Design of water resource management information system based on Web GIS

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***Abstract*—It is significantly important to make the management of water resource more normative and efficient through accomplishment of water resource information management system which based on Web GIS, internet and database technology. Therefore, the study aims to realize the water management internet and visualize based on water data.**

Keywords- water resource; information management system; design; real-time monitor and evaluation; water requirement model; decision and support

I. INTRODUCTION

As the foundation natural resources and strategic economic resources in 21st century, it has played an important action to the human society survival and development of the scientific management and reasonable utilization in water resources, and has been one of the social focus[1]. Although China's water resources development and management has achieved good result, but still exist deficiencies in resource maintenance, system management, and still can't meet practical needs in water resources sustainable and efficient use[2-3].

At present, the base data information of water-intaking permit examine and approve, confirm fountainhead observation point, gross amount of water resources count, water quality assessment and prediction, water pollution situation distribution, forecast in water supply and water storage, water resources evaluation etc[4-7]. in water resources management work still more take paper file as mainly, also can't really realize paperless and digital electronic information, can't fully realize real-time assessment and monitoring yet, have caused great hobbles to the scientific standardization development of management work[8].

In recent years, with continually computer technology and network technology development and improvement, GIS (geographic information system) as a new interdisciplinary between information science, computer science, geography, mathematics, mapping & remote sensing science and management science has also won the rapid development[9-11]. GIS as an important tool of taking, arranging, analyzing and managing geography spatial data has had extensive use and rapid development in various businesses. Water resources management information system based on the GIS will become one of the effective ways of effectively release growing water resources crisis and improve the water resources scientific management.

II. SYSTEM OVERALL DESIGN

The advanced computer software technology and network technology have been used to develop water resources information management system. This system construction goal is: develop water resources information data-base of in line with norms, real-time efficient, stable operation and open mature; advanced Internet/Intranet technology platform has been used to realize all kinds of water resources information networking transmission and processing, storage, calls, inquires, distribute and management; water quality, water pollution sources, water need and water supply information, hydrologic data etc. have been analyzed.

System design scheme is as shown in figure 1[12].

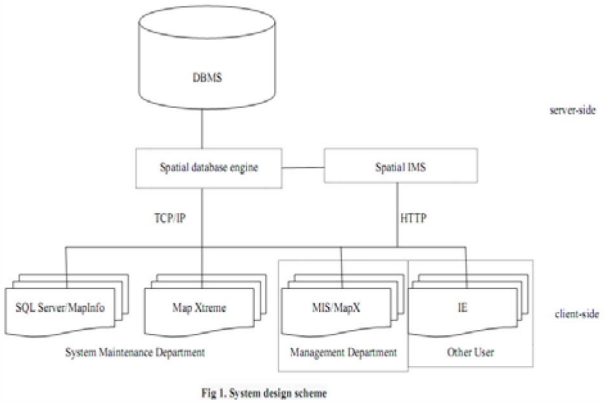

Fig 1. System design scheme

Water information management goal is to establish the accurate water resources graphics context database, along with the mathematical model and the decision analysis to

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realize intelligent physical and logical resource management, and combining advanced geographic information system technology to provide the real-time and accurate decision support for assistance realize the water resource scheduling and management, water pollution monitoring and management so as to realize the water resource information collection, transmission, storage, processing and service, etc. The modularized structure of water resources has been finished and the specific function module is as shown in figure 2.

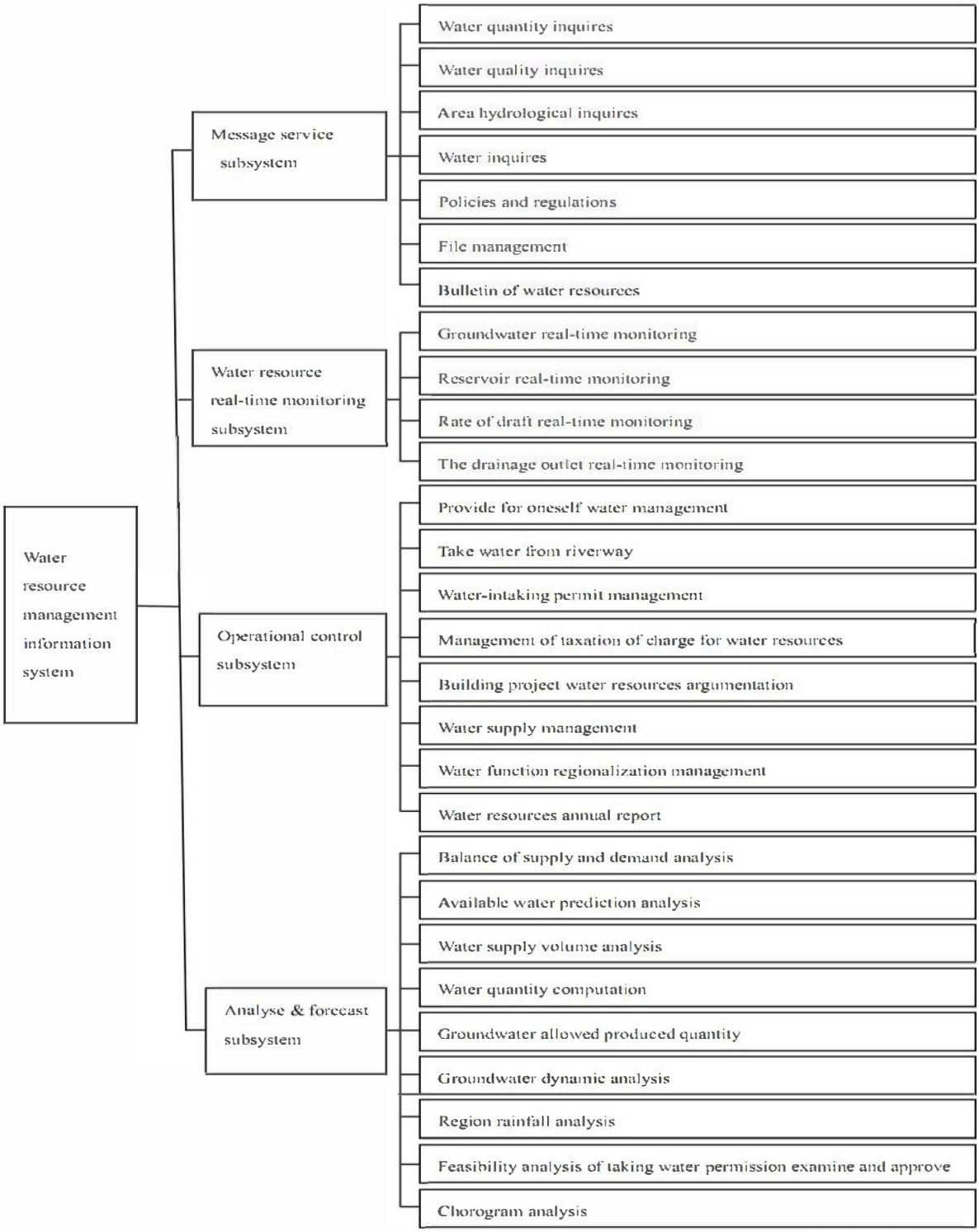

Fig 2. Water resource management information system functional module

III. NUMERICAL CALCULATION AND ANALYSE

It is significantly important to make the management of water resource more normative and efficient through accomplishment of water resource information management system which based on Web GIS, Internet and database technology. Therefore, the study aims to realize the water management internet and visualize based on water data. It makes the main results as following.

A interactive water resource management system is designed to improve the management of water resource management. The pith technique of system is based on Web GIS, SQL Server database is adopted to the backstage supporter, and dynamical mutual is assisted to the system, and it is characterized by three layer structure based on WebServer+Mapvices+spatial database engine and dynamic data. The system realizes water resource information visualization, network, visualization and sharing.

The system makes sure the methods of water resource calculation, evaluation and prediction analyses and decision-making, and applies these methods in system to analyze water resource capacity in case of Fushun. The results are as following. Rive basal flow capacity was is about 4.46 or 4.51 million m^3, It is the biggest in Hunhe River for the value of 2.302 million m^3 among six River and the smallest for 0.270 million m^3 in Huifa River catchment. Rive basal flow capacity was 1.508 billion m^3 in Qingyuan county, 2.070 billion m^3 in Xinbin county, 0.676 million m^3 in Fushun country, 0.206 million m^3 in Fushun county.

There are sixteen water resource monitoring profile, nineteen ground water wells, five reservoir monitor site, seventy two industrial and life intake, sixteen industrial sewages, life sewage drainage monitoring site. It is equipped with ultrasonic water level flow meter, pressure water level meter, water quality monitoring equipment to monitor water resource. Data are collected through wireless network.

Water resource management information system in Fushun city is a wide-distributive area monitor system. Its data is real-time, but the flux is small. Data from collection to center (subcenter) are transferred by GPRS wireless network, data from center to subcenter are collected by internet network.

The system is constructed one center in Fushun city, three country subcenters. It functions following as: manage and accept information, statistical reporter table, generalize figure and table, and accept superior management, and transfer data to center. System in center is organized of database service, communication service, Web service, local network, router, terminal PC, large screen communication system. Monitoring center is organized by center and subcenter.

Based on the data of surface water qualities in basic in2002, equal slope grey clustering methods is applied to assess the surface water quality. The surface water quality is divided to five classes according to national GB3838-2002 standard and mostly classified to Ⅱ and Ⅴ,and the quality of water environment is best in May, the worst is in December.

Water requirement is predicted with water requirement quota methods, the error was lower and the value predicted closed to the real value. Industries Water consumption is predicted by utilizing the repeated utilization improved methods, the results show the value predicted is far above real industrial water consumption. Comprehensive water requirement is predicted with BP neural network, the error value is less than 10%, The BP neural network has strong and reliable prediction ability.

The real time analysis for water resources is going based on data in flood season and in flood season from 1985-2004. The results show average rainfall was separately 583.16mm, 562.43mm and 567.58mm, in Qingyuan county, Xinbin county and Fushun county in flooding season(from Jun to Sep). The optimum wiring is available according to the variance data in 20 years. The optimum wiring in Qingyuan county is Cv=0.28, Cs/Cv=2.50, and Cs=0.68, The optimum wiring in Xinbin county was Cv=0.28, Cs/Cv=2.50, and Cs=0.699, The optimum wiring in Fushun county was Cv=0.27, Cs/Cv=2.50, and Cs=0.68. While average rainfall is separately 213.84mm, 210.88mm, 200.06mm in non-flood season (from Oct to May). The optimum wiring is Cv=0.19m, Cs/Cv, Cs=0.28 in Qingyuan county, Cv=0.19 Cs/Cv=2.50,Cs=0.47 in Xinbin county, Cv=0.23, Cs/Cv=2.50,Cs=0.575 in Fushun separately.

IV. CONCLUSION

The water resource information management system is included real-time water resource monitor system, a database inquiry system for water information, decision support system, service management, management maintenance, equipment management, and realized the information sharing. It forms a comprehensive management system through integrating divided data from management department, to some extent which has avoided independent information from department and many errors, and improves the condition of heavy workload with low efficiency.

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