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EDITORIAL

Sustainable water–energy–environment nexus

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Water–energy–environment has been closely interwoven among the natural, social, and economic networks. Integration of energy, water, and environment systems is essential in the multidisciplinary concept of sustainable development, which is a highly multidisciplinary field of research that has been extensively studied during the last two decades.

This special issue discusses some of the latest progress in three main areas of sustainability themes, i.e., energy, water, and environment, that emerged from the International Symposium on Water Resource and Environmental Management held in 2019 (WREM 2019).

After a meticulous peer-review process, thirteen (13) high scientific-level papers have been accepted for publication. They mainly concern sustainable development of energy, water, and environment systems.

The first paper is entitled "An impact assessment of energy undesirable output on climate-carrying capacity: a case study of Shanghai" (Shan and Wang 2020). In this work, the impact of undesirable energy output on the climate-carrying capacity of the power grid–based economy in Shanghai has been studied. The authors used three indicators, i.e., climate natural capacity, urban climate pressure, and urban coordinated development capacity, as input factors to study the climate-carrying capacity. The efficiency and performance efficiency of climate environmental carrying capacity are found both lower than 0.8.

The second paper is entitled "Ecological treatment technology for agricultural non-point source pollution in remote rural areas of China" (Yi et al. 2020). The paper introduced the practical application of ecological treatment technology. Eco-processing technologies are cost-effective in terms of their construction, maintenance, and energy needs and can be considered a sustainable wastewater treatment method, especially in remote areas and developing countries. The paper provides basic ideas for the construction of rural ecological treatment technology in China and puts forward suggestions and ideas for the future development trend of ecological treatment process sewage.

The third paper is entitled "Toward ecological function zoning and comparison to the Ecological Redline Policy: a case study in the Poyang Lake Region, China" (Xu et al. 2021). In this work, multiple ecosystem services were quantified and mapped; the ecological function zoning strategy was promoted based on the importance and vulnerability analysis of ecosystem services in Poyang Lake Region, China. By comparing the ecological function zoning strategy with the Ecological Redline Policy (ERP) and discussing the implications and applications of ecological management, this study contributes to achieve high-efficiency ecological protection of Poyang Lake at the regional scale and compare the different zoning results in the same region with different space scales.

The fourth paper is entitled "An in-depth quantitative analysis of wind turbine blade tip wake flow based on the lattice Boltzmann method" (Wu et al. 2020). In this work, the state-of-the-art lattice Boltzmann method (LBM), combining with large eddy simulation (LES) and wall-adapting local-eddy (WALE) model, was used to investigate the unsteady flow characteristics of the blade tip region due to impeller wake for a wind turbine. The calculation model of LBM was proven reasonable and effective with the associated experimental data. The relevant in-depth results clearly showed a series of characteristics and changing laws for the dynamic spiral structure in tip wake area and the static pressure distribution on blade surface as well as the closely related indicators.

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The fifth paper entitled "Revealing the impact of water conservancy projects and urbanization on hydrological cycle based on the distribution of hydrogen and oxygen isotopes in water" (Xia et al. 2020) aims to investigate the hydrological condition changes under anthropogenic activities based on isotope tracers. The results show that the groundwater–surface water interaction has been greatly influenced by the operation of dams. By using a sinewave fitting method, the authors found the periodicity of river water isotopes grows better from upper to lower reaches and reflects the gradual dominance of local precipitation. The estimated mean residence time of river water presented a downward trend from upper to lower reaches due to the combined effect of water project operation and urban activities.

The sixth paper "The permeability of dredged material-bentonite backfills" (Xu et al. 2020) aims to study the influences of bentonite content, confining pressure, and pore size distribution on the permeability of dredged material–bentonite backfills. According to the test results, from the perspective of medium-term and short-term permeability, it is feasible to recycle dredged material as the backfills of a vertical cutoff wall. The permeability of the mixture soil decreases with the rise of confining pressure, and the reduced range is within a certain order of magnitudes. The higher the confining pressure is, the smaller the variation of hydraulic conductivity with bentonite content will be. The adding of bentonite changes the pore size distribution of the mixture soil, and reduces the porosity and characteristic pore size.

The seventh paper "Investigation of the impacts of tunnel excavation on karst groundwater and dependent geo-environment using hydrological observation and numerical simulation: a case from karst anticline mountains of southeastern Sichuan Basin, China" (Chen et al. 2021) aims to study the impacts of tunnel excavation on karst groundwater and dependent geo-environment. Integrated approaches of field survey, hydrogeological analysis, and numerical simulation collectively showed robust reevaluation for the changing karst groundwater condition under tunnel excavation. The achievements can improve the understanding of the impacts of tunnel excavation on karst groundwater system and dependent geo-environment, and provide reference to the protection of water resources and geo-environment in karst regions like Chongqing worldwide.

The eighth paper is entitled "Does environmental engineering help rural industry development? Discussion on the impact of Taiwan's "special act for forward-looking infrastructure" on rural industry development" (Hsu et al. 2020). The research believes that although environmental construction can improve the current state of infrastructure and the quality of people's daily life. Good communication channel cannot be carried out before construction, and in during construction, obtaining consensus from the people and business, acquiring precise information, spraying water to reduce dust, heightening the peripheral fence, planning a substitutive plan, avoiding crowd, reducing mistakes in the process, avoiding influencing water and electricity supply and soil, water, and environmental sanitation, and planning for substitutive route and parking space with subsidy for damages are not possible. In this way, a negative image will be produced; willingness to spend will be reduced in the people due to a building blocking the view (75%), billboard's losing functionality (63.2%), and inconvenience caused by line of movement (75%) and parking space (55.9%), which is not helpful to development.

The ninth paper "Source profile and health risk assessment of $PM_{2.5}$ from coal-fired power plants in Fuxin, China" (Zhao et al. 2020) using the geological accumulation stage coefficient method, the enrichment factor method, index method, and the EPA-recommended health risk assessment model, respectively, which tested the ashes of $PM_{2.5}$ in Fuxin coal dust catcher downloads and ion and carbon element (EC, OC) levels, aims to establish coal-fired source profile of $PM_{2.5}$ and the health risk assessment of heavy metals in ash. The results indicated that the main components of $PM_{2.5}$ of coal dust in Fuxin were Ca, Al, Fe, EC, OC, NH_4^+, SO_4^{2-}, Ca^{2+}, Na, Mg, K, Ti, Cl^-, NO_3^-, Na^+, Mg^{2+}, and K^+. For adults, the non-carcinogenic risk was attributed to As and Cr, and for children, to As, Cr, V, Pb, Mn, Ni, and Zn.

The tenth paper is entitled "Macro analysis of spatiotemporal variations in ecosystems from 1996 to 2016 in Xishuangbanna in Southwest China" (Zhang et al. 2021). In this work, the spatiotemporal variations in ecosystems have been studied in order to analyze the macrochanges of the ecosystem pattern in Xishuangbanna Dai Autonomous Prefecture in the past 20 years. The authors used remote sensing images from 1996 to 2016 as the main data source, and selected the average annual ecosystem type net change rate, ecosystem type transfer matrix, and comprehensive index of land development degree to assess the spatiotemporal variations. The results revealed the spatial and temporal changes of the Xishuangbanna ecosystem and their regional differentiation.

The eleventh paper "Dietary shifts and nitrogen losses to water in urban China: the case of Shanghai" (Sammarchi et al. 2020) offers an estimation of dietary nitrogen (N) intake, excretion, and consequent discharge to water bodies from the residents of Shanghai, following the recent shift in dietary trends towards higher consumption of animal products in China's heavily urbanized areas. The paper compares the increase in dietary N intake with the development of Shanghai's sewerage system and wastewater treatment facilities, projects different scenarios to 2030 in terms of further dietary shifts and different rates of improvement of the city's N removal capabilities, and identifies the best strategies to prevent an increase in N losses to water bodies.

The twelfth paper is entitled "Analysis of land use change and its influence on runoff in the Puhe River Basin" (Zhang and Yu 2020). In this work, the impacts of urbanization on land use changes and the effects of land use changes on catchment's runoff have been studied. The authors used remote sensing images of the Puhe River Basin from 1985 to 2015 to show the development of urbanization and used the Mann-Kendall test, sliding *T* test, and double accumulation methods to analyze the impact of land use changes on watershed runoff. The results show that human activities become the main factor affecting runoff change in the Puhe River Basin.

The thirteenth paper "How changing grain size affects the land surface temperature pattern in rapidly urbanizing area: a case study of the central urban districts of Hangzhou City, China" (Yuan et al. 2020) aims to study the land surface temperature (LST) pattern and its spatial heterogeneity at different scales. The authors utilized transfer matrixes, landscape metrics, and spatial autocorrelation analyses to study the transfer of LST classes, changes in the LST pattern, and changes in LST clusters with varying grain sizes. The LST pattern presented a scale-dependent characteristic with the optimal grain size of 120m.

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