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Editorial

Sustainability in China: Bridging Global Knowledge with Local Action

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Abstract: As the biggest emerging and developing country, and the second largest economy on the planet, China's road to sustainability has attracted global attention; therefore, we need to have a deeper understanding to address this issue at very different levels. This editorial mainly reviews the contributions of the published papers in the Special Issue of "*Sustainability in China: Bridging Global Knowledge with Local Action*", the main findings in this special edition suggest that the concept of sustainability is more comprehensive and complex, and the transformation process from scientific knowledge to local action still has a long way to go, not only in China, but also in many developing countries. More research on the fundamental and innovative processes of sustainable transformations should be conducted. China needs to make more efforts to strengthen its road to sustainability, by merging all relevant types of knowledge, both within and outside science, as well as locally and globally.

Keywords: human-natural complex system; sustainability governance; sustainable transformation; China

1. Introduction

As the biggest emerging and developing country on the planet, China's rapid pace of both urbanization and industrialization over the past few decades has attracted global attention, while a heavy environmental price has been paid for being the world's second-largest economy [1]. By announcing future reforms toward long-run sustainable development, China's leaders have offered green hope to the public [2], aiming to build a modern ecological-civilization society in the coming decades. However, just as Liu concluded that "any individual force can cause positive and negative impacts on sustainability directly or in-directly" [3], therefore, we need to have a deeper understanding into China's sustainability at very different levels. Both spatially and structurally, concerns range from generating sustainable household livelihoods to global climate change, to developing technological applications to generate institutional changes. Moreover, China needs both local, case-based empirical studies, as well as global, experience-based learning to inform itself of the best route towards sustainability. This Special Issue, "*Sustainability in China: Bridging Global Knowledge with Local Action*" of *Sustainability* aims to investigate the intended and spontaneous issues concerning China's road to sustainability in a top-down or bottom-up manner. Thus, based on the peer-reviewing results, this Special Issue selected papers trying to address some key aspects related to China's sustainability. More specifically, the reader can expect more contributions, as presented in Section 2.

2. Contributions

During the past thirty years, China's rapid economic development has been mainly driven by an abundant supply of cheap labor (the so called "demographic dividend"), however, the arrival of an aged society, with a still quite undeveloped economy, will make it more difficult for China to establish a comprehensive social pension system. Wang and Béland's paper on *Assessing the Financial Sustainability of China's Rural Pension System*, finds that the funding gap of China's rural pension system would rise from 97.80 billion Yuan in 2014 to 3062.31 billion Yuan in 2049, which implies that the rural pension system in China will not be financially sustainable [4]. Even in this article, the authors explained how this "gap" could be fixed through policy intervention by referring to recent international experiences; however, further risks are still hidden behind the realities.

As a major force behind anthropogenic carbon emissions, China accounted for 29% of global carbon dioxide emissions in 2012 and 80% of the world's increase in CO_2 emissions since 2008 [5], and carbon emission has been one of the biggest challenges on China's road to long-term sustainability [6], however, the uncertainty of China's CO_2 emission are always being discussed [7], therefore, more efforts should be made in uncovering China's carbon emission in various sectors. Liu and his colleagues' paper [8] examines the greenhouse gas (GHG) emission of the industrial process by taking Shenyang, a typical Chinese industrial city, located in the Liaoning province, as a study case. One of the key findings is that the cement, iron, and steel industries will be the largest emission sources, and the total carbon emissions under the business as usual (BAU) scenario will be doubled in 2020 compared with those of 2009, however, when counter measures are taken, the GHG emissions would be reduced significantly.

Water management is another of the key challenges in China, due to the increasing water demand, both from industrial and agricultural sectors, along with rapid urbanization and industrialization [9].

Yuan and his colleagues find that, under the BAU scenario, water consumption for coal power generation in Western China provinces would increase from 1130 million m^3 in 2012 to 2085 million m^3 in 2020, therefore, an integrated energy-water resource plan with regionalized environmental carrying capacity as constraints should be developed [10]. The paper "*Water Quality Changes during Rapid Urbanization in the Shenzhen River Catchment: an Integrated View of Socio-Economic and Infrastructure Development*", submitted by Qin *et al.*, investigates the causes of water quality change over the rapid urbanization period of 1985–2009 in the Shenzhen River catchment of China, and examines the correlation with infrastructure development and socio-economic policies. They conclude that water quality in urbanization could be significantly improved by implementing integrated methods [11].

Concerning the energy sector, reflecting its rapid industrialization and economic growth, China has become a voracious consumer of energy. For example, the residential energy consumption of China in 2012 was about 400 million tons of coal-equivalent, which approximately equals the total amount of energy consumption of Brazil in the same year [12]. Great efforts have been made in China to reduce energy consumption [1], however, just as Lin *et al.* stated in their paper, "China is a fast developing country with a vast size, and there are great differences in both the amount and structure of residential energy consumption at the provincial level" [12], therefore, they conducted a factor analysis and found that population, economic development level, energy resource endowment, and climatic conditions are the main factors driving residential energy consumption [12], their efforts could contribute to a deeper understanding on Chinese residents' energy consumption demands in the future. Another paper submitted by Yan and Tao [13] focuses on evaluating the performance of the biomass power plants in China in 2012, by developing and employing two new DEA (data envelopment analysis) models they found that there is a great technology gap between the biomass power plants in the northern part of China and those in the southern part of China. The results from these two papers show that, regardless of energy consumption or energy technologies [12,13], regional difference should be considered as a basic factor in sustainability policy-making.

Regarding the governance system in pushing forth China's sustainability, such as environmental legislation, performance evaluation, policy implementation, and hidden barriers, there are four interesting papers in this Special Issue that are targeting this question. Mu and his colleagues investigate the achievements, challenges, and trends in China's environmental legislation, and they conclude that China's environmental legislation still faces a series of challenges, such as the imbalance between rights and obligations and less effort in engaging public participation, therefore, more effort should be made in revising environmental law [14], fortunately, we are glad to say that on 1 January 2015, a new environmental protection law (EPL) took effect in China, which is the nation's first attempt to harmonize economic and social development with environmental protection. However, some gaps still exist in the new law, such as implementation and accountability, especially at the local level [15].

By focusing on the policy of cleaner production, Guan, Grunow, and Yu conducted comparative research to examine local cleaner production policy implementation in China and they find that the location-based incentives of local governments strongly influence the implementation strategies, and that the choices of different strategies can bring out various policy results. They suggest that multi-level approaches should be employed for addressing successful policy implementation [16]. Liu *et al.* focus on the environmental impact assessment (EIA) policy, in their paper "*Environmental Justice and Sustainability Impact Assessment: In Search of Solutions to Ethnic Conflicts Caused by Coal Mining in*

Inner Mongolia, China" [17], they note that existing environmental assessment tools are inadequate to address sustainability, which is concerned with environmental protection, social justice, and economic equity, therefore, it is necessary to develop a sustainability impact assessment (SIA) to fill in the gap. Guo *et al.* focus on investigating the impacts of air pollutant emission policies on thermal coal supply chain enterprises in China [18], the policy-simulated results imply that the energy conservation and emission reduction policies, and sustainable energy policies, can work more efficiently, which provide evidence that a co-benefits approach should be suggested in policy integration when facing more challenges with limited capacity and resources [1,19].

Synthetic measurement of regional sustainable development has been one of the key issues in the research field of sustainability [20]. Zhang, Chen, and Peter conducted a socio-economic metabolism analysis by means of the Emergy Accounting method, coupled with a DEA model and decomposition analysis techniques to assess sustainability assessment at the city level. They conclude that the integrated approach is suggested as a tool to design future scenarios of resource-use and ecological efficiency, and that the result of socio-economic metabolism analysis implies that more efforts should be made to promote the efficiency of resource utilization and to optimize natural resource use [21]. In contrast, Ma, Eneji, and Liu explored the agro-ecosystem, according to the results based on Emergy Analysis, they conclude that the agro-ecosystem maintained provisioning and regulating services but with an increasing volatility under continued growth in production inputs and disservice outputs [22]. Lu *et al.* developed an integrated model by combining an assessment index system, assessment model, and GIS approach, and successfully applied this model to investigate the temporal-spatial characters and the trends of the sustainable development degree in Loess Plateau Ecologically Fragile of China [23]. By focusing on industrial solid waste and municipal solid waste, Chen *et al.* investigated the sustainability performance of solid waste management by applying a decoupling analysis and further identified the main drivers of solid waste change in China by adopting the Logarithmic Mean Divisia Index model [24]. The paper by Feng *et al.* [25], "*An Entropy-Perspective Study on the Sustainable Development Potential of Tourism Destination Ecosystem in Dunhuang, China*", addresses the sustainability issues in developing tourism from the perspective of Entropy analysis. They propose an evaluation index system, based on dissipative structure and entropy change for the tourism destination ecosystem, and then build up the evaluation model, based on the methodology of Information Entropy, and, finally, applied this model to investigate the sustainability degree in local tourism development. Integrated analysis on the human-nature system could provide a scientific basis for understanding and optimizing regional sustainability [26], therefore, more tools on sustainability-evaluation should be encouraged to be developed and applied for meeting regional sustainable development.

Li, López-Carr, and Chen conduct research on ecological migration, based on case study in the arid northwest of China [27]. The history of China's eco-migration can be traced back as early as the 1980s, and those eco-migrations were usually performed as the resettlements of million individuals or families moved from poor areas with harsh environment and fragile ecology to environmental livable areas. In recent years, in order to protect the local culture and maintain the social stability of immigrant communities, local governments started to implement the new policy of "resettlement of entire village" instead of the previous individual or family-based resettlement. However, most residents actually do not intend to migrate, despite rigid eco-environmental conditions and governance polices threatening livelihood-sustainability [27], therefore, both horizontal and vertical interactions, as well as the

dynamics between migrants and their resettlements should be illustrated, based on disciplinary approaches by taking China as a study case. We may draw lessons from China's practices regarding ecological-migration and then adapt these experiences to develop a better management approach on international climate-induced resettlement [28].

3. Outlook

The main findings of the papers in the special edition suggest that the concept of sustainability is more comprehensive and complex, and that the transformation process from scientific knowledge to local action is still a long way away, not only in China, but also in many developing countries. Considering that a new set of UN Sustainable Development Goals, which build upon the Millennium Development Goals and converge with the post-2015 development agenda will be effected from 2016 [29], more investigations on the fundamental and innovative processes of sustainable transformations should be conducted to secure effective, equitable, and durable solutions to some of the most urgent problems of global change and local sustainability, including climate change, water security, energy consumption, *etc*., [30]. The Potsdam Nobel Laureates Symposium, "*Global Sustainability—A Nobel Cause*", has identified the need for a new "global contract" to bring together relevant knowledge from inside and outside the scientific community in order to meet the challenges of increasing sustainability in the age of the Anthropogenic [31]. As the biggest developing country, the second largest economy, and the largest energy consumer and carbon emitter, China needs to make more efforts to strengthen its road to sustainability, by merging all relevant types of knowledge, both within and outside science, as well as both locally and globally.

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Conflicts of Interest

The authors declare no conflict of interest.

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