Theme 4:Management of Water environment

HYDROLOGY FOR ENVIRONMENTAL WATER ALLOCATION IN RIVER BASINS: GLOBAL PERSPECTIVE AND ASIAN CASE STUDIES

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Abstract: Quantification of water requirements of aquatic ecosystems is required for many projects related to environmental security and efficient water use in agriculture. These requirements however, are still very much neglected in river basin management and remain the topic of a heated debate in the world. The paper will describe several recent studies which attempt to estimate these requirements, using the examples from Asia region. It will also briefly review the exiting perceptions and the emerging philosophy of environmental flows in Asia. The first pilot estimation of water volumes required for the maintenance of freshwater-dependent ecosystems at the global scale will be presented. This environmental water requirement consists of ecologically relevant low-flow and high-flow components and depends upon the objective of environmental water management. Both components are related to river flow variability and estimated by conceptual rules from discharge time series simulated by the global hydrology model. The paper will present an estimate of environmental water requirements for 128 major river basins of the world, introduce the concept of the "environmental water scarcity" and examine the implications of environmental water allocation for several major river basins in Asia. It will further discuss the applicability of desktop hydrology-based environmental flow assessment methods, such as the Range of Variability Approach (RVA) and the South African Desktop Reserve Model (DRM) – in the context of several Asian countries including Nepal, India, Sri Lanka and Viet Nam. The above techniques make intensive use of hydrological time series and flow duration curves. Some of these techniques are modified, following the discussion of their limitations. It is indicated that hydrology-based methods of environmental flow assessment represent the necessary first step in planning for environmental allocations in developing countries. It is shown how use can be made of complementary features of exiting environmental flow assessment techniques in order to arrive at justified estimates of environmental flows even in the conditions of limited basin-specific eco-hydrological knowledge. The methods and applications described in the paper could be replicated in other countries of the region – by relevant departments, agencies and organizations, which are engaged in freshwater ecosystem management and preservation of aquatic environment. The paper will aim to promote the importance for environmental water allocation planning in river basin development and to streamline the inclusion of environmental water demand assessments into relevant national policies in Asian countries.

Quantification of Ecological Water

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Abstract: Quantification of amount of water for protection of stream ecosystems is important for supporting sustainable watershed management and designing water use or release strategies. Since 1970s, numerous approaches have been developed to determine suitable amount of water for aquatic species or biodiversity. With significant accumulation of scientific knowledge in stream ecology and hydrology, it has been gradually accepted by scientific and resource management communities that an ecological process-based approach must be adopted when determining water amount for ecosystem function and integrity. The traditional “single species and minimum flow” approach is being replaced by a more dynamic, ecosystem-based approach. This paper will review concept of ecological water, and compare various approaches for quantification of ecological water. Possible application of those approaches in China and other Asian developing counties will also be discussed.

MODELING OF WATER QUALITY WITH THE AID OF GENERALIZATION OF P. TCHEBYSHEFF'S INEQUALITY AND CORRECTED A. KOLMOGOROV'S ESTIMATION

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Abstract: There is an increasing of pollution from industrial and non-point sources now. The decreasing of water quality connects with movement of the dispersed pollutant particles and not dispersed pollutants in water in different flows. However, there is a problem with information for simulation pollutant loads. Known algorithms for a calculation of these processes request many initial data about systems and water flows. But, the full information for the calculations is not available in many cases. Therefore, we must calculate a probable result of the water pollution under different information's conditions. It was find the generalization of the Tchebysheff's inequality and A. Kolmogorov's estimation for this aim. The new scientific law has been stated for solution of the estimation's problem with the aid of the concept of modified measure of the separation action on dispersed particles in water flows. This scientific law stated that: The sum of the ratio of the dispersed pollutant particle characteristic to the uniform modified measure of the separation action on dispersed particles in water flows and the dimensionless parameter of those uniform measure bounds from above all possible values of relative entrainment and lets to execute a point estimation of water quality with they a priori estimation error. Furthermore, an individual estimation may be improved at the expense of complementary information with the aid of an auxiliary coefficient. The coefficient's indeterminacy equals a degree of an uncertainty of the initial data. Expression for an auxiliary coefficient has been found with the aid of a velocity distribution in water flows. Author has created an algorithm for calculations of coefficient's indeterminacy in different water flows without complete initial data and unknown dispersed pollutant particle size distribution for water quality modeling.
The Korean experimental data of water pollution near Incheon in Korea have been used for modeling of water quality with the aid of generalization of P. Tchebysheff's inequality and corrected A. Kolmogorov's estimation. All these experimental Korean data are fully correspondent of the new theoretical expressions for created new algorithms of water quality modeling.

Environmental Improvement in Reclaimed Land of Coastal Area and Analysis on System of Rainwater Utilization

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Abstract: Nowadays, the earth reclamation has become an important way to solve the problem of the lack of land resource in coastal city. However, this has brought increasingly serious environment problems at the same time, such as the high salt and alkalescence content in reclaimed land, the erosion of water supply net, the notable effect of urban heat island, the serious seawater intrusion, the deterioration of inshore quality, the flood disaster and so on. Through the analysis for environmental problem of the reclaimed land of coastal area，and setting up an environmental effect model of reclaimed land, it shows that the shortage of water resources is a main factor which limits the environmental improvement of reclaimed land of coastal area. The exploration and utilization of rainwater resources is an efficient way to solve the problem. It can improve the ecological environment of a region effectively and economize the high quality source of water. There are many effects of utilization of rainwater, such as increasing the water resources, alleviating the conflict between water supply and require, recharging groundwater, reducing land subsidence, lowing the soil salt content, slowing the water supply net erosion, controlling the seawater intrusion, decreasing the flood flow, lightening the load of water supply net, recharging the ecological water requirement, and so on. This paper taking Dalian reclaimed land as an example, analyzes the precipitation and the amount of rain water collection. According to the principles of local collection, local utilization, and around utilization, the paper chooses a proper rain water utilization way, and implements the rain water compensating for the limited fresh water.

The results show that water demands for watering and dusting can be met by making use of the collection of rainwater in impermeable ground. The rain water can be exploited as a second water resource. Solving the environmental problems of reclaimed land by rain water utilization is an economical and feasible way, which can bring significant benefits of society, environment and economy.

Keywords： reclaimed land of coastal area； environmental problem； environmental improvement； rainwater utilization

The results of the pilot plant study to remove arsenic from Groundwater

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Abstract: Contamination of potable ground water (well water) with arsenic is a large problem in India and Bangladesh. For removal of arsenic from the well water, various measures are positively examined mainly by UNICEF and WHO. We recently studied, jointly with Hokkaido University and Rajshahi University, a system that coagulates iron ions and arsenic, which are coexisting in the well water, and that removes iron ion and arsenic by sand filtration. This paper reports the results of running of a pilot plant using the well water in Chai Nawabganj area, which was implemented as a part of this joint study. Arsenic removing methods can be roughly classified to coagulation and filtration method, adsorption method and membrane separation method. The adsorption method and membrane separation method are capable of removing the arsenic contained in the water to the order of several mg/l. However, these methods involve problems such as hard operation and high cost. The coagulation and filtration method, on the other hand, provides such merits that the equipment is simple and the cost is low, although the removing effect is rather low, and it is advantageous when well water of a large volume is treated. Iron ions are coexistent with arsenic in the well water. When these iron ions are oxidized and insoluble iron hydroxide is formed, arsenic is absorbed in iron hydroxide flocs and is removed from the water. Arsenic is located in the water in the forms of As(III) and As(V), and they are caught by the sand filter simultaneously with iron hydroxide flocs. Two sand filter columns of 200 mm in diameter and 2,000 mm in height are laid in tandem and each one of them is filled with manganese sand of height 1,000 mm. Well water oxidized with air or chemical (NaCLO) is continuously supplied to these sand filter columns, and arsenic is removed in the first stage and manganese is removed in the second stage. Furthermore, a nano filter (NF) was provided for removing to a high degree the trace arsenic that outflows from sand filter columns This pilot plant was installed in April 2001 and field tests at this pilot plant were conducted for about eight (8) months up to December 2001. By this treatment plant using membrane the removal ratio of Fe is 97% and Arsenic removal ratio is 89 %.

Arsenic Pollution in Groundwater of Bangladesh

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INTRODUCTION

The scientists of Rajshahi University together with Hokkaido University, Research Group for Applied Geology (RGAG) and Asian Arsenic Network (AAN) of Japan suspect that groundwater of about 60 out of 64 districts are seriously contaminated with arsenic. There are 11 Million tube wells in Bangladesh, of which about 5 Million tube wells are highly arsenic contaminated. About 75 Million people of the affected districts are at risk, with 7000 reported patients suffering from Arsenicosis, of which about 200 died in the last few years. It is very much essential to arrange safe water supply for the peoples. To give safe arsenic free water to the people more investigations in the whole country is essential. The source of arsenic in groundwater of Bangladesh is as yet unknown. But it is now widely believed that the high arsenic levels in the groundwater in Bangladesh have a natural geological source which may be due to heavy abstraction of water from deltaic aquifers. In Bangladesh Groundwater from sandy alluvial deposits are considered to be arsenic free. It is essential to consider the groundwater occurrences, its distribution and geological and hydro geological settings of the country for the mitigation of arsenic problem. To know the basic understanding of the source and mobility of arsenic it is essential to investigate the sampling depth and aquifer provenance. Present study will give some clue about the future action plan for the mitigation of the arsenic problem in Bangladesh. Variation of heart disease mortality have a general relationship with the relative hardness of drinking water.

Materials and Methods

Core boring has been done depth up to 210 feet in different locations in Samta village under Sharsa Police station of Jessore district, Bangladesh for the collection of soil samples for Analysis in the laboratory. About 50 g of each sample was dried at 110 C, and was powdered to a particle size (<63μm) using an automatic agate pestle and mortar for 30 minutes. About 5 g of each sample was ignited at 1000C for 1 hour to examine LOI (Loss on ignition).

RESULTS AND DISCUSSION

Arsenic occurs in mud samples of the up section (4.6 to 6.4m, over 20 mg/ L excluding one sample) and As/$Al_2O_3$and As/Pb show significant projection in this horizon. In the natural system, As behaves similar to Pb thus As/ Pb ratios may indicate As enrichment related to other reactions. As concentration, however, is still lower than that of average soil (As = 30 mg/l) thus higher concentration in groundwater should be considered as an active solution of As from the sediments. Major elements (SiO_2 , TiO_2, AI_2O_3, Fe_2O_3 , MnO, MgO, CaO, Na_2O, K_2O, and P_2O_5) and trace elements (Th, Sc, Pb, Cu, Zn, Zr and Sr) were analyzed using the RIX-2000 XRF system at Shimane University. Analyses of these elements were made on glass beads prepared with a flux (mixture of lithium tetraborate and lithium metaborate in ratios of 4:1) to sample ratio of 2: 1 followed by Kimura and Yamada (1996). Other trace elements (As, Ni, V and Cr) were analyzed by the power press method. Contents of total organic C (TOC) , total N (TN) and total S(TS) were measured after 1M-HCI treatment of 15 mg samples by combustion and gas chromatography using a Fisons (Carlo Erba) EA 1108 CHNS Elements Analyzer at Shimane University

Sands show high concentration of SiO_2. Among other major elements, TiO_2, Fe_2O_3, MgO, K_2O and P_2O_5 show gradual increasing in the up section. Muds contain rich organic matters revealed by higher LOI (Loss on ignition) over 8 wt % They have TOC (total organic carbon) values over 1.0 wt%. Sands and muds have CC (carbonate carbon) values of about 0.3 wt%. The core sediments generally homogeneous compositions in terms of geochemical indices representing source rocks, SIO_2/Al_2O_3, Al_2O_3/TiO_2, and Th/Sc ratios are examined with stratigraphy. These ratios show small variation in the column excluding middle portion of the horizon 27.7m and 28.9 m shown in SiO_2/Al_2O_3, Al_2O_3/TiO_2 ratios, which may be due to influx of coarse sands. Muds with rich organic matters generally concentrate metal elements and are utilized as mineral resources the reaction of such elements is complex and is proceeded through several stages. The present limited data could not reveal wholistic reaction of As concentration in the sediment samples, nor As contamination of groundwater. The present study, however, demonstrates the relationship of As concentration with other possible guide elements having similar behavior. Arsenic generally behaves very much like divalent Fe and they correlate well in concentration. The samples show positive correlation between Fe_2O_3 and As (R^2=0.71) suggesting that Fe may be a guide element for As concentration in ground water of Bangladesh.

CONCLUSIONS

Priority should be given for the mitigation of arsenic problem in Bangladesh and give people access to arsenic free water. If precautionary measures against arsenic contamination are not taken immediately, consequences like death of many people will be inevitable and massive. Raising awareness about the issue among the people should be the first step for precaution. It is also very important to know the mechanism of arsenic contamination in groundwater. Essential to find out the exact and possible sources of arsenic in the groundwater in the arsenic affected areas of the whole country. Surface water such as ponds, lake, river can be used as a source of drinking water after boiling it. Rain water can be another safe source of drinking water. Sophisticated laboratory facilities should be developed to detect arsenic concentration in tube well water as well as that in human body. Not to jump from one local explanation to a nation wide or basin wise explanation because there is no reason to think that these answer's will be applicable in all cases. Arrange to supply arsenic free drinking water because safe water is the best medicine for the people of the arsenic poisoning areas of the country

Keywords: Aquifer Provenance, Arsenic, Contamination, Groundwater, Hydro geological Settings. Geochemical Occurrence.

Spatial variation of atrazine sorption properties in soils

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Abstract: To model the fate and transport of herbicides in a catchment or a region will often need sorption parameter of herbicides in the area because sorption is one of the most important mechanisms that influence the transport process. However it is very difficult to obtain the sorption parameter values at the large scale. A popular and easy way to determine the sorption of chemicals in soil is batch equilibrium experiment which is performed with soil samples representing a very local scale. Therefore the knowledge of the spatial variability of the sorption properties of herbicides in soils is needed to extrapolate the batch experiment-derived sorption parameters to a larger scale model. Herbicide atrazine (2-chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine) was investigated in this study since it was widely used and often found in groundwater. Several batch experiments of atrazine were carried out with various soil samples along a 22 m long and 90 cm deep transect in the upper Rhone river valley in Switzerland. The textural fractions, bulk density, water content, soil organic carbon (OC) content, Cation Exchange Capacity and pH values were also determined in the laboratory. The relationships between the sorption parameter and these soil properties were investigated. It had been found that the sorption parameter and the distribution coefficient K_d, of atrazine present significant spatial variations; sorption parameter values are normally distributed; no spatial correction has been found along the transect. Accordingly a reasonable number can be determined to sample the soil both precisely and economically. The distribution coefficient of atrazine had a strong positive correlation with the soil organic carbon content; the heterogeneity of soil organic carbon content accounted for more than 80% of K_d variability of atrazine. None of the other soil properties was important in explaining the atrazine K_d values. Thus the introduction of organic matter to soil will increase the sorption of atrazine to soil and therefore reduce the risk of groundwater pollution by atrazine.

LAKE PLUIT REVITALIZATION

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Abstract: The Jakarta City as the capital of Indonesia has been an area which grows rapidly. In order to comply with the urban development, it is crucial to provide adequate infrastructure. An action of optimizing lakes which function merely as flood control in Jakarta area is a way to achieve the aim. It is an important effort in increasing water resources' capacities in the area to support a better quality of life of its local community. Lake Pluit, located at northern part of Jakarta at downstream area of Ciliwung River and very close to Jakarta Bay, is a large lake in Jakarta area which badly needs optimization. The revitalization of Lake Pluit is composed of some study fields to be integrated, starting from water quality to hydrology and hydraulics. Solution of problems is focused on improvement of the lake's water quality having main characteristics of domestic wastewater as well as planning of flood and sediment control measure. Through a series of field survey, an alternative of integrative concept of Lake Pluit revitalization has been formed. The water quality improvement planning includes two units of wastewater treatment plant considering the condition of inlet flows and the nature of the new flood control measure concept. The new flood control measure concept is designed by utilizing existing infrastructure as well as increasing pumps' capacity and redesigning an existing channel into a long-storage. At the end, a harmonious cooperation between stakeholders could develop the revitalization concept to achieve a better water resources' capacities improvement more effectively and efficiently.

Keywords: urban development, revitalization, water quality improvement, flood control, integrative concept

Social Boundaries, Cultural Factors and the Use of Arsenic Free Safe Water Sources

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Abstract: The contamination of groundwater by arsenic poses serious health risk to residents in Bangladesh. The Bangladesh Government, international organizations and various other groups actively conducting mitigation efforts. One major means of arsenic mitigation is the construction of alternative water supply options that can provide to the suffering residents with the arsenic free safe drinking water.

This paper presents a detailed analysis of the behaviour of the use of alternative water sources in a rural Marua village under Jhikorgacha Upozila of Jessore district based on village surveys conducted by our research team. In the surveyed village three alternative water sources had been installed at the time of survey. While many households actively use the safe water sources, there are other households who do not take the opportunity. The most common reason for not using the safe water source is the far distance from the households. The analysis , however, finds other socio-cultural reasons for no use, such as the boundaries of social groups and the cultural restriction of the female behaviour.

Based on these analyses, we conclude that in order to supply the arsenic free safe water more efficiently, the mitigation plan needs to address such socio cultural factors in the installation of new water sources. Moreover, these alternative water sources for collective use alone cannot supply safe water to the entire village because households who cannot and will not go to collect water sources for varied reasons are scattered. Therefore, it is necessary to develop other types of smaller sources to supply arsenic free safe water to cover these isolated households of the surveyed Marua village

Key Words : Groundwater, Safe Water sources, Arsenic contamination, Social boundaries, Cultural factors, Cultural restrictions, female behaviour

Study Of The Waste Load Dispersion In Songkhla Lake By Simulation Model Method

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Abstract: The changes of water quality in Songkhla lake due to the water pollution released from the canals and the surrounded areas of the lake, obviously impact to the fishery, the aquatic life, aqua farming and the habitation around the lake. A large amount of waste water in Songkhla Lake mainly comes from the municipalities and the industries from Sadao, Hatyai and Songkhla district. The study of waste load dispersion by a simulation model method is an approach of the solution. The purpose is to determine and to locate the boundary and the degree of the pollution impacts as the results of the canals. The study focused on Khlong U-Tapao and Khlong Sam Rong canal rather than the others. As they are the main canal which flow through the most active areas of the basin. The other canals namely; Khlong Laem Po, Khlong Ku-Kut and Khlong Pavong, are not so significant as both canals. Since they flow in the remoted areas and there are not much activities from the development. So that they are ignorable, Khlong U-Tapao and Khlong Sam Rong canal receive the municipal and the industrial waste water from Hatyai, Sadao and Songkhla city with an increasing amount every year, for example only the suspended sediment from Hatyai and Sadao region are more than 20 million tons per year. The pollutants such as BOD5 (untreated), Coliform Bacteria, DO and Suspended Load are interested and are collected as input data for testing a 2-D mathematical simulation model. Initial boundary conditions and basic parameters such as tidal current, wind speed, wave magnitude, mean sea depth, sea bottom slope and channel characteristics of the canals, etc.; are necessary. The collecting of field data was done in dry season so as to obtain concentrated pollutant data and to avoid the affects of the high discharge from the rain. The tidal fluctuation and the tidal current from the open sea have influence on the movement of dispersion and the circulation. Both events cause to the event of vortexity in the lake in relating with water flow from the canals. The dispersion of the pollution from Khlong U-Tapao will cover the area from the river mouth at the distance within 2 kilometers during high tide. It will stay in the lake in a longer period rather than to be discharged to the Gulf of Thailand during low tide. Other important factors to the delay of the pollution discharge are from the narrow outlet of Songkhla Lake to the Gulf of Thailand, a high density sea transportation, a developing of new ports and a accumulative sand-sedimentation at the outlet of the lake.

Assessment of surface water and groundwater using water quality index (WQI) in industrial estate --A case study

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Abstract: Pollution is a serious problem world wide especially in developing countries like India. The chief sources of contamination are discharges of untreated or under treated domestic sewage and industrial effluents. They render the water unfit for any intended use and upset the ecological balance. The contamination of water bodies is a severe threat to human and aquatic life.

The present study is spread over couple of seasons. In this context and attempt is made to classify the condition and pollution strength of surface water and groundwater by using water quality index (WQI) as a tool which is classified as Excellent, Good, Poor, Very Poor and Unfit. The surface and ground water samples collected from kattedan industrial area showed high amount of total dissolved solids, electrical conductivity, color, phosphates, sulphates, and heavy metals like lead, cadmium, nickel iron, manganese, and copper. The study reveals that all the samples were highly polluted and the water quality rating was decreasing as the concentration of pollutant was increasing. Hence, surface water and ground water cannot be used without prior remediation according to the water quality index classification, if used without treatment can effect the human beings as well as the living organisms existing in the lakes.

Based on this classification, it is very easy to calculate the concentrations of pollutants for a particular use and the water quality requirements for protecting aquatic biota and maintaining individual water use e.g. drinking, bathing, irrigation and industrial purposes etc.

Particulate organic carbon and stable carbon isotope $\delta^{13}C$ of a small mountainous tributary of the Lower Pearl River, China

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Abstract: Bimonthly sampling in the dry season (Oct.-Mar.) and more frequently sampling in the wet season (April-Sept.) were conducted in the outlet of Luodingjiang River, a small mountainous tributary of the Lower Pearl River, China. Total suspended sediment (TSS), particulate organic carbon (POC) and nitrogen (PON) contents, as well as stable carbon isotopic composition of C^{13}/C^{12} of POC were analyzed. Particulate organic carbon contents, particulate organic nitrogen contents and the POC/PON ratio decrease with increasing water discharge and TSS due to more coarse materials from subsoil layers are transported with higher water discharge. Stable carbon isotope composition of C^{13}/C^{12} is more enriched with higher water discharge and TSS in wet season. The implications of POC and its stable isotope characteristics to seasonal cycles of water discharge, soil erosion and vegetation distribution are also discussed.

Risk analysis of wastewater reclamation and reuse

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Abstract: Although implementation examples demonstrated the technical and economic feasibility of reclaiming municipal wastewater, it's difficult to predict the prospect of the reclamation project. The wastewater reclamation and reuse system is a big and complicated system and has a great uncertainty, which involves the promises of the government, the different states of nature (policies, collaboration, management, socio-economic environments, climatic conditions, irrigated crops, irrigation systems), alterative technologies for sewage treatment (biological oxidation, nitrification-gentrification and aquifer recharge), and various preferences of criteria (economic, environmental, aesthetics, etc.) etc, so a risk still exists from enteric virus and toxic contamination. To determine risks from unexpected uncertain events happed in the system such as uncertain loss to the safety of people's life, property, health and ecological environment, during the period of operation and management or imperiling, it's necessary to analyze the potential risks of the engineering. The use of risk modeling techniques to quantify such uncertainties is an essential part of engineering risk analysis, and the various steps to be undertaken for a comprehensive application of risk analysis techniques to wastewater reclamation and reuse are summarized in this paper.

This paper shows how the engineering risk analysis may be used in order to quantify the risk of wastewater reuse, which concentrates on the four essential factors of risk analysis of the wastewater reuse system: (a) identification of risk, (b) risk quantification (risk estimation and evaluation), (c) risk disposal and (d) risk management. As a whole, the risk analysis system has used the methods involving operational research, network technology, information technology, large capacity data bank, nonlinear science technology and systematic engineering management.

From above, the main purpose of the risk analysis is to provide information regarding regional wastewater reuse and wastewater management and build a decision support system (DSS) for managing the risks related to a particular implementation of wastewater reclamation and reuse.

key words: uncertainty ; policy analysis; decision theory ; risk analysis ; risk management : wastewater reuse

Simulation and evaluation of pollution control strategies for Shenzhen River by coupling a system dynamic model with a water quality model

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Abstract: The Shenzhen River is the boundary river between Hong Kong and Shenzhen City. The river catchment of shenzhen side is undergoing a rapid urbanization process. In the past 25 years, from a fishing village with a population of less than 30 thousand residents and a GDP of less than 200 million RMB, Shenzhen has swelled into a modern metropolis with people over 10 million and GDP over 340 billion RMB. With highly rapid growth of the city, much wastewater has been generated and drained directly into the Shenzhen River, and water quality of the river has deteriorated. In order to control water pollution of the river, both engineering technology schemes and social economics policies have been proposed.

In this paper, a system dynamic model (SD) for water environment system of Shenzhen City and a water quality model (WQ) of Shenzhen River were developed to evaluate the effects of various pollution control strategies. The SD model is composed of four modules, which describe society, economics, water resource, wastewater system, respectively. The model highlights interaction and feedback processes among the modules, and was implemented to predict the population, GDP, water supply and demand, and water pollutant loads of Shenzhen in next 20 years under different strategies. The WQ model was applied to describe pollutant transport and transformation processes and predict water quality in the Shenzhen River. The two models were coupled by distributing the pollutant loads of Shenzhen City to the Shenzhen River catchment based on catchment area, population, economic, and layout of sewage system.

The results show that it is impossible or highly expensive to control water pollution of the river in the future by only carrying out engineering & technology schemes, such as wastewater interception, sewage disposal and water supplement; and it is necessary and efficient to reduce the pollution source through social economics policies, such as industry structure regulation, population control, water price adjustment. According to the simulation and evaluation, an optimal strategy combined engineering and policy measures was proposed to harmonize water environment improvement and economic development in this region.

Keyword: Shenzhen River; system dynamic model; water quality model; pollution control

Reconstruction of Cities' Sewage Handling System and Realizing Hydrological Resource Sustainable Development in China

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Abstract: "2003 Chinese environmental condition bulletin" indicated: in 2003, nation-widely cities' family sewage discharged 24.76 billion tons, about 53.83% of the total (industrial and family sewage) and increased 6.6% than the last year. Family sewage COD discharged 8,217 thousand tons, about 61.62% of the total and increased 5.0%. Experts ever estimated that the environmental capacity of COD was 8,000 thousand tons in China. So, we can say that cities' family sewage has been the most important pollutant source, which caused water, soil polluted and ecosystem function declined in China.

But in ecological view, the organic substances in family sewage aren't genuine trash and they are priceless nutrient resource for agro-ecosystem. In the past 50 years in China, along with the transition to massive production, market economy and the urban and rural division, agricultural resource and product (grain) flowed in larger scale. The nutrient outputs with food from agro-ecosystem were impossible to return into soil completely. The nutrient balance of agro-ecosystem was damaged heavily and agro-ecosystem became barren gradually. So, if we can not return the nutrients of cities' family sewage to agro-ecosystem, not only we wouldn't fertilize farmland and promote agriculture flourishing, but also we couldn't improve our country's water resource quality greatly.

How to return the nutrients of cities' family sewage into agro-ecosystem (soil) and realize the sustainable development of hydrological resource and agro-ecosystem? At first, the nutrients in cities residents' and domestic animals' excrete materials must flow back to agro-ecosystem reasonably and safely. In urban planning and construction, not only we should divide the rainfall and sewage, but also divide the industrial sewage and residents' family sewage. Industrial sewage should be processed to completely reach the requirement of standards for environmental protection. The organic substance of residents' family sewage must be separated, concentrated and made into organic fertilizer, finally flew back into agro-ecosystem. In addition, the organic substance isolated from solid garbage also must be made into organic fertilizer and feed back agro-ecosystem.

Key words: reconstruction, sewage handling system, hydrological resource, sustainable development, China

New Approach to Modification of Streeter—Phelps Model for Water Quality Research in Three Gorges Reservoir

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Abstract: As an often used physical model with good theoretical and practical values, Streeter--Phelps model has been widely used to research water quality at present. However, in some special water areas the utility of Streeter--Phelps Model suffers limitation because confirming reaeration coefficient often comes from tests in rivers with fast water flow speed rather than considering the wavy effects. Furthermore, in practical research in Three Gorges Reservoir the changing rule of COD appears abnormity. In some water areas far from pollution source the value of COD changing with time doesn't accord with exponential attenuation rule but slightly sways in a certain value. This phenomenon can not be explained by former modified Streeter--Phelps models. After research it indicates that through modifying the reaeration coefficient good calculation results will be obtained. Similarly, the changing rule of COD not only can make clear but also provide scientific evidence to further studying rules of pollution ejection and sediment motion.
Key words: Streeter--Phelps model reaeration coefficient water surface fluctuation oxygen solubility

Index System for Assessment of River Health

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Abstract: The reasons of the exasperate ecosystem of river are the over-empoldering and demand of water resources. The urgent matter is to maintain the river's health life, which the continuable impose of river. First, this thesis study the index system for assessment of different yardstick river health form three ways, physical chemistry characteristic, biological characteristic, landform characteristic. The index include mensurable index and qualitative index. Second, it analysis the index system by principal component analysis method. The last, the thesis filter the relative unattached index.
Keywords: river health, index system, yardstick

Vegetation changes in the lower reaches of Heihe river after its water import

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Abstract: In recent years, the discharge of water has continuously declined in the lower reaches of Heihe River thereby resulting in the reduction of groundwater—replenishing water from the river, which cause the water table to go down and thus resulted a series of environmental problems. The wetland area has varnished in great quantity, the natural vegetations have fully degenerated, the land salinization has become intensified, and *Populus euphratica* and *Elaeagnus angustifolia* areas, which are mainly occupied by the over-matured forests, have decreased. *Tamarix ramosissima* shrubberies have decreased in number so as to become sparsely-distributed and dwarfed communities. The meadows consisting of various cereal grasses have severely degenerated and mainly succeed into *Sophora alopecuroides* communities. The emergency project of water import to the lower reaches of Heihe River started in July 2000 on purpose of rehabilitating and constructing the ecosystems in the lower reaches of the river, and water imported by the project flowed into the West and East Juyan lakes on the July 17, 2002 located at the lower reaches of Heihe River thus making the 10-year dryness of the lakes winded up. The paper explores the relations between water table and vegetation growth on the basis of water table and vegetation data about the lower reaches of Heihe River obtained in the monitoring of the river during three years fore and aft its water import. The results showed that water import has greatly improved the environment of the area in question, raised the water table, recovered *Populus euphratica* forests, partially recovered desert shrubberies, and regenerated meadow grasses to some extent.

Key words: the lower reaches of Heihe River; water import; water table; natural vegetation.

The social willing-to-pay for national water ecological protection in normal condition

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Abstract: Being essential for people's lives, water resources have been put important place and many international and domestic experts have studied significantly from quantitative and qualitative analysis. The water ecological protect has two benefit, one is economical to guarantee relative economical objectives at the reasonable cost and the other is social to provide the enough water without influence human's health. In short, the final objective is it's social improvement. But in the normal condition, the social willing-to-pay for water ecological security is limited. According to social welfare law, by analyzing the contribution of water resources security to social welfare, the willing-to-pay is discussed as well as its influential factors assumed that the index to measure the improvement of health is the mean longer years of people in water resources protection. Applied the cost-benefit method, the social willing-to-pay for water resources ecological protection equals to the people's willing-to-pay for the length of their lives. The most useful factors to influence social willing-to-pay include the water unrenewable period、the elasticity of utility for consumption and the discounting level, concluding that it is effective to increase the social willing-to-pay through changing the national consumption ideas and developing the technologies to extend the unrenewable period, raise the elasticity of utility for consumption and bring the discounting level down, but the latter two are difficult to alter in a short time, which are decided by various factors, so what we can do is to lengthen the water unrenewable period through the science and technology ways and so on.

keywords： water ecological protect willing-to-pay social welfare law

Study on Water Environmental Capacity and Total Pollutant Quantity Control of Bosten Lake

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Abstract: Bosten lake is the largest fresh water lake in Xinjiang and also the largest inland-lake in China. Bosten lake is not only the main water resources of industry and agriculture and people's living for Yanqi basin and Korla and Liwei , but also the direct water resources to restore the endangered Tarim ecosystem. However, with economic development and population increase, more and more wastewater is drained into the lake, which causes water quality deterioration and brings out many ecological problems. So it's very important to study water environmental capacity and total quantity control of pollutant loading. Mathematical models are established to calculate water environmental capacity of Bosten Lake. Ameliorative gradient method is used to calculate parameter k in the two-dimensional water quality model. Water environmental capacities under different water levels and inflow rates are calculated. The total pollutant loading of the lake is predicted and the control objective in 2010 is proposed, which provides technical guidance to the water pollution control for Bosten lake valley.

Key word: Bosten Lake, water environmental capacity, total pollutant quantity control.

Water Quality Forecast of Jiaozhou Bay

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Abstract: Jiaozhou bay plays an important role in the development of qingdao, in recent years with the development of economy, the water quality become worsen ， in order to forecast the water quality, based on the ECOM-si model a water quality model is established. The water quality model involves 5 variables: phytoplankton, zooplankton, N, P, DO. The water quality model is forced by 4 tides (M2,S2,O1,K1)and wind stress. Considering the need of management of marine environment, the model adopts fine grid: grid step is about 100m. The water quality is forecast based on the planning sewage amount. The result shows the sewage amount exceed the environment capacity.
Key words: Jiaozhou bay, ECOM model, water quality model

Application and Research Status of Amphiphytes in Ecological Restoration in the Water Fluctuation Belt Zone

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Abstract: The thesis discusses the connotation of amphiphyte, investigates the amphiphytes frequently met in the water fluctuation belt zone of rivers, streams, lakes, pools, reservoirs, and coasts in southern China, and analyses the application status and research progress of amphiphytes in ecological restoration in the water fluctuation belt zone. Some newly selected amphiphytes with high popularization values such as Leersia hexandra, Panicum repens, and Ficus spp.(one ecotype of fig in Southern China) are introduced. And research direction for amphiphytes in ecological restoration in the water fluctuation belt zone has also been discussed.

Key Words: amphiphyte; the water fluctuation belt zone; ecological restoration; application; research

Numerical modeling of heavy metal leaching from landfill Leachate on soil water environment pollution

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Abstract: Leachate from the landfill containing toxics such as dioxin and heavy metals is a great concern. In order to estimate the rate and amount of heavy metal migration into the subsurface, a flow-through leaching test was developed in order to evaluate the heavy metal release under a variety of infiltration conditions. The relationship between heavy metal concentration and leaching times, PH values of the media and rainfall quantity are studied. Results show that as pH decreases, trace heavy metal leaching concentration increases; however, the larger of rainfall quantity, the higher of heavy metal concentration. PH value and rainfall quantity are the main important parameter influencing the leachability of heavy metals. Taking Jinkou landfill site in Wuhan City of China as an example, we have first expounded such postulates as terrain, physiognomy and hydrogeology and analyzed. The mechanism and characteristics of the filtrate generated in the course of garbage filling. The heavy metal distribution rules in landfills are analyzed in this paper. Based on column leaching test, a two dimensional coupled model has been established to simulate the migration of contaminants in soils and groundwater under different dynamic condition, the coupled model including the saturated-unsaturated flow model and heavy metal transport model in porous media. Solutions to the coupled model are accomplished by eulerian-lagrangian localized adjoint method and two-step sequential operator splitting method. The model simulations are compared to monitored results of heavy metal concentration, with reasonable agreement between them. It provides theoretical evidence for quantitative assessment soil-water quality of heavy metal release from landfill on environment pollution.

Characteristics of groundwater resources and water environmental problems in Anhui Province

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Abstract: This paper sketches the natural condition and spatio-temporal distribution of water resources of Anhui Province, especially, the distribution characteristics and current situation of groundwater exploitation and utilization. With regard to water resources, surface water predominates in area to the south of Huaihe River (Huainan) but is equal to groundwater in volume in the area to the north of Huaihe River (Huaibei). Water resources in Anhui Province are inadequate and are unevenly distributed in time, so such natural disasters as flood and drought happen frequently along with various kinds of geologic disasters due to concentration in precipitation. Meanwhile water resources are also unevenly distributed in space. There are abundant water resources in mountain area where population in less, however, water resources are short in Huaibei area where population is large with sufficient cultivated land. These distribution characteristics and the water pollution aggravate the contradiction of water use. This article discusses the role of human engineering projects and economic activities to the transformation of natural water bodies and the environment geological problems caused by the irrational exploitation of groundwater resources. In some cities such as Fuyang, Jieshou, Huaibei, etc., excessive mining of groundwater causes regional descent of groundwater level and land subsidence. In some mining areas such as Lianghuai and Tongling, sewer drainage for mining and karstic water exploitation caused groundwater depletion, water resources pollution and karst cave and karstic earthen cave collapse. In the area to the north of the Jieshou-Lixin-Guzhen line, the endemic dental fluorosis and dental caries are common due to regional high fluorine contained water distribution. In mountain area and Southern Anhui, endemic goiter is popular because the intensively cut topography provides good conditions for groundwater discharge, leading to lower iodin content in groundwater. Regional water shortage is witnessed in the Yangtze River-Huaihe River Dividing Area and the Huaibei Area. Water resources deficit, serious water pollution and other water related environmental problems seriously damage the ecological environment. These problems seriously restrict the sustainable development of economy, society and environment of Anhui Province. Water is the most active element of environment, and its most important characteristic in water cycle is repeated usage and satisfies the need of ecological balance. The macro global hydrologic cycle unites, the environments of all countries throughout the world to a whole, and regional micro hydrologic cycle connects the intrabasins or regional environments. Therefore, in order to realize sustainable development of water resources, it is necessary to build a man-land harmonious environment for human living by taking synthetic utilization and management of water resources and water environmental protection as a while.

Key Words: groundwater resources; water environmental problems; pollution; sustainable development; Anhui Province

The Spatial Distributions of Hydrochemistry of River, Groundwater and Lakes in Nanfei River Catchment, Anhui Provence, P.R. China

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Abstract: Human activities, especial urbanization on a large scale, have significant effects on both quality and quantity of regional water resource (including groundwater, river and lake). Nanfei River catchment has been chosen to study the relationship and interactions among those water bodies. Nanfei River flowing through Hefei city, was used as water-supplied sources during 1960s~1970s, and now is just a draining river and a path of transportation for the city. However, it connects two water-supplied sources of Hefei city: the Dongpu reservoir in its upstream and Chaohu lake in its downstream.

In January 2005, 16 water samples (5 for surface water, 9 for groundwater, and 2 for rain water) along with Nanfei River were collected and analyzed by HPLC to make clear the spatial variability of hydrochemistry in the catchment. At the same time, the data of water use and hydrological conditions were collected through literature and interviewing the local water users

Results show that: (a) Human activities, especial development of Hefei city, have an important influence on the quality of waters. For surface water, when flowing through Hefei city, the water chemical type changes from HCO_3-Ca to SO_4-Na or Cl-Na. There is a similar tendency for groundwater; (b) The shallow groundwater used as water supply by local inhabitants in the catchment has contaminated. The main contaminants are NO_3^-, NH_4^+, the secondary contaminants are SO_4^{2-} and Cl^-. The spatial variations of NO_3^-, NH_4^+, SO_4^{2-} and Cl^- concentrations in the shallow groundwater ranged from ND to 93.628 mg L^{-1}, 1.296 to 9.383 mg L^{-1}, ND to 756.049 mg L^{-1}, and 0.394 to 345.543 mg L^{-1}, respectively. (c) Groundwater quality is affected by surface water and precipitation. And wetland is the zone where groundwater, surface water and rainwater interact. (d) Natural wetland has a kind of ability decreasing the concentration of NO_3^- and NH_4^+; Comparatively, the surface water is prone to be polluted. The results provide a basis for further study on reducing eutrophication of Chaohu lake to protect the regional water resources.

Key words: Spatial variability; Hydrochemistry; Nanfei River catchment; Interaction between groundwater and surface waters

Future trend analysis of wastewater reclamation and reuse in northwest typical cities with water shortage

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Abstract: Wastewater reclamation and reuse (WARR) had become an effective approach to solve water shortage and pollution. This paper developed a method integrating system dynamic model (SD) with non-linear programming model (NLP) for (WARR) planning in cities with water-shortage problems in northwest area. Based on the characteristics of northwest water-deficient cities. The SD-NLP model was applied to evaluate the planning and the trend of WARR system in the city of Xi'an. At the same time, the situation analysis method was applied to analyse the strategies of wastewater reuse. Based on the SD-NLP model, the future Eco-Environment demand to reuse water, the growth of wastewater reuse scales and the investment requirement for WARR was simulated and evaluated. Otherwise some relevant influencing factors were also discussed about the relationship of the price of water used for ecological purpose to capacity of wastewater reuse and WARR to water resource exploitation rate in Xi'an.
Keywords: SD-NLP model, Eco-Environment, situation analysis, northwest water-deficient cities

PROBABILITY STUDIES FOR ASSESSMENT OF DISSOLVED OXYGEN PROFILES IN KRISHNA RIVER

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Abstract: One of the most important issues for effective resource management is recognition of cyclical and cascading effects of human activities on the water quality and quantity along hydrologic pathways. The degradation of water quality in one part of a watershed can have negative effects on users downstream. Everyone lives downstream of the effects of some human activity. An extremely important factor is that substances added to the atmosphere, land, and water generally have relatively long time scales for removal or clean up. The nature of the substance, including its affinity for adhering to soil and its ability to be transformed, affects the mobility and the time scale for removal of the substance. Policy alone will not solve many of the degradation issues, but a combination of policy, education, scientific knowledge, planning, and enforcement of applicable laws can provide mechanisms for slowing the rate of degradation and provide human and environmental protection. Such an integrated approach is needed to effectively manage land and water resources.

Identifying the critical location in a stream environment system plays an important role in regulating and monitoring water quality. The critical location is defined as the point of maximum dissolved oxygen deficit within any reach of stream. It is at this location that the threat to the health of the aquatic biota is most severe. Unfortunately, due to the existence of random processes and parameter uncertainties within actual stream conditions, the critical location cannot always be determined with certainty. In recognizing the importance of identifying such a position, this study attempts to assess the appropriateness of using some of the more common probability distributions to describe the random characteristics of the critical location in a stochastic stream environment. The results from such an assessment could enable one to estimate useful properties of the random critical location such as confidence interval information and the mode of its location. It is believed that this information would have important implications in managing and monitoring stream water quality.

In this study, river inflows are generated by using the AR (1) model and it found to be successful for synthetic flow generation. Applicability of ANN based models for generating stream flows is also attempted in this study, the results demonstrates the potential of ANN in making reasonable reliable discharge predictions using lagged discharges as inputs. Error indicators and time series plots indicate the applicability of the model. The generated flows along with historical flows are later used as inputs to the DO model. Streeter-Phelps DO model is used to estimate critical dissolved oxygen deficit, time to critical deficit, and

distance to critical deficit for all hypothetical cases of wastewater and BOD inputs into the river. The critical DO deficit curve indicates the significance of the results. The probability studies can be used to estimate the probability of having a critical DO deficit greater then or less than a fixed value or the probability for this value to fall between certain specified limits. Hence, this information can be of great used in deciding degree of treatment for the effluents to be discharged into the river. The results of DO model can be used to fix wastewater disposal and water intakes along the river.

A Swarm-intelligence Optimization for Flood Control Operation of Multi-reservoir System

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Abstract: In most developing countries, reservoirs play a vital role in flood prevention and disaster relief, and reservoirs operation is a very important issue of river basin management. In this paper, a novel optimal approach of swarm-intelligence, the Particle Swarm Optimization (PSO), is introduced and applied to the solution of flood control operation of multi-reservoir system. According to the analysis of the relationship between releases of upper river reservoirs and flood peak discharge in protected regions, this paper establishes the mathematical model of the multi-reservoir flood control system, with the objective of minimizing flood peak discharge at the protected point and all the relative constraints being involved. To get to the optimal operation strategy of the system, the particles, each of which represents a feasible solution, fly in the multi-dimension solution space, adjusting its velocity and position according to the flying experiences of their own and others, and search for the fittest location that evaluated by the fitness function (transformed from the model objective). A cross operator of Genetic Algorithm (GA) is also imported in the PSO to avoid premature convergence, and a self-adapting inertia is adopted to enhance its searching efficiency. In the case study of multi-reservoir system on Lishui river of Hunan province, south China, the PSO shows good performance under the largest historical flood, and the comparison with DP optimization results also verifies its feasibleness and effectiveness to this problem.
Keywords: Flood Control; Optimal Operation; Particle Swarm Optimization; Multi-reservoir System

Hydrochemical Analysis and the Main Processes Influencing the Groundwater Chemistry of Mabul Island

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Abstract: Mabul Island is a small coral oval shaped island surrounded by sandy beaches located in the east coast of Sabah, Malaysia. The island has no surface water and depends entirely on rainfall for the recharge of its unconfined aquifer. The residents of Mabul Island rely on well water for their daily fresh water supply. Groundwater samples were collected from seven existing wells on the island. Analysis was carried out on a number of samples to understand the groundwater chemistry based on various ion compositions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, HCO_3^-, SO_4^{2-}, Cl^-) and in situ parameters such as DO, EC, TDS, pH and temperature. Descriptive analyses and correlation matrices were used in this study to gain an understanding of the hydrochemical behaviors and process that affected the ions content of the groundwater. The result of analyses indicates that in general the groundwaters of the study area were highly enriched with Na+, HCO_3^- and Cl^-. At some sampling locations, the concentration of these ions (Na^{+}, Ca^{2+}, HCO_3^-, SO_4^{2-}, Cl^-), as well as other parameters such as total dissolved solids (TDS) were above the World Health Organization standards for drinking water. The high concentration of Na^{+}, Mg^{2+} and Cl^- in the groundwater at some sampling locations indicates an encroachment of seawater into the aquifer. Such a condition is also supported by the value of Na/Cl and Cl/HCO_3 ratios of the groundwater samples. The groundwater facies of the island ranged from Na-HCO_3 to Na-Cl water type. It was found that the main process influencing the ions composition of the groundwater are dissolution of minerals, cation exchange processes and simple mixing between two types of waters.

Water Quality Classification Model: The Bagmati River in Kathmandu Valley, Nepal

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Abstract: This study deals with the **Bagmati River Water Quality Classification** of the Kathmandu Valley, Nepal. The river together with its tributaries is the main source of water for domestic use, irrigating agricultural land and industrial use. Since the last few decades, the water quality of all these rivers has been degraded due to discharge of untreated sewage and industrial effluents into them.

An attempt is made here to classify the Bagmati river into different water quality classes based on the Saprobic approach and each Saprobic water quality class has been described in terms of benthic animals, bacteriological and physico-chemical conditions.

- A total of 73 sample sites along the Bagmati river in the valley were selected. The geographical and physical conditions of each site were recorded on the field survey protocol and meanwhile, qualitative sampling of benthic invertebrates and water samples were collected from each sample site.for both bacteriological and chemical analysis.
- The Saprobic approach has been used to classify the water quality in terms of diversity and abundance of benthic macroinvertebrates. Four main standard saprobic water quality classes (SWQC) such as Class I-non-polluted (Oligosaprobic), Class II-moderately polluted (Beta-mesosaprobic), Class III-heavily polluted (Alpha-mesosaprobic) and Class IV-extremely polluted (polysaprobic) have been identified Index.

- Each SWQC has been described in terms of indicator bacteriological and chemical parameters.
- Altogether 71 families, 136 genera and 157 species of macrozoobenthos along the Bagmati river were identified. Two new species *Aphelocheirus nepalensis* ZETTEL and *Aphelocheirus pradhanae* ZETTEL have been identified.
- With regard to bacteriological analysis, the number of heterotrophic count (cfu/ml) has increased rapidly along with the poor Saprobic classes. A strong correlation between HPC and SWQC was observed, indicating deteriorated water quality due to organic pollution. E. coli and faecal streptococcus count (cfu/100ml) were present in all Saprobic classes with increasing numbers in each of the successive poorer classes.
- In regard to chemical analysis, mean temperature was recorded the lowest in SWQC I that included all sites of headwater region but not much varied among other SWQ classes. DO was highest in SWQ classes I and I-II and lowest in class IV. In contrast to DO, BOD_5 was low in SWQC I and gradually increased in other Saprobic classes such as II-III and then remarkably increased in class III, indicating increasing organic pollution.
- Values of other parameters such as phosphate, chloride, NH4-N, conductivity and total hardness were low in Saprobic class I and then increased along with the poorer saprobic

classes. High concentration of chloride, NH4-N and conductivity in the poor Saprobic classes indicates the influence of domestic sewage or organic pollution.

- To sum up, regarding bacteriological parameters with respect to Saprobic classes, SWQC I with simple physical treatment and disinfection (A1), SWQC I-II with full physical and chemical treatment with disinfection (A2) and SWQC II with intensive physical and chemical treatment with disinfection (A3) can be used as raw water for drinking water abstraction.

Key words: Bagmati River, Saprobic Water Quality Class, Benthic Macro-invertebrates, Bacteriological Parameter, Chemical Parameter.

Water Quality improvement using conservation buffer
A case study: zaiandehrood river of Isfahan

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Abstract: Water is the most important challenges in the new century. Unsuitable management of land use is caused water quality degradation and appears health human hazards and water treatment difficult. Riparian buffer have multiple use that improvement of water quality is one of these. Zaiandehrood River is the most important river in the central region of Iran which is polluted by industrial, agricultural and municipal pollutants. Riverside ecosystem of it was degraded and need to reclamation. In this study several data of riverside includes slop, soil, erosion, runoff, groundwater and land use collected and entered in the layers in the base of Geographic information systems (GIS). Data of ETM^+ satellite were used for land use dividing. These layers are overlay then suitable and unsuitable zones for riparian buffer were distinguished. These zones are checked with the field survey. Criteria Design for buffer creation was determined and Vegetation spices in riverside were distinguished.

Keywords: Riparian buffer, riverside, Water quality, Zaiandehrood River.

Investigation of Precipitation Droughts in Isfahan Province

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Abstract: Most parts of the Isfahan Province are located in central arid land of Iran and are sensitive to drought occurrences. So is required to study on drought analyzing and prediction for this problem. There are many ways to define drought using different indicators. Climatology drought were evaluated using annual precipitation time series and statistical indexes such as, percent of rainfall mean, rainfall deviation index, standard deviation index and methods of truncation levels (including: 30%, 40%, 50%, 60%, 70%, 80%, 90% and 95%).In this study 85 precipitation stations were selected of Isfahan province and around of it, in period of 1966-1998.Interpolation methods such as, kirigging, co-kirigging, inverse distance weighted and TPSS were evaluated for interpolation of truncation levels and standard deviation index and the error of each methods is calculated. In the selected methods kirigging method has minimum error and TPSS method has maximum error. Drought extension maps were drowning for each truncation levels and standard deviation index using ILWIS software. Also water volume of probable precipitation is calculated for each truncation levels. Result showed about half of rainfall events occurred in 30 percent truncation level, whereas about 80 percent of the events are in 30 percent truncation level, thus Intensity droughts occurred in the study area. Drought area extension is decreased when rainfall is increased. Result indicated that truncation levels and standard deviation index are suitable method for climatology drought evaluation in the studied area.

Keywords: climatology drought, drought indices, interpolation methods, Isfahan province, truncation levels, Geostatistics.

Modeling bioremediation of contaminated water with contaminant mass exchange between mobile fluid and stationary porous media

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Abstract: Contamination of surface and ground water has emerged as one of the most important environmental issues in the Asian developing countries. Due to the interdependence between fast economic development and contamination problems, rivers and aquifers have been polluted at an alarming rate. To guarantee water supply for both urban and rural areas in the future, it is necessary to develop low-cost water treatment and remediation technologies.

Biological water treatment technologies, such as packed-bed bioreactors, streambed biofilters, and groundwater bioremediation, permit fast, cheap, and effective water decontamination. However, these technologies are poorly understood and usually not fully controlled due to the lack of information describing the natural phenomena involved. Therefore a better understanding of the phenomena involved in the biodegradation process could help to design more efficient technologies.

Mathematical models of mass transport in porous media are very useful to understand the process of biodegradation of contaminants in packed bed bioreactors, streambed biofilters, and groundwater systems. In order to achieve a representative description of the phenomena involved, these mathematical models should incorporate advection and dispersion in the mobile fluid, diffusion and/or reaction within the stationary medium, and mass transfer between the fluid and the stationary medium. Finite difference solutions of the model involve the discretization in space and time of a set of nonlinear partial differential equations. These solutions sometimes require a prohibitive amount of computing time, making them ineffective design tools. The solution becomes even more demanding if the system requires the consideration of a number of different chemical contaminants.

In the present study, we compare two approaches to numerically solve the mathematical model of reactive mass transport in porous media with mass exchange between mobile fluid and stationary medium. The first approach, named the "traditional method," solves a single system of differential equations that results from a standard finite-difference discretization of the governing equations. The second approach, named the "direction-splitting method" (DSM), iteratively solves two separate systems of differential equations: one for transport in the mobile fluid, and one for uptake and reaction in the stationary medium. The two systems are coupled by a boundary condition at the mobile-immobile interface.

The efficiency of the DSM has shown to be superior in terms of accuracy, CPU time, and CPU storage for many different environmental conditions. The DSM employs a modular code that can easily be modified to accommodate different mathematical representations of the physical and biological phenomena. Each module of the code can employ a different numerical algorithm to optimize the solution. This DSM can be used to solve a number of mathematical models for a variety of biotreatment processes. Mathematical simulations allow low-cost testing of various treatment scenarios, permitting the advance in the design of water treatment and remediation technologies.

Effect of agricultural water use in the middle reaches on the eco-environment in the Heihe River Basin and countermeasures

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Abstract: In the irrigation district of the middle reaches of Heihe Basin, the reuse and transfer ratio between the surface water and the ground water is high, and the eco-environment is vulnerable, so the amount of agricultural water use has close relation with eco-environment' change. How to allocation the amount of water between agricultural water use and eco-environment use is very important in reason. From the points of the characteristics of water resources and water cycle, the historical amount of agricultural water use and the change of the groundwater level, this paper analyses and discusses the effect of agricultural water use in the middle reaches on the ecological environment in the Heihe River Basin through field research and data analysis in the irrigation areas of the middle reaches of the Heihe River Basin. The results show that Zhangye' agricultural acreage occupied 90% of the total agricultural acreage, but area of land occupied 16%; and the total amount of agricultural water use about the middle reaches of the Heihe River Basin occupies 76％ of the total amounts of water use from the Heihe River. The agricultural water break-in the eco-environment water use to maximum extent, it aggravates the extreme lack of artificial- and natural- oasis .It caused some environment problems such as groundwater level dropping, soil desertification and secondary salinization and vegetation degenerates. It is suggested that some measures for sustainable development must be taken to solve the present problems, such as rationally distribute water resources on the foundation of controlling the irrigated area, strengthens to the ground water resources management, and develop water-saving agriculture, etc.

Key words: agricultural water use; eco-environment; effect; countermeasures

Research on the Resistance of Terephthalic Acid in Wastewater from the Polyester Fabric Alkali Weight-Reduction Progress

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Abstract Polyester fabric used in weight-reduction process was subject to alkaline hydrolysis with aqueous sodium hydroxide in order to improve feel, luster and soil release properties. The disodium terephthalate received in the waste water from the weight-reduction process was treated with sulfuric acid and resistance of terephthalic acid (TA) was studied. Several different acidification conditions was select including temperature(30-90℃), sulfuric acid concentration(10-80%), sulfuric acid adding velocity(1-11ml/min), mixing velocity(0-650r/min). The TPA crystal particle size difference volume revealed about 50 percent terephthalic acid particle size was more than 45um and terephthalic acid resistance revealed the best acidification condition was 30℃,8ml/min,10-40%,260r/min. The theory of terephthalic acid acidification was developed to describe the mechanism and a set of acidification equipment was designed. The method is very useful in decreasing the water pollution and recycling of polyester wastewater and other containers because nowadays, terephthalic acid is replacing dimethyl terephthalate as the main monomer in the industrial production of PET.

Key words polyester fabric, terephthalic acid, acidification, crystallization, polyester waste water, weight-reduction

DROUGHT ANALYSIS AND FORECASTING FOR AGRICULTURAL WATER MANAGEMENT IN AWASH RIVER BASIN, ETHIOPIA

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Abstract: Drought is one of the recurring natural hazards in Ethiopia. Understanding the characteristics of drought is crucial to establishing an effective and comprehensive monitoring and early warning system for an effective drought management plan. The objective of this study is to describe and forecast droughts in the Awash River Basin, Ethiopia, based on meteorological and hydrological variables on the basis of which appropriate agricultural water management strategies are proposed for a large irrigation estate in the basin.

Droughts in the basin are described using two methods: Standardized Precipitation Index (SPI), a measure of meteorological drought, and the theory of runs, a measure of hydrological droughts. The SPI method is used to generate monthly spatial patterns of various categories of drought on a basin level at different temporal scales (3, 6, and 12 month). The study reveals that Middle and Lower Awash Basins are the most vulnerable areas to drought conditions. Similarly, the feasibility of rainfed agriculture in the basin for some selected crops is assessed based on the available meteorological data with the aid of ArcView/GIS. It is found that growing cotton crop in the basin should be considered only under irrigated condition for optimum yield. The second method of drought characterization, the theory of runs, is used to monitor and measure drought events in terms of streamflow in the Awash River system. Based on their intensity, it is found that the severest drought events occurred at Melka Sedi stream gauging station during the periods May/1988 to June/1988 and April/1998 to May/1998.

A non-linear streamflow forecasting model is developed using Artificial Neural Network (ANN) modeling technique for the Melka Sedi stream gauging station with adequate lead times. This gauging station is located above a weir that diverts water to a large estate irrigation scheme, Middle Awash Agricultural Development Enterprise (MAADE), for which water management strategies are proposed. On the basis of the model-forecasted streamflow time series and irrigation water and minimum flow requirements, the study proposed appropriate agricultural water management strategies for the irrigation scheme. These proposed strategies are evaluated based on different scenarios of abstraction demand which are formulated based on a range of possibilities of developing agricultural fields in the MAADE. An appropriate scenario of agricultural development is decided on the basis of the residual flows in the river vis-à-vis the trigger/threshold value established for Melka Sedi stream gauging station. It is found that for a reliable supply of water to the scheme throughout the growing season, a 1-24% reduction (depending on the scenarios considered) in the cultivated area of the scheme is necessary.

Water environment capacity in watershed scale: A case study in the Yong River system

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Abstract: Water environmental capacity is a threshold of pollutant discharge into a river system under certain hydrological, drainage conditions and water environmental objectives. It is important to environmental management of a river system and one of the basis to control pollutant loadings into the river system. Many such kinds of studies were mainly focused on point source pollution, such as effluents from industrial sites and centralized wastewater treatment plants (WTPs), and non-point source (NPS) pollution were usually not taken into account while calculating maximum permit of pollutant discharges. In this study, a new modelling approach was proposed which considered non-point source pollution loadings and different hydrological conditions, such as dry, normal and wet seasons. The NPS pollutant loadings from the catchment area of each river reach was estimated considering NPS contributions from agricultural fertilization, dispersive rural residential areas, and/or impermeable urban area. The estimated NPS loadings was generalized as a kind of linear source pollution and was evenly discharged into river reach itself, and a ratio was used (as a calibrated parameter) to represent actual NPS loss part from the catchment into the river reach during different hydrological conditions, and it was calibrated using observed hydrological and water quality datasets during different seasons. The results showed that water environmental capacity varied with hydrological conditions and corresponding non-point source pollutant loadings into the river system. During the dry season, water environmental capacities of chemical oxygen demand (COD) and ammonium nitrogen (NH_3-N) is small due to low stream flow and low diluted capacity, and only a minor part of NPS pollutant loadings into the river due to less surface runoff generated. However, the COD and NH_3-N capacities increased with increase of stream flow during the wet season, and in the meantime, the NPS pollutant loadings into the river also increased due to more surface runoff generated, which showed that NPS contribution was also important to water environment protection of the Yong River system. This study also showed that water resources development level in the upstream area, such as reservoir construction and water diversion from upstream directly to urban area in the downstream area, had great influences on the stream flow and subsequent water environmental capacity of the river reaches in the downstream area. It indicates that a reasonable development level of water resources in the watershed is very important to sustainable utilizations of water resources not only in quantity but also in quality, and this should be kept in mind while drawing up regional water resources planning.

Key words: water environment capacity; water resources development; non-point source (NPS); watershed

Sediment Hazard by Typhoon Aere in the Shih-Men Reservoir Watershed

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Abstract: Taiwan is a landslide-prone region, and the landslide caused by typhoon, heavy rainfall, or earthquakes. Landslide is also a tough problem causing soil and water disasters and is the major sediment source in reservoir watersheds in Taiwan. As a consequence of invasion by Typhoon Aere (08/23/2004～08/26/2004), many catastrophic flood, debris flow event and shallow landslide caused severe damage to Taiwan. Torrential rains accompanying the typhoon induced severe sediment problems in the Shih-Men reservoir watershed. The annual sediment yield of the Shih-Men reservoir is about 1.4×10^6 m^3, but approximately 20×10^6 m^3 after Typhoon Aere. The purpose of this research is to analyze the hydrological characteristics and sediment change in the Shih-Men reservoir watershed, the cause of sediment disaster especially. Results of this study show that increases in lifespan of the Shih-Men reservoir is about 40 years because of the effectiveness of the long-time reservoirs management plans and watershed conservation work. However, the lifespan also decreases rapidly because of the sedimentation after Typhoon Aere. Furthermore, the rare rainfall and newly landslides are the most important factors influencing soil and water losses by Typhoon Aere in the Shih-Men watershed. During Typhoon Aere, the average rainfall of rain stations in the Shih-Men watershed is 974 mm. There is more than 500 mm rainfall in all rainfall stations at the watershed of the Shih-Men reservoir, the Yufon and Baishih stations are both more than 1500 mm especially. The dominant regions of landslide are distributed within the storm center in the west part of the Shih-Men watershed, including the Yufon and Sholuan sub-basins. After Typhoon Aere, the annual sediment yield in the Shih-Men watershed rises from 25.67 ton/ha-yr to 366.78 ton/ha-yr, and the soil erosion of cultivated lands rises from 55.77 ton/ha-yr to 174.82 ton/ha-yr. In the event of ignoring the soil erosion of the watershed besides landslide area to simplify the problem of sediment source, the soil loss is about 2.1 m in depth in landslide areas.

Key words: Shih-Men reservoir, Typhoon Aere, soil erosion, landslide, sediment yield.

Stormwater quantity performance of porous pavement systems in Beijing

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Abstract: This study examined the effectiveness of porous pavement as an alternative to traditional impervious pavement in 2004 and 2005. Three commercially available porous pavement systems were evaluated for ability to infiltrate precipitation. Based on artificial rainfall experiment in laboratory, by means of building models of porous pavement and soil, experiments were carried out to simulate different kinds of porous pavement with a different sub-base in each of reservoirs, from which the discharges were monitored for quantity. Hydrological relationships involving rainfall, outflow and outflow duration are presented. Results showed that all porous pavement treatments enhanced water infiltration and decrease rainfall runoff. In all treatments, the optimum thickness of the porous pavement was 31 cm: a 6 cm thick porous surface course on a 25 cm thick base course (10 cm thick concrete sub-base without sands and 15 cm thick gravel).
Keywords: Integrated Water Resource, impervious pavement; pervious pavement; sub-base; stormwater; urban runoff; artificial rainfall

Water Quality of Urban Runoff from Different Rain Harvesting Surfaces

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Abstract: Water shortage and water environment pollution is a very serious problem in Beijing. It is necessary to study the quality of the annual runoff. In this paper, we investigated the water quality of runoff for different rain harvesting surface (i.e. roofs, streets and greenbelt). The major contaminants were organic and suspended solid. The NH_4^+-N, Permanganate Index and volatile phenol were all beneath V class when the rain harvesting surface was roof; The runoff from the greenbelt is attributed to V class, but the water quality is quite good and only the content of NH_4^+-N is beyond criterion comparing to class III; While the COD from the surface of road was exceed 493.5ml/L in the initial term of the runoff, and it trended to a lower stable concentration with the rainfall duration. By discarding the water of the initial term, the runoff from the roofs can be used for life and municipality, but the runoff from the road surface could not be used directly.
Key words: urban rainfall utilization; water quality; rain harvesting surface; runoff

Rainfall-runoff relationship of porous pavement under the condition of artificial rainfall

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Abstract: Three commercially available porous pavement systems were studied to evaluate the ability to infiltrate precipitation. Experiments were carried out to simulate different kinds of porous pavement with a different sub-base in each of reservoirs, from which the discharges were monitored for quantity. Hydrological relationships involving rainfall, outflow and outflow duration are presented. Physical models were built in laboratory. Results showed that all treatments of the porous pavement enhanced water infiltration and decrease runoff. In all treatments, the optimum thickness of the porous pavement was 31 cm which contain a 6 cm porous surface course and a 25 cm sub-base (10 cm concrete sub-base without sands and 15 cm gravel). It is showed that the coefficient of the runoff of the infiltration treatment is decreased about 85% than that of the impervious pavement.
Keywords: impervious pavement; pervious pavement; sub-base; urban runoff

The Problem of Saltwater intrusion in Pearl River Estuary, South China

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Abstract: The Lower Pearl River, South China, is flanked by eight low-lying estuaries with a largest coastal wetland of South China. Marked changes in the form and position of the coastline over the past 20 years have been paralleled by a dramatic extension of inning & tidal creeks and the intrusion of salt water into many of the freshwater river net of the Delta. In low water season of 2004, the Pearl River Delta encountered the most serious saltwater intrusion disaster since 1984. The disaster severely affects the people's need of freshwater in life and production in coastal tidal sensitive area such as Zhongshan, Zhuhai and Panyu District of Guangzhou, South China. Due to the strong prevalence of salinity in past several years, the safety of drinkable water source is badly threatened. Using data from 2004 saltwater intrusion monitoring of Pearl River Estuary(a large-scale saltwater monitoring activity in PRE), combining river runoff , tidal data and other mankind elements, we investigate the characteristics and generation mechanisms of the severe saltwater intrusions in PRE. The several important factors that tip the balance between freshwater and sea water ecosystem are analyzed in detail. Some evidence such as riverway relief as a significant driving mechanism for the Saltwater intrusions is found. The future strategy of saltwater intrusion prevention in PRE is also suggested.
Key words: saltwater intrusion, Pearl River Estuary, characteristics, mechanism

On Information System of Marine Oil Spill Contingency and Response

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Abstract: As the development of the oil exploration, production and transportation, the marine environment is more likely to undergo higher risk caused by oil spill accident. Under this background, the pollution caused by spilled oil has been listed in Agenda 21 by the UN. Every sea area and oil port has to establish corresponding plan for contingency and response of pollution by oil spill. The oil spill information system, as a decision supported system and the main component of the contingency-and-response plan, plays more and more important roles in dealing with the environmental impact caused by spilled oil. This paper will present a newly developed information system of marine oil spill contingency and response (MOSCAR). The main difference between this system and the conventional oil spill information systems is that an integrated and fast tidal current simulation model is developed based on the character of Chinese sea area and coastland. This feature allows one to find out the current field with high accuracy in less CPU time and make the software easy and suitable to be extended and applied to different coastlands and/or ports in China. Apart from this, the 3D spilled-oil diffusion and weathering models, contingency and response models are developed and integrated in the system based on the Geographic Information System(GIS) technique. The MOSCAR not only has the high efficiency to simulate the process of oil diffusion and weathering, but also has the ability to visually show the relative information, i.e. the sensitive environmental region and the distribution of equipment and human source. The MOSCAR was applied to numerically predict the behaviour of the spilled oil in different accidents. The results agreed well with the measured data. It has high potential to improve the efficiency of marine oil spill contingency and response.

Key words: Oil spill; Contingency and response; Numerical prediction; GIS

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Link the impacts of human activities on water quality and hydrology in river system of Poyang Lake watershed, China

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Abstract: Poyang Lake watershed mainly consists of Poyang Lake, its five sub-watersheds and the river system. Its wetlands, the largest bird habitat in Asia, play an important role in biodiversity and ecologic protection. With the rapid economic growth, urbanization and extensive agricultural actives, the river system in the watershed, which finally discharge into Poyang Lake have been subject to dramatic changes and face many environmental challenges. And, thus, endanger internationally recognized Poyang Lake wetland. To better understand the environmental and hydrological changes of the river system in the Poyang Lake watershed, we apply RS techniques and statistical methods in a study of the characteristics and process of surface water of Poyang Lake watershed.

In this study, satellite images (Landsat TM, ETM+ and Terra MODIS) from 1990, 2000 and 2004 were acquired for the entire watershed. The land uses in the watershed were classified as agricultural land, urban, wetland, forest, grassland, bare soil, and water body using a combination of supervised and unsupervised classification techniques. Data for water quality and river hydrological parameters such as Total Nitrogen (TN), Total Phosphorus (TP), runoff and Suspended Sediment Concentration (SSC) were collected from related department.

A good indicator reflecting human activities is Human Use Index (HUI), which is defined as the total areas of urban, agricultural and bare soil in land use classification. In order to examine the relationship between human activities and water quality, percentage of HUI was regressed against TN and TP concentration, respectively. The results indicate an initial increase in TN concentration as percentages of HUI increase and then remains unchanged. The regression of TP shows similar trend as TN.

In order to identify the impacts of different land use types on river hydrological characteristics, runoff and SCC were regressed against percentages of various land use types. It was found that forest and grassland could significantly reduce runoff and SSC while land uses such as urban and agricultural could increase runoff and SSC.

The findings of this research reveal the effects of different human activities induced land use types on water quality and hydrology in river system and could be served as scientific foundations to guide watershed planning and river management.

Key words: RS, land use, water quality, hydrology, river system

Analysis and Research on Water Resources Carrying Capacity in Urban Area

——A Case Study of Shenzhen City

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Abstract: In order to control and use the water resources with higher efficiency so as to guarantee the local economic development, it is very important to get a precise evaluation of the social economy that water resources can support. In one hand, the evaluation can provide the government and the general public a clear view of the current status of the water resource and guidance for government's decision making. On the other hand, it is expected that public cognition of the protection of water resources could be highly improved for the sustainable use of water.

Water Resources Carrying Capacity (WRCC) can be explained as the social economy that water resources can support under certain technical economy and historical conditions. In this paper, a series of dynamic relations including exploitation and application of water resources, the moderate economic development and reasonable population in different periods was studied starting from the relationship among resource, environment, population and development based on the principle of sustainability. Approaches are supposed to be found through the analysis in this paper to enhance the water resources carrying capacity. Related policies of population, usage of resources, improvement of ecological environment and economic development should be set up.

The research on water carrying capacity is the result that human beings respond to the problems of water resources arising during the development of society. The aim of the research is development. It's the important part of sustainable development research on water resources. By studying water carrying capacity quantification , planning and management schemes of water resources may be plotted, which control human beings' exploitation and using of water resources so that it may stride forward objects along the perfect track. Based on existing researches, this paper brings forward the method of establishing multi-object model of water carrying capacity. This model is solved by one of mutual solutions—-method of linear weight step by step. The results include scales of society, economy and population. It's a model which covers forecasting, optimization and planning.

This paper applied this model to compute the water carrying capacity of Shenzhen city, one of 110 cities lacking water resources badly in China, gaining the projects of different decision-making intents and different water-using rations under different water-supplying conditions. The computing results are also analyzed and corresponding measures for different projects are put forward. Finally, this paper pointed out the directions of further studying on water carrying capacity model.

An emerging problem of salinity and nitrate contamination in the groundwater of NCT-Delhi, India

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Abstract: Present study has been carried out to assess the real status of groundwater, second major water resource for the drinking water supply in the National Capital Territory (NCT) of India, Delhi. Salinity and nitrate contamination are the two major problems in the area which is alarming for drinking purpose. Various graphical plots and statistical analysis has been carried out to understand the geochemical processes and its relation to the groundwater quality based on the ionic constituents, water types, hydrochemical facies and to understand nutrient chemistry (nitrate, phosphate and potassium) with spatial and seasonal variations in the groundwater nature in the study area. The concentration of nutrients in groundwater acts as an indicator to identify the nature and influence of agricultural and urban runoff on the shallow subsurface environment. Results of the study suggests that leaching from the various unlined landfill sites is the prime cause of nitrate contamination along with other factors like agricultural activities, soil mineralization processes and irrigation return flow. The result also indicates a different source of origin for the nitrate and potassium and not a common source for their origin as it was thought earlier. Local recharge is associated with low salinity of Ca-Mg-HCO_3 type which is through rainfall and surface water body especially by west Yamuna canal and Yamuna River. Large lateral variation of conservative elements shows that recharge through lateral flow is not dominant in the area. Highly saline and brackish groundwater in the discharge zones like northwestern and southwestern parts of the area seem to be associated with long history of evaporation and oxidation of sulfur gases in low lying areas. In view of increasing demand of drinking water in the area, present study is vital and suggests the need of immediate management action for landfill sites.

Spatial distribution of Groundwater Chemistry in the Turpan Baisin, West China

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Abstract: The processes affecting salinization of groundwater were studied in the Turpan Basin, west part of China. The stable isotopes and chemical concentrations were used in this basin to gain insight into the mechanism of solute concentration and flow processes. The variability in $\delta^{18}O$ and δD values of groundwater were used in association with chloride concentrations to provide information on mixing characteristics of groundwater within the basin. Depend on the chemical analysis data, soluble salts increased from mountain area to oasis and dramatically increased near the Flaming Mountains and Aiding Lake. At this part even occurred maximum Cl value (497.9 mg/l) in the groundwater. The Ca – HCO_3 type identified in the surface water samples at the mountain area, the HCO_3 –Cl type and Cl – SO_4 – Na – K type identified in the oases, the Cl – SO_4 – Na – K type identified in the groundwater near the desert and lower part of the Flaming mountains. The stable isotope compositions show that there occurred evaporation only in the surface water but no any evidence in the groundwater. Isotopic enrichment identified only surface water due to the evaporation. It indicated that the salinization of the groundwater is not result of direct by the evaporation. Evaporation from the soil surface plays a major role as a mechanism of solute concentration in the unsaturated zone.

Chemical and isotopic data suggest that the salinization of groundwater is dependent upon more than one of the following mechanisms: 1) Dissolution of aquifer minerals. 2) Evaporation of soil water from irrigation and leaching of salts by irrigation water. 3) Seasonal variation of groundwater table cause to extensive water – soil interaction in the unsaturated zone.

DESIGN OF AN AQUATIC BIOMONITORING PROGRAMME USING THE WATERWAYS OF SHANGHAI AS A CASE STUDY

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Abstract: In recent years, major efforts have been made to improve the water quality of surface waters in Shanghai, mainly focusing on its two major rivers, Huangpu River and Suzhou Creek. A regular monitoring of chemical parameters is undertaken to control surface water quality but no biological analyses are applied on a regular basis. Biological indicators, both single organisms and communities, are known to be excellent means of assessing water quality. Unlike the monitoring of chemical and physical data, biomonitoring is capable of revealing the effects of toxic substances on living organisms. Biomonitoring can also detect synergistic or antagonistic effects of contaminant mixtures and, as it investigates the composition of biological communities and characterizes water quality over a certain period of time without the limitations of the 'snapshot' approach of chemical analysis.

The surface water system of Shanghai is very complex. It consists of more than 20,000 waterways with sizes between several meters and several hundred meters wide, natural river beds and concrete banks and significant differences in contaminant loads. Pollution, both point and diffuse, originates from domestic, industrial and agriculture sources. In the future, biomonitoring shall be used to control the water quality not only of the major rivers but for the system of waterways as a whole, including a larger number of rivers and canals of different sizes and in different areas of the city. The task was therefore to define the techniques that will allow the biological monitoring of surface water quality across this wide range of different conditions.

This paper presents chemical and biological monitoring results derived from a pilot study and the biomonitoring methodology designed on the basis of these results. Chemical analyses of major nutrients, heavy metals, oxygen and others were carried out and, where possible, biological samples were taken. The results of this pilot study revealed the Extended Biotic Index (EBI) and the Generic Diatomic Index (IDG) as complementary techniques that allowed for a simple, reproducible determination of water quality of natural and anthromorphic waterways, of waterways of different sizes and different types and degrees of contamination. It could be shown that these techniques are applicable at most of the Shanghai waterways and that they do not require sophisticated equipment which was important for the applicability in a vast system of waterways like it is characteristic for Shanghai. Where more localized and momentary information was needed to assess short term and long term effects of discharges, tests of ecotoxicity and mutagenicity and additional chemical analyses were carried out on water and sediments samples.

The approach presented here will serve as the starting point for implementation of an integrated biomonitoring programme for the waterways of Shanghai.

Keywords: Biomonitoring, Generic Diatomic Index, Shanghai Waterways

Ecological environmental evaluation of the Four-rivers Basin flood control project in Hunan Province

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Abstract: The flash flood disaster caused by heavy rains of the Four-rivers Basin is serious in Hunan Province. The Four-river Basin consists of the Xiangjiang basin, the Zijiang basin, the Yuansjiang basin, and the Lishui basin. From 1949 to now, Hunan provincial government has put huge investments to build the basin flood control project in the Four-rivers Basin. The whole project includes the mountain area flood-control system, which involves many flood-control structures (such as reservoir , dike , soil and water conservation dams, and so on)， and the lake area flood-control system made up of dikes, flood diversions, storage areas, as well as the Dongting lake. This paper is to evaluate the effect of this project on the ecological environments, in terms of the currency (mainly, the RMB). It must be noted that this quantification of the eco-environmental effect is very difficult for the complexity of the Four-rivers Basin flood control system.

The evaluation of the eco-environmental effects of the Four-rivers Basin is divided into two steps. First, the Matrix method was used to select those major impact variables (e.g. the atmospheric environment, land resource, and landscape). Second, for each of these impact variables, the economical effect of the flood control project on eco-environments is determined by applying the new theories and techniques (including the market value technique, the shadow engineering technique, etc.). These evaluation theories and techniques have two categories, i.e. subjective and objective. As far as the first impact factor, i.e. the atmospheric environment, is concerned, the shadow engineering approach is applied to decide the benefit of ecological impact. By using the Engel's Coefficient (EC) in Hunan province which has functioned well in reflecting residents' living level and the Pearl growth curve to fit the change about the resident's willingness to pay for improving the urban ecological environment, the analysis is made to show that the modified eco-environment benefit coefficient is 0.27 now. This modified coefficient is employed to adjust the ecological benefit of greening.

Using the change of land productivity method and land value evaluation technique, this paper calculated quantitatively the direct economic loss or benefit of agricultural land and urban land. First, the Four-rivers Basin flood control project project is closely related to the property values with obvious external effects: along with the increasing garden and orchard quantity, the productivity is adding. Secondly, the project may also increase the value of lands along the dikes, and further influence the values of residential and business properties. Thirdly, the land alteration influence on property values is characterized by the temporal and spatial variation.

The travel cost method is used to evaluate the benefit of flood-control dike landscape which will be adorned or improved (a section of ground) by contouring and by planting flowers, shrubs, or trees in urban, based the investigated travel data. The wholly empirical demand curve is built on the basis of the survey data, and then the landscape value can be obtained by the integration of this curve.

It is shown by analyzing the calculated data that the ecological environmental effects of the Four-rivers flood control project are enormous. As the option value and the non-use value are not considered in the benefit computation, the general ecological environmental effects are

less than actual level. By the ecological environment evaluation of the Four-rivers Basin flood control project in Hunan province in term of the environmental characteristics and sustainable development, it is suggested that the Four-rivers the Four-rivers Basin flood control project should be taken as an excellent example of enhancing the environmental and ecological benefits through the flood control project.

A STUDY ON THE DRINKING WATER QUALITY OF BOREHOLE WELLS IN MOUNTAIN AREAS OF KANDY, SRI LANKA.

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Abstract: Hydrogeological investigations were carried out to provide groundwater for the people living in rural areas by the Kandy District Water Supply and Sanitation Project, being part of the development co-operation between Sri Lanka and Finland. Most of these rural areas are hilly or mountains with narrow and steep valleys. The objective of this paper is to highlight the groundwater quality variation of different low yielding borehole wells in the hilly areas and its effect on people living in the study area.

Boreholes (about 75 meter depth) were constructed by drilling at the selected sites of north-west of Kandy district. The sites are located on the slopes of the hills adjacent to the roads. After evaluating the quantity, the wells have been classified as high yielding or low yielding wells. Water samples were collected to find the quality of water sources from 152 borehole wells in the selected area. Total of 474 water samples were tested for this study.

Water in the mountain areas can be collected from the deep borehole wells through the fractured rocks. Water penetration to the ground is low in this area due to the thin weathered rock overburden at the hilly slopes. Therefore it may be the reason for low yielding wells. Eighty percent of the water samples conformed to WHO standards of drinking water. Thirteen percent of wells had high iron content. It was found that even the deep groundwater from the fractured crystalline rocks may be contaminated by bacteria and therefore boiling is necessary before drinking.

The Adsorption and Desorption of Phosphate by Sediments in Natural and Constructed Wetlands in Hong Kong

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Abstract: Wetland creation is increasingly practiced worldwide to mitigate the loss of habitats and ecological functions of natural wetlands. Sorption processes play an important role in the regulation of water quality, which is one of the key functions of wetlands, through exerting influence on the phosphate concentrations in porewater. This study examined the characteristics of phosphate adsorption and desorption by sediments in natural and constructed wetlands in Hong Kong. Triplicate core samples were taken at eight selected sites in both the natural Mai Po Marshes (MP) and constructed Hong Kong Wetland Park (HKWP). Batch incubation experiments were then performed on the top 5cm sediments to determine the phosphorus sorption characteristics. Sediments in the natural marshes had significantly higher mean value of Langmuir adsorption maxima (S_{max}) than the constructed HKWP sediments (1441 vs 578 mg P kg^{-1}). The higher capacity of MP sediments in sorbing phosphate is likely a result of their greater metal concentrations, which provide abundant surface area for adsorption. This is supported by the significant correlations found between S_{max} values and total Fe and Al contents in sediments of the two wetlands ($r>0.7$, $p<0.01$). The adsorption of phosphate by the MP and HKWP sediments was highly irreversible, with 70-89% of adsorbed phosphate being retained after the desorption experiments, which greatly facilitates the long-term storage of phosphorus. Zero equilibrium phosphorus concentration (EPC_0), the concentration at which no net adsorption or desorption of phosphate occurs, was significantly lower in HKWP than in MP sediments, averaging 0.02 and 0.23 mg P/L respectively. This implies that sediments in the constructed wetland had a greater potential for phosphate adsorption under moderate phosphorus loading. However, when considering the very low phosphate concentrations (< 0.01 mg P/L) in the overlying water of the HKWP, sediments may instead desorb phosphate into the water and become a source of phosphorus. On the other hand, phosphate concentrations in the highly eutrophic waters of the Mai Po Marshes (0.76-1.14 mg P/L) were consistently greater than their respective EPC_0 values, which favour the adsorption of phosphate by sediments and help account for the high purification efficiency found in this natural wetland. Results of this study suggest that considerations be given to metal contents in sediments and phosphate levels in overlying water when using wetlands as a means to remove water-borne phosphorus.

The Calculation of river Ecological Flow for the Liao Basin

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Abstract: Unreasonable development of water resources, and the neglect of the water for *ecosystem)*, has caused rivers to dry out, declines of underground water levels, and the dying out of aquatic biology etc in the Liao basin. Therefore, the insurance of ecological water for rivers and the reestablishment of the normal function of the river ecosystems has become an important *part(tache)* of the rehabilitation of the aquatic ecology. Morphological methods, based on the morphological and hydrological characteristics of the river, are used to calculate minimum river flows that will sustain the low-flow channel of the river. Fish habitat method, depended on the aquatic biological and hydrological characteristics of the river when the precondition of low-flow channel existence, are used to calculate appropriate ecological flows that will protect the ecological health of the river. Existence of low-flow channel in the river is the primary objective, while maintenance of the ecological health of the river is secondary. The results of the calculation indicate that in the whole Liao River the ratio of the minimum river flow to the mean annual natural flow is 5-13%, and from the upstream to downstream, the (minimum ecological flow) ratio gradually decreases; We find ratios of the *appropriate* ecological flow to the mean annual natural flow is 19-33％ Using the fish habitat method and the method fits the cross-section where the relation of water level-discharge and discharge-velocity is steady, but it doesn't fit the control section which is influenced by river backwater jacking and ocean tide.
Key words: ecological flow, morphology, fish habitat method, appropriate velocity

Optimizing the planning for ‘green space’ ecosystem based on ecological principles for small towns in China(Abstract)

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Abstract: Urban ‘green space’ is an important component of the complex urban ecosystem. Parks, woodland and farmland are three main types of urban green space, which have significant ecological, social and economic functions, of significance to urban sustainable development. The ‘Threshold Method’ is the best way of establishing the amount of ‘green space’ required. This paper quantifies the total amount of ‘green space’ required to keep the ecological system in balance for the town of Shaliuhe (population 33905), Hebei Province. The study calculates the population carrying capacity, the balance of carbon-oxygen and water resource supply components in the ecosystem for 2004 and calculates the effect of various ecological improvements for years 2005, 2010 and 2015. The improvements are reforestation of farmland, strengthening the ‘green space’ planning, enlarging the area of greenbelt and optimizing landscape layout. Having implemented these improvements the balance of supply and demand for oxygen and water resources become positive by the year 2015, even though the population is expected to have increased to 42500.
Key words: ‘green space’; environment; carbon-oxygen balance; water resources; soil and land use; reforestation of farmland; China

Enhancement of a Turbulence Model for More Accurate Predictions of Salinity In a Stratified Estuary

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Abstract: Salt tide (or salinity intrusion) in estuaries has been attracted more and more public attentions in recent years. Predicting estuarine hydrodynamics and salinity transport has become an important issue for water and environmental management. However, due to turbulence mixing and density-induced flow, it is not an easy task to accurately predict the density-induce flow and salinity transport. In this paper, the author presents a case study in an estuary in Florida, USA. Field observations indicate that density-induced bottom current is toward upstream direction while surface freshwater is discharged to the downstream direction. A three-dimensional hydrodynamic model was applied to study the mechanism of the density-induced current in responding to tide, wind, and buoyancy forcing. The hydrodynamic model employs a second order turbulent model by Mellor and Yamada (1982) to determine the vertical eddy viscosity and diffusivity. This turbulent model has been widely used to modeling of geophysical fluid flow such as coastal oceans. The accuracy of the vertical eddy viscosity is considered critical for a satisfactory modeling of the density induced stratified flow. A complete hourly data set for a 30-day period were used to validate the model performance, which includes velocity and salinity at the surface and bottom, river inflow, wind, and tide. Using the default turbulent parameters, results indicate that model predictions over estimate the stratification.

Theoretical analysis indicates that eddy viscosity calculated from the turbulent model has significant effects on vertical stratification. Therefore, in this study a correction factor was added to allow the slight adjustment of the turbulent eddy viscosity that is very sensitive to the calculation of the vertical stratification. Sensitivity study was conducted for the correction factor ranging from 1.0 to 1.2 to examine the improvement of the turbulent model performance. For the case study in Apalachicola River, results show that the increase of the turbulent eddy viscosity to a 1.15 factor leads to the best agreement between model predictions and observations. The result from this study also shows that the default parameters in some 2^{nd} order turbulent model may not be universal to all situations. Slight adjustment of some parameters may be required for the improvement of the model prediction accuracy. The correction factor given in this study may be helpful for other model applications for stratified flow.

Application of QUAL2K model to simulate the water quality in Jiulong River

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Abstract: Jiulong River is the second largest river in Fujian province, China. Its mainstream length is 285 km, with a drainage area of 14,714 km^2. Jiulong River passes through Longyan city and Zhangzhou city, and it is the principal water resource in southern Fujian province for agricultural irrigation and water supply. Jiulong estuary is near the Xiamen harbor. The drinking water of Xiamen city is mainly from diversion works on one of the main stream of Jiulong River.

A suitable water quality model which can simulate the large river systems is essential to the water quality management of Jiulong river. In the past recent years, USEPA's QUAL2E model was the most popular water quality model in application. Now, USEPA has released a new version model, QUAL2K to represent a modernized version of the QUAL2E model. QUAL2K model emphasize the importance of autochthonous sources and denitrification in biochemical oxygen demand (BOD) and nitrogen dynamics, and these new elements can overcome limitations of QUAL2E. This paper compared the differences between QUAL2E and QUAL2K models, and demonstrates the QUAL2K model application in the Jiulong River. The changes include the modification of computational structure and the addition of new constituent interactions, such as conversion of algal death to BOD, denitrification, and dissolved oxygen (DO) change caused by fixed plant.

Based on the river characteristics as well as the model structure, the main stream and the tributaries were divided into many reaches. Each reach was then subdivided into uniform computational elements, which form the basis for model's finite difference numerical solution. The model was calibrated and verified using the water quality monitoring data during 1996–2004. The water quality parameters included in the model were DO and BOD. Using the input conditions, the model was run and the results compared to the field measurements. System coefficients were appropriately adjusted until reasonable agreement between model results and field measurements was achieved. The values of system coefficients were based on the typical values cited in the model documentation and some selected coefficients were calibrated. In order to predict water quality conditions under different ambient weather and flow condition, the water quality was modeled based on the different flow frequency. The modeling results shown that, the QUAL2K model was suitable to simulating the water quality in large river system.

Photodegradation of Sulfonylurea Herbicides in Aqueous Solutions under Natural Sunlight

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Abstract: Photolysis of Sulfonylurea herbicides (Thifensulfuron methyl (Thifen), Metsulfuron methyl (Met) and Ethametsulfuron methyl (Eth) in aqueous solutions were studied under natural sunlight at the concentration of 0.75 to 3.33 ppb. All herbicides investigated were degraded in about 42 days. The experimental data fit pseudo first-order kinetics with kinetic constants ranging from 0.04 to 1.40 $days^{-1}$ and half-lives ranging from 5 to 16 days. The loss of each herbicide in controls resulting from hydrolysis was found to be 13 to 60% during 126 days of the experiment. A separate photolysis experiment using Halogen Aluminum Reflector as a light source (400 to 700 nm) was also performed. Under the latter wavelength conditions, no photolysis was observed in 33 days of the experiment period. Work is continuing to see whether the rapid photolysis observed under natural sunlight extends to natural prairie waters.

Pretreatment of coking wastewater using anaerobic sequencing batch reactor (ASBR)

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Abstract: The coking wastewater includes many pollutants such as ammonia, cyanogen, phenol, naphthalene, pyridine and quinoline ect, which may cause severe contamination to the environment and also threaten the normal life of human beings. Unfortunately, these pollutants are recalcitrant to biodegradation under aerobic conditions.

A laboratory-scale anaerobic sequencing batch reactor (ASBR) was used to pretreat the coking wastewater at a constant temperature of 35℃. The ASBR was seeded with anaerobic granular sludge that was cultivated with synthetic wastewater containing sucrose. After 225 days' acclimation, anaerobic granular sludge was essential to induce the microorganism adapting to the coking wastewater without the disintegration of the granular biomass activity. And then, the biochemical methane potential (BMP) of coking wastewater was measured with the acclimated granular sludge. The BMP assay indicates that 0.165 m^3 CH_4 was producted per Kg COD in coking wastewater at anaerobic condition. This result showed that the maximum methanization of the coking wastewater in the anaerobic condition was 41.9%. At the same time, some fundamental technological factors, such as the filling time and the reacting time ratio (T_f/T_r), the mixing intensity and the intermittent mixing mode, that would affect performance of anaerobic pretreatment were evaluated through orthogonal tests. The COD removal efficiency reached 38-50% in the stable operation period with the organic loading rate of 0.37-0.54kg COD m^{-3} d^{-1} at the optimal of T_f/T_r, the mixing intensity and the intermittent mixing mode were 0.5, 0.025 L (biogas) L^{-1} (reactor volume) min^{-1} and 100 s/45min respectively. After the pretreatment of ASBR, the biodegradability of coking wastewater had a distinct improvement and the ratio of BOD_5/COD increased from 0.27 in influent to 0.58 in effluent. In the end of experiment, the microorganism forms in the granulated sludge in ASBR were observed using the SEM (Scanning Electron Microscope) and fluoroscope. The results showed that the dominant microorganism on the granular sludge was *Methanosaeta* other than *Methanosarcina* that dominated on the inoculated sludge.

Keywords: Anaerobic sequencing batch reactor (ASBR); Coking wastewater; Anaerobic pretreatment

The Effect of Trace Metal Elements on Coking Wastewater Treatment Using ASBR

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Abstracts: The pollution caused by the coking wastewater has been a severer environment problem in China as coal is the main energy resource. And China is a big country of coal production and consumption. Coking wastewater is generated in the coal gas purification and by-product recovery processes. The discharge of the coking wastewater has cause severe contamination to the environment and also threatens the normal life of human beings as many compositions have been reported mutative and carcinogenic. Therefore, it is necessary to treat the coking wastewater for reducing its harm to environments. The treatment of coking wastewater using anaerobic sequencing batch reactor (ASBR) was conducted at 35℃with the addition of general amount of trace elements in this study. Generally it is necessary to add trace metal elements besides of nutrients of N and P in anaerobic wastewater treatment, as there were short of Fe, Co and Ni and other trace elements for many wastewaters. At the same time, the addition of trace metal elements will be a large cost in field scale anaerobic wastewater treatment. But as a specific wastewater, it can save the cost of the addition of fewer trace metal elements when the treatment of coking wastewater was using ASBR. Although the addition of proper trace elements to the anaerobic reactor has positive effect on the anaerobic treatment of coking wastewater, too much or too little of it will have negative effect. It is necessary to assay the optimal addition of trace metal elements to either enhance the anaerobic treatment efficiency or save the cost of addition trace metal elements. The optimal addition of trace metal elements was conducted in this research, and the effect on the coking wastewater was evaluated at the same time. The results indicated that the optimal addition of trace metal elements was 60% of general standards trace elements. In the condition of the addition of 60% of general trace elements into ASBR reactor, the COD removal rate could reach 67.8% (higher than 45.3% of average COD removal rate with the addition of general standard trace metal elements) and had a high biomass remain in the reactor. But when there were only 20% of general standards trace elements added into the ASBR reactor, the COD removal rate was just low as about 20% and there was a decrease of biomass in the reactor.

Keywords: coking wastewater; anaerobic digestion; trace elements

Research on Ecological and Environmental Water Demand and Sustainable Water Management of Region

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Abstract: With the rapid urban population increasing and the pollution and requirement of socio-economic development, the limited water resources in the aspect of water quantity and quality all will restrict the environment and ecological circumstance improvement of city to some degree. And it is necessary to allocate a certain ecological and environmental water demand in order to maintain the better compound ecosystem balance and sustainable development of society. In this paper the typical large city in the downstream of Yangtze River is taken as research object, and its total ecological water demand and environmental water demand was calculated separately. According to the ecological balance theory and water environmental capacity theory the city water requirement of industry, agriculture and ecological water and so on were reallocated reasonably. At the same time a series of technical water conservancy measures and management system were preferred to overcome the problems of water scarcity and better water quality.

Key words: water demand, ecological, environment, city, management

Rough Analysis on Water Quality and Pollutant factors under Unascertained information

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Abstract: Pollutant factors of water quality for rivers and lakes and relationships of them are the key factors for water pollution control.Traditional theories based on ascertained maths are not appropriate to deal with them because they are belong to unascertained information. The rough set theory as a new technically maths tool can analyse and mine unascertained information from water pollutant factors. And the maths model based on rough set theory is put forward in this paper to calculate the important coefficients of pollutant factors and to discover hidden datum from them. It is important to improve water quality of polluted rivers or lakes. Then this maths model is applied to analyse the water quality datum of Chaohu Lake, it shows that the pollutant factors such as TP and COD are the most important factors which describe correctly the contaminated degree of Chaohu Lake. And it also point out that the future study of Chaohu Lake should be focused on reducing concentration of TP and COD to improve water quality in it.

Key words: rough set theory; unascertained information; pollutant factors; the contributing rate

To control the polluted water. To raise the quality of water. To reduce nasopharyngeal cancer rate of the Pearl River Valley residents.

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Abstract: It is clear that hydropower resource's development is only one department of a unified plan for full development and improvement of the Pearl River Valley. But it also is correct, the first work to supply full of electric energy, workshops increase, some workshops have equipments to control the polluted water. The second to be concerned about, in winter season, the tide flow may be reach Zhaoqing city, and the tide level can be reach Guangxi Autonomous Region Wuzhou City. The polluted water goes and backs, it can't all empties into the South China Sea. Many years, in Gangzhou City and the Pearl River Delta waterway network area, residents like drinking bottle's distilled water. To raise the quality of water varied more important. In the Pearl River Delta waterway network area, there are high rate of nasopharyngeal cancer. Is the river polluted by the glaze which is used on potterys.Or the Hejiang water has been polluted ? Does need us to plan it again? Hemianshi major reservoir has total storage capacity of 0.3 cubic killmeter. Does it apply chemical medicine in its water? Copper ore matachite is poison. It must be to study and research. A word , health of people is the most important thing. Four years ago, the West River Bright Pearl great dam site is settled in Wuzhou city. The distinctive achievements are done by ministers of Pearl River Water Conservancy Commission.

Combined treatment of Landfill leachate and Fecal supernatant with Sequencing Batch Reactor system

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Abstract: A study was undertaken to examine the feasibility of biological treating a mixed waste water of landfill leachate and municipal fecal supernatant with a sequencing batch reactor (SBR). The mixed water of landfill leachate and municipal fecal supernatant containing high concentrations of ammonia nitrogen and phosphorus. A laboratory-scale SBR was used to carry relative performance evaluations of biological treatment of the waste water. A laboratory-scale SBR was used to carry relative performance evaluations of biological treatment of the waste water. The SBR was operated in daily time scales employing the following sequential operation phase: fill/ react period, anoxic period, aeration period, settling period, draw and idle period. During the aeration period, Dissolved Oxygen (DO) concentration was controlled between 0.5-2mg/L in the initiatory 6 hours, and DO concentration was controlled between 0.2-0.5 mg/L in the posterior 12 hours. The results indicated that the SBR system was capable of COD_{cr}, BOD_5, TN and NH_4^+-N removal, high removal efficiencies of COD_{cr}, BOD_5, TN and NH_4^+-N were achieved in the SBR system. The average removal efficiencies of COD_{cr}, BOD_5, TN and NH_4^+-N were 93.76%, 98.28%, 84.74% and 99.21%, respectively. However, poor removal efficiency of total phosphorus (TP) was achieved in the SBR system. Furthermore the concentration of nitrate in the effluent was still high. Through analyzing alkalinity and biodegradation carbon consume in the system, nitrogen removal in the system had been testified more than via the avenue of traditional nitrification and denitrification. The benefits from the system were the saving of (i) an external carbon for denitrification and dephosphatation, (ii) a reactor for simultaneous nitrogen and phosphorus removal.

Keywords: SBR, leachate, fecal supernatant, nitrification, denitrification

Optimal Search Method of the Water Pollution Accidental Source

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Abstract: When the river basin happen pollution accidents, it is much important and necessary to find out the accidental source of pollution. But we usually know nothing about the accidental source of pollution after several days because of the less monitoring efforts and the secluded source. Now it only takes water routine-monitoring in cross section of river for most cities and counties between which the distance is from tens kilometers to more hundred kilometers, so the monitoring method for searching the pollution accident source is to descry the possible source of pollution mostly by the eye to choose the probable target, then set the monitoring position in the lower reaches of a river of this probable source.

Now there is none of research on the search of the accidental source of pollution by mathematics method. The aim of search theory is efficiently find the target in search operations. In order to maximize the probability of detecting the accidental source of pollution during a fixed time, the optimal allocation of searching effort is studied.

The pollution affairs of river basin are taken place by many reasons, so there are a large number of searching problems by the difference of monitoring efforts, the distribution of pollution source and the type of pollution source. The focus of the paper is on an ideal problem in which the target is stationary and the affair is caused by the normal pollutants. The problem of optimal search is to find the pollution accident source which located at one region in the river *J* subject to a fixed constraint on effort. The model is built with the following assumption: the detecting is randomly and independently but uniformly distributed in these sources; no effort falls outside the search region; it is equiprobable for the accidence being one of these sources in the cell. The optimal search model is made of a target distribution, a detection function and the constraint. Then using of Lagrange multipliers and maximization of Lagrangians to find optimal search plans which maximize the probability of detecting the water pollution accident source subject to the constraint on time.

The optimal allocation constructed there can only be realized in an ideal state, but it is the basis for other accident pollution source-search that to approximate the optimal allocation. The following research can consider: the search for discrete effort, the sequence search of target and so on.

Keywords: accident source, search theory, optimal search model

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Removal of iodide contaminants by calcined layered double hydroxides

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Abstract: Radioactive iodide is widely used in biological experiments, medical treatments and in diagnosis. And during fission of uranium several iodine species are also produced. Iodine is one of the nuclides causing most concern among radioactive anions. ^{129}I is especially considered as one of the key radionuclides that dominate the long-term radiation in underground radioactive waste stores. Significant treatments need to be taken when disposing of radioactive waste containing radioactive iodine into the environment, because radioactive iodine is harmful to human body for readily absorbed by the body. Different adsorbents such as zeolites, anion exchange paper membrane, activated carbon and activated carbon fibers, have been investigated as potential materials for elimination of iodide from liquid wastes.
In the present work, Calcined layered double hydroxide (CLDH) as a potential adsorbent to remove iodide contaminants was conducted in batch mode. We explore the effect of various factors on the removal of iodide contaminants using batch method. The adsorption phenomenon is explained by means of X-ray diffraction, FT-IR spectroscopy and TG-MS measurements. The results reported here demonstrate the potential applicability of CLDH for environmental cleanup.

Keywords: layered double hydroxides; calcined; removal; iodide; memory effect; contaminants

Factors influencing the removal of chloride ion from wastewater by calcined layered double hydroxides

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Abstract: Layered double hydroxides (LDHs) are anionic clays with high anion exchange capacities which are effective adsorbents for removal of a variety of anionic pollutants. The chemical composition of an LDH can be described by the formula $[M^{2+}_{1-x}M^{3+}_{x}(OH)_2]^{x+}(A^{n-})_{x/n}\cdot mH_2O$, where M^{2+} and M^{3+} are metal cations that occupy octahedral sites in the hydroxide layers, A^{n-} is an exchangeable anion, and x is the ratio $M^{3+}/(M^{2+}+M^{3+})$. Carbonates are the interlayer anions in naturally occurring hydrotalcite. The thermal decomposition of layered double hydroxides (CLDH) leads to mixed metal oxides, which are characterized by high specific surface areas, homogeneous dispersion of metals. The CLDH has also been demonstrated to reconstruct their original layered structure after adsorption of various anions, and is therefore good ion exchangers/adsorbents for removal of toxic anions from aqueous /contaminated water.

Waste water containing chloride ions is often discharged from landfills and in addition, certain industries such as tanning, pickling, and seafood canning also discharge salty wastewater from their manufacturing processes. The high salt content in the wastewater can pose problems in treatment systems particularly in biological units, and can give rise to corrosion of waste pipes, scaling, or crop damage. Desalting treatment of this waste water by electrodialysis has been carried out recently although there are some unresolved problems such as the existence of K^+ in the resulting dried salt.

This work employs calcined Mg-Al-CO_3 LDH (CLDH) to remove chloride ion from wastewater, utilizing the reconstruction of their original layered structure in the presence of appropriate anions. The influences of CLDH structures, dosage of CLDH, initial chloride ion concentration, temperature and co-existing anions on the removal of chloride have been investigated, respectively. It was found that the LDH with an Mg/Al ratio of 4 calcined at 500^{o}C had the highest capacity to remove chloride. The uptake capacity of CLDH increased with increasing dosage of CLDH, but decreased with increasing initial chloride concentration. It was found from the temperature effects that the uptake capacity decreases with increased temperature, which shows that the uptake process is exothermic in nature. The data of chloride removal fitted well into the linearly transformed Langmuir equation. Thermodynamic parameters such as ΔG^0, ΔH^0 and ΔS^0 were calculated. The results reported here show that these factors affect the uptake of chloride and are significant towards a better understanding of the potential application of CLDH for dechlorination from wastewater.

Keywords: layered double hydroxides; calcined; removal; chloride; memory effect; wastewater

The interaction of groundwater quality and *Populus euphratica* forest to intermittent water delivery in the lower reaches of Tarim River, Northwest China

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Abstract: The groundwater chemistry was studied during four times eco-water transferring in the lower reaches of Tarim River in this paper, and the spatio-temporal variations of total dissolved solid (TDS) in groundwater was revealed, The spatial variations of TDS showed: that the first time of water delivery affected groundwater chemistry within 250m to watercourse, and extended to 450m after the second time. The TDS at 750m to watercourse started to react after the third time water transferring. The scope of groundwater chemical characteristics affected by intermittent water transportations limited 1000 m to the watercourse after five times water conveyance, the farther to the watercourse the less in change. The temporal variation of groundwater chemical can be divided into three stages: initial stage-increase in TDS; intermediate stage-decrease in TDS, and increase in TDS once more at late stage. The mechanism of TDS in groundwater and the factors impact on the variation of salinity in groundwater were also analysed. Furthermore, *Populus euphratica*, the dominant vegetation in the lower reaches of Tarim River responded greatly: the amount of new leaves, leaf weight, length and width vary much impacted by water delivery, and their spatial variations show a similar regulation to that of the groundwater quality. Because the period of *Populus euphraticaa* seeds from ripe to sprouting is quite a short time and the young forests require high quality groundwater, so the time of water conveyance should meet the time of *Populus euphraticaa* seeds ripe and sprouting, the interval of two times of water conveyance is the shorter the better.

Research on the Non-point population control based on various land-use types

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Abstract: Human's land-use activities is the mostly cause of non-point pollution. Various land-use activities and managements will lead to soil erosion and nutriment loss with surface runoff, which will cause large-area non-point pollution of watershed. Forecasting the relationship between land-use type and non-point pollution, analyzing the contribution of various land-use types to the non-point pollution load and puting forward the land-use types and management modes of optimal economic output is important to control the non-point pollution, improve the water quality of watershed and keep the balance between the economic and the environment. Taking Heihe river watershed as an example, Using the SWAT mode by GIS software, the relation between land use of different hydrologic echo unity and non-point pollution is built up. Taking the water quality standard of watershed as the restrictions and using the linear programming and optimum method of eco-economic structure, the optimal design mode of land-use types is set up, and the best land use management mode to control the non-point pollution is put forward. This study provides references for the other watershed in non-point pollution control research.

Classification-based Flood Forecasting Model by Artificial Neural Networks

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Abstract: Flood forecasting is a vital part for flood control and water resources managements of catchments. It is well known that the relationship of rainfall and runoff appears very complicated, and for a basin, its native response in rain periods is quite different from those in non-rain periods. So in rainfall-runoff simulation, it is often difficult for modeler to face the challenge of considering different response simultaneously. In this study, we explore the applicability of two models to divide different catchments behaviors for three-hours ahead flood forecasting. One is Fuzzy C Means method coupled with a Multi-layer Feedforward Network (FCMMFN), and the other is the Self-Organizing Feature Map(SOFM) coupled with a Multi-layer Feedforward Network(SOMMFN). Fuzzy C Mean and SOFM are used in data classification. Firstly antecedent precipitation and streamflow data is classified to four stages: (1)low flow, (2)rising flow, (3)flood peak, (4)recession, which appear in different rainfall periods. Then, for each stage, a Multi-layer Feedforward Network(MFN) is applied to simulate its rainfall-runoff relationship. Forty-five historical flood processes from 11 years in the Wangjiachang Reservoir are applied for calibration whilst 14 flood processes happening in recent 3 years are utilized for validation. Results of this study show FCMMFN and SOMMFN are both superior to MFN, which demonstrates the classification preprocess of data will help to improve forecasting accuracy. Moreover, FCMMFN and SOMMFN are investigated and compared in terms of model prediction efficiency coefficient, relative error and absolute error.

Keywords: Artificial Neural Networks, Fuzzy C Mean, Self-Organizing Feature Map, Flood forecasting

Experimental study on constructed rapid infiltration for slightly polluted water quality improvement in Reservoir

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Abstract: Land treatment systems are capable of achieving removal levels comparable to the best available conventional wastewater treatment technologies with some additional benefits such as recovery and reuse of wastewater. On the base of land disposal, the paper presented using constructed rapid infiltration （CRI）to improve slightly polluted reservoir water. Constructed rapid infiltration is one kind of land treatment systems, which consisted of an inlet pipe, infiltration basin and outlet pipe. The infiltration basin was filled with sand （d_{eff}=0.21mm）in 1m by 1m,1m deep. Two replicates were performed. Sand was obtained from potential effluent recharge sites in Beijing. Slightly polluted reservoir water was taken from Sanjiadian Reservoir, which was the access of Guanting Reservoir to Beijing. The constructed rapid infiltration system operated for 190 days from summer with high temperature to winter with low temperature, under alternating wet/dry conditions. Water quality parameters included COD_{Mn} and NH_4^+-N. The experiment indicated that the average removal rates of COD_{Mn} were 42% in summer and 23% in winter, respectively, as the hydraulic loading was 0.15~4.0m/d. The main factor affecting the removal efficiency of COD_{Mn} was the microbial activity, which decreased when the temperature dropped. Removal of COD_{Mn} was not significantly different with the increase of hydraulic loading in summer, but evidently lowed in winter. The change of NH_4^+-N was not obvious with the lowering of water temperature and the increase of hydraulic loading. The average removal rates of NH_4^+-N were 65% in summer and 60% in winter, respectively, as the hydraulic loading was 0.15~4.0m/d. The study results indicated that the constructed rapid infiltration system had better purification effect on COD_{Mn} and NH_4^+-N of the slightly polluted raw water. The system could still operate normally at low temperature in winter, however, in order to assure the removal effect, hydraulic loading need to be reduced. Constructed rapid infiltration is a preferable choice for slightly polluted raw water pretreatment.

Urbanization and green-planting impacts on regional summer precipitation in megacity--Beijing

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Abstract: According to the fact that summer serious rainfall event is the most predominant factor to the annual rainfall amount and its distribution in Beijing, and serious rainfall near Miyun water reservoir has important contributions to the total water resources budget of Beijing and its climatic variation, We summarize the above relationship as: Water resources -> atmospheric water resources -> rainfall -> serious rainfall weather events -> summer serious rainfall. And then investigate the statistical relationship between regional precipitation and rapid urbanization of Beijing. Thirdly, under different urbanization and green planning schemes that are designed based on the 1980-2000s' underlying surface data with 500'm resolution in Beijing, and two green planning schemes(annular and cuneiform) for 2010 years, 24hrs numerical simulation of Aug. 18-19 2002 with typical precipitation pattern similar to summer precipitation climatically, utilizing the 10/3.3km two-domain two-way nested MM5V3.6 coupled with Noah LSM, are conducted to indicate the influence of landuse change of megacity--Beijing on regional summer precipitation, respectively. Results show that, due to the important interaction and mass and energy exchange between land surface physical process and synoptic system, the underlying surface change and future green planning all play distinct impact on the intensity and center position of rainfall. The maximum relative difference of precipitation reaches up to 30-40%, and distribution difference can be extended over 50km. especially, the underlying surface extending resulted from rapid urbanization plays positive impact factor on the total precipitation decrease, hence it is disadvantage to mitigate the arid and water resources shortage of Beijing. Above numerical results are quite consistent with those climatic analyses statistically from 1980-2000s' data. Furthermore, numerical experiments also show that green-planting is helpful to enlarge rainfall, green styles (grass or tree) play more significant impact on precipitation relative to planning schemes (annular or cuneiform).

Key words: Land surface physical process， Urbanization， Green planning， Water resource， Numerical simulation

Changes of Pollutants in Wastewater Treated with Constructed Wetlands

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Abstract: There are many researches concerning about wastewater treated with constructed wetlands in the world. EPA has established the manual of constructed wetlands treatment of municipal wastewater, and introduced the free water surface wetlands and vegetated submerged beds. In China, the vertical flow constructed wetland originated from Chinese Academy of Science got broad application. There are many engineering examples about the design, implementation and management of vertical flow constructed wetlands, but issues such as changing of pollutants in the vertical flow constructed wetlands needs to be solved. In the current experiment, the question was discussed. The results showed that the four vertical flow constructed wetlands had a great capacity to remove various contaminations in sewage. Among three chosen species of plants, the effect of *Juncus effuses* to get rid of pollutants in wastewater was better than *Canna generalis* and *Typha angustifolia*. Moreover, the removal of phosphor was better than the other contaminations. The accumulation of organic matte in the root system of *Juncus effuses* was distinct and up to 3.264mg/g. The content changing trend of organic carbon was similar to the organic matter's content changing. During the total course of experiment, the nitrifying in the constructed wetlands was intense, and ammoniacal nitrogen had been transformed into nitrate nitrogen, which led to the increasing of nitrate nitrogen. The removal of total nitrogen was inefficient. The transferring of ammoniacal nitrogen and nitrate nitrogen in multi-medium system consisted of the wastewater body-substrate- plant root was complicated. In wastewater, it appeared that the content of ammoniacal nitrogen decreased and the content of nitrate nitrogen increased, on the contrary, content of ammoniacal nitrogen increased and nitrate nitrogen's content decreased in roots of *Canna generalis,* in addition, the content of ammoniacal nitrogen and nitrate nitrogen both decreased in substrate. Nitrifying and denitrifying in the system were coexisted. Ammoniacal nitrogen and nitrate nitrogen had been transferred from one to other. In sum up, the complex changing of nitrogen and other contaminations in vertical constructed wetlands should be studied in future.

Keywords: pollutant; constructed wetland; nitrogen; organic matter; removal

Application of EFDC-WASP modelling system in water pollution control: A case study in the Nansha River

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Abstract:.Water pollution is serious in the Nansha River of Haidian District, Beijing, which is owing to domestic and industrial wastewater discharges. In order to control pollution and rehabilitate water environment of the river system, 4 water pollution control scenarios of planning year 2020 were proposed for decision-makers to finalize the control scheme. Using integrated EFDC-WASP modelling system, water quality scenarios of the Nansha River were simulated and compared under different pollution control scenarios. Thereinto, EFDC was applied to simulated hydrodynamics of the river system, and simulated hydrodynamic data was used as input of WASP to simulate water quality variation in the river. Observed water level and water quality datasets were applied to calibrate hydrodynamic and water quality parameters of the EFDC-WASP modelling system through trial and error method. The water quality items of dissolved oxygen (DO), chemical oxygen demand (COD), ammonia nitrogen (NH_3-N), total nitrogen (TN) and total phosphorus (TP) were simulated and water quality effects of different scenarios were compared, the better water-environment-friendly pollution control scheme was recommended. In the meanwhile, water environmental capacity of pollutants COD, TN and TP loadings were estimated for the river depending on recommended scheme. The simulations indicate that COD concentrations of all scenarios can meet national surface water quality standards of level 4 under predicted COD loadings. However, TN concentrations of all scenarios cannot meet the standards for more than 10 months in a year, which indicates that the TN loadings into the river is too large. TP concentrations of all scenarios also cannot meet the standards from December to May in a year, because it is in drought in Beijing during that period and the low stream flow of the river does less help to the decomposition of pollutants. The results of water environmental capacity showed that capacities of TN and TP are smaller than their predicted pollutant loadings in 2020 respectively. It is impossible to achieve current water quality objective of level 4 for TN and TP, and function zoning adjustment of water environmental quality was suggested for the Nansha River system.

Key words environmental fluid dynamics computer code(EFDC); water quality analysis simulation program (WASP); water environmental capacity; water pollution control

Removal of Nitrogen and Phosphorous in a Surface-flow Constructed Wetland

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Abstract: A small-scale constructed wetland (CW) was built up in order to investigate the nitrogen and phosphorous removal from domestic wastewater. This CW located out door, which consists of three tanks filled with artificial porous materials. Wastewater was pumped to the first tank and then followed to the other two tanks by gravity. All three tanks are in length of 1m and width of 0.7m. However, the depth of the first tank is 1.5m, while the other two tanks are 1.2m in deep. In order to examine the role of plants in nitrogen and phosphorous removal, another tank with the size of (0.5 x 0.5 x 0.6m) was used as blank. The experiments were conducted from beginning of April to end of July in the year 2004.

Artificial wastewater was made by adding sugar, KH_2PO_4 and carbamide into tap water. The influent CODcr, NH_3-N, PO_4^{3-} concentrations are 200 mg/L, 10 mg/L, and 1-2 mg/L, respectively. After treated by three tanks, and 91% of CODcr, 85% of total nitrogen and 91% of total phosphorous were removed from wastewater, respectively, which showed promising treatment performance.

In order to examine the role of plants on pollutant removal, a comparison was made between blank tank and planted tank. Results showed that, in blank tank, only 50% of CODcr, 27% of total nitrogen, and 43% of total phosphorous were removed, while in the planted tank 73% of CODcr, 54% of total nitrogen, and 75% of phosphorous were removed, respectively. Plants exists in the treating system can improve the treatment efficiency approximately 1.5 to 2 times.

As the winter temperature of north China is quite low compared to south China, a further experiment was conducted to examine the winter running performance of such a constructed wetland. Without any heating facilities, the system was operated from beginning of September to end of December in 2005. During the running period, no obvious change in removal efficiency was observed. Even at high level of influent concentrations (CODcr 400 mg/L, total nitrogen 30 mg/L and total phosphorous 4-5 mg/L), the average removal efficiency were kept above 94%, 73%, and 96%, respectively. While a slight decrease in total nitrogen removal was found. Which may resulted from the sensitivity of nitro- and nitroso-bacteria.

Keywords: Nitrogen and phosphorous removal, surface flow constructed wetland; domestic wastewater treatment

. **CATTAIL.** Typical varieties: *Typha angustifolia*, **BULRUSH.** Typical Varieties: *Scirpus acutus*

Hydrolysis Acidification-Membrane Bioreactor Process for Ramie Degumming Wastewater

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Abstracts: The paper introduced some experiments on ramie degumming wastewater treatment by membrane bioreactor (MBR). The results showed that the ramie degumming wastewater could be well treated by hydrolysis acidification-membrane bioreactor process.
The removal efficiency of COD through hydrolysis acidification was between 10%~35% and NH_3-N was 20%~35% when HRT was 24h. In addition, the process could provide suitable environment for degradation of lignin. In MBR stage, four operation conditions were investigated in different influent COD and ammonia nitrogen concentration in the reactor. In the experiments, the feasibility of MBR to treat ramie degumming wastewater, COD, NH_3-N removal efficiency and operation parameters were probed.
Through the experimental research, it was feasible and effective to treat ramie degumming wastewater using hydrolysis acidification-membrane bioreactor process. In addition, the average removal efficiency of COD and NH_3-N was above 80%.
Key words: membrane bioreactor (MBR), ramie degumming wastewater, hydrolysis acidification, membrane module

Research on the reserves of Sea Ice as the Potential Resource to Bring Freshwater to Areas around the Bohai Sea, China

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Abstract: In order to add to the reserves of the land freshwater, hunting for out new freshwater resources in the northern area of China has been the key basic theory and an issue of applied technique in the fields of resources science research, because at present the shortage of freshwater resources has seriously restricted the sustainable development of national economy and society in the area around the Bohai Sea. Owing to the fact that sea-ice salinity is lower than that of sea water far, sea-ice can be changed into freshwater at the lower cost after simple treatments. So it's possible to find new freshwater resources in order to deal with the lack of water in the northern area. And that adds to the total amount of freshwater resources. Therefore, Chinese researchers have boldly proposed the imagination of developing and utilizing the sea-ice of the Bohai Sea in recent years. There is no precedent yet in the world to study sea-ice in terms of practical utilization of resources. That also presents new contents and requests on sea ice research. As to the cognition, development and utilization of a new potential resource, we should first understand its characteristics, overviews and reserves, etc. In this paper, researches on the characteristics of ice status in the Bohai Sea, the methods to measure sea-ice resource reserves, the characteristics of sea-ice reserves etc. are made and the conclusions are as follows:

1）Ice ages and thickness are different during the years, and also different to some extent in different sea area.

2）The amount of sea-ice resources is connected with the area and thickness of sea-ice. In respect to the nature correlated with the reflection and transmission of the shortwave radiation energy of the sun by sea-ice in the Bohai Sea, new theories on the absorption of sun shortwave radiation energy by sea-ice and the reflection by sea-ice relevant to thickness are set up and a new inversion algorithm of sea-ice thickness is proposed in this paper. Based remote sensing data, the total amount of sea-ice resources can be calculated finally by applying GIS technology to combine the data of sea-ice thickness with those of sea-ice distribution.

3）The resource amount of sea-ice is 3.815×10^9 m^3 in normal ice years and 0.842×10^9 m^3 in light ice years in Liaodong Gulf, and the theoretical resource amount of sea- ice will be $0.271\text{-}1.892\times10^{11}$ m^3 and $3.115\text{-}4.715\times10^9$ m^3 respectively. The amount of sea-ice resource in Liaodong Gulf is characterized with the disparity in space distribution, namely that the resource amount of sea-ice of the east coast exceeds that of the west coast. In normal ice years, the resource amount of sea-ice within the range of 10km off the east coast accounts for about 11%-17% while within the range of 10km off the east coast about 21%-28% of the total amount, but within the same range off the west coast about 4%-13% and 10%-27% respectively.

The Study of Reclamation of Wastewater in IWRM

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Abstract: Water resource is essential natural resource of relatively scared quantity in 21st century. Water, which is the important strategic economic resource in economic development, is an important part of the comprehensive national power. The main problem of water resources management in China is the exacerbating contradiction between the increasing population and the relatively scared water resources. There is severe phenomenon of water resources wasting. And the problem of water pollution hasn't been resolved. IWRM is becoming the scientific water resources management model in the world. The use of substitutable water resource is a good way to resolve the problems above. This paper enumerates real substitutable water resources and dummy water resources. The key-point of the paper is wastewater reclamation. The condition of wastewater reclamation in the world is presented and the private opinion of wastewater reuse's impact on water saving is also mentioned. Wish water resources management to get benefits from wastewater reclamation.

A study on hydrological effect of soil under different subalpine forests on east slope of Gongga Mountain

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Abstract：Soil is the key function horizon of hydrology, and soil hydrological effect is one of key factors to study the spatial variability of water and runoff generation mechanism in watershed, at same time, it is the basic work to study the forest hydrology. In this paper，hydrological features of soils under different subalpine forests on east slope of Gongga Mountain in upper reaches of Yangtze River were studied．The results showed: (1) the water holding capacity of soil under different forests became worst from over mature forest to young forest; (2) the index of soil hydrology effect changes with soil depth，the change extent was young forest>mid-age forest>mature forest>over mature forest; (3) hydrology effect of soil unit depth was over mature forest>mature forest>mid-age forest>young forest；(4) soil hydrology effect is affected by soil depth besides its characters，the indexes of unit depth of soil under over mature forest and mature forest were better than that of young forest and mid-age forest，but their total hydrology effect index was lower except of natural storing water amount since the thin soil horizon in the high altitude．
Key words: Gongga Mountain; woodland; soil hydrological effect

The study of water resource carrying capacity and sustainable utilization of Changchun city

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Abstract: Changchun is one of the fifty cities that water deficiency is serious in China. The contradiction of water between supply and demand is greatly. The paper takes the relationship of water supply and demand as the gist to weigh the water resource carrying capacity. Based on the existing data, we analyze the trend and the main causes of the water resource carrying capacity. After comparing the result of correlating analysis with the one of factor analysis, the production value of industry and the population are selected as the two main factors. Then, using the multi-regression model, we predict the supply and demand state of water resource in Changchun city. Based on the potency of water resource and the state of water resource exploiting, we also present feasible suggestion for the sustainable development of Changchun water resource.

Link the impacts of human activities on water quality and hydrology in river system of Poyang Lake watershed, China

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Abstract: Poyang Lake watershed mainly consists of Poyang Lake, its five sub-watersheds and the river system. Its wetlands, the largest bird habitat in Asia, play an important role in biodiversity and ecologic protection. With the rapid economic growth, urbanization and extensive agricultural actives, the river system in the watershed, which finally discharge into Poyang Lake have been subject to dramatic changes and face many environmental challenges. And, thus, endanger internationally recognized Poyang Lake wetland. To better understand the environmental and hydrological changes of the river system in the Poyang Lake watershed, we apply RS techniques and statistical methods in a study of the characteristics and process of surface water of Poyang Lake watershed.

In this study, satellite images (Landsat TM, ETM+ and Terra MODIS) from 1990, 2000 and 2004 were acquired for the entire watershed. The land uses in the watershed were classified as agricultural land, urban, wetland, forest, grassland, bare soil, and water body using a combination of supervised and unsupervised classification techniques. Data for water quality and river hydrological parameters such as Total Nitrogen (TN), Total Phosphorus (TP), runoff and Suspended Sediment Concentration (SSC) were collected from related department.

A good indicator reflecting human activities is Human Use Index (HUI), which is defined as the total areas of urban, agricultural and bare soil in land use classification. In order to examine the relationship between human activities and water quality, percentage of HUI was regressed against TN and TP concentration, respectively. The results indicate an initial increase in TN concentration as percentages of HUI increase and then remains unchanged. The regression of TP shows similar trend as TN.

In order to identify the impacts of different land use types on river hydrological characteristics, runoff and SCC were regressed against percentages of various land use types. It was found that forest and grassland could significantly reduce runoff and SSC while land uses such as urban and agricultural could increase runoff and SSC.

The findings of this research reveal the effects of different human activities induced land use types on water quality and hydrology in river system and could be served as scientific foundations to guide watershed planning and river management.

Key words: RS, land use, water quality, hydrology, river system

Evaluation of Sediment Nutrients in Lake Taihu

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Abstract: Sediment organic matter(OM), sediment total phosphorus(TP) and sediment total nitrogen(TN) were evaluated for 583 sediment samples collected from different depths of 223 monitoring points in Lake Taihu during Oct.2002-Jan.2003. The maximum OM, TP and TN contents all appeared at the sediment surface layer. The average OM content was highest at the surface layer and lowest at the bottom layer. The average TP contents of all these six sediment layers were similar. The average TN content at the surface layer was obviously larger than those of the other layers below. From 1990s, according to data of previous five sediment surveys, at the surface layer, the average and maximum OM contents increased obviously; the average TP contents were similar, but the maximum TP content increased; the average TN content also increased obviously. Moreover, TP and TN contents were evaluated according to sediment quality guidelines in literatures, and relationships among sediment water content, OM, TP and TN were analyzed.
Keywords: Taihu Lake, sediment nutrients

A new distinguishing model of evolution of urban water environmental system

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Abstract: Based on the complexity of urban water environmental system，he system is regarded as dissipative structure.. And the water is defined as a sequential parameter to depict the system's sequence and evolution.. Urban water environmental system is the result of coordination of ecology, economy and social.. Applying to the complexity theory the dissipative structure and gray system theory，the distinguishing model which is a new method of research is successfully established.. In this paper the model is applied to describe the evolution of urban water environmental system in Xiangjiang basin,Hunan province. The result indicate that the magnitude of entropy show structure and direction of evolution of urban water environmental system. It provide a new basis of measuring.

Keywords: dissipative structure；gray relational entropy；evolution direction；rban water environmental system

PCBs, PCNs and PBDEs in sediments from the Qingdao coastal sea, the Yellow Sea, China

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Abstract: 50 congeners of polychlorinated biphenyls (PCBs) including 12 coplanar PCBs, 31 congeners of polychlorinated naphthalenes (PCNs), and 21 congeners of polybrominated diphenylethers (PBDEs) in surface sediments and a sediment core from Qingdao coastal sea were analyzed using HRGC-HRMS and GC-MS to investigate their spatial distribution, sources and toxicity equivalent quantities (TEQs). The maximum content of PCBs, PCNs and PBDEs are all occur near the Haibo River mouth. The total PCBs content in the sediments range from 0.35 to 32.9 ng g^{-1} dw (dry weight), dominated by lower chlorinated-CBs. The total PCNs contents are in the range of 212－1209 pg g^{-1} dw, dominated by tri-CNs. The total PBDEs contents are in the range of 117－5510 pg g^{-1} dw, dominated by hexa-BDEs. Except for the area near the river mouth affected by sewage sludge, an important source of PCBs, PCNs and PBDEs in this area is believed to be the atmospheric deposition. The local source of PCNs and PBDEs are likely from combustion and diffusion processes. The fluxes of the total PCBs and ∑TEQ (PCBs) have been decreased steadily since 1951.

Keywords: PCBs; PCNs; PBDEs; Sediments; fluxes

Flocculation of turbidity and organic matter in source water using chitosan

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Abstract: Chitosan, a deacetylated derivative of chitin, is a biodegradable cationic polymer. Chitosan can be a potential substitute for aluminum salts and synthetic polyelectrolytes in water treatment because it can: (1) avoid the health effects from residual aluminum (III) and synthetic polymers; (2) produce biodegradable sludge; and (3) reuse the crab shell. In this study, the chitosan flocculant behaviors and its effect of removing turbidity and organic matter in source water were studied firstly, and then the combined flocculation of chitosan flocculant and inorganic flocculant was tested. The results show that the chitosan has favourable coagulation behavior. But the optimum dosage of chitosan removing turbidity and organic matter is different, and each other cannot unite. So the optimum effect of turbidity and organic matter removal at the same time cannot be achieved by using chitosan alone. However, the combined flocculation can reciprocally promote their each coagulant behavior and remarkably enhance the effect of organic matter removal. More importance, the effect of turbidity and organic matter removal can be united. Comparing the effect of three inorganic coagulants (aluminium sulfate, ferric chloride and polymeric aluminium-ferric) combined with chitosan, the effect of chitosan combined with polymeric aluminium-ferric is best, under optimum conditions, the rate of removing turbidity, COD_{MN} and UV_{254} achieved 97％, 44％ and 55％ respectively.

Keywords: Chitosan; Combined flocculation; Polymeric aluminium-ferric; Aluminum concentration

Model trial of a rainwater collect system in Hang Zhou

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Abstract: Rainwater utilization by means of pipe-bound systems in private households, public buildings and industry, which is spring up at Germany in ninety years last century. The idea was to save valuable drinking water and not to use it for flushing toilets etc but to substitute it by collected rainwater. This paper describes a model rainwater collect system that has been constructed within a residential area. The system has been fitted with a monitoring system, which has been used to record the water delivered and to estimate the rainwater collected over approximately a 3-month period. The results are used to calculate the collection efficiency of the system compared to potential gains determined from local rainfall data. This data has also been used to calculate the revenue cost savings for this system. Finally, this paper considers the effects of alternative roof area and tank sizes on system economics. This shows that present tank is oversized and that savings could be made by specifying a smaller tank size or enlarging the roof area, and then reduced the total cost and made the system more economic.

Keywords: Model trial; rainwater collect system; storage tank; Economics

A research on nanometer TiO_2 photocatalysis degradation of organic phosphorus pesticide in water

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Abstract Plenty of organic phosphorus pesticide exceeded 2×10^5 ton was produced and employed in China every year. Pesticide cannot be treated effectively in many plants and was drained to the water, which brought pollution. Further more phosphorus pesticide, which got to water bodies through circulation, would cause public water quality pollution. Any study about treating organic phosphorus pesticide, especially which is difficult to degrade, is a significant problem. Using semiconductor photocatalysis to degrade organic contamination has received great attention recently. In this paper, study of using the anatasena nometer TiO_2 light catalyzer loaded on the fiberglass cloth to degrade the low concentration organic phosphor pesticide dichlorovos (DDVP) in aqueous solution was done. The results showed that the surface density of TiO_2 had great effect on the DDVP degradation. The best effect of DDVP degration can be gotten when the surface density of TiO_2 loaded was $17.5g/m^2$ (corresponding quality is 1.13g), and the degradation ratio was 85.22% on catalyzing reaction in 210 minutes under this condition. Through addition the H_2O_2 and O_3 oxidant in the system of nometer TiO_2/UV, the ratio of degradation improve greatly and the corresponding ratio can achieve 73% and 67% respectively in 60 minutes. Same experiment for other organic phosphorus pesticide was also done and the similar results were gotten.
Key words: TiO_2; photocalytic oxidation; organic phosphorus pesticide; degradation ratio

A design for monitoring the Quality and Quantity of Subsurface Drain Flow at a farming demonstration plot in HangZhou

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Abstract Groundwater pollution is of increasing concern because some of the drinking water comes from groundwater. Subsurface drainage water quality monitoring is useful for assessing the loss of agricultural chemicals to shallow groundwater because it gives more representative chemical leaching information from a larger area than point sampling methods. In this paper an automated flow data collection system was installed in a subsurface drainage system to determine discharge volumes and drainage flow rates. A test site was established by installing a subsurface drainage system on 16 plots, each of 0.5 mou at a farming demonstration plot in HangZhou, to measure subsurface drain flows and collect drain water samples for water quality analysis. Subsurface drains from individual plots were intercepted at the end of plots and routed to individual sumps to collect drain water. Flowmeters connected to individual sump pumps measured the volume of water pumped from these sumps. Electronic outputs of the flowmeters were recorded with data loggers, and readings of the analog registers were recorded manually. The data loggers recorded the time when each sump pump started and stopped pumping water. Data collected by data loggers were used to calculate drain discharge volumes and drain flow rates. This monitoring system was evaluated by comparing the drain volume rates between flowmeter readings and the data collected by data loggers for some rain events. Subsurface drain flow measured by the data logger system was not significantly different from the manual readings taken by the flowmeters. The data logger system was an effective method for measuring changes in subsurface drain flow rates over short time periods and drain flow response to individual rainfall events. This automated system was also used to monitor the movement of nitrate-nitrogen (NO_3-N) to subsurface drain water.

Key words: monitoring; water quality; subsurface drain flow; pollution

Assessment of HuaiHe river water quality in BengBu city

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Abstract Bengbu is a important city in AnHui province and the water quality problem has become a concern for the pollution of the HuaiHe river in these years. SO it is important to assess water quality in BengBu. In this paper in order to evaluate whether water quality problems are concentrated at a small number of chronically affected sites or whether the problems are widely distributed, we compiled 6 months of monitoring data collected at 29 sites, 11 of which are sampled daily. Other locally available rainfall and sewage spill monitoring information data were added to this data set to assess whether sewage spills, dryweather runoff, or wet-weather runoff contribute the most to exceedences of water quality thresholds. Approximately 11% of the river mile-days along monitored sites in BengBu exceeded the governing water quality standards during the 6-month study period. Most of the water quality exceedences occurred near urban runoff drains even though areas affected by drains represent only a small portion of the total river. Although storm is frequent in BengBu, the extent of water quality exceedances resulting from storm water runoff was similar to the extent of water quality exceedances found during dry weather. Sewage spills, while potentially more serious because they lead to beach closures rather than to the more limited posting of warning signs, represented less than 0.1% of the river mile-days that exceeded water quality thresholds. During dry weather conditions, most of the water quality problems occurred near five of the largest drains and at two beach areas that have unique physical characteristics, which limited mixing, dispersion, and dilution. During wet weather conditions, water quality problems were more widespread.

Keywords: assessment; water quality; pollution; coliform

The soil surface evaporation capacity is studied by the experiment in the oasis district

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Abstract: In testing in the field, the soil surface evaporation generally adopt by the microlysimeter directly to measure. And mostly formulas are gained according to the Penman formula revised in the relative research. As you know, these formulas are used to calculate the evaporation capacity about the wet area. As far as the arid regions, this formula is necessary to correctly calculate the soil surface evaporation. So then, The author, through the experiment research of two years, combine graceful Penman formula, draw one suited to calculating the soil surface evaporation in arid regions. Is it think soil moisture factor and meteorological factor to influence main factor of the soil surface evaporation, t examines and F examines indicating with, there are relevant relations of height between them.

The efficient way to solve the shortage of water resources

——The recycle of post treatment sewage

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Abstract: Among the three globe problems- population，resources and environment，the shortage of water resources is the most serious and urgent one．So does China．The recycle of post treatment sewage is an important measure approved internationally to solve the crisis of urban water shortage．But it has always been neglected in the process of exploiting water resources all over our country．In this article，the author expounds roundly the great significance of sewage water recycle，such as releasing the water shortage in urban area，improving water surroundings，industrializing sewage treatment，constructing the wealthy life in the round，and etc．After deeply analysis its feasibility，the author points out that the reuse of post-treatment sewage has many advantages，such as its practical feasibility，the maturation of its technique，its general benefit and its large potential market．The author emphasizes that the reuse of sewage is the key to the problems of water shortage in the new century，and its successful implement needs conjunct endeavor from all parts of our society．

Colleges and universities have become main water consumers in urban of our country．Middle water using technology is one of the important ways in sewage resource．The article ana1yzes the advantages of applying the reusing technology in campus construction and the feasibility and great quantity of water resources could be saved．

MBR(abbreviation of Membrane Biological Reactor)is widely used in domestic sewage treatment as a new kind of wastewater treatment method．This method is adopted in an intermediate water reuse project of a training center in Shen yang. The whole system keeps good running through setting the appropriate operating parameter. Its discharge water meets the reuse standard of intermediate water, which can be reused in many occasions．The process flow and main equipment for reclaimed water reuse project in depot of Beijing Metro were introduced．The operation result shows that the effluent quality reaches Beijing Reclaimed Water Quality Standard，and can be used for washing electric passenger train and irrigating greenbelt，etc.，with good environmental and economic benefit obtained. The application of sequencing batch reactor(SBR)to treat bathing wastewater in school is presented．This process has a high removal percentage in treating the C0D，BOD，SS and LAS in the bathing wastewater．The processed water can meet the reuse of urban recycling water quality standard for urban miscellaneous water consumption (GB／T18920—2002)and be used for 1avatory flushing in students’apartments．The designed SBR process is simple with low land demand and easy to manage．

Construction Theories and Application of Ecotype Riverbank

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Abstract: The technique that makes use of the engineering measure to protect riverbank is already a long time. The development of the revetment experienced four stages mostly, that is natural terrene riverbank, artificial-natural riverbank, hard quality riverbank, and ecotype riverbank. The ecotype riverbank has the ecology characteristic, landscape and penetrability of the nature riverbank, at the same time having the structure characteristic and stability of the hard quality riverbank .This paper presents the construction theories of ecotype riverbank based on hydraulic engineering, bioscience, ecology of environment and landscape engineering. Then, the design procedure is elucidated in details, which includes function investigation of riverbank, preparatory choice of riverbank material, calculation on hydrology and hydraulics, ascertain of construction types, prospective management and effect evaluation and so on. At last, the paper applies above-mentioned theories to the ecotype riverbank construction project of Fudu River in Dalian city and makes the brief evaluation to the engineering effect.

Key words: Ecotype Riverbank; Construction Theories; Application; Fudu River; Dalian City

Validity Study on Treatment of Pharmacy Wastewater with Membrane Bioreactor (MBR) Process

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Abstract: A study on treatment of pharmacy wastewater with membrane bioreactor (MBR) process was carried out using domestic hollow fiber membrane. The results showed that the process is effective on treatment of pharmacy wastewater with high COD and bad biodegradative. The MBR effluent quality match up to the first class of integrated wastewater discharge standard (GB8978-96). The results showed that suspended solids in MBR effluent was zero; the total count of bacteria was lower than the requirement of drinking water standard; the removals of COD and ammonia were higher than 95%. The effluent can be reused directly. The process effectively reduced the volume of Bioreactor and depressed construction cost, but the operation cost was higher due to the cost of membrane and the power consumption of MBR (1.0 $kW \cdot h/m^3$). Setting flocculation tank and floatation tank in former process is important to remove the bactericidal matter and oil. It can effectively prevent the oily damage on fiber membrane and improve the life of the membrane and lower operation cost.
Key words: pharmacy wastewater, biotreatment, MBR, Validity, floatation tank

Research on contamination flux of Qiantang River based on ADCP measuring

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Abstract: It is very significant to research the contamination flux of river profile to promote the trans-frontier pollution management. In this paper, based on SonTek Acoustic Doppler Current Profiler (ADCP), with the method of mobile Real-time monitoring, the contamination flux of key sections of Qiantang River in dry season has been measured. The method for ascertaining the contamination flux based on current discharge real-time monitoring has been groped. And the temporal and spatial distribution orderliness of the contamination flux of Qiantang River has been discussed.

There are 6 monitoring profiles in Qiantang River, which are Xin'an River factory, Lan River estuary, Yanlingwu, Zhai rivulet, Puyang River estary and Yuanpu. The measured discharge are 12.48 m^3/s, 171.16 m^3/s, 1020.58 m^3/s, 103.38 m^3/s, 33.34 m^3/s and 185.62m^3/s respectively.

The samples for water quality analysis are taken from the center of every river profile, orientated by GPS. Take 3 water samples in turn from surface to bottom in ever monitoring profile, the vertical positions of which are 0.5 m from the surface, middle-level of 1/2 water depth and 0.5 m from the bottom. The water quality indexs of COD_{Mn}, NH_3-N, TP, and petroleum compounds have been analyzed. The research shows that the maximum concentration of COD_{Mn} is in Yuanpu profile, which is 6.047 mg/l. The maximum concentration of NH_3-N and TP is in Lan river estuary, which are 0.8150 mg/l and 0.2070 mg/l respectively. The concentration of petroleum compounds is under the detecting limit (0.05mg/L).

According to the current discharge data obtained with ADCP and the contamination concentration data monitored, the contamination flux of key sections in Qiantang River has been calculated. The research shows that the maximum contamination flux is in Yanlingwu, no matter of COD_{Mn}, NH_3-N or TP, in dry season in 2005. And the minimum contamination flux is in Xin'an River factory. Dissect at length, the reasons come out that the Lan River contributes a lot to the contamination of Yanlingwu section, and the interception of the dams of lower reaches, such as Qililong water control project, has caused the pollutant accumulation in Yanlingwu profile. It is quite urgent to control the pollution in Lan River estuary and Yanlingwu section effectively.

Key words: Acoustic Doppler Current Profiler (ADCP), current discharge, water quality analysis, contamination flux of river profile

Effects of Land use on nitrogen export in Xitiaoxi typical sub-watersheds

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Abstract: This paper takes Xitiaoxi watershed in Taihu Basin as the study area. Using hydrologic modelling and spatial analysis extensions of Arcview3.2, the sub-watersheds were delineated and some typical sub-watersheds were selected. The land use data obtained from extraction of the TM/ETM image in 2000. Land use of the 11 sub-watersheds were analysed, these sub-watersheds were chosen to represent the upper, middle and lower reaches of Xitiaoxi River. The concentration of total nitrogen at each outlet of selected sub-watersheds was monitored in July, September and December of 2004. Runoff calculated by the relationship between precipitation and runoff in many years. Based on above dataset, the effects of land use on nitrogen export were analysed. The results showed, the intensity of nitrogen exports from each sub-watershed have great varieties. Land use/land cover changes have important impacts on nitrogen exports in Xitiaoxi Watershed. The intensity of nitrogen exports has more relationship with land use composition of watersheds and less relationship with areas of watersheds. The nitrogen exports increased with higher percent of cultivated land areas, and lesser forest areas percent.
Key words: Xitiaoxi Watershed; Land use; Export intensity

Content and variation of rare earth elements in the suspended sediments of the Zengjiang River, southern China

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Abstract: Measurements of rare earth elements (REEs), including scandium, yttrium, lanthanum, cerium, neodymium, terbium, dysprosium, erbium, ytterbium and lutetium of collected samples from water sampled in the Zengjiang River basin of South China were made on a 4 weeks basis from March 2002 to February 2003 by inductively coupled plasma-atomic emission spectrometry (ICP-AES). The effects of hydrological conditions, grain size, and organic matter content on the REEs content of the riverine suspended sediment were discussed. The REEs content in the riverine suspended sediment varied significantly with hydrological conditions. Under the condition of high water level, the REEs content in the riverine suspended sediment decreases while the concentration of riverine suspended sediment rises. The REEs content in the fine-fraction riverine suspended sediment is greater than that in the coarse-fraction, with the exception of terbium and erbium. The most of REEs contents varied positively with the organic matter content in the riverine suspended sediment. Compared with Chinese sediments in the upper continental crust (CSED), the REEs are considerably enriched in the riverine suspended sediment of the Zengjiang River, especially lutetium and erbium are the most enriched elements.

Keywords: Riverine suspended sediment; Rare earth elements (REEs); Hydrological condition; Grain size; Zengjiang River dbasin

A study of water cycle affected by water and soil conservation projects in Loess Plateau using environmental isotopes and hydrochemistry

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Abstract: Since 1990s, runoff of the Yellow River has decreased markedly. Climate changing and human activity such as construction of many soil and water conservation projects and changes in land use has been recognized its causes. But telling who should be the main cause, how much do human activities affect water cycle by changing the underlying surface are still lack of scientific evidence. This study is coming to quantify the effect of climate change and human activities on water cycle of the Yellow River Basin in Loess Plateau region.

The study area Chabagou watershed, a third tributary of the middle Yellow River locating at the Loess breck ravine region with an area of 187km^2, has a great erosion modulus, and so, vast silt arresters have been built since 1970s with a total storage capacity of 33.12 million m^3 before June 2001. Water cycle and conversion of precipitation, surface water, ground water and soil water has been changed greatly. For this purpose, two experimental drainage basins were built since 2003, Caoping West Ditch small watershed and Chabagou watershed, respectively. In Caoping West Ditch watershed, information about precipitation, runoff, climatic information and soil water content in two spots with different plant mulching were observed, and precipitation and soil water samples after each event were collected in step. In Chabagou watershed, 12 stations' precipitation data was observed and monthly mixed water samples were collected. Additionally, 112 surface and ground water samples were collected in June and August of 2005, corresponding EC/pH and temperature tested on the spot. Environmental isotopes composition of $\delta^{18}O$ and δ D were analyzed using isotope spectrometer Finnigan MAT253.

The result is as following: according to the spot investigation in August 2005, for the groundwater, EC (electric conductivity) ranges from 1004 to 3210 $\mu s/cm$, with an average of 1931 $\mu s/cm$, and pH from 7.86 to 9.37, averages 8.11, while to the surface water EC from 121.3 to 3160 $\mu s/cm$, averagely 2001 $\mu s/cm$ and pH from 7.82 to 10.12 $\mu s/cm$, averages 9.31. EC of surface water is especially high in ditches silt arresters widely spread, and pH also distributes high in the northeast of the basin. Based on the isotopic analysis of 109 water samples in 2004, the local meteoric water line $\delta D = 6.21\delta^{18}O - 10.028$ was gained, with $\delta^{18}O$ ranging from -12.357 to 4.868 and δ D from -90.725 to 8.496. From 15 surface samples collected in June 2005, the δD-$\delta^{18}O$ relationship is $\delta D=3.56\delta^{18}O-34.365$， while for groundwater is $\delta D=6.9358\delta^{18}O-6.8499$. After integrative analysis of EC/pH, climatic information and characteristic of environmental isotopes composition, a quantitative evaluation on how much the soil and water conservation projects affect the water cycling mechanism is given out, which will provide a scientific foundation to the water resources planning and management in a changed environment with high intensity human activities in the Yellow River Basin.

Key Words: soil and water conservation projects, water cycle, water cycle, hydrochemistry, Loess Plateau

A project evaluation study about soil erosion affecting factor controlling by AHM

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Abstract: Basing on the project choice about affecting factor of soil erosion by Analytic Hierarchy Process (AHP), authors has quantification analyzed the factors affecting soil erosion by using Analytic Hierarchical Model (AHM) method for the first time. The result indicates that soil erosion has been controlled by accelerating erosion so as to achieve the aim of controlling soil erosion in effect, development manufacture and alteration nature actively. This has offered forceful support to engineering decision-making and has accelerated soil erosion & the conservation of soil and water continuable development.
Key words: soil erosion; affecting factor; AHM; quantification evaluation

A effect study of water resource continuable use project of capital in 21th century early days on water resource environment of Chao River drainage area

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Abstract: On the base of qualitative analysis, the author has adopted multi-scene comparison analysis method combining with statistical analysis and system dynamics model count, has constructed dynamic mathematical model of multi-layer & multi-area, has used dissipation structural theory to research evolvement course of Chao River drainage area during fore and aft of the actualization the item, has putted forward target pattern and realizing mode of achieving continuable development in Chao River drainage area. Protecting water resource, preventing and curing water pollution, protecting aquatic environment and water zoology not being destroyed, increasing water resource backlog, keeping water table not dropped, establishing water resource ensure system of maintenance ecological system safe. Constructing and building evaluating indicator system of water resource environment continuable development, accordingly found out the route of realizing harmony development on human and nature, has offered warranty for decision-making. Four questions must to be solved: Miyun reservoir sediment source, actual soil and water conservation measures affect on sediment, small watershed management investigates a few years recently, by water quality analysis study, offering decision-making & gist for industry and enterprise technological transformation of Chengteh environmental protection.

Experimental studies on the effects of circle rate on transfer and distribution characters of soil moisture and nitrate nitrogen of intermittent infiltration under surge flow irrigation

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Abstract: The optimal combination of technical elements in surge flow irrigation can make the best water saving and irrigation effect. Among those elements the circle rate *r* directly affects the development of the water sealing layer, therefore weakens the infiltration reduction and the increase of advancing velocity of furrow flow under periodic water-supply. In this experiment, a simulated indoor environment, a vertical one-dimension intermittent fertilizer infiltration, with 70cm of ground water table, was set up. In the experiment, the influences of circle rate on the infiltration reduction, the transfer and distribution character of moisture and nitrate nitrogen in the soil and the consistency distribution of nitrate nitrogen in the ground water were studied. The results indicate that with the same water supply, the smaller the circle rate is, the better the water sealing layer develops, and the stronger the infiltration reduction is. Meanwhile the moisture and nitrate nitrogen would distribute in shallower soil layer, therefore the leaching trend of nitrate nitrogen weakens. In the ground water, the nitrate nitrogen mainly distributes in the upper part and its concentration decreases evidently with the circle rate reduces.

Key words: surge flow irrigation intermittent infiltration circle rate infiltration reduction nitrate nitrogen ground water

Sources and variability of nitrate leaching under different land uses in an agricultural catchment in southeast China

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Abstract: Eight soil lysimeters were installed under different land uses such as bananas, sugarcane, paddy and vegetables, for continuous monitoring of nitrate leaching in a village scale catchment in southeast China throughout 2005. The origins and transformations of NO_3^- , variability of nitrate concentration during different season were assessed based on a water quality analysis and δN^{15} of nitrate. Concentrations of NO_3^- in leachate under different land uses were highly variable which differ from 0.1~12. 9 mol/L and had a great temporal variability. The nitrate concentrations under bananas, sugarcane, vegetables were higher and the leaching peak occurred during July to August. Rainfall and fertilization are the major factors influencing nitrate leaching. δN^{15} of nitrate also exhibited considerable isotopic variability, ranging from -3.9‰ in March to a late summer maximum of 15.6‰ which may be related with fertilizer and manure application, rainfall and soil organic matter. Lower δN^{15}, 3.9‰ in May and 3.9‰ in August occurred under double rice cropping due to intensive fertilization in these two periods. Higher values of isotopic nitrogen under vegetables and bananas indicated manure management in these land uses during the growth season. Mineralization and denitrification also play a significant role in affecting nitrate concentration and nitrogen isotope values during different seasons. Generally, isotopic technique can be a useful tool to identify sources and fates of nitrate in ground water and to develop Best Management Practices (BMPS) in agricultural land for reducing nitrate leaching risk in future.

The gaseous loss flux of the nitrogen through the denitrification and ammonia volatilization from the soil in the Jiulong river watershed

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Abstract: Denitrification and ammonia volatilization in the soil are the main pathways of the gaseous loss of nitrogen in the catchments. The objectives of this study are to quantify the gaseous losses of nitrogen in the soil through the denitrification and ammonia volatilization at a catchment scale and apply the Geographic Information Systems (GIS) to identify the sensitive objects. This study measured the rate of denitrification and ammonia volatilization on a catchment scale by using the acetylene inhibition technique and the continuous air flow enclosure method, respectively. We conducted the experiments in the plots which is located in the upland of the Jiulong river watershed(13,767km^2). And the watershed has a sub-tropic climate. Precipitation averages 1400 mm • yr^{-1} ~1800 mm • yr^{-1} and is unevenly distributed throughout the year. Air temperature fluctuates between 5℃ and 37℃ with the average temperature between 19.9℃~21.1℃. The soil of the watershed is red earth, the topsoil of the watershed has the organic content 0.7~5.2%, TN is 0.46 ~ 2.55mg/mg, and TP is 0.28 ~ 2.45mg/mg, and unit weight of the soil is 1.08 ~ 1.82g/cm^3. We conducted the experiments for one year. Then we measured N_2O which was considered one of the products of the denitrification and the NH_3 which emitted through ammonia volatilization from the soil, and applied GIS technology to model the different agrotypes and vegetations in the Jiulong river watershed, we estimated the gaseous nitrogen loss flux of the watershed on a catchment scale. We analyzed the distribution of the nitrogen losses in a catchment scale, and the study showed that denitrification of the soil in Jiulong river watershed play a great role in nitrogen losses.

The result of this experiment indicated that the denitrification and the ammonia volatilization had the temporal and spatial variance. The rate of the denitrification that occurred in riparian zones was higher than any other places, and the denitrification was enhanced when there were many rains and when the soil temperature was high. And the flux of denitrification was mostly related with fertilization, soil moisture and rain events. And fertilization, air temperature and affected the flux of ammonia volatilization significantly. The Soil moisture and rain events after fertilizer was top-dressed affected denitrification and ammonia volatilization significantly. And the gaseous N loss rate through denitrification and ammonia volatilization represent about **10～20**% and 10～20% of the fertilizer, respectively. the gaseous N loss rate through denitrification and ammonia volatilization was 150 kg N yr^{-1} .

Keywords: denitrification, ammonia volatilization, gaseous loss, watershed

Net nitrogen mineralization in the soil of Wuchuan catchment in relation to temperature, moisture and land use

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Abstract: Net nitrogen (N) mineralization determines soil N availability, which limits plant growth and productivity. A better understanding of the effect of temperature and moisture on soil microbial activity can improve our ability to predict soil N mineralization. In this study, a laboratory study was conducted to evaluate the effects of temperature and soil moisture on N mineralization in Wuchuan catchment. Undisturbed soil cores were kept in PVC tubes and adjusted to different soil water contents and then incubated at 5, 15, 25 and 35℃ for 30 days. Each treatment was repeated three times. To keep the soil samples moisture and air circulation, we wrapped both ends of PVC pipes with plastic film, because the plastic film with a hole in the middle of it owns mild aeration and can decrease the process of water transmit. The inorganic N in soil extracts before and after incubation was analyzed. The inorganic NH_4-N was determined using indophenol blue colorimetric analysis and measured using spectrophotometer; the inorganic NO_3-N was determined using the deoxidization method by the coppery cadmium pole and measured using spectrophotometer; and inorganic NO_2-N was determined using aniline-N-(1-naphthyl) ethylene diamine spectrophotometer. In addition, to analyze the relationship among the ratio of C/N, pH and net nitrogen (N) mineralization, we measured the Microbial biomass C using chloroform fumigation, and measured pH using the pH-meter. The results showed rate of soil net N mineralization was significantly related to the temperature effects (p<0.001) and the net N mineralization rate was not statically different irrespective of the incubation periods at lower temperatures (5℃). however, net N mineralization rate increased with temperature at higher temperature (15, 25 and 35℃). Soil moisture also significantly affected Net N mineralization rate, and net N mineralization rate increases with soil water content until it reaches an optimum value at each temperature. There is a decrease of net N mineralization rate when the soil water content is above the optimum value which is different for various types of land use. We confirmed different soil water contents according to four different types of land use and found net N mineralization rate is different under the same temperature and moisture and different types of land use, which showed there are different cultivation methods and fertilization practices, resulting in differences in soil structure and nutrition and pH, which have impact on the net N mineralization rate. And we found the change trends of net N mineralization rate were different in the same temperature or moisture, which suggested interactive effects of temperature, moisture and different types of land use on the rate of net N mineralization.
We scaled up the effect of temperature and moisture on soil nitrogen mineralization to the Jiulong river catchment's scale by GIS technology according to different types of land use.

Keywords: N mineralization rate, soil moisture, water content, land use

Accordant Relationship of the Small Hydropower Development with Water Environment Protection in Luoding City

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Abstract: The small hydro-power development is an important ingredient of power source planning and construction for Luoding city. The analytical results of water environment status in recent years made clear that the small hydro-power development plays an important for social and economic development of Luoding city, meanwhile it creates coerce for water environment. According to the characteristics of the small hydro-power development and the initiated water environment problems, it is suggested that the managers should work out an effective development and management model to alleviate the negative water environmental impact and to ensure the sustainable development of the hydropower resources and water environment.

Key words: small hydropower； development； water environment； protection； coerce

The Bio-Effect of the dissolved organic phosphorus in seawater

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Abstract: The text introduced the bio-effect of DOP in seawater and its analytical method. Organophosphorus pesticides (Ops) was widely utilized in agriculture, yet it can be washed from farmland into the sea by rain, also with the discharge of pesticides factory, it has caused a big pollution which has risen to a serious threat to the water body of the shore area. toxicity mechanism, promoting reasonable utilization of Ops are emphasized in the text.
Key Words: DOP, bio-effect, organophosphorus pesticides (OPs), toxicity mechanism, analytical method

Development and Research on Abrupt Water Pollution accident Emergency Response System

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Abstract: using some advanced techniques, such as "3S" techniques, database, net communication and so on, according to the requirements of water pollution accident emergency management system, this paper discusses the foundation of the interactive Virtual Reality platform which 2D scene and 3D scene is seamlessly combined in. And this platform integrates all kinds of background information and monitoring information related to water pollution, such as the foundational geographic information, hydrological information, entironmental information, social and economic information and so on. This platform can simulate water pollution pervasion status and offer a high precision, real time and sharable digital assistant decision-making system for foundational information query, abrupt water pollution accident warning, forecasting and emergency decision-making in Three Gorges Reservoir. As a result, a demo system in Wanzhou city is built.
Key words: Three Gorges Reservoir; Wanzhou city; abrupt water pollution; emergency response system; 3D visualizing platform

Characterization of Rainwater Harvesting from Rooftop in Urban Area, Xi'an,China

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Abstract: Nowadays, in many countries of the world, rainwater collected from small catchments such as roof tops has become a viable alternative source of water in regions where other sources have proved too difficult to obtain or where the quality has been very poor. Generally, rainwater collected from roof catchments has been regarded as a source of safe water for drinking purposes, but recent studies have shown that its quality is affected when the roof is contaminated by diffuse sources of pollution from the atmosphere and with the feces of birds and other creatures, as well as from deterioration of the roofing material itself.

In this paper the characteristics of rainwater runoff from rooftops on storm events, and the first flush effect in urban areas is studied. Four kinds of roofage in the city of Xi'an, China were selected for sampling and study with different characteristics during the period from October 2002 to November 2004. The quality parameters of rainwater and rooftop runoff such as pH，COD， N-$NH4^+$，Pb，SS，TH, Turbidity，EC were analyzed for the relationships between rooftop runoff and water quality.

The study indicated that pollutants of rooftop runoff have close relationships with the roofing material and the duration of dry weather between storm events, and concluded that the pollutants can be mostly removed by pre-sedimentation.

Key Words: urban rainwater，first flush，rooftop
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Wastewater recycling in Jianghan Salt & Chemical Complex

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Abstract: Adjusting-deoiling-coagulating settling-filtering process is adopted to treat the salt & chemical wastewater of high COD, high color, high SS and low BOD_5 from salt & chemical manufacturing in JSCC, the treated water meets the national "Integrated Wastewater Discharge Standard" (GB8978-1996) since July, 2001, and the final effluent had been discharged to Hanjiang before the year of 2003. In order to decrease the water consumption, and contribute more to the Hanjiang ecosystem, a polishing scheme was promoted to produce the final effluent reuse in the salt-chemical processes, i.e., the treated water has been recycled into the brine exploration as injection water since 2003. The technological process is simple, and the investment is low, attaining efficiency of economy, society and environment simultaneously.
Keywords: Salt & chemical; Wastewater; Deoiling; Coagulating settling; Filtration; Recycle

Water Quality Assessment, from 2002 to 2004, in Dongting Lake, China

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Abstract: According to Quota Ⅲ of Basic Analytical Methods of Environmental Quality Standards for Surface Water, GB3838-2002, we used the 2002-2004 monitoring data to evaluate and characterize water quality condition of Dongting Lake, based on the application of comprehensive index methods such as Nemerow Index and Huangpu River Organic Pollution Index. (1) The main pollutants of Dongting Lake are total phosphorus (TP), total nitrogen (TN) and fecal coliform. (2) Huangpu River Organic Pollution Index mean is 0.27, so the water quality does not have the black smelly phenomenon at twelve designated sections in Dongting Lake. (3) Water pollution is the most serious during the drought water season in West Dongting Lake and South Dongting Lake, and water pollution is the most serious during the normal water season in West Dongting Lake. Water pollution degree during the flood water season is smaller than the normal water season. (4) Point sources make a great contribution to water pollution of Dongting Lake; the possible main sources of the pollutants are trade effluents and domestic sewage. (5) Water quality mainly is at the light pollution condition of a majority of Dongting Lake water bodies, water quality of the partial water body achieves the heavy pollution condition during the drought water season. There is no indication in the available data; however, to suggest that lake water quality has improved in recent years in response to changes in the land settlement and Three Gorges Project.
Keywords: Dongting Lake; Water quality; Assessment; Nemerow index; Huangpu River Organic Pollution Index

Karst Multiple Media Environment's Soil and Water Pollution Prevention and Environmental Security

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Abstract: Karst multiple media environment of karst terrain in south China has diversified types, it is complicated and easy be changed. It's soil and water distribution is different and easy be interfered by human activity. This article will start with karst multiple media environment's component character and human influence, then it will research the reasons of soil and water pollution in order to protect karst terrain's resources and environment security and continuous development.

Keywords: Karst terrain in south China Karst multiple media environment Soil and water pollution Environmental security

REGION-WIDE ASSESSMENTS OF WATER NEEDS AND AVAILABILITY: EXPERIENCE FROM ILLINOIS

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Abstract: The purpose of this research project was to develop water-use models and prepare estimates of future water use in Illinois counties and compare it with water availability. The principal source of water use information used in this study was the U.S. Geological Survey's National Water Use Information Program (NWUIP), which has prepared estimates of county level water use in Illinois for 1985, 1990, 1995 and 2000. Separate water-use models were developed for publicly-supplied (municipal) water use and self-supplied commercial water use. For the municipal sector the regression model of per capita water use was based on such variables as housing type, weather, employment, residential water price, trends in water use technology, policy, and behavior, and county specific influences. The model variables explained approximately 85 percent of variance in per capita withdrawals. The mean average percent error (MAPE) of the model's estimation was15.2 percent. In the self-supplied industrial and commercial (C&I) sector, two variables, total county employment and the percent of county self-supplied withdrawals provided most of the explanation in the water-use model. Employment in three categories of standard industrial classification (SIC) were also important showing that the quantity of self supplied withdrawals can be expected to increase with increases in the percents of county employment in the food and kindred products (SIC 20), primary metals (SIC 33), and laundry services (SIC 72). The industrial model explained more than 95 percent of the variance in self-supplied C&I withdrawals and showed the mean absolute percent error of 36 percent. For these two water use sectors (public supply and C&I) water use projections were made using both "baseline" and "conservation" scenarios. The results indicate that public supply water use is projected to increase in 70 counties with four counties with projected declines. Self-supplied commercial and industrial water use is projected to increase in 47 counties and have no change or decrease in 25 other counties. With respect to water availability, the projected increases in water needs will increase withdrawals of water from some critical sources including Lake Michigan, and Illinois groundwater including the Mahomet Aquifer.

Characteristics and Pollutant Loadings of Precipitation Runoff in Zhuhai Urban Areas

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Abstract: The water quality of precipitation runoff from various gathering areas was analyzed in Zhuhai urban area. The results show relatively high levels of pollutant loadings of the runoff in Zhuhai urban area. The pollutants of the runoff contained mostly TN, NH_4^+-N, COD, BOD_5 and TSS and their concentration was highest in the first flash of the runoff. As influenced notably on the underlying surface differences in various gathering areas, the runoff in residential and commercial area contributed greatly to the pollutants in receiving waters. In comparison with the rivers, the concentration of pollutants in the urban runoff was higher. The runoff pollutant loadings have been close to industrial point source pollution, which becomes another important factor that affects river water quality.

Key words: characteristic; precipitation runoff; pollutant loadings; urban area; Zhuhai

Implementing a Strategic Environmental Assessment on the Water Resources Development Plan of China's Yellow River Basin

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Abstract : Based on analysis and assessment of the current status of water resources use, with a close look at the changing patterns and intricate relationships between water supply and demand, social development, and ecological conditions over the past decade, this paper presents a Strategic Environmental Assessment (SEA) on the proposed policies of water resources development in the Yellow River Basin. Compared with traditional project-based Environmental Impact Assessments (EIAs) on water resources exploitation, the broader characteristics of SEA are implemented. The effective application of SEA on water resources development and social sustainable development are emphasized. The paper's conclusion argues the necessity of using SEA techniques in river basin water resources planning and policy making and promotes its critical role in creating comprehensive water resources management strategies that can optimize resource allocation, protect and improve ecological conditions, and abate of water scarcity pressures.

Keywords: Yellow River; Water Resources; Water Supply and Demand; Strategic Environmental Assessment

Study of Small River Restoration after Water Resources Development

Yasumuro River Experience JAPAN

Abstract: The Yasumuro River is a small river in the southeastern part of Hyogo prefecture, Japan. (Catchment area: 65 km2, Length:17 km, Bed lope: 1/100 - 1/625) This river is one of the typical small rivers in Japan. Some weirs were constructed to secure a water supply for agricultural use and its channel were improved and widened as a flood control measure. These impacts decreased frequency of riverbed disturbance and caused deterioration of the river environment. One of the endangered freshwater alga species, “Thorea okadae”, has not been identified since 1995. And now in order to restore the river environment in which “Thorea okadae” is inhabitable, various measures are being carried out in collaboration with the local government, citizens, cultivators and fisheries cooperative. For example, “Flushing release” were performed by operating agricultural diversion weirs, and citizens dug up the riverbed by hands instead of floods. This paper shows followings, based on the Yasumuro River experience.

- Causal relationship between riverbed disturbance and river ecosystem - floods and “Thorea okadae” -
- Simulation to estimate a shape of hydrograph of flushing release
- Effects of the flushing release
- Coordination with the stakeholders
- Public participation

Measures for Lake Ecotones Restoration: Lake Biwa Experience

Abstract: Lake Biwa, located the heart of shiga prefecture, is by far the largest lake in Japan. It is one of the most ancient lakes in the world and has developed a rich lake ecosystem, including over 50 indigenous species.

The Lake Biwa Comprehensive Development Plan was launched in 1972 as a national program to shore up the population and economic growth, and was concluded in 1997. The primary objectives of the plan were to develop additional water resource for the downstream Osaka-Kobe (Hanshin) region and to reduce the threat of floods in the lakeshore areas and the downstream areas, while preserving the natural environment of the lake and restoring a water quality that was showing the effects of pollution.

Then the weir operation rules for water-level control were amended, levees were constructed around the lake, and some parts of lakeshore were empoldered. Such human-induced changes caused decreasing the area of land-water transition zone (ecotone), the loss of its continuity, and lessening its function as a habitat. These changes are some of the reasons for the recent depopulation of indigenous species.

In recent years, various measures for the ecotone restoration are launched in collaboration with the related government ministries and agencies, the local government and citizens.

This paper shows efforts to promote sharing information about lake environment and cooperating between interested parties, and anecdotal reports of engineering for restoration of ecotones around Lake Biwa.

Optimal Design of Seasonal Flood Control Level Using Multi-objective Genetic Algorithm

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Abstract: Reservoir is one of the most efficient measures for the integrated water resources development. The seasonal flood control level (FCL), which the storage allocation for flood control is varied seasonally, can be adopted to obtain more benefits under the condition of flood standard unchanged when the flood season is divided into several sub-seasons. This paper was focus on simulation-based optimizing design of the seasonal FCL using a multi-objective genetic algorithm (GA) with the Three Gorges Reservoir (TGR) as case study. For given design flood standards, the seasonal FCL isn't unique and should be determined optimally. With the constraints of the seasonal FCL risk less than the risk of current annual FCL, a simulation-based optimal seasonal FCL model was developed to optimize the proposed multi-objective criterion. This optimal model is to maximize the beneficial use and to minimize the flood risk simultaneously. By inputting the past 122-year (from 1882 to 2003) daily discharge record of Yichang hydrological station, a multi-objective GA with mixed encoding was used to optimize the seasonal FCL for the TGR and yielded a set of Pareto solutions. The fuzzy decision method was adopted to select the relative optimal one among the Pareto solutions. The application results indicate that the optimized model can make an effective tradeoff between the flood control, hydropower generation and navigation, and enhance water resources utilization ratio as well as the economic benefit of the TGR without reducing the designed flood standards.

Key words: seasonal flood control level; multi-objective; genetic algorithm; the Three Gorges Reservoir

Identification and Strategy of River Water Quality Development Supporting Clean City Water Supply in Indonesia

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Abstract
PDAM raw water quality in studied area (a number of cities on the islands Sumatera, Java, Kalimantan and Sulawesi) does not comply to the raw drinking water qualification particularly regarding the parameters BOD, COD,DO,Detergent and Fecal Coliform Bacteria. Pollution by seawater intrusion was also detected. The service area range and clean water use per person per day is relatively low because capacity of existing production design was not exploited to its maximum Similarly is the service rate not fulfilling the criteria of clean water use per person per day. Service to consumers can be improved by application of a technical strategy for the expansion of production and distribution unit), setting-up of institutional organizations, implementation of law on the preservation of raw water quality and fund allocation programmes motivating regional authorities to develop drinking water of good quality mainly in the interest of the poor and stimulate the participation of the private sector and community.

Key words
clean water,Java,Kalimantan, Sumatera,Sulawesi, PDAM, seawater intrusion, water quality

Approaches Used to Build Environmental Sustainability in Water Resource Management: Setting Targets and Defining Principles

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The concept of sustainability in water resource management is beginning to be seen in planning.A key need is managing relations between water managers and experts in environmental science and engineering. Four waterway ecosystems cases are reviewed to identify practical methods for promoting sustainability. Rehabilitation of the industrialized Quinebaug River (northeast USA) used a single ecological target to provide program direction, progress assessment, and public relevance. The Mississippi and Illinois rivers (central USA) form an important shipping waterway, and 21 ecosystem targets were identified for navigation system improvement. These were developed with three selection criteria: policy and management relevance, technical merit, and practicality. An interdisciplinary team is defining how the waterways in the City of New York can be improved while being redeveloped for modern harbor facilities. Target ecosystem characteristics were selected to promote resilience and persistence of flora and fauna, reverse habitat losses and degradations, increase public enjoyment of the water environment, and build public support for a clean and healthy waterways. Finally, an interdisciplinary expert group has planned how a set of sustainability principles can be applied in the redevelopment of the Hudson River (northeast USA) waterfront. The adoption of sustainability in planning suggests a more comprehensive, long-term approach to water resource management is emerging.

Conflicts and Opportunities in Integrated Water Resources Management: Two case studies

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Abstract:
Two ongoing regional studies aimed at improving both the economic and ecologic benefits derived from the management of water and related land resources are presented. One involves the southern half of the state of Florida in southeastern US ?a region called the Everglades. This unique ecological habitat has been degraded over the past half century and is now trying to be restored through changes in the way water is managed. Other water supply and flood control objectives are also important and often conflicting. Some 10 billion US dollars are to be allocated to this restoration effort over the next several decades, and it is not at all obvious that restoration will occur.
The second study involves the lower portion of the Great Lakes. Here too the environment has been damaged from the operation and use of this major source of freshwater in eastern North America affecting both Canada and the US. Over the past five years this system has been studied and modeled in an effort to derive improved ways of managing the levels of Lake Ontario and the flows of the St. Lawrence River. Many stakeholders have interests in how these levels and flows are managed, and not all agree. Add to this the need to improve the ecosystems of the surrounding wetlands, and the differing opinions of various ecologists on just how best to do this adds to the complexity of this project.

ARMS (Aquatic Real-time Management System) : A decision support system for aquatic resources integrating data and modelling

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ABSTRACT:

Analogous to flood forecasting systems, ARMS (Aquatic Real-time Management System) is a decision support system that aids in the real-time management of aquatic resources (lakes, reservoirs, estuaries, coastal areas) through the integration of data and numerical modelling. ARMS seamlessly provides automated services for data management (real-time data acquisition and quality control), simulation management (update model input files, real-time and forecast simulations), and communications management (email and SMS alerts). A coupled three-dimensional hydrodynamics model (ELCOM) and biochemical model (CAEDYM) provide the capacity to simulate the spatial and temporal variations of water quality and to forecast the effect of a 'crisis' event such as a pollutant spill, saltwater intrusion during drought, or a algal bloom. ARMS is currently operational on Sydney's (Australia) major water supply reservoir to minimize the risk of microbial contamination during floods. Each day real-time simulations with ELCOM-CAEDYM provide operational staff with the current conditions within the reservoir. Further, each day forecasts of the effect of several flood magnitudes are simulated to assess the effect on the reservoir's water quality over the subsequent month. Hence, ARMS provides an early warning system that is useful for operational decisions to manage optimal water quality during such events. Currently a river model (DYRIM) is being incorporated into ARMS so that real-time management of river basins from the upper catchments to the sea will be possible.

GIS-based vulnerability analysis of floods

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Abstract In this paper, we illustrate a procedure of employing GIS to conduct vulnerability analysis of floods with various spatial data. The paper is part of an ongoing project aiming at making hazard risk assessment and hazard mitigation plan for Tennessee, USA. Vulnerability analysis, as the last and most important step in risk assessment, is conducted based on a combination of historical hazard data and profiles. It has a two-fold objective, i.e. estimating and explaining asset loss caused by possible hazard events. The study area of this paper is Shelby County in Tennessee. Streams, DEM data, and floodplains data are collected to estimate or delineate the affected area caused by possible floods. Overlay and buffering analysis of GIS is used to calculate the loss of residents and roads falling into or intersecting with the affected area. Besides, with GIS, the spatial distribution of affected residents and roads can be explicitly explored.

Key words GIS; flood; vulnerability analysis

NITRIFICATION BEHAVIOR OF HIGH-STRENGTH AMMONIUM UNDER INTEGRATED AND SUBMERGED MEMBRANE BIOREACTOR

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Abstract:
The behavior of CODMn and NH4+-N removal under an integrated and submerged MBR was investigated, The membrane supported from KUBATA Lit. shows better stability in filtration during the long period of operation, and the removal rate of COD reached above 80%, but NH4+-N was not over 50%, This findings may be largely responsible for the relative lower pH value of the sludge, which could severely hinder the nitrification ability of nitrifying bacteria. Consequently, out of pH control, the reactor maintains it pH value at about 5.4.

Key words: nitrification, high-strength ammonium nitrogen, membrane bioreactor;

Pharmaceutical Wastewater Pollution and its Countermeasures to Take

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Abstract:
pharmaceuticals, drugs and its metabolites has been found in surface water, groundwater and drinking water, and many investigations demonstrated that municipal wastewater disposal is an important sources of pharmaceutical pollution to the water environment. In this paper, many countermeasures to take with the pharmaceutical wastewater pollution are putted forward, such as some managing measures including Cleaner Production, ISO14000 standard, and Wastewater Reclamation, along with some process to treat the pharmaceutical wastewater which focuses on physical-chemical, biochemical and other advanced treatment technologies.

Key words: pharmaceutical wastewater; pollution; countermeasures.