

The Circular Economy

A New Development Strategy in China

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Since the late 1970s, China's transformation from a planned economy to one that is market-based and open to foreign trade and investment has fuelled economic development. Rapid economic growth has helped China to become one of the most important world economic powers, increasing the wealth of the population and providing employment and business opportunities. The rapid economic growth, however, has engendered serious natural resource depletion and environmental pollution, and the continuing increase of population has exacerbated this situation greatly. Recent research has pointed out that growth of the gross domestic product (GDP) in China has significantly reduced the opportunities of future generations to enjoy natural and environmental resources.¹


The central government promised in 2002 to build a prosperous society in a comprehensive way by 2020. By then, GDP per capita is anticipated to reach U.S. \$3,000 and the total GDP to quadruple. Obviously, it is unrealistic for China to expect to realize this ambitious objective in terms of natural resource use if it continues its current development pathway, with population increasing to 1.45 billion in 2020 (Qu 2004), low productivity, and the absence of eco-efficiency.

Activities over the past several years, however, clearly show that CE is emerging as an economic strategy rather than a purely environmental strategy. The major objective of the government is to promote the sustainable development of economy and society, while it also helps to achieve sustainable environmental protection.

As the results of resource depletion and environmental negligence have become visible, Chinese society and decision-makers have realized the seriousness of the situation. Over the last decade, reduction of environmental pollution loads and better management of natural resources have become priorities of state policies. As the Chinese Communist Party Secretary Hu Jintao and Premier Wen Jiabao stated: "China needs development which balances development between urban and rural areas, between the regions, between social and economic aspects, between humanity and nature, and between domestic and international policy development."

The Origins of the Circular Economy

The concept of a circular economy (CE) was first proposed by scholars in China in 1998 (Zhu 1998) and formally accepted in 2002 by the central government as a new development strategy that aims to alleviate the contradiction between rapid economic growth and the shortage of raw materials and energy (Su and Zhou 2005). This concept originates from the industrial ecology paradigm, building on the notion of loop-closing emphasized in German and Swedish environmental policy, and has been pursued by China's environmental policy makers as a potential strategy to solve existing environmental problems. Though it is not regarded as a panacea, many efforts have been made by the government to ensure that CE is applied in China. The

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development of CE is in line with the newly promoted scientific development strategy.² It has been widely recognized that CE could help improve resource productivity and eco-efficiency, reform the management of the environment, and achieve sustainable development.

Although there is no commonly accepted definition of CE so far, the core of CE is the circular (closed) flow of materials and the use of raw materials and energy through multiple phases. The “3R” principles—reduction, reuse, and recycling of materials and energy—are often cited to describe the three possible approaches in practice (Feng 2004). The approach is expected to achieve an efficient economy while discharging fewer pollutants. The strategy requires complete reform of the whole system of human activity, which includes both production processes and consumption activities.

To date, scholars have focused on either material and energy conservation or easing of environmental pollution. Activities over the past several years, however, clearly show that CE is emerging as an economic strategy rather than a purely environmental strategy. The major objective of the government is to promote the sustainable development of economy and society, while it also helps to achieve sustainable environmental protection.

Many scholars have tried to develop a paradigm for CE by integrating theories and methods of industrial economics, systems engineering, bionics, and physics (Wu 2003). They found, however, that it is very difficult to formulate completely original theories and methodologies for analyzing industrial and social systems (Huang 2004). In fact, most methods such as life-cycle assessment and material flow analysis are also used by industrial ecologists and experts in related fields.

In organizational terms, in 1999, the State Environmental Protection Administration (SEPA) became the first central government agency to promote the concept of CE when it launched a series of projects across the country. It also provided guidelines for the development of the circular economy in China, especially for the planning of eco-industrial parks (EIPs). With the promotion by SEPA, many projects called circular economy and EIP were carried out.

According to the connotations of CE, these projects should focus on improving resource productivity and eco-efficiency in a comprehensive way, especially optimizing the structure of industry/product, developing and applying new technology, upgrading equipment, and improving management. Almost all the projects before 2002, though, focused on waste recycling through the construction of waste-based closed loops among different companies.

Most researchers working on the topic of the circular economy at this stage had backgrounds in environmental engineering, chemical engineering, and mineral process engineering. Without a scientific evaluation of the cost and technological feasibility of the projects—in fact, those pursuing circular economy approaches have often borrowed designs from previous projects without further thought or analysis—the planned projects have not been easily implemented because of technological constraints or cost. These initial projects, however, became a source of accumulated experience for programs in later years and pushed scientists to rethink CE from various aspects.

With the development of CE, it was increasingly recognized that this approach would be a more efficient solution for the improvement of resource productivity if it shifted its focus from recycling waste to adjusting industrial structure, developing new technology, and reforming industrial policy. As a result, the National Development and Reform Commission (NDRC; a unit of the State Council that studies and analyzes the economic situation in China and formulates and implements strategies of national economic and social development, annual plans, and medium- and long-term development plans) was appointed by the State Council to take over the duty of promoting CE in the country in 2004. Although SEPA is still playing an important role in promoting and implementing CE, such a change means that the central government would like to position CE as a comprehensive state policy rather than simply as an environmental strategy. By doing so, CE was elevated to play a more important role in China’s economic development: it became one of the underpinning strategies of the country in the 21st century.

This transition had a fundamental impact on the development of CE. First, government at different levels has paid more attention to CE and much planning of CE is being conducted all over the country. Second, scholars from the fields of economics, management, law, and sociology started to contribute their unique thinking on CE, and environmental professionals also have gained a broader understanding. As a result, concepts such as green supply chain management and green building are getting more attention across the whole country.

To promote the circular economy, the central government is working hard to develop a series of laws and regulations. Local governments are also formulating their own regulations and policies. NDRC is leading by drafting a “circular economy promotion law” and “regulation on electronic wastes.” If the process goes smoothly, the circular economy law is expected to be enacted sometime in 2007 or 2008.

The Chinese government in the past decade had already issued several laws that are very supportive of circular economy. The first and most significant is the “Cleaner Production Promotion Law,” put into effect in January 2003. The amended Law on Pollution Prevention and Control of Solid Waste, which took effect on 1 April 2005, also supports the development of CE; the law is part of the country’s growing demand for strict management of solid wastes.

The Circular Economy at Three Levels

In practice, there is a three-layer approach to implementing CE. This approach relies heavily on theories of cleaner production (CP), industrial ecology, and ecological modernization. At the micro or individual firm level, companies are either required or encouraged to conduct CP auditing. For heavily polluting enterprises, CP is obligatory. Unfortunately, the rate of CP auditing in China is still very low since the Cleaner Production Promotion Law took effect in 2003. Nonetheless, there has been a trend for polluting enterprises to seek CP auditing because, by improving their environmental performance, it helps them avoid disclosure in the local media. Local environmental protection bureaus are re-

quired to establish a public disclosure system in which all enterprises are divided into five categories, green, blue, yellow, red, and black, according to their environmental performance, from good to bad. Companies can be labeled as green in the public disclosure system by eliminating outdated technologies and equipment and reducing resource consumption and pollution discharges—showing that they are environmentally friendly enterprises.

Companies are also encouraged to design more environmentally friendly products and adopt cleaner technology in their manufacturing processes. As of 2004, the system had been implemented in more than four provinces including Jiangsu, Anhui, and Guangxi.

At the meso or second level, the main objective is to develop an eco-industrial network that will benefit both regional production systems and environmental protection. Approaches include but are not limited to energy cascading, sharing of local infrastructure, and exchanging by-products and recycling wastes. The development of eco-industrial parks (EIPs), a typical practice at this level, is very popular in China. More than 100 industrial parks throughout the country have claimed that they are developing themselves as EIPs, of which about three-quarters were planned by environmental professionals focusing on the circular economy, and others were planned by local governments with the help of professionals in chemical engineering, management science and engineering, and sociology.

At the macro or third level, the development of the eco-city, eco-municipality, or eco-province is one of the most prominent environmental movements in China. SEPA and local environmental protection bureaus are utilizing this movement to bring environmental issues to the attention of decision-makers. Both sustainable production and consumption are key elements at this level. In China, the difference between the notion of an eco-city and that of an EIP is that eco-cities focus on both production and consumption activities, whereas EIP focuses on production activity, especially industrial production.

Efforts at all three levels include the development of resource recovery enterprises and public facilities to support realization of the CE concept.

This adds a strong economic development dimension through investment in new ventures and job creation. In terms of investment and job creation, the CE opens opportunities for both domestic and foreign enterprises.

So far, projects, most in the planning stage, have been carried out at all three levels. At the national level, the Chinese Academy of Engineering finished research in July 2005 on the national development of CE in the process of urbanization. The NDRC also launched some projects at the national level. Liaoning, as the first province to plan CE development, completed an implementation framework for CE in 2002. Jiangsu, a province in east central China, finished its integrated development plan of CE in 2003—the first one in China—and this plan was formally approved by the provincial government early in 2005. In the past year, many provinces, such as Guangxi, Yunnan, Hai'nan, and Shandong, have also promoted the development of CE. At the city level, Guiyang was the first to launch a CE program and many others have initiated their own programs in the past 2 years. In terms of EIPs, SEPA has approved 14 national demonstration EIPs as of the end of July 2005. On October 27, 2005, the NDRC announced the list of entities to be the first (model) entities in China to develop the circular economy; the list includes fifty-six enterprises, thirteen industrial parks, seven provinces, five cities, and one town. At the same time, many individual enterprises are benefiting from CE projects in which enterprises are required or encouraged to implement cleaner production audits.

It is increasingly recognized that the conventional linear model of economic development is unsustainable in China. The CE strategy is a more likely path to achieving improvements in resource productivity and eco-efficiency. Though CE has been accepted in China and it is thought to have a promising future, there are many gaps to be filled before the ideal dream of CE can be realized in the foreseeable future. Issues such as theoretical development of CE, a systematic regulation and policy system, a well-prepared and enhanced institutional system (the structure and function of central and local government systems), well-developed technologies, and a well-trained and -informed public are critical in the

implementation of CE strategy. If all these issues can be suitably addressed step by step, China will develop its sustainable economy without sacrificing its environment.

Notes

1. References and literatures related to the circular economy can be found in publications in Chinese available on the China's Journal Group Website at <www.global.cnki.net/> and China's Circular Economy Network Web site at <<http://xh.chinaxh.com.cn/>>. Citations to some of these references are available in an e-supplement on the *Journal of Industrial Ecology* Web site <<http://mitpress.mit.edu/JIE>>.
2. The scientific development strategy, also called second-generation development strategy or new development strategy, was formally promoted in the third plenary meeting of the 16th CCP conference in October of 2003. Scientific development strategy aims to prompt the harmonious development of economics, society, and humanity by advocating human-centered, inclusive, balanced, and sustainable development. It is further explained as pushing the innovation and development of China with the principles of the coordination of urban-rural development, regional development, socio-economic development, humanity-nature development, and domestic-international policy development.

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