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Editorial

ENVIRONMENTAL CHALLENGES IN CHINA: AN INTRODUCTION

In 2008, *Environmental Toxicology and Chemistry* (*ET&C*) for the first time in its history dedicated an entire issue (Volume 27, Issue 1) to documenting the current research conducted mostly by Chinese scientists residing in China [1]. Six and a half years later, *ET&C* is revisiting the topic of environmental challenges in China. It should be noted that the circumstances surrounding these 2 time periods were considerably different. Although the volume of articles in this special section is smaller than that published in 2008, the environmental problems faced in China are by no means less challenging this time around.

Two major economic developments have occurred in China since 2008. First, China overtook Japan in 2010 to become the world's second largest economic powerhouse, measured by gross domestic product (GDP), just behind the United States; and the difference between the top 2 nations has been shrinking. Second, although China's economy has continued to grow at an unprecedented pace, the growth rate has obviously slowed down in recent years. For example, the annual GDP growth rates in 2013 and 2012 were 7.70% and 7.65%, respectively—substantially lower than the range of 9.21% to 10.45% between 2008 and 2011. The slowed growth is partially attributed to the increasing difficulty of growing a larger GDP but also highlights the Chinese government's ongoing struggles to sustain a fast-expanding economy based on labor-intensive development model that depends on high energy consumption. The adverse environmental consequences from such a development model are obvious, as demonstrated by the rapid increases of energy consumption and wastewater discharge (industrial and domestic combined) that have positively correlated with the rise in GDP but far outpaced the population increase (Figure 1).

Recognizing the urgency to maintain a steady and sustainable economic development pathway with efficient resource utilization and protection of the environment, the Chinese central and local governments have taken steps toward optimizing the nation's economic structure. Although the outcome may be debatable, recent studies have observed declining trends of sediment contamination by polycyclic aromatic hydrocarbons [2,3], a group of organic pollutants partially derived from anthropogenic sources, which are consistent with an increase in the amount of cleaner energy (natural gas and liquefied petroleum) consumed and a decrease in the use of coal, a more traditional energy type [3].

Parallel to the dynamics of socioeconomic development, environmental research topics in China have also evolved. For example, of the 9 articles published in this special section [4–12], 5 target halogenated flame retardants, a group of emerging organic contaminants typically used in consumer products such as electronic devices and appliances. Such an emphasis on emerging organic contaminants is apparently reflective of the importance of electronic/electric product manufacturing as the main driver of China's economy as well as the notion that China has presumably imported approximately 70% of e-waste produced globally [13]. Another apparent change has been the shift of focus from routine surveys of the state of the environment to in-depth investigations into the processes and mechanisms governing the pollution trends and patterns. Although this special section contains only a fraction of the abundant literature generated in China, it can indeed serve as an important update on the quality of environmental research in China and an indicator of the direction in which the mainstream research activities are moving.

One seemingly unchanged trend is the geographic distribution of the corresponding authors' institutes, which are heavily concentrated in regions with economic prosperity and ample financial resources. In fact, the 9 articles in this special section are evenly distributed between institutes located at the Bohai Bay area (Research Center for Eco-Environmental Research, Minzu University of China, and Nankai University), the Yangtze River Delta (Tongji University, Nanjing University, and Nanjing Normal University), and the Pearl River delta (Guangzhou Institute of Geochemistry [$n = 3$]) along the coasts of northern, eastern, and southern China, respectively. These 3 regions are China's most important megalopolis, collectively accounting for 56% and 33% of the nation's total GDP and population, respectively, but occupying only 8.4% of the nation's geographic area. Such a trend is consistent with the previous finding that scientific research output in China was positively correlated with the nation's economic power, as characterized by GDP [1]. Furthermore, the findings presented in this special section also indicate that anthropogenic activities have remained the major contributors to environmental pollution in China. In this regard, the key steps toward effective containment and mitigation of environmental pollution should include increasing the efficiency of energy consumption through optimization of economic

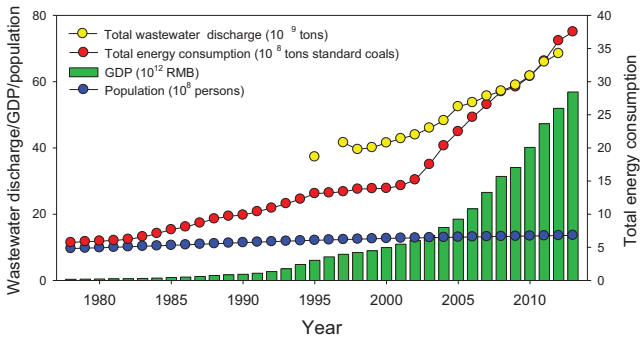

Figure 1. Changes of China's total wastewater discharge, total energy consumption, gross domestic production (GDP) in Chinese currency (ren min bin [RMB]), and population from 1978 to 2013. Data were acquired from *China Statistical Database, China Energy Statistical Yearbook 2012*, and *China Environmental Statistical Yearbooks* from 1995 to 2012.

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structures and promotion of clean energy, as well as reducing population density in large urban areas. With continuing efforts from both the management and scientific communities, there is no reason not to be optimistic about the prospect of proper handling of the environmental challenges in China.

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