

# The Special Economic Zone as a Locomotive for Green Development in China

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## Abstract

Special Economic Zones (SEZs) are considered the backbone of rapid economic development in China, the epicenter of reform, and the testing ground for the introduction of new business models and activities for long-term learning and value ladder up gradation. In fact, the Chinese SEZs are not only “windows” to promote exchange between China and the rest of the world but also testing laboratories to experiment with economic, social, and political reform. The objective of this paper is to study how the SEZ acts as a change agent for sustainable economic development by serving as a role model of a green economy incubator that provides inspiration and guidance to other economic agents of the country. A focus group was organized with executives from the SEZs in this effect. We explore how companies operating in these SEZs perceive their role in the development and promotion of a green economy in China. Based on the results of a focus group discussion with 26 Chinese managers from SEZs, as well as secondary data from reliable sources, this research shows that, given the importance of these SEZs in the industrial production of the country, all these zones need to face up to major ecological challenges. China would need to not only introduce more regulations on the development of a green economy model in these SEZs but also promote a true green culture via education and outreach programs to create an overall understanding of environmental concerns for short-, mid-, and long-term economic growth and the public good. The contributions of this research are twofold: first, it reveals the characteristics of Chinese SEZs; second, it identifies the major challenges and key factors for the development of a green economy in China. Future research should include broad based samples and rigorous analysis with mixed method approach for generalizable results.

**Keywords:** Chinese special economic zones, environmental challenges, green SEZs, understanding of Chinese managers, green education

## 1. Introduction

China is undoubtedly both a key promoter and a major beneficiary of globalization. China has progressively made the transition from a planned economy to a market economy. The catalyst that led China into the process of implementing many important economic reforms and “open door” policies came into operation since 1978. One of the major decisions was the creation of “special economic zones” (SEZs) in China.

In many respects, China is the country that has popularized this form of rapid economic development, integrating it into the global value chain. With their innovative business practices, the SEZs induced economic reforms and encouraged the introduction of market-based economic policies in China. In fact, the SEZs are not only “windows” to promote exchange between China and the rest of the world and engines of regional development in China but also leaders of change and laboratories to experiment with economic and political restructuring that is increasingly taking place in the middle kingdom. Chinese SEZs have now become development models for not only other regions in China but also many countries in the world (Tao et al., 2013). The SEZs’ role in rapid economic development in China has been applauded by all; however, given their intensive industrial production with

inadequate environmental measures, all these zones, as well as the whole country, are likely to face major ecological challenges in the near future. The objective of this research is to study how these SEZs, once the role models of rapid economic development, can again serve as trailblazers for environment-friendly sustainable growth and how companies operating in these SEZs perceive their role in developing and promoting a green economy in China.

The ideas, situational analysis, and future perspectives of this paper emanate from our focus group discussion with executives from the SEZs in China, supported by the extensive literature review on this topic. The rest of the document is organized as follows. Section 2 presents the characteristics of Chinese SEZs, Section 3 describe the role of the SEZs for green development, Section 4 presents the strategy of developing green economic model in the SEZs, and finally, our conclusion are presented in Section 5.

## **2. SEZs as Role Models for Economic Reforms and Integration into the Global Value Chain**

A SEZ is an area in which a comparatively free management system and other conditions are in place to ensure rapid economic transformation and development. It enjoys several types of economic cooperation with foreign multinational corporations, ranging from mergers and acquisitions (M&A) and international joint ventures (IJV) to fully owned Greenfield investment, in most industrial sectors except security and defense industries. SEZs are open to manufacturing, light engineering, trade, banking, insurance, and many other economic activities (Park, 1997). China has different types of SEZs. Each of them presents unique features based on the economic objectives set by the government during its implementation. The progressive creation of these zones, as well as the evolution of each one, illustrates the gradual and sequential regional development strategy followed by the Chinese government. With its heterogeneous economic structure and very limited resources, China had to implement strategies based on the features of each area instead of following a countrywide strategy to develop role models of individual entrepreneurs, firms, and regions, so that the rest of the country can draw inspiration and learn from their experiences-both successes and failures. The first and the most successful SEZs were implemented in 1980 in Shenzhen, a small fishing village in the southern Guangdong Province. The SEZ of Shenzhen truly symbolized the beginning of the Chinese “open door” policy implementation. Almost at the same time, three other cities were designated as SEZs by the Chinese government: Shantou and Zhuhai in Guangdong Province and Xiamen, in Fujian Province. In 1988, the province of Hainan was introduced designated as the fifth special economic zone. These implementations of SEZs in these regions were established by the Chinese government were initially based on for several reasons. The first was to use them as “windows” to promote exchanges between China and the rest of the world and also as testing laboratories for to experimenting with economic and political reforms. In addition, their proximity to Hong- Kong, Macao, and Taiwan makes easier for these SEZs to attract their businesses and to demonstrate to the people of these regions the seriousness of the policy that the government is serious about the “one country, two systems” policy. The creation of these SEZs also helps to determine if the capitalist and socialist systems were able to co-exist within the same country.

### *2.1 Major Categories of Chinese SEZs*

China has also established at least five variants of SEZs, each catering to a specific need. The SEZs together with their variants contribute one-third of Chinese exports to the world market.

#### **2.1.1 Economic and Technological Development Zones**

Considering the success of the SEZs, the Chinese government decided, in 1984, to establish 14 “open coastal cities,” which facilitated the creation of “economic and technological development zones” (ETDZs). According to Chinese government statistics, China currently has more than 60 state-level ETDZs. As opposed to the previous SEZs, the ETDZs focus more on technology-intensive industries. The main ETDZs are located in the cities of Beijing, Tianjin, Shanghai, and Qingdao.

#### **2.1.2 Free Trade Zones (FTZs)**

Since the 1990s, the Chinese government also developed, anticipating its entry into the World Trade Organization (WTO), about 15 “free trade zones” with the objective of experimenting with free trade by promoting commercial exchanges, most notably through simplified custom procedures and tax refunds on exports, imports, and value added tax (VAT). The largest and oldest is the Waigaoqiao Free Trade Zone located in Shanghai, which spans an area of 10 square kilometers. It has attracted more than 9300 firms; one-third of all foreign firms in Shanghai are set up in that area (RightSite.Asia, 2012).

### 2.1.3 Export-Processing Zones (EPZs)

This is the most popular type of zone worldwide. Its mission is essentially to produce goods for the export market. There are more than 60 zones of its kind in China. Firms can easily bring raw materials from abroad to be processed in these EPZs and re-exported to international markets. These zones enjoy relatively relaxed rules that benefit firms and allow them to bring foreign currency to the country. The foreign firms established in these zones also bring higher technology and management practices.

### 2.1.4 High-tech Industrial Development Zones

Created also in the middle of 1980s, these zones are quite similar to the ETDZs, but they benefit from additional fiscal, financial, and administrative incentives for innovation and research and development. The main goal of these zones is to develop new high-tech products to catch up with the industrialized countries in the high-tech industry sector. This strategy helped China to increase its share of high-tech exports in the international market. This policy contributes to technology transfer and human resources training and helps upgrade the value ladder.

### 2.1.5 SEZs and SEZ Variants in China

China has now five “new areas” at the national level: Shanghai Pudong, Binhai Tianjin, Chongqing Liangjiang, the islands of Zhoushan in Zhejiang Province, and Qinwangchuan in Gansu Province. These areas serve as a platform for industrial and commercial growth and an engine to accelerate the economic development of their respective regions. Table 1 presents the summarized details of the different types of SEZs in China.

Table 1. Details of SEZs and SEZ variants in China

Type of Zone	Number	Year of Establishment and Location
Special Economic Zones (SEZs)	5	1980: Shenzhen, Zhuhai, Shantou, Xiamen, 1988: Hainan
Economic and Technological Development Zones (ETDZs)	69	Yangtze River Delta: 18; Pearl River Delta: 10; Central Region: 15; Bohai Bay Region: 11; Northeast Region: 2; Western Region: 13
Free Trade Zones (FTZs)	15	First FTZs: Shanghai Waigaoqiao in 1990; coastal cities: 13; inland cities: 2
Export-Processing Zones (EPZs)	61	First EPZs: Kunshan in 2000; coastal regions: 44; inland regions: 17
High-Tech Industrial Development Zones (HIDZs)	54	First HIDZs: Zhongguancun (Beijing) in 1988; coastal regions: 25; inland Regions: 29
New Areas	5	First new area: Shanghai Pudong in 1989

Source: Prepared from Zeng (2010) and China National Bureau of Statistics, 2010.

## 2.2 Major Characteristics of Chinese SEZs

The SEZ (hereafter, the term SEZ includes its variants as well) represented a fundamental strategic innovation incubator for local firms and policy makers to obtain practical knowledge of a market-based economy before the introduction of liberalization in China. In many ways, however, Chinese SEZs offer advantages that are more attractive than those of other countries (Goswami, 2007).

### 2.2.1 Special Beneficial Policies

Companies investing in cities and regions designated as SEZs by the central government benefit from a significant number of preferential policies, such as fiscal advantages, tax incentives, easy access to domestic markets, rapid customs clearance, and a privileged judicial environment.

### 2.2.2 Government as Economic Policy Programmer

The regional or local government offers various business incentives, including one-stop service, consulting service, and marketing, accounting, and legal services to firms wishing to invest in SEZs. In fact, the investor could also, in many cases, negotiate the implantation terms with the local government. The state's role in the area is confined to proactive policy making for the guidance of investors rather than direct involvement in actual production.

### 2.2.3 Broad Institutional and Economic Autonomy

The SEZs are relatively independent as far as international trade is concerned and are viewed as a testing laboratory for the rest of the country. Moreover, companies can benefit from favorable project investment rules because of fewer bureaucratic layers with the power to make unilateral decisions and regulations, such as municipal laws and local tax rates and structures. Notably, the local government of Shenzhen was extremely successful in its institutional innovations such as wage reform and government approval within 24 hours.

### 2.2.4 Abundant Human, Natural, and Industry-specific Resources

Apart from the fiscal and legal incentives and promotions, it is important to point out that these SEZs have access to a large supply of low-cost, high-value manpower and natural and industry-specific resources that facilitate installation of new production facilities in the SEZs. Being the most populated and a relatively underdeveloped country, China created a framework for the investment of its huge amount of resources for rapid economic development to catch up with the more advanced countries in a relatively short period of time.

### 2.2.5 Location Benefits

These SEZs usually have large tracts of affordable land and an interesting geographical location for businesses since many of them are coastal cities with access to important maritime ports. Besides, they have become hotspots for research and innovation because of the presence of some important foreign and Chinese firms and the availability of high-skilled labor and infrastructure. With such locational advantages, Chinese SEZs are also well integrated with regional production networks in Asia that facilitate foreign companies to disperse their activities across the regional production hubs depending on availability of resources they are in need of.

The SEZs in China are quite different from those found elsewhere in the world. However, the various types of Chinese SEZs, despite their differences, share several special features in common: i) rather than relying mostly on private capital, they receive significant funding from the Chinese government; ii) they accept not only foreign investments but allows also Chinese companies to take advantage of the very attractive operating environment; iii) they do not build their competitiveness solely on cheap labor, but engage in upgrading the value chain by developing, step by step, core competencies and getting increasingly involved in higher value added activities; iv) rather than being confined and isolated, they maintain close relations with other regions of China to promote spillover effects; v) they do not limit themselves to economic activities, but develop and experiment with new ideas and practices by acting as laboratories for Chinese reforms.

## 2.3 *The SEZs' Impact on Economic Policies and Rapid Development*

The SEZs play a major part in China's economic development and reforms as well as in opening up to world trade and investments. They represent the first move towards integrating into the global value chain, contributing to segments where they are competitive and gradually developing their capabilities. Not only have they contributed immensely to the development of the Chinese economy, but they have also become symbols of hope and emergence for the country as a whole. They are successful testing laboratories for the market economy and act as beacons for the rest of the country to follow.

In the first place, SEZs have had a great impact on the Chinese economy during the last 30 years as one of the main engines of economic growth. Considering the difficulty of obtaining relevant data, a more detailed description of the economic importance of each of the SEZs would be a challenging task. However, according to Zeng (2010), the 54 state-level ETDZs, 53 state-level HIDZs, and 15 FTZs contributed 11.1% of China's total GDP and 29.8% of exports in 2006. In 2007, the total GDP of the major state-level SEZs contributed 21.8% of national GDP. If other subnational-level SEZs were added, the figure could be higher. With a much higher growth rate than the national average, the original five SEZs today represent more than 5% of China's total GDP. The development of SEZs has also contributed greatly to the creation of jobs in China. In 2007, the SEZs provided 31 million jobs, about 4% of the total national employment (Zeng, 2010). The inflow of investments into the SEZs has contributed to triggering an important shift in the workforce from the agricultural sector to the industrial sector. In the process, many Chinese wage earners in these zones have become high-skilled workers.

The Chinese SEZs are also drivers of international trade between China and the rest of the world. According to the China National Bureau of Statistics, the original five SEZs today contribute 22% of Chinese exports of merchandise and 9% of total FDI inflows, and Chinese SEZs accounted for around 60% of total exports of China in 2007. According to the China National Bureau of Statistics, Shenzhen, an original SEZ, contributed almost 13% to national trade by the end of 2006, up from 0.04% in 1980. China is now a global hotspot for foreign direct investment-the world's second largest recipient of FDI in 2012. The SEZs are a major platform for attracting foreign investment. Based on 2007 data, the major national-level SEZs (excluding HIDZs) are estimated to have

utilized around 46% of the total FDIs (Zeng, 2010).

In addition, many of these SEZs have now become national champions in technological innovation, thus contributing significantly to the transformation of China from a “workshop of the world” to the “laboratory of the world.” Several Chinese high-technology firms, such as Huawei, ZTE, and Great Wall Computers, are now established in SEZs. Today, most of the companies located in Shenzhen are working in the field of high technology. In 2007, 54 HIDZs registered some 50 000 invention patents in total, more than 70% of which came from domestic firms (Zeng et al., 2012). Patents filed in China increased by around 26.1% between 2003 and 2009 (Reuters, 2010). However, it must be mentioned that a large number of these patents are not necessarily tied to truly fundamental inventions, although quality patents are trending up. Thus, SEZs will play a more prominent role in technological innovations in China in the future.

Also noteworthy is the positive role played by the SEZs in the development of all regions of China, especially their efforts to reduce economic disparities between the different regions of the country, which have become too large over time. In fact, the accumulation of wealth in the eastern coastal regions, because most of the SEZs are located there, explains the disparities between the eastern region and the rest of China. The population living in the central and western part of the country is significantly poorer than in the coastal east. The Chinese government has recently implemented some economic disparity reduction measures. For example, the central government has invested significantly in core sector (energy, telecommunications, general infrastructure, and transport) projects in these backward regions. The government has reportedly promised that a substantial percentage of loans from foreign governments and the World Bank would be reinvested in the economies of the central and western regions of China as part of the economic stimulus program. The SEZs are expected to contribute in this area. The “9 + 2” project, which involves close cooperation between the nine south and south-west provinces plus Hong Kong and Macao, launched in the Pan-Pearl River Region in 2012 around the original five SEZs illustrates their important role.

Another novel feature of the Chinese SEZs is their role as laboratories to experiment with economic and even political reforms attempted by the Chinese government. In fact, the reform and opening up of the Chinese economy represent quite a unique case as China wishes to follow neither the earlier closed economic model nor the Western model of *laissez faire*. China thus attempts to construct a socialist model based on Chinese characteristics following a “trial and error” approach. Therefore, the reform measures are first introduced in different regions of China and their success or failure evaluated before they are to be implemented in the rest of the country. In other words, the Chinese government aims to verify if a market economy can be adapted to a socialist framework. This progressive approach appeared to be the only option for the Chinese government, which lacked experience at the time and needed to test the new policies and institutions required for a market-oriented economy. Several SEZs have been particularly strong in introducing several market economy approaches. For example, the Shenzhen SEZ accomplished several important breakthroughs in China, such as the first Sino-foreign joint venture, the first Chinese stock market, the first to adopt a new government structure, the first to reform the management system of government officials, and the first to practice e-government.

### 3. The SEZ as an Engine of Green Development in China

The experiences of Chinese SEZs, though differing in speed and performance, are generally quite successful despite several problems and criticisms against them (Goswami, 2007). The current trend among many countries, such as Greece, India, Mauritius, and Nigeria, to follow the Chinese SEZ model confirms the important benefits that SEZs can offer those (Reuters, 2012). However, after more than 30 years of existence, the SEZs still have an important role to play in the development of China. In fact, China is currently facing increasingly complex and important challenges in terms of innovation, governance, social justice, and, most notably, sustainable economic development (economic efficiency, social efficiency, and eco-efficiency). In this context, the SEZs can always play a significant role and provide leadership in these fields, showing how China can adopt economic and the societal values for sustainable economic growth rather than follow a development model that might not be viable either for the firms or for the country since it inevitably leads to ecological disaster. SEZs, being relatively small geographic areas that are well organized in terms of infrastructure and administrative services and new ways of environment-friendly production, can be developed as prototypes to address the above issues on a small scale and then expand their experience to the country as a whole in the same way as the foreign investment capitalistic product model was first introduced in the SEZs and then to whole of China. Thus, the SEZs can also play a prominent role in developing a green economy in China. In fact, given their important role in the national industrial production and in economic reforms in China, the SEZs should spearhead the green development of the country.

### 3.1 Accumulative Production Mode and Ecological Disaster in China

China has made significant economic progress since the launch of its economic reform program in 1978 and especially since its entry into the World Trade Organization (WTO) in 2001. However, China supports a population of unprecedented size that places severe pressure on the vulnerable ecosystem, and its excessive industrial growth and rapid urbanization over the last three decades have created major upheavals in the world in terms of natural resource consumption and environmental protection. China is now facing serious challenges of sustainable development. According to some of the most alarmist views, China is now on the threshold of a major ecological disaster (Li et al., 2013).

Today, a quarter of the people in China have no access to clean drinking water. One-third of the urban residents have to bear with polluted air. Clearly, most of the population is exposed to a degraded environment with low quality of air, water, and soil. In recent years, severe environmental and ecological problems have posed a great threat to economic development and, even more tragic, to human life and property (Li et al., 2013). The Chinese government recognizes that “with the continuous advancement of industrialization, urbanization and agricultural modernization, the environment faces serious challenges” (Ministry of Environment Protection of the P.R.C., 2013). Serious pollution in China has had a significant impact on the climatic condition: “Starting in 2011, the country has been hit by a string of extreme weather and climate events, including low-temperature freezing rain and snow in south China, spring and summer droughts in the middle and lower reaches of the Yangtze River, rainstorms and floods in the south, typhoons in coastal areas, autumn rains in western China and serious waterlogging in Beijing. These weather and climate disasters have impacted China’s economic and social development as well as people’s lives and property to a great extent. In 2011 alone, natural disasters affected 430 million people and caused direct economic losses of about 50 billion dollars” (The National Development and Reform Commission of the P.R.C., 2012).

Since 2006, China has been the world’s largest overall emitter of carbon dioxide (CO<sub>2</sub>) and, as opposed to almost all the other major economies, China’s CO<sub>2</sub> emissions have increased at an accelerating rate since 1999 (see Figure 1). China is currently by far the world’s biggest emitter of greenhouse gases and burns nearly as much coal as the rest of the world combined (China Briefing, 2013).

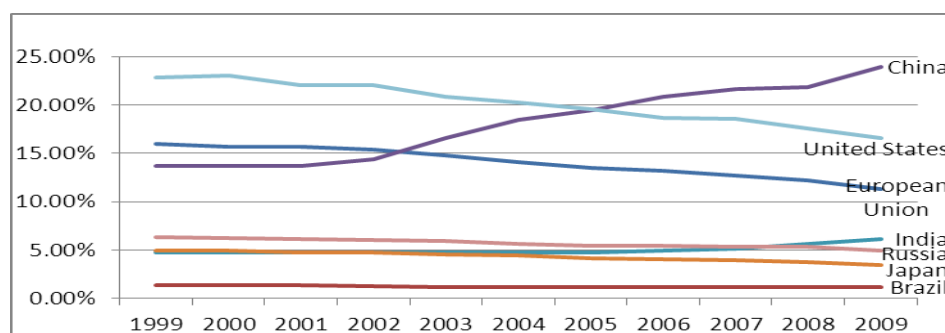


Figure 1. CO<sub>2</sub> emissions of various countries over the years (as % of world's total)

Source: Compiled with data from the World Bank Database, 2013.

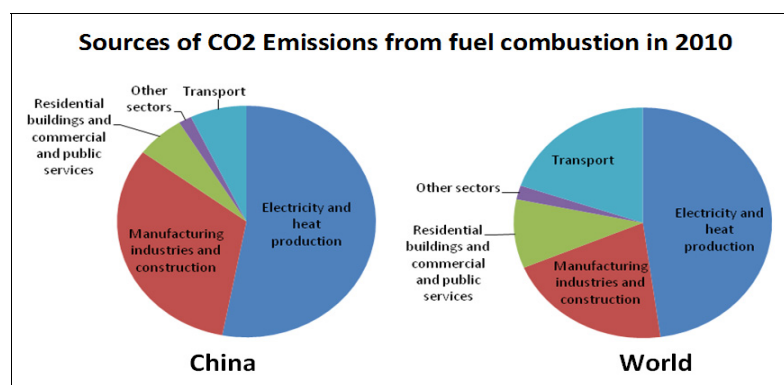


Figure 2. Sources of CO<sub>2</sub> emissions from fuel combustion in 2010

Source: Compiled with data from the World Bank Database, 2013.

The combustion of fossil fuels is a main source of air pollution in China, where coal represents more than 70% of the total energy consumption. Coal is widely used for not only industrial but also domestic consumption, from which large amounts of pollutants (suspended particulates, sulphur dioxide, etc.) are emitted under incomplete combustion and inadequate emission controls. Figure 2 clearly shows these Chinese characteristics in comparison to the world situation.

The situation is more worrisome in China, if one considers the following data from the World Bank (World Bank Database, 2013):

- a) the electricity production from oil, gas, and coal sources was 79.73% in China in 2010, which is higher than the world average of 66.96%;
- b) the proportion of electricity production from renewable sources, excluding hydroelectricity, has increased in China since 2004 but, at 1.14% in 2010, is still lower than the corresponding figures for OECD countries (5.25%) and for the world as a whole (3.37%);
- c) CO<sub>2</sub> emissions from solid fuel consumption, which mostly consist of coal, are much higher in China than elsewhere (73.56% in China as of 2009 compared to the world average of 17.94%);
- d) CO<sub>2</sub> intensity in China is higher than the world average (3.42 and 2.58 kg per kg of oil equivalent energy use, respectively).

Indeed, China is in great need of resources to support growth and develop an eco-friendly production capacity. It has only 7% of the world's arable land, 6% of drinking water, 4% of forests, 2% of oil reserves, and 12% of mineral reserves of the planet. From being an oil-exporting country till 1993, it has now become almost the largest importer of oil in the world (about 60% of its oil consumption is imported). China is responsible for a 40% increase in global oil demand since 2000, and a 60% increase in global demand for non-ferrous metals since 2003. With about 15% of the global manufacturing output, China consumed 20% of the global production of aluminum, 35% of the world's steel production, and 45% of cement. It now appears that China is emerging as the main driver of the rise in commodity prices. If China continues to grow at this rate, the whole world's resources will no longer suffice (Earth Policy Institute, 2003).

It is important to note that the lack of economic efficiency is also a major challenge for the sustainable development of China. Chinese authorities recognize that, to produce the same product, China uses seven times as much energy as Japan and five times as much as Europe do. Chinese steel companies consume 40% more energy resources than the world standard level, which is 50% more than the electricity sector does. Every 10,000 yuan of GDP costs China five times as much water and three times as much energy as the same amount does the developed countries. As a result, China has 20 of the 30 most polluted cities in the world today, in addition to being the biggest emitter of CO<sub>2</sub> in the world (World Bank, 2008). The Chinese government estimates the direct economic loss caused by pollution in 2010 at 1.1 trillion yuan, which represents 2.5% of China's GDP. This is equal to 2.15 times the loss incurred in 2004. In 2010, pollution costs increased even faster than China's GDP growth rate did (South China Morning Post, March 28, 2013).

According to a recent research study (Li & Kuai, 2013), "Energy supply per unit GDP in China is higher than the average level across the world and among other major developed countries. Specifically, the energy supply per GDP in China is 2.7 times that of the world, 4 times of the U.S., 4.5 times of OECD countries, 4.5 times of France, 7 times of the U.K., and 8 times of Japan," and China's carbon intensity is one of the highest in the world, higher than not only the developed countries but also some developing countries such as India as well as the world average. The 2009, carbon intensity of China is about five times that of the U.S., more than eight times that of Germany, and nine times that of Japan. This huge difference reveals the ignorance of environmental protection in China, a result of the pursuit of rapid economic growth at any cost. This needs to be addressed for the reduction of carbon intensity.

### *3.2 Towards Eco-friendly Green Production Bases in SEZs*

In recent years, the Chinese government has made considerable efforts for sustainable development. Green indicators have received increasing attention in the 12<sup>th</sup> Five-Year Plan of China. Eight resource and environment indicators take up 33.3%, compared to seven taking up 27.2% in the 11<sup>th</sup> Five-Year Plan. Moreover, for the first time in this plan, China aims to cut CO<sub>2</sub> emissions per unit of GDP by 17% from the 2010 level before the end of 2015 in order to combat global climate change. Incentive-based and binding mechanisms are also set up to intensify price reform for resource-based products and environmental protection. The plan also calls for evaluation of energy-saving and emission reduction programs and curbing total energy consumption. During the 12<sup>th</sup> Five-Year Plan period, green development will focus on six aspects: climate change, resource management,

circular economic development, environment protection, ecological restoration and water conservancy, and disaster prevention and mitigation. China has also announced plans to increase its 2015 solar installation targets by 67% (Knowledge at Wharton, 2013). China will also introduce a set of new taxation policies designed to preserve the environment. “The Chinese government will collect the environmental protection tax instead of pollutant discharge fees, as well as levy a tax on carbon dioxide emissions, and the local authorities will be responsible for the tax collection” (China Briefing, 2013). The country’s first plan to safeguard the environment against dangerous chemicals, the 12th Five-Year Plan for Prevention and Control of Chemical Risks to the Environment, announced on February 21, 2013, specifies 58 key chemicals to be controlled and prevented from exposure to the environment. Furthermore, the 12th Five-Year Plan for the Development of a State Environmental Protection Standard, announced on February 22, 2013, plans to enact and revise 600 types of environmental standards and release 300 more by 2015. The Chinese government is considering a new coal tax, calculated on the price of coal rather than the amount sold. Energy-intensive products such as batteries and luxury goods such as private jets may also attract new taxes. From March 1, 2013, six of the most heavily polluting industries in 47 major cities have been required to follow the new air quality standards designed to tackle the country’s escalating smog crisis.

The SEZ has proven to be a successful model for China in its industrialization, modernization, and internationalization, demonstrating its strong leadership as a role model for the rapid economic development of the country. Similarly, they can also assume leadership and act as role models in promoting low-carbon, green growth in the country. In fact, their important role in industrial production and high dependence on natural resources (Zhong, 2012) can alone justify their transformation into green SEZs. Moreover, the political and economic complexities of China make SEZs more attractive as laboratories in the implementation of sustainable development measures. According to Farole and Akinci (2011), “Clustering of companies and industries in an SEZ could provide multiple advantages not only to apply different components of a climate-friendly policy and investment regime, but also to target existing zones or future zones. On one hand, the low-carbon, green zone maximizes the effectiveness of environmental infrastructure for industry, which otherwise could be expensive for individual companies. On the other hand, single zone management for hundreds of companies from a low-carbon, green perspective allows for a huge synergy effect in various forms, such as the efficient use of low-carbon management expertise, the steep learning curve, and peer pressure to do what is right that does not exist outside the zone.” Just as SEZs have effectively driven industrial development and growth in China, low-carbon, green SEZs could be a useful platform for the realization of a green development strategy and a shortcut for the achievement of low-carbon development in China in a concrete and realistic way.

#### 4. Ecological Awareness and Development of Green SEZs

For an environment-friendly industrial policy in the SEZs or elsewhere, stakeholders need first to be aware of the importance of adopting such a policy and then align themselves (Kimiagari et al., 2013) on the larger goal of sustainable economic development. Adapting from Farole & Akinci (2011), we consider that the success of green SEZs depend on certain basic conditions that can be summarized as follows:

- a) *Greenhouse Gas (GHG) Mitigation Target*: The economic activities in the SEZ need to be aligned with concrete action plans for mitigation of ecological consequences. Therefore, a low-carbon, green SEZ should establish a goal and commitment to GHG mitigation at the center of its overall industrial strategy (e.g., SEZ-wide 30% reduction by 2020, renewable energy mix of 15%). The first step is to develop a baseline using basic GHG accounting rules and inventory systems making it possible to monitor how much GHG emission comes from which source and how much emission reduction potential exists in each sector.
- b) *Sustainable Infrastructure*: Planning, designing, and building of SEZs’ infrastructure using energy-efficient, resource-saving, and low-carbon methods would provide ample opportunities to reduce the carbon footprint. Some sources for GHG reduction include renewable energy, energy efficiency, green buildings, and a waste reuse and recycling system.
- c) *Climate-friendly Investment Generation*: Low-carbon, green SEZs can generate a streamlined and low-risk environment that fills in the gaps in the national legal framework to attract new, climate-friendly investment and technologies. To do so, it is also important to develop relevant investment promotion tools and methodologies to incorporate green elements in terms of green business targeting, incentives, intellectual property protection, and marketing strategy.
- d) *Low-Carbon Policy Incentives and Regulations*: Putting the right public policy framework in place is a critical success factor for low-carbon, green SEZs. Some best practices include eliminating trade and nontrade barriers to climate-friendly products, instituting green building codes, and establishing renewable energy or



energy-efficiency laws (e.g., Brazil, China, India) that introduce a feed-in tariff system, renewable portfolio standards (RPS) and energy-efficiency standards, tax reduction for green high-technology investment, and R&D support.

e) *Carbon Finance*: A carbon finance mechanism, such as a clean development mechanism (CDM), can provide the potential to channel a new source of funding to develop low-carbon, green SEZs in middle- and low-income countries.

However, we believe that political, legal, administrative and financial measures alone would not allow the Chinese SEZs to effectively play the expected role in green development, given the peculiarities of the Chinese context. In fact, many aspects are to be considered in this regard:

a) On the political level, despite the new development strategy adopted by the Chinese central government, the local Chinese authorities always pay more attention to the speed of economic growth in their zones and job creation for youths. The projects are evaluated on these criteria.

b) On the economic level, many Chinese companies find themselves in a precarious financial situation because of the lack of real competitive advantages, maintain sometimes artificial competitiveness, and are extremely sensitive to their economic results.

c) On the cultural level, over the past 30 years, a mercantile mentality predominates in Chinese society, which promotes the search of material gains at any cost without thinking of future consequences or public good.

Our focus group discussion with managers from the SEZs shows a lack of green culture in Chinese society. Some even consider the green economy as a plot by Western countries (Gou, 2010).

In December 2012, we organized the focus group with 26 managers and administrators working in a major SEZ to consider the environmental challenges and responsibilities of China and of Chinese companies and examine what the SEZs can contribute in this regard. The results show clearly that China would need to not only introduce more regulations on the development of a green economy but also develop a true green culture via education and other outreach programs. In fact, the participants are fairly responsive to environmental challenges in China and feel more or less concerned about green development. At the end of the three hours of discussion, the consensus of the group is that China and Chinese enterprises should pay attention to sustainable development, but to the extent of their means, and they must prioritize their economic development while trying to reduce “survival pollution.” The group was of the opinion that SEZs can first facilitate environment-friendly industrialization in their exclusive zones and then extend their activities to other parts of the country as they did for the rapid economic development of the country. Many of their arguments also reflect the following issues that are currently quite widespread in China:

a) *CO<sub>2</sub> emissions per capita vs. CO<sub>2</sub> emission per country*

Figure 3 indicates that on a per capita basis, China is not the worst polluter. Developed countries such as the US, Canada, Japan, and the EU have some of the worst rates of emissions per capita, and developing countries such as Russia and Brazil have highly variable results. According to the International Energy Agency, by 2030, each individual in China will emit nearly 7 tonnes of CO<sub>2</sub> a year, but the average in OECD countries by then will be 13 tonnes (Vidal, 2007).

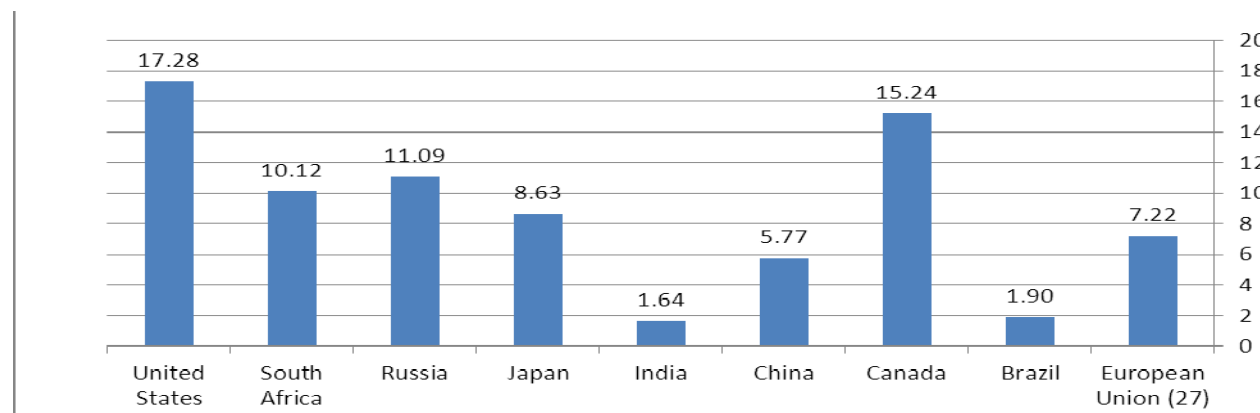


Figure 3. CO<sub>2</sub> emissions (metric tons per capita) in 2009

Source: The World Bank Database, 2013

### b) *Survival pollution vs. luxury pollution*

In this regard, the example of the number of cars owned in different countries is often referenced in China (see Figure 4). Many Chinese believe that the pollution of China is more about survival and that Western countries' pollution is more about luxury.

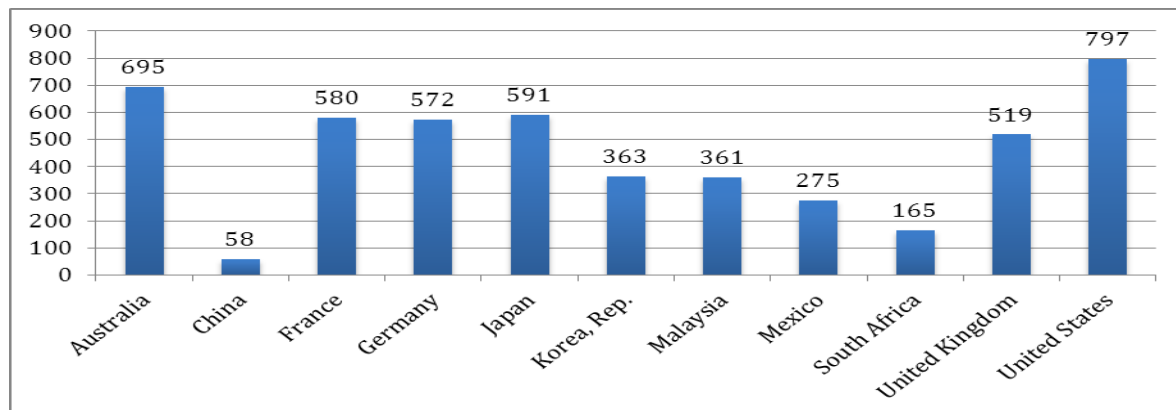


Figure 4. Motor vehicle population (per 1000 people) in 2010

Source: The World Bank Database, 2013.

### c) *Historical responsibility vs. current impact*

According to an analysis by Müller, Höhne, & Ellermann (2007) based on calculated shares in cumulative historic emissions of the greenhouse gases CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O (from land use change and forestry) as a relative measure of causal contributions, China has historically contributed little to the present build-up of greenhouse gas emissions in the atmosphere, but the industrialized countries have, up to the present, causally contributed 54.5% to the climate change problem.

### d) *Production of pollution vs. delocalization of pollution*

The full extent of Western responsibility for Chinese greenhouse gas emissions has been revealed by Oslo's Centre for International Climate and Environmental Research (Clark, 2009). Around a third of all Chinese carbon emissions are the result of producing goods for export. Half of the recent rise in China's carbon dioxide pollution was caused by the manufacturing of goods for other countries, particularly developed nations. Around 9% of Chinese emissions are the result of manufacturing goods for the US, and around 6% are from producing goods for Europe (Müller, Höhne, & Ellermann, 2007). Many Chinese think that countries that consume goods and services produced elsewhere should also be responsible for emissions resulting from their production. However, these arguments, though understandable to a certain extent, cannot solve the vital issue of ecological problems that the world, including China, is going to face. The citizens of the world need a true green consciousness to ensure sustainable production and consumption for the present as well as future generations. What we need is to avoid playing the blame game or pointing the finger at either the producer or the consumer of products that create ecological damages, but collaborate on how to alleviate the ecological consequence of our current and future mode of production and consumption. "It is important to come to a common understanding that shifting to a low-carbon, green economy does not mean sacrificing competitiveness and economic growth; but rather, is an investment in long-term sustainable economic development" (Farole & Akinci, 2011). Our discussion with the executives of the SEZs and our extensive literature review led us to a framework for low-carbon, green SEZs, shown in Figure 5.

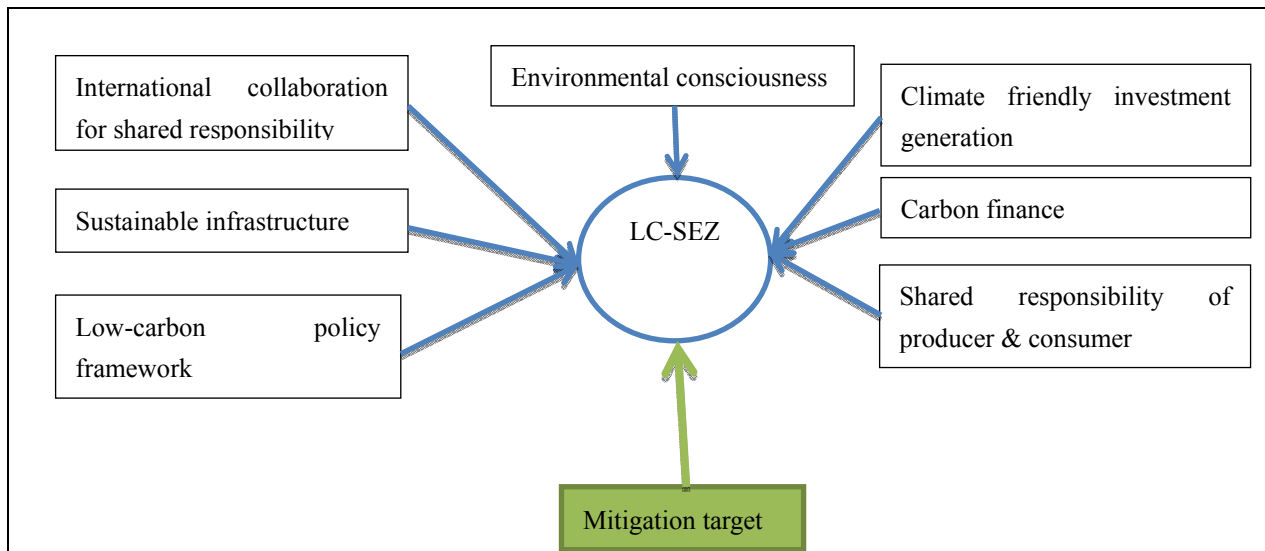


Figure 5. Framework of low-carbon (LC), green special economic zones (LC-SEZs)

Source: Prepared by the authors with inputs from Farole & Akinici (2011).

## 5. Conclusion

In August 2010, the National Development and Reform Commission (NDRC) of China launched a national low-carbon province and low-carbon city experimental project. The project will be implemented in five provinces (Guangdong, Liaoning, Hubei, Shaanxi, and Yunnan) and eight cities (Tianjin, Chongqing, Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang, and Baoding) that host several SEZs. The governments of these experimental provinces and cities will clearly establish operational goals, major tasks, and specific measures to control local emissions of greenhouse gases. In addition, they will also establish a management information system for greenhouse gas emissions and actively promote a low-carbon lifestyle and consumption pattern to reduce carbon emissions. The NDRC also required the experimental areas to explore a mechanism to promote energy conservation and emission reduction as well as development of low-carbon industries and implement a target-oriented responsibility system to control greenhouse gas emissions. The experimental areas are also required to explore effective government guidance and economic incentive policies, study and apply the market mechanism to achieve the emissions goal as well as closely follow the latest advances in low-carbon technologies, and actively promote the introduction, absorption, and re-innovation of technologies or conduct joint research and development on new technologies with overseas companies (People's Daily Online, 2010).

However, "none of China's so-called low-carbon industrial zones currently live up to the name." This is the conclusion drawn from a report of the US Institute for Sustainable Communities (ISC), which released, in 2012, a guide for the development of green industrial parks in China (Chun, 2012). This organization attempted to rank China's leading industrial zones against a set of low-carbon criteria; however, not one reached the pass mark of 60%. Strong government support has driven the development of China's industrial zones. But, today, industrial zones have no motivation to go low-carbon, and no concrete guidance on how to do so. Government has hept itself to issuing instructions, to which business has failed to respond (Chun, 2012). Clearly, the path is still long for Chinese cities in general, and for the SEZs in particular, to actively and effectively contribute to green development in China. Given its particular situation, China would need to not only develop more regulation and technical support for the development of a green economy but also promote a true green culture via education and outreach programs. National and international collaboration among the stakeholders is required for such a strategy to be implemented and be successful. Despite many shortcomings and dilemmas, the SEZs hold promise for the adoption of environment-friendly industrial policies and for spreading the trend to other parts of the country. By developing awareness among the stakeholders and with proper private-public partnership, the SEZs can show the way to green development in China. Despite interesting issues and ideas analyzed in this paper, there are several limitations that future researches need to address. First of all, with an extended sample of SEZs and rigorous data collection mode, both quantitative and qualitative, a mixed method approach is recommended for generalizable results. Secondly. Through a longitudinal study, changes towards greening the SEZs and their impact on wider economy need to be evaluated.

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