



## Transformation toward an eco-city: lessons from three Asian cities



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### ABSTRACT

This comparative case study of three Asian cities (Penghu in Taiwan, Seoul in South Korea and Tianjin in China) elucidates the effects of different national approaches to eco-city development and the antecedents of the building of an eco-city. To better understand the Asian context, the three Asian cities of interest were compared with two European cities – Freiburg (Germany) and Samsö (Denmark). The effects of the approach to the development of an eco-city and the fitting of its business activities to the local context are investigated. The analysis identifies four transforming antecedents of the development of an eco-city in Asia, which are (1) utilization of a national approach and policy, (2) the presence of a dedicated local public authority, (3) the continuous engagement of local citizens, and (4) an infusion of national capability and business activity. The transformational development of an eco-city in Asia seeks to create a new techno-social regime that is based on sustainable solutions, whereas their respective national capabilities must be emphasized with an eye to efficiency, economy, and effectiveness simultaneously.

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### 1. Introduction

The evolving development of eco-cities has become one of the major challenges in the development of a sustainable society, and it has been especially important in the Asian context (de Jong et al., 2013; Yusuf and Saich, 2008). According to the United Nations, the world is undergoing dramatic urbanization such that 66% of the world's population is projected to reside in urban areas by 2050 (UNDESA, 2014). In particular, Asia alone will be the home of more than one-half of the global urban population. Although this spectacular urbanization can be expected to bring economic and social benefits to Asia, it has historically been associated with environmental despoliation if necessary regulations, policies, and infrastructure are not well-established (World Bank, 2014; UNDESA, 2014). All Asian countries exhibit an increasing urbanization rate, and Japan, South Korea and Malaysia are approaching urbanization saturation. Table 1 shows the major countries in Asia. During the last decade, China, in particular, increased its urban population from 500 million to 680 million – meaning that on average 18

million people moved to cities each year. This movement is the equivalent to building six new cities every year, each inhabited by three million people.

Given rapid urbanization, some Asian countries, such as China, South Korea and Taiwan, have seen the development of new eco-cities as a great opportunity to transform themselves by transitioning away from the existing techno-social fossil fuel-based regimes, toward new, green ecologically-based regimes (Hu et al., 2015).

However, building an eco-city is a highly complex and new phenomenon (Joss, 2010). Accordingly, there is an urgent need to understand how emerging approaches in Asian countries can be used in the building of eco-cities, and to understand the various effects of these approaches in the society (UNDP, 2010; Baeumler et al., 2012; Caprotti, 2014). The success of the eco-cities will depend on how well they can be reproduced and their pace of establishment. Of particular interest and importance are the circular dynamics of development, and the way in which different stakeholders interact with each other, including the roles that various public and private actors play in transforming markets during the building of an eco-city. This study therefore seeks to answer the research question: What are the antecedents of the building of an eco-city in the Asian cities?

Given the complexity and uniqueness of each eco-city, this study adopts multiple-case studies and replication logic to compare

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**Table 1**  
Urbanization rates of major countries in Asia, 2005–2030 (UNDESA, 2014).

Country	2005	2010	2015	2020	2025	2030
China	43%	49%	56%	61%	65%	69%
Japan	86%	91%	94%	95%	96%	97%
Mongolia	63%	68%	72%	76%	78%	80%
South Korea	81%	82%	82%	83%	84%	85%
Cambodia	19%	20%	21%	22%	24%	26%
Indonesia	46%	50%	54%	57%	60%	63%
Malaysia	67%	71%	75%	78%	80%	82%
Philippines	47%	45%	44%	44%	45%	46%
Thailand	38%	44%	50%	56%	60%	64%

and confirm the insights that are derived from an examination of each city of interest (Yin, 1994). Three cities in Asia are selected to help find answers to the research question: Penghu in Taiwan, Tianjin in China, and Seoul in South Korea. The major funding source in these three cities is the government, which drives the overall construction of the eco-city in each case in a top-down approach (Lee et al., 2013). To understand the Asian perspective on the building of eco-cities, this study also examines the transformation process of two European cities – Samsö in Denmark and Freiburg in Germany. Unlike the Asian eco-cities, the funding sources for the two European cities were mostly private, representing a bottom-up approach. The developmental trajectories of each of the eco-cities toward sustainability have distinctive features, providing a comprehensive understanding of the development of sustainability in the Asian context. This study uses an adapted 3Es framework – referring to efficiency, economic, and effectiveness – to investigate the various dimensions and degrees of sustainability of an eco-city, and to identify the key factors that drive the associated transformative processes.

Section 2 discusses the literature on the development of the eco-city and its performance assessment, which leads us to propose a 3Es framework for evaluating each city's performance with respect to their sustainable solutions. Section 3 addresses the methodology adopted for the comparative case studies. Section 4 presents the up-to-date performance of the three cities (Penghu in Taiwan, Seoul in Korea, and Tianjin in China) and their transformational processes, comparing and contrasting them with those of the two European cities of interest (Samsö in Denmark and Freiburg in Germany). Section 5 discusses the causes and effects underlying the developmental models adopted in each city and elaborates on the transformational antecedents. Section 6 presents findings with respect to the Asian cities that are trying to create a new social-techno regime built on ecological systems.

## 2. Theoretical background

### 2.1. The eco-city

'Eco-city' is a relatively new term, but the concept has existed for some time. Urban city planning and reconstruction have been extensively discussed for many decades (Yanitsky, 1984; Dominski, 1992; Roseland, 1997). Efforts to improve cities both environmentally and socially can be traced back to 1850, when the urban planner, Haussmann, reconstructed Paris by expanding the green areas in the city. At that time, such green areas were only used for leisure activities. Since the end of the 19th century, rapid industrialization has strongly influenced the development of the urban environment causing various problems such as air pollution, water shortages, and heavy traffic. Ebenezer Howard, an English urban planner, described a new city model in his book '*Garden Cities of Tomorrow*' (Howard, 1898), which has been identified as a

'prototype' for the modern eco-city. The eco-city concept continued to evolve throughout the 20th century, but remained ill-defined and ambiguous until Richard Register, in the early 1970s, along with the urban ecology movement in Berkeley, California, redefined the term to include the idea of restructuring cities in a way that was balanced with nature. However, only in recent decades has the eco-city concept become an important issue and increasingly realized in practice.

According to Joss (2010), the history of the development of eco-cities can be divided into three phases. The first phase was during the 1980s and the early 1990s, when practical examples of the eco-city concept were few. The second phase came after the United Nations' '*Earth Summit*', held in 1992, which resulted in an action plan for sustainable development, called Agenda 21, and provided the background against which increasingly practical eco-city initiatives were undertaken. Several eco-city initiatives such as Curitiba in Brazil, Waitakere in New Zealand and Freiburg in Germany, are well-known exemplars from this phase. The third and most recent phase began in the middle of the present century, and has been characterized by a high degree of international awareness of climate change and problems caused by rapid urbanization. In this phase, the eco-city phenomenon has become globally a mainstream means of addressing sustainability. Accordingly, the number of eco-cities around the world is rapidly increasing. By 2011, over 170 eco-cities were at various stages of development (Joss et al., 2011).

In Asia, the boom in eco-city development in recent years has been well-documented in the media, but little studied (de Jong et al., 2013, 2015; Pow and Neo, 2013). In particular, the development of eco-cities in China on various scales puts this country in the lead among Asian nations in this respect (Wu, 2012). China's building of sustainable eco-cities is an inevitable response to its environmental problems and remarkable rate of urbanization (Caprotti, 2014). Generally, the top-down approach, in which the funding and planning are dominated by the government, is characteristic of Asian nations (Konrad-Adenauer-Stiftung et al., 2012) and represents the embedding of a new, green ecologically-based regime in the national political context.

Despite growing interest in the development of eco-cities, the concept has no clear and generally accepted definition. Therefore, the way in which an eco-city is constituted and effectively developed remains an open question. While the eco-city is commonly associated with ambitions related to sustainability and 'low-fossil-carbon', very little literature explores the factors influencing the way in which eco-cities are developed, especially in the Asian context (See, for example, Caprotti, 2014; de Jong et al., 2013, 2015; Kenworthy, 2006; Valkering et al., 2013).

### 2.2. Performance evaluation for an eco-city

When developing an eco-city, its performance in terms of various aspects of sustainability, including economic, environmental, social, and cultural components, must be monitored (Kenworthy, 2006). Frameworks comprising indicators of such sustainability have been developed for the purpose of governance and used to evaluate the extent to which the goals of specific eco-city initiatives are achieved. Since the sustainability of an eco-city has many aspects, a wide range of indicators has been employed such as reduction of greenhouse emissions, percentage of renewable energy usage, promotion of low-carbon education, and the regenerative economy. Each eco-city can formulate a set of indicators in accordance with their respective characteristics and contextual scheme. These indicators can be regarded as the specification of a city toward sustainability (Joss et al., 2012).

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