Global Green Growth Institute

Case Study

China's Green Special Economic Zone Policies — Development and Implementation

Acknowledgements

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This case study is intended to serve as an example of policies and practices relevant to pursuing a green growth model of development. It describes activities and programs performed by organizations other than GGGI, and GGGI itself had no direct role in their development, adoption, or implementation.

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01 Summary

Over the past few decades, the People's Republic of China (China) has arguably experienced the largest economic expansion of any country in history, and this has been largely as a result of its efforts to launch and develop Special Economic Zones.

When China introduced the ground-breaking 'Reform and Open-Door' policy in 1979, SEZs were devised as the main tool to materialize the new experimental strategy. Initially set up in four coastal cities, SEZs quickly proved their success in attracting foreign investments and stimulating trade and industrial development. National and sub-national level SEZs and SEZ variants mushroomed across the country following the success of the initial models, and they eventually became the locomotive of the rapid economic advancement which brought China to its current economic prominence.

Rapid industrialization, however, has had devastating effects on the environment and on public health, particularly in most industrialized cities in China. This created high pressure on the Chinese government to take more substantial measures to promote more innovative and green economic development. Increasing competition for resources and weakened price competitiveness of Chinese products in the international market also pressed industries to adopt more sustainable means of production.

The Chinese government implemented a series of programs to stimulate green transition of industries and the entire economic value chain. The first, the Eco Industrial Park (EIP) demonstration program, started in 2003, aimed to promote transformation of conventional industrial zones into a resource-efficient and clean model or construction of new industrial zones based on industrial symbiosis and clean production principles.

The Circular Economy Demonstration Industrial Parks (CEDIP), launched in 2005, was based on the same principles as the EIP program, including promotion of Reduce, Reuse and Recycle (3R) and emission reductions. However, it aimed to approach the Circular Economy within the broader context of promoting sustainable urban development around SEZs. China's adoption of Circular Economy as one of main themes in China's 11th Five Year Plan (FYP), China's mid-term development strategy for 2006-2010, further bolstered support for the CEDIP program. In 2012, the CEDIP program was replaced with the Circular Transformation of Industrial Parks (CTIP) program to support the 12th FYP and China's global climate change commitments, placing a strong emphasis not only on sustainable industrial zone development but also on the promotion of clean and high added-value industries such as new energy, clean vehicles, and information technology.

In parallel with CTIP, in 2013 the government launched the Low-Carbon Industrial Park (LCIP) demonstration program to operationalize China's new constitutional goal of 'ecological civilization'. The program stressed carbon monitoring and accounting and relevant infrastructure development in the context of promoting low carbon industrial zones.

Primarily thanks to strong national-level promotion by the central government, all of these programs have been deemed successes. The theme of Circular Economy and green industrial transition regularly appeared in the FYPs, providing a clear, high-visibility signal of the central government's support for these policies. These consistent messages facilitated uptake of the programs in the private sector, as well as voluntary participation by local governments. In addition, successful implementers and participants in all of the three programs received official certifications.

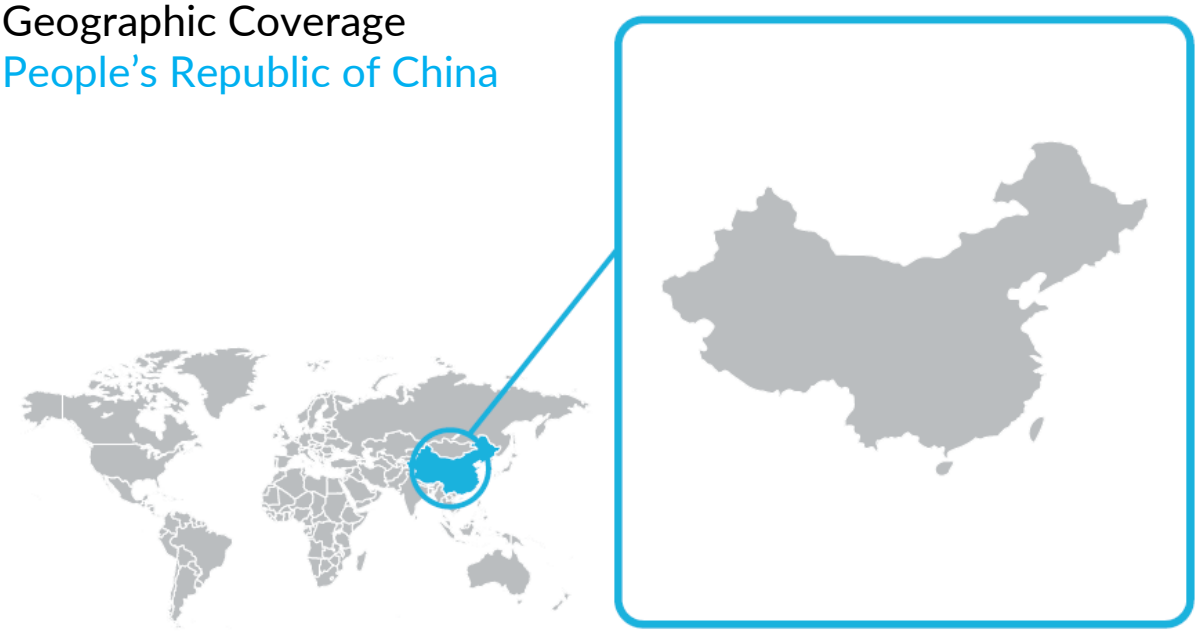
Increasing participation in the programs created added incentives, as the growing number of SEZs generated greater competition among the SEZs to attract investment. Overall, an estimated 13% of 1,568 national and provincial-level SEZs now belong to one of the three programs, and 33 SEZs were participating in at least two programs as of 2013. The collective benefits of these SEZs were substantial, such as reduced toxic discharges, reduced greenhouse gas (GHG) emissions, and job creation.

Another success factor of China's green SEZ programs has been the central government's efforts to simultaneously build up appropriate policies and relevant market mechanisms, instead of focusing only on direct financial subsidies and tax benefits. The Chinese government began a project to mainstream environmental records as a principal criterion in accessing financial services and products, and has also concentrated its efforts in nurturing the Clean Development Mechanism under the United Nations Framework Convention on Climate Change. The government's effort to promote clear monitoring and evaluation standards and indicators also helped program participants understand and follow program requirements, and enabled the central government effectively review progress and determine how best to award subsidies or certification.

There have been some challenges in China's SEZ programs. Overlapping mandates between the three green SEZ programs and the lack of clear coordination mechanisms among participating ministries represent a few of these challenges. Additionally, local government capacity for managing GHG emission monitoring and accounting also needs to improve to more effectively integrate green industry programs with China's national climate change goals.

Sectors in Focus	Industry, Energy, Cities
Key Challenges	Sustainable economic growth, GHG reduction, Resource efficiency
Impacts	Environmental: Chinese green SEZ initiatives are contributing significantly to the reduction of greenhouse gases and other emissions as well as enhancements in energy and resource efficiency. Social: Water, soil, and air pollution in China has reached a level that is seriously threatening to public health. The green SEZ initiatives address sustainability issues at a community level and also provide new green jobs. Economic: Green SEZ initiatives have been China's new impetus for economic growth and sustainable development. They have stimulated development of high value green industries and relevant service markets which give China a new competitive position in the global market.
Keywords	Special economic zones, low-carbon industrial zones, circular economy, eco-industrial parks, green economy, mitigation and adaptation, clean technologies, green industries, renewable energy

Geographic Coverage
People's Republic of China



02 Context

Special Economic Zones (SEZs) are perhaps more 'special' in China's socioeconomic development history than anywhere else in the world. The Chinese government adopted the so-called Reform and Opening Up policy in 1979 which entailed the ground-breaking policy experiment of hybridizing market economy principles with the country's socialism structure. SEZs, initially called Special 'Export' Zones, were adopted as the testbeds of new economic and social policies, and the first four SEZs were established in the four coastal cities of Shenzhen, Zhuhai, Shantou, and Xiamen in 1980. Thanks to considerable support from Beijing as well as favorable business conditions such as competitive labor markets and geographical advantages, these four SEZs quickly demonstrated the policy's effectiveness and became the locomotive of the national economy, receiving 59.8% of the total national Foreign Direct Investment (FDI) in 1981 (Zeng 2010).

Following this pioneering success, various kinds of SEZs were developed across the country by both the national and local governments (Table 1). By the end of 2006, the total number of SEZs grew to 1,568 including 222 at the state-level. China's major state-level SEZs (including Economic and Technological Development Zones, High-Tech Industrial Development Zones and Free Trade Zones) contributed to 18.5% of the national GDP and 60% of national exports (Zeng 2010). At the same time, production and exports from the first four SEZs and the Hainan SEZ increased more than 40,000% between 1980 and 2006, and FDI also showed five-digit growth during the same period (Sahling 2008).

However, SEZs (hereafter including all kinds of specialized industrial zones) also became the main cause of extreme environmental degradation and a consequential increase in health risks. As production increased, pollution from these specialized industrial zones soared together with energy and resource consumption. China became the world's single largest greenhouse gas (GHG) emitter in 2006, and the industrial sector is estimated to account for 72% of the country's carbon emissions and 70% of its energy consumption (Thieriot and Sawyer 2015). SEZs were accountable for half of the industrial emissions, since most of the large industrial emitters were located in SEZs (The International Institute for Sustainable Development (IISD).

SEZs have played an increasingly important role in addressing China's environmental challenges as the single largest source of various types of emissions. Air pollution has risen to an alarming level in most industrialized regions, contributing to an estimated 1.6 million deaths per year or roughly 17% of the total deaths in China (Rohde and Muller 2015). Water and soil contamination have also become serious problems. In April 2014, the Chinese Ministry of Land and Resources (MLR) reported that the quality of groundwater was either 'poor' or 'very poor' in almost 60% of 203 prefectures in China. About 20% of the Chinese farmland was also contaminated at the same time, according to a joint study by MLR and the Ministry of Environment Protection (MEP) (Ho and Wang 2014). Total economic loss caused by pollution was estimated to be around USD 227 billion (RMB 1.5 trillion) in 2010, roughly 3.5% of the national GDP that year (Albert and Xu 2016). The true figure may even be as high as 8% of the national GDP, according to the World Bank (Zeng 2015). Severe pollution also undermines usual business activities and makes it difficult for companies to retain or attract international talent, including senior executives (Mangin 2014).

Table 1. SEZs and SEZ Variants in China (as of 2010)

Type of Zone	No. of state-level zones	Year established	Main locations	Characteristics
Special Economic Zones (SEZs)	6	1980	Shenzhen, Zhuhai, Shantou, Xiamen, Hainan, Kashgar	Largest in scale.
Economic and Technological Development Zones (ETDZs)	69	1980	Dalian, Tianjin, Yantai, Qingdao, Shanghai, Beijing, Guangzhou, Suzhou, Kunshan	Focus more on technology-intensive industries.
High-Tech Industrial Development Zones (HDIZs)	54	1988	Beijing (Zhongguancun), Shanghai (Zhangjiang), Nanjing, Wuxi, Shenzhen	Promote development of high-tech industries.
New Areas	5	1989	Shanghai Pudong, Tianjin, Binhai, Chongquing, Liangjiang, Zhoushan, Qingwangchuan	Regional economic growth centers.
Free Trade Zones (FTZs)	15	1990	Shanghai (Waigaoqiao)	Established in preparation for accession to WTO, provide simplified customs, tax refunds on export, import and VAT.

* Compiled with data from Mohiuddin, et al. (2014) and Zeng (2010)

Table 2. Performance of SEZs and National ETDZs (as of 2006)

	SEZs (% of total)	National ETDZs (% of total)	China Total
Employment (millions)	15 (2.0)	4 (0.5)	758
Real GDP (billion RMB)	910.1 (5.0)	819.5 (4.5)	18,308.5
Utilized FDI (billion USD)	5.5 (9.1)	13.0 (21.6)	60.3
Merchandise exports (billion USD)	168.6 (22.1)	113.8 (14.9)	762.0
Population (millions)	25 (1.9)	-	1,308

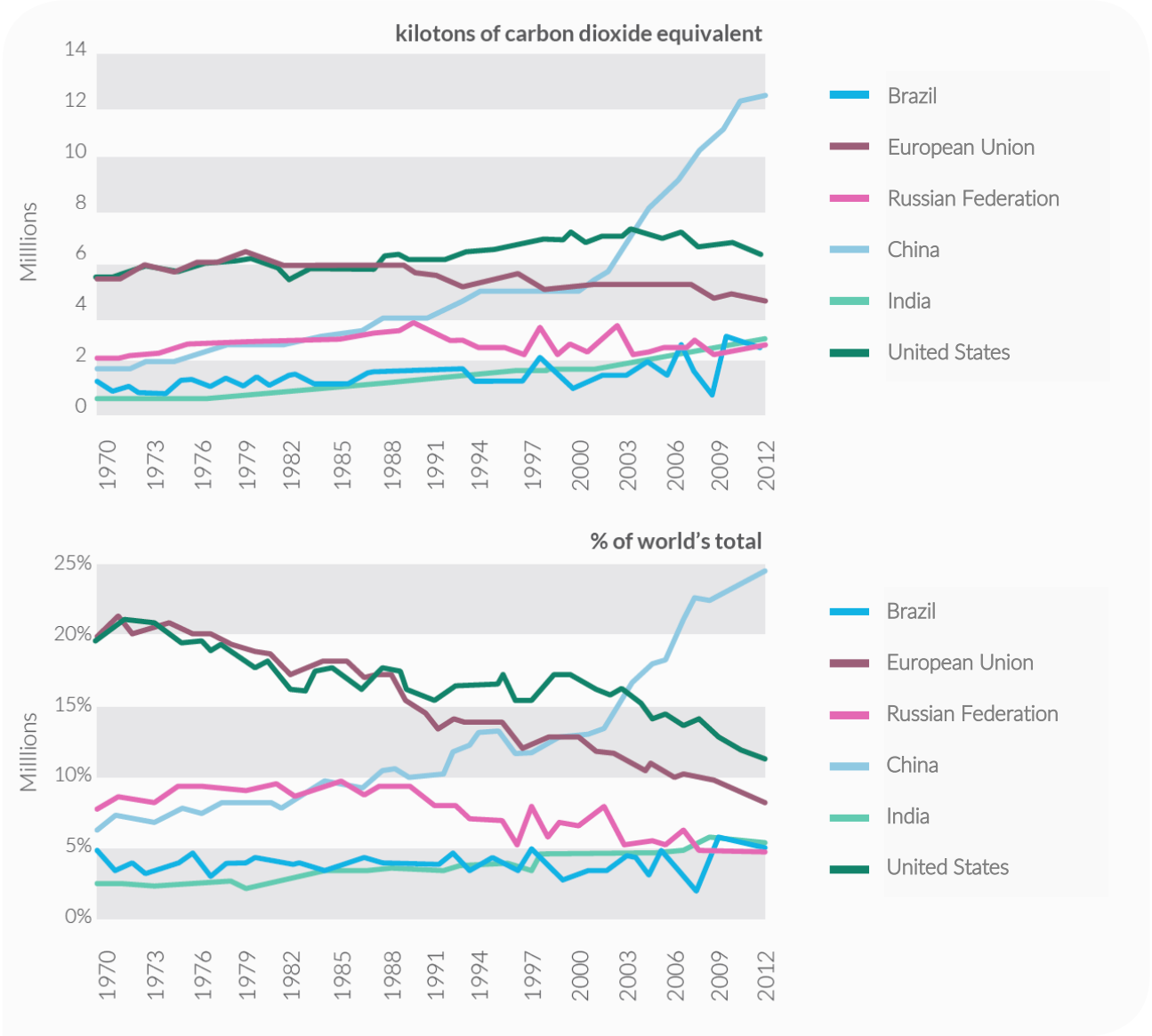
Source: National Statistics Bureau 2006 (Zeng 2010)

Not surprisingly, pressure on the Chinese government to take more substantive action on climate change and environmental protection has grown stronger every year from both within and outside of the country.

In addition, rapidly rising labor costs in recent years have reduced the competitiveness of Chinese manufacturing sector in international markets, and more intense global competition for resources has made China's resource-intensive economic model unsustainable.

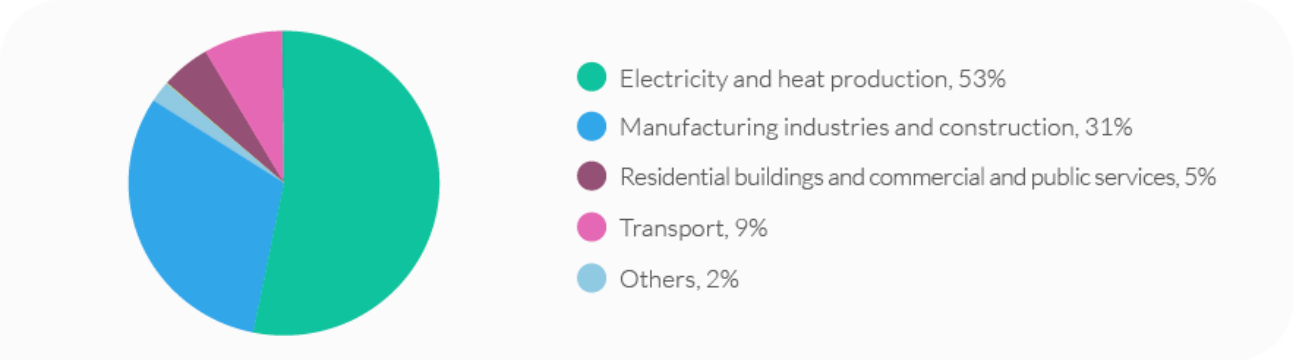
All these factors have led to a shift in the national development strategy towards more sustainable and innovative growth, and the Government has given special attention to industrial zones for their economic as well as environmental significance.

Figure 1. Total greenhouse gas emissions by major economies



Source: The World Bank statistics

Figure 2. China's CO_2 emissions by source (2013)



Source: The World Bank statistics

03 Approach

Faced by challenges of climate change, pollution, and resource scarcity, the Chinese Government launched three major initiatives to promote SEZs. The concept of Circular Economy (CE) emerged in the national development agenda starting in 2001, and the government launched the Eco-Industrial Park (EIP) demonstration program in 2003 as a CE implementation strategy.

Initiated by MEP, formerly the State Environmental Protection Administration (SEPA), the EIP program promoted transformation of existing SEZs or construction of new SEZs based on the principles of clean production, industrial symbiosis, and centralized pollution abatement principles. The aim of EIP was to save resources and minimize waste generation and pollution in the "key sectors" of iron and steel, non-ferrous metals, coal, electricity, chemicals, building materials, and light industries.

Although it is run as a voluntary program, National EIP Certification, which is granted to SEZs meeting certain criteria, has provided the primary motivation for SEZs to participate. The evaluation criteria are grouped into three categories corresponding to the three types of EIPs, including sector-specific EIPs (HJ/T272-2006), sector-integrated EIPs (HJ/T274-2006), and venous-industry EIPs (HJ/T275-2006; focusing on the recovery of solid industrial waste) (MEP 2003). Each group has 19-21 indicators, addressing economic development, pollution control, resource utilization, and recycling performance of a trial EIPs. Compliance with all national and regional environmental regulations and establishment of an environmental management system according to ISO 14001 standards are also among the basic requirements for the certification (MEP, Ministry of Commerce (MOC) & Ministry of Science and Technology (MOST) 2007). MEP, MOC, and MOST set up a consortium to jointly run the EIP program.

In parallel with the EIP program, the National Development and Reform Commission (NDRC), the central macroeconomic policy-making body under China's State Council, introduced a program called Circular Economy Demonstration Industrial Parks (CEDIP) in 2005 in collaboration with MEP, MOST, MOC, the Ministry of Finance (MOF), the Ministry of Industry and Information Technology (MIIT), and the National Bureau of Statistics. CEDIP is similar to the EIP program in many respects such as the focus on the principles of

Box 1.
China's Green Credit Policy

One of the most important instruments in China's green finance system is 'Green Credit Policy'. This was first launched in 2007 by MEP, People's Bank of China (PBC) and China Banking Regulatory Commission (CBRC), and then revamped in 2012 as 'Green Credit Guidelines'. The policy has two basic aims. First, it supports energy-saving and emission reduction projects and enterprises by giving preferential conditions in loan lending. Second, it limits access to credit by highly polluting and high energy-consuming projects and enterprises. It requires banking institutions to take loan applicants' environmental performance records into account and poor record-holders can be denied access to loans. A national information disclosure system about corporate environmental credits was also incorporated in the policy.

Reuse, Recycle and Reduce (3R) for resource efficiency maximization and emission reductions. However, the CEDIP initiative deals with broader aspects of CE such as efficient use of materials and pollution control in the entire economic chain of production, distribution, and consumption as well as extended management of land, waste, and water with linkage to urban areas surrounding industrial zones.

CE became one of the main national development strategies in the 11th FYP for 2006-2010 to emphasize sustainable development, and various pieces of legislation followed to support its implementation. One of them was the Circular Economy Promotion Law which came into effect in 2009.

In particular, this law stipulates the development of incentive measures for CEDIPs such as special funds at national and regional levels, tax breaks and various other financial instruments to support relevant R&D, clean technology, and facility investments, which were not available under EIP (The Central People's Government of the People's

Republic of China 2008, Geng, Zhang, et al. 2008). Energy, water, land, and resource saving products and technologies as well as projects for comprehensive use of resources were designated as the key areas for support, and banking institutions were requested to give priority to these areas for loans and other credit services. The law also reaffirmed 'phasing-out' of harmful production technologies, equipment, and materials, by restricting them from accessing to credit in the financial market and prohibiting the import or sale of such items.

In 2012, NDRC and MOF launched a program called Circular Transformation of Industrial Parks (CTIP) in support of the 12th FYP, which replaced CEDIP. The new five-year national strategy picked up CE as the central theme of development, with a strong emphasis on energy conservation and carbon reduction in line with China's pre-COP15 commitment of a 40-45% cutback in national carbon intensity from 2005 levels by 2020 (Lewis 2011). At the implementation level, the strategy focused on low-carbon industrial restructuring and development of 'new pillar industries' including clean energy, new materials, and so on (Table 3).

Accordingly, governmental financial support for the CTIP program was refined together with the CTIP implementation guidelines, and selected pilot CTIPs began to receive a subsidy determined by NDRC and MOF from the central budget. The central government immediately provided 50% of the subsidy for start-up capital, and disbursed the remainder based on to performance results (NDRC & MOF 2014). CTIP evaluation criteria have 22 indicators covering five areas of resource outputs, resource consumption, integrated resource utilization, waste generation, and other issues (Thieriot and Sawyer 2015). Policies to nurture the

Table 3. Old and new pillar industries in the 12th FYP

	Old pillar industries	New strategic and emerging industries
1	National defense	Energy saving and environmental protection
2	Telecom	Next generation information technology
3	Electricity	Biotechnology
4	Oil	High-end manufacturing (e.g., aeronautics, high speed rail)
5	Coal	New energy (nuclear, solar, wind, biomass)
6	Airlines	New materials (special and high performance composites)
7	Marine shipping	Clean energy vehicles (plug-in hybrid vehicles and electric cars)

Source: Source: (Lewis 2011)

growth of carbon markets and relevant mechanisms were also strengthened under the 12th FYP.

In line with the 12th FPY, the 18th National Congress of the Communist Party in 2012 stipulated 'ecological civilization' as one of the main national goals in the constitution, and this encouraged the Chinese government to take a more holistic approach to green transformation of industrial zones in the context of long-term social and economic development. Circular transformation of industries for low-carbon economy was adopted as an alternative growth strategy to enhance competitiveness and sustainability of the Chinese economy through innovation.

In line with this, NDRC and MIIT jointly launched the Low-Carbon Industrial Park (LCIP) demonstration program in 2013 as part of the Low-Carbon Zone initiative, an ambitious urban development project which aims to integrate low-carbon green growth principles in all aspects of urban infrastructure. In fact, many details of the LCIP program are similar to the three previous programs, such as promotion of clean technology and renewable energy, circular use of resources, and pollution control and management. However, LCIP places particular emphasis on GHG accounting and reporting, as well as relevant infrastructure development and human capacity building, unlike the other programs. MIIT released LCIP work plan preparation guidelines jointly with NDRC in 2014, but no official evaluation criteria have been published yet.

China recently launched the 13th FYP for the period of 2016-2020, and the strong emphasis on low-carbon economy continued in the strategic plan. Strengthening market mechanisms became one of the government's top priorities in order to boost private investment in relevant areas. The new national strategy also re-emphasized the importance of low-carbon SEZs for their role in pioneering new green finance measures and leading the low-carbon industrial transition as showcasing models (MIIT 2016).

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04 Outcomes

Along with the growing importance of sustainability in the Chinese national development agenda, the number of SEZs participating in one or more of the EIP, CTIP, and LCIP programs has grown. Starting with Guigang National Eco-Industrial Demonstration Garden in 2001, the number of pilot EIP sites expanded to 30 in 2004, and included 21 sector-integrated parks, eight sector-specific parks, and one venous park (Geng, Zhang, et al. 2008). As of April 2014, 26 SEZs were awarded the National EIP certificate, and 59 other SEZs were in the pilot EIP list (MEP 2014). The first recipients of National EIP Certificate were the Tianjin Economic-Technological Development Area, the Suzhou Industrial Park, and the Suzhou High-tech Industrial Development Zone.

Likewise, CEDIPs and CTIPs have developed in an increasing number of locations across the country over the past 10 years. Thirteen SEZs were selected in the first group of pilot CEDIPs in 2005 and 20 more were included in the second group launched in 2007 (NDRC 2005, 2007). With the launch of CTIP in 2012, NDRC set an ambitious target of having more than 50% of national-level and 30% of provincial-level SEZs implement the CE model by 2015 (NDRC 2012). The implementation of CTIP was accelerated during the following years, and the total number of SEZs participating in CTIP reached 118 in 2016, counting only national-level zones (Thieriot and Sawyer 2015, NDRC 2015, Yeji National Economic Development Zone 2016). To further elevate the popularity of the CTIP program, the Chinese central government provided stimulus funding for the CTIP program, a sum of RMB 754 million (USD 113 million) to 22 pilot zones1 in 2012 alone, which accounts for approximately 8.5% of the total project investment in these zones (Thieriot and Sawyer 2015).

In contrast, the LCIP program is still going through the initial trial period. The first batch of 55 pilot zones were announced in 2014 for a pilot period of 3 years, and another 39 zones were approved in the following year (Xinhua Finance Agency 2015, MIIT & NDRC 2014). Selected pilot zones are required to report their progress against the submitted plan twice a year during the project period. The implementation usually goes hand-in-hand with urban development, under the bigger umbrella of the Low-Carbon Zone development program. The LCIP program consequently addresses more comprehensive areas of green industrial zone development, such as constructing green areas, installation energy-saving materials in buildings, and use of renewable energy as a main or supplementary power source. In the case of Shenzhen, for example, a new district which incorporated industrial areas for clean and high-tech businesses was built based on low-carbon principles, and the local government provided various subsidies, such as a subsidy of RMB 10-20 per watt up to 70% of the total cost for solar power generation projects in order to enlarge the proportion of renewables in the energy grid (Shenzhen municipal government 2009). This aspect of LCIP also stimulated the creation of innovative SEZs which focus entirely on clean industries or promote extensive use of solar power in places like Baoding and Dezhou.

Overall, it is estimated that about 13% of the 1,568 national and provincial-level SEZs belong to at least one of the three programs and 33 of them participated in two or more programs according to the Chinese government's 2013 data (Thieriot and Sawyer 2015).

Although the number does not seem to be so significant, the programs include most major SEZs and the reduced impact they have collectively had on the environment is considerable. For example, CE implementation of which CEDIP took an important part was estimated to have resulted in a 10.6% increase in industrial wastewater reduction, a 77.45% increase in resource recycling, and a 24% rise in energy yield per ton of coal during the 11th FYP period (The Central People's Government of the People's Republic of China 2013). Also, recycling or reuse of industrial solid

waste improved by 110.1% from 770 million tons in 2005 to 1,618 million tons in 2010 according to the same assessment. SEZs participating in the EIP program have also shown lower rates of energy consumption and waste generation per added industrial value than conventional economic zones (Geng, Zhang, et al. 2008).

The impact of these green initiatives on local economies can be even more profound when considering individual SEZs. The Naning ETDZ, which is part of the CTIP program, is expecting that green transformation will generate 10,000 new jobs and income of RMB 100 billion (USD 14.5 billion), in addition to reducing energy consumption and pollutant emissions by 5-12% and 10-15%, respectively (Gunxi News Network-Guanxi Daily 2016). The Yeji Economic Development Zone, also approved to be a national CTIP in 2015, has raised RMB 2.3 billion (USD 348 million) in total investment funding so far, including RMB 590 million from the central government and RMB 88.4 million in subsidies from the national energy-saving fund (Yeji pilot national circular transformation demonstration park 2016).

Box 2.
Tianjin Economic-Technology Development Area

Tianjin Economic-Technology Development Area (ETDA) is one of the biggest and oldest special industrial zones in China, and it shows a good example of gradual greening of a conventional industrial zone. Located in close proximity to a sea port city of Tianjin in North East China as well as the capital Beijing, TEDA pioneered in upgrading social and environmental standards of the zone since the 1990s. Starting with ISO 140001 Environmental Quality Certificate obtained in 2001, the Area is now accredited in both EIP and CTIP programs (Tianjin Economic-Technological Development Area n.d., Thieriot and Sawyer 2015). Tianjin ETDA also has various other facilities to promote the growth of green businesses in the zone. One of them is Eco Center which offers consulting and training services to companies for the development of low-carbon clean technologies, production processes and products. The center also provides low-carbon business match-making and business incubating services and facilitated international cooperation for low-carbon projects (Wong 2016, TEDA Trade promotion center n.d.). The zone also boosts ample green space such as Taifeng Park and TEDA Tropical Botanical Garden.

Box 3.
Baoding High-tech Industrial Development Zone

Baoding High-tech Industrial Development Zone (HIDZ) in Hebei province is another good case of transformation of a high-polluting industrial park into a clean technology development hub. Baoding was approved as National Development Zone in 1992, but the city municipality started actively promoting the renewable energy industry from 2002 and then the zone became appointed as the first and only industrial base for new energy and power equipment manufacturing by MOST in the following year thanks to massive support by the Baoding government such as tax incentives and improvement of policy environment (Reinvang, et al. 2008). There were two catalysts for the change: first, severe pollution from the industrial zone that killed thousands of fish in a nearby lake, and second, success of a local solar panel manufacturer which grew to be one of the major suppliers (JohnsonRobert 2011). Currently, Baoding HIDZ hosts two government research laboratories and 170 clean power equipment manufacturing companies whose revenue reached 45 billion RMB (7 billion USD) in 2010 (McDonald 2011). The clean energy industries are estimated to make up for 60% of the total annual GDP of Baoding (Asia-Pacific Economic Cooperation (APEC) 2012). Since Baoding was also selected in the first pilot group of Low-carbon Zones, the local government is now promoting the application of solar panels even in residential and commercial buildings through regulations as well as various incentives towards relevant industries. As of 2010, 90% of its traffic lights are solar powered, which saves an estimated $220 per intersection (Whitehead 2010).

05 Lessons

The greatest strength of the Chinese green SEZ initiatives lies in their status in the government's main development agenda. They are all centrally driven by, managed by, or at least in close coordination with NDRC, the most powerful policy coordination body of the Chinese government. The programs are also mainstreamed in the FYPs, the overarching mid-term national strategy, and are widely promoted through government channels as well as national and regional media. This provides a clear indication for SEZ management authorities and local governments on where they have to place their policy priorities, and a strong motivation to participate in the programs even in the absence of direct incentives like in the case of EIP.

Another important fact is the consistency in the message of the Chinese government on greening industries and promoting relevant clean innovations and policies. Although implementation details as well as the main focus have varied slightly, the concept of energy-efficient and low-carbon transition of industrial zones have continuously appeared in FYPs as a main economic strategy from the late 1990s until now. It has built up trust and confidence in government policies among investors and local governments, thus helped EIP and other green SEZ programs take off quickly when launched in the 2000s.

The use of an accreditation system has also been highly efficient to encourage voluntary participation of SEZs in these programs. After a certain trial period, zones that pass evaluation tests are designated a National Demonstration Zone in each respective program, and it is widely promoted through national media and government websites. This has provided a strong incentive for SEZs to adopt green programs since the official recognition of being 'ecological' or 'low-carbon' strengthens their positions in the fierce competition for attracting investment in both domestic and international markets (Geng and Hengxin 2009). Green measures signal to investors lower risks of environmental incidents, greater economic benefits through resource recycling and energy-saving systems, and higher transparency in SEZ management.

In addition, the Chinese government has made steady efforts to build up an appropriate policy environment which can accelerate the green transition of SEZs and the entire economy. At first, environmental policies focused mainly on end-of-pipe pollution control and other regulatory measures, but attention was gradually expanded to the development of more enabling and incentivizing conditions. Starting with the 11th FYP in particular, the Chinese government placed heavy emphasis on developing market instruments such as carbon trading based on the Clean Development Mechanism (CDM) and green finance in order to stimulate private participation and leverage financial capacity.

While the carbon credit market is still at an early development stage, China's green financial market has grown at an unprecedented pace thanks to comprehensive support from the central government. The establishment of new banks dedicated to green finance, green funds and insurance services, discounted loans for green projects, and green rating systems are among the options which are currently being

discussed at the central government level (The Green Finance task force 2015).

Installation of regular monitoring and evaluation requirement in all green SEZ initiatives was also effective in delivering real and measurable success on the ground. Although the evaluation is mostly in the form of self-assessment against pre-approved work plans, program participants are supported by ample guidelines and policy interpretation notes from the central government. Evaluation criteria are already established for the EIP and CTIP programs, composed of measurable and verifiable indicators in all essential elements of each program such as land use, recycling of water, material and other resources, energy efficiency, emission of toxic gases, and so on. The government also intends to develop a set of detailed assessment indicators for the LCIP program in the near future.

However, the capacity of local authorities has been a constraining factor in the effective operation of the SEZ programs. Several studies have assessed that local government officials and SEZ management authorities in China still lack sufficient technical capacity to properly implement the low-carbon green SEZ programs, and it is particularly challenging when it comes to monitoring and evaluation in the absence of a reliable statistical data collection system even at the national level (IISD 2015, Sawyer and Thieriot 2015). This has compelled the Chinese central government to put institutional as well as individual capacity-building at the top of the national priority list, and GHG inventory development and management have earned special attention in the agenda for fuller implementation of China's low carbon economic transition (NDRC 2012).

In addition, the Chinese government needs to improve institutional coordination for the operation of the three green SEZ programs. The current management settings have been confusing with different and often too many supervising ministries for each program, and this has been a significant obstacle for investors to understand relevant policies and effectively utilize supporting systems. A central coordination body will instead not only encourage more participation of domestic stakeholders, but also help further promote the programs to international investors.

At the same time, the objectives and incentive structures of all three programs need to be streamlined. Currently, the programs are serving largely overlapping mandates, and the fact that a number of SEZs participate in more than one program can be seen as neither resource efficient nor strategic from a management perspective.

Success Factors

- Strong driven by the central government which is clearly demonstrated in national Five Year Plans
- Nation-wide promotion of the programs and incentivizing effects of the official accreditation.
- Comprehensive government support which not only covers direct subsidies and tax incentives but also focuses on building up use of market mechanisms such as the Clean Development Mechanism and green finance as well as an appropriate policy environment.
- Regular assessment of progress and outcomes against a pre-approved work plan, and official accreditation based on final results.

Impact

- Most large major SEZs are participating in at least one of the three green SEZ programs.
- Substantial impact estimated on economic, environmental, and social development at both national and local levels.
- Stimulation of development of high-tech clean industries such as solar, wind, energy-saving equipment and application of those technologies not only in SEZs but also in urban development.

Limitations and Challenges

- Overlapping mandates of the three programs and occasionally unclear coordination within the government.
- Weak local capacity for GHG emission monitoring and accounting

Further Information

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