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Comparative study on the pathways of industrial parks towards sustainable development between China and Canada

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ABSTRACT

As a key economic development source of urban industrial symbiosis, industrial parks are an effective strategy to facilitate economic development and have been globally recognized and practiced. However, rapid development of these industrial parks has also generated several problems, such as intensive resource consumption and increasing environmental pollution caused by industrial activities. Sustainable development of industrial parks has become a global concern. In this regard, various strategies and projects have been adopted such as eco-industrial park development, low-carbon industrial park construction, circular economy industrial park. However, due to different levels of economic development and different operational system, the pathways of industrial parks towards sustainable development between developing country and developed country have differed. Their experiences and disadvantages should be explored by other countries in similar circumstances. This paper aims to fill such a gap by carrying out case studies between China and Canada, two countries identified as a rapidly developing country and a developed country. Both countries have encouraged to develop industrial parks to support economic development and have recently began to explore whether they can lead to sustainable industrial development. To support the analysis, Tianjin Economic Development area (TEDA), the largest industrial park in terms of its economic scale in China, and Burnside Industrial Park, which is one of the largest park in Canada, were selected as comparative case studies. Through the analysis on the adopted policies strategies and practices, the results indicate that China has put much more effort into their eco-industrial park due to the urgent situation of resource pressure and environmental pollution utilizing a top-down management system. Industrial parks in Canada appear to be moving more slowly in their adoption of sustainable development.

1. Introduction

Sustainable development has been a global consensus among countries all over the world following the release of "Our Common Future". Sustainable development can be defined as "development that meets the needs of the present generation without compromising the ability of future generations" (WCED, 1987), which is generally divided into three dimensions or components: economic sustainability, environmental sustainability and social sustainability (Moffatt et al., 2001). In this regard, sustainable development was deemed to be a successful attempt to reconcile lasting economic growth and the protection of environment as well as natural resources. Economic sustainability is most commonly referred to as a condition of non-declining economic welfare projected into the future (Pezzey, 1992). Environmental sustainability is expressed as the ability of the environment to sustain human ways of life, and the ability to provide the necessary inputs to the economy to enable it to maintain economic welfare, as well as the ability to assimilate the waste produced by the economy. Social sustainability is defined as "a society's ability to maintain", on the one hand, the necessary means of wealth creation to reproduce itself and, on the other, a shared sense of social purpose to foster social integration and cohesion (Ekins, 1997).

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Industrial parks have been adopted by many countries as one way to promote industrial development. However, rapid development of these industrial parks also generated problems, such as excessive resource consumption and increasing environmental pollution caused by industrial activities in the industrial parks. In order to respond to these problems and boost the sustainable development of industrial parks, countries applied distinctive strategies and policies to facilitate their development towards sustainable development. For instance, in United states of America, most of the EIPs have been developed through a national initiative to develop and foster applications of industrial ecology to industrial parks through the President's Council on Sustainable Development (PCSD) and US Environmental Protection Agency (USEPA). In 1994, the USEPA announced the availability of $300,000 for eco-industrial park design and development and in 1995 it funded the preparation of the fieldbook for the Development of Eco-Industrial Parks (Lowe et al., 1995; Chertow, 2000). More than 60 eco-industrial networking projects in Canada and the United States have been identified (Peck, 2002; Sakr et al., 2011). In Europe, there are several eco-industrial parks in various countries, including which some are operational, others are in pre-operational, planned, or attempted phases. One of the most cited EIP case studies in the world is the industrial symbiosis network in Kalundborg, Denmark. In the UK, the national Industrial Symbiosis Program was launched in 2005. In Asian counties like Japan, eco-towns were initiated as a national program by Japanese Ministry of Environment (JMOE) and Ministry of Economy, Trade and Industry (METI) in 1997 to simultaneously cope with municipal solid waste problem while fostering economic stimulation (Dong et al., 2014a). In South Korea, industrial symbiosis is manifested in the national EIP program initiated in 2005 (Park et al., 2008; Behera et al., 2012; Fujii et al., 2016), which provides one approach to industrial symbiosis development. There are about 1000 industrial complexes, which have fueled rapid economic growth over the past 50 years but have also been the source of environmental problems. To restructure the national industrial base, the Korean government established a three-stage, 15-year plan to retrofit existing industrial complexes into EIPs (Park et al., 2016). In China, Ministry of Environmental Protection (MEP, the former State Environmental Protection Administration) initiated eco-industrial parks (EIPs) project in 2001. The National Development and Reform Commission (NDRC) released national circular economy industrial park indicators in 2007. Ministry of Industry and Information Technology (MIIT) released national low-carbon industrial park indicators in 2013 in order to address the increasing concerns on climate change (Geng et al., 2014; Liu et al., 2016) etc. In China, industrial symbiosis is also applied as a key strategy to implement the sustainable development goal (Ren et al., 2014; Ren and Sovacool, 2014; Ren et al., 2015, 2016; Dong et al., 2013, 2014b, 2016; Song et al., 2014; Li et al., 2015).

Different countries have their own strategies to encourage domestic industrial parks to adopt sustainable development practices. Due to disparity of economic development level and operational system, the pathways of industrial parks towards sustainable development between developing country and developed country will be different and their various experiences and disadvantages can be valuable lessons to other countries under similar conditions, so as to promote improvement in their own industrial park development. To date, few such studies had been reported. With this in mind, this study will select case studies of industrial parks one from China and the other from Canada to conduct comparative analysis on their pathways towards sustainable development. China as the largest developing country maintained the highest economic growth in the past few years. However, the issues of environment have been receiving increasing attention by the national government. Other developing countries are also facing a similar situation. Canada is highly regarded as developed country in terms of its standard of living and economy based on industrial development. In addition, the environment has been a relatively high profile issue since the early 1970s. Regarding the specific cases, TEDA is selected in terms of its economic scale and structure in China, which is a typical industrial park in China. Furthermore, TEDA reflects the trend of most Asian industrial estates as it has a large number of tenants of diverse nationalities, many of whom tend to be competitive with one another (Geng et al., 2007). Burnside Industrial Park is also selected because it has a large number of tenants and its role as a laboratory for eco-industrial park development.

The framework of this paper is organized as follows: The methodology is detailed in the Section 2 and the pathways of TEDA and Burnside Industrial Park towards sustainable development in the past few years are introduced in Sections 3 and 4. The the analysis and discussions on the reasons behind the disparity towards sustainable development as well as limitation and future research are described in Section 5. Finally, conclusions are drawn.

2. Methodology

2.1. Materials collection

Several approaches were conducted to collect materials for this study, including field surveys, literature reviews, key informant interviews, and informal meetings. Materials availability and reliability are very important. Therefore, several material acquisition approaches are performed, in parallel, to validate the quality of information. To further validate the collected materials information, informal meetings with local stakeholders were held to verify the credibility of the gathered information. Information categorization is the next step. The information included adopted strategies, amended policies and achieved progress and was categorized in order to identify the similarities and differences comparison.

2.2. Analytical framework

In the study, we aim to comparatively analyze the different pathways used by the two industrial parks in terms of their development background, adopted strategies, amended policies and achievements during the past few years. In the following step, the analysis and discussions are detailed to understand the reasons behind the disparities between the case studies from the perspectives of political system disparity, different industrial development level and local capacity etc.

3. The pathway of TEDA towards sustainable development

3.1. Introduction of TEDA

TEDA, founded in 1984, is one of the first national industrial parks in China. TEDA is a special development zone located on Bohai Bay in North China, which is located in the east of Tianjin city, about 50 km to the city center and with an overall planning area of 340 km^2 (see Fig. 1).

TEDA can be classified as an outer suburban estate with comprehensive functions, with varied companies and industries. Businesses in the estate cover a range of ownership-types, such as joint ventures, private companies, state-owned enterprises, and wholly foreign owned enterprises. Numerous tenant sites, especially companies with a staff of more than 400 employees, have both manufacturing and residential buildings within their compounds. This is in accordance with Chinese government policy that businesses are expected to provide social benefits to employees, such as food and accommodation (Geng, 2005). As one of the first

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