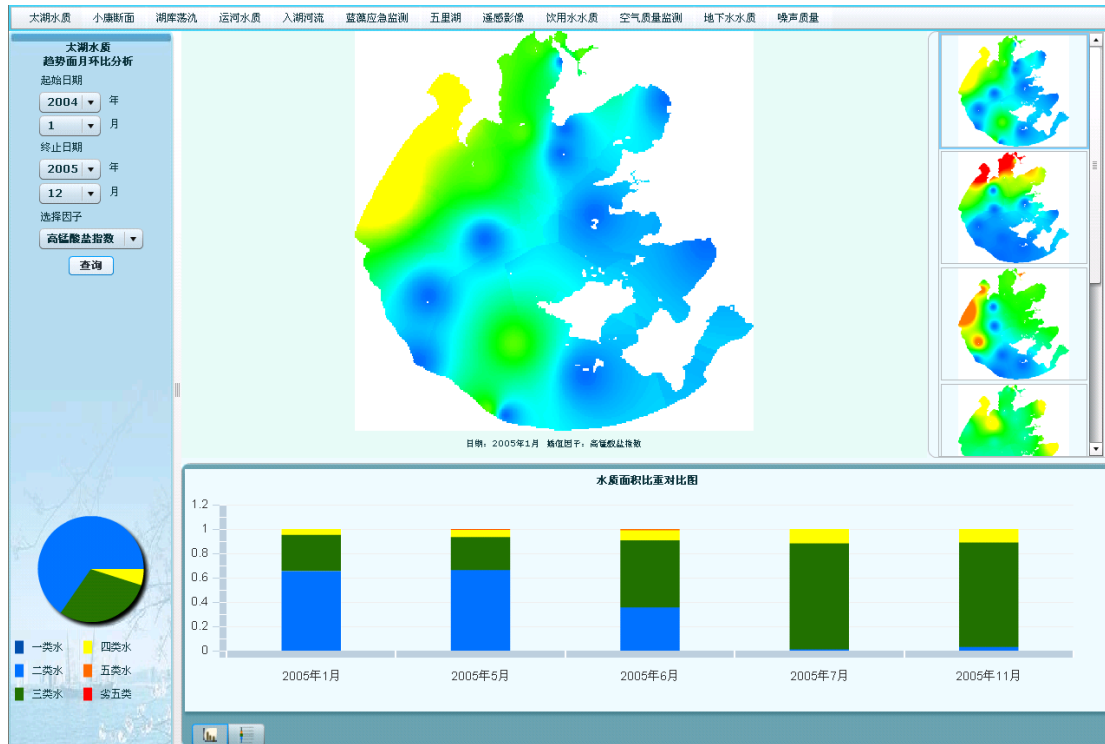
Figure 3 the Tai Lake water quality trend surface analysis module

The water quality grades analysis module of the rivers relevant to the Tai Lake is shown in Figure 4. It provides users to inquiry about water quality grades of the rivers with options of time, administrative districts, rivers and environmental factors. The search results are shown in the thematic map with different colors to present water quality grades for all rivers' sections. The pie chart shows percentages of water quality grades for all rivers' sections.

Figure 4 the river water quality grades analysis module

The functionality of the water quality standardized rate analysis module of Xiangkang cross section is presented in Figure 5. The thematic map displays the points reaching the water quality standards with green color, black color otherwise. The pie chart shows percentages of section points reaching water quality standards. The histogram chart shows monitoring value and standard value for all points with evaluate factors selected.
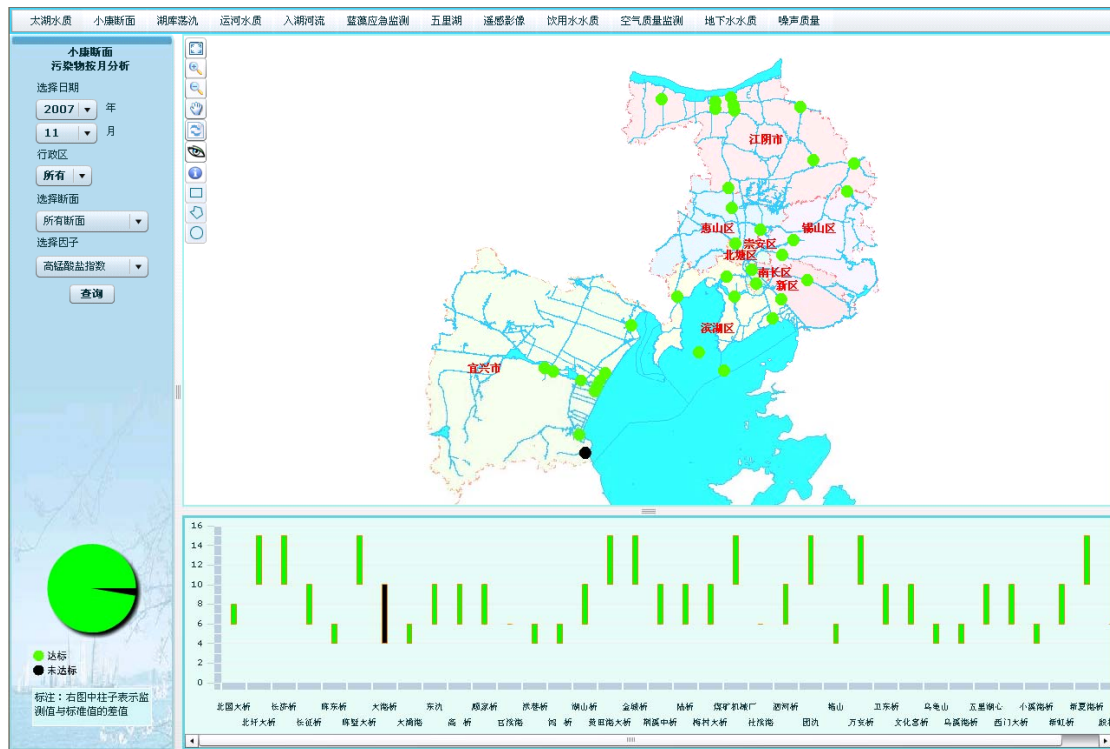
Figure 5 Xiaokang cross section water quality standardized rate analysis module

Conclusions

The system has implemented in local environmental protection department. As a result, the development and deployment of WebGIS in environmental management has yielded a number of significance. The users can manage the mass data more easily, search environmental pollution aftermath more precisely, publish information more frequently, and analysis data more efficiently. Moreover, the users highly appraised the system as its effectivity, reliability and stability. However, the running and calculating speed of the system has yet to be improved in the future research.

References
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