ABSTRACT

The advent of the Brundtland's Report *Our Common Future* in 1987 and the successful launching of the Rio Earth Summit in 1992 has built international consensus on "sustainability" as a new paradigm for development. The development of "eco-cities" has become an international phenomenon for the creation of more sustainable urban areas. Subsequently, the negotiation of the Kyoto Protocol in 1997 supported another global wave of "low-carbon cities" development. Additionally, since the early 2000s, the development of information and communication technologies has become the impetus for an innovation-oriented sustainable urban trend known as the "smart cities". However, despite the enthusiastic advancement of these new urban models worldwide, there is still a lack of consensus regarding systematic approaches or methods for the standardization and evaluation of these trends.

This thesis aims to investigate and examine three global trends of sustainable cities with case studies from China and Japan, in both quantitative and qualitative perspectives, to understand their defining features and components. Furthermore, this thesis intends to propose and develop a methodical approach for the evaluation of these urban development models to have flexibility in relation to local inputs, and applicability to other similar urban initiatives or projects.

For the "eco-cities", this thesis reviews studies regarding concepts, frameworks and indicator systems, A large amount of literature on the selection of indicators under a singular framework in China is observed rather than having a quantity comparison from a broader scope. To obtain a quantitative sense of how effective China's eco-cities are compared to other best practice in the international arena, two cases from China and Japan have been selected to examine their indicator values under the national eco-city framework of China. Gaps between economy related indicator values are identified, suggesting lower average economic values and energy efficiencies of Chinese eco-cities. Targets concerning the waste sector are also lower for China than in Japan. The environmental indicator values show lower levels than in the other two cases as well, while social indicators entail a specific methodological approach for measurements in China. Suggestions are made in the discussion section based on the outcomes of the aforementioned comparisons, to provide a reference for the future development of other eco-cities.

The ensuing study on low-carbon cities employs a qualitative view of these policies such as "garden city" to "low-carbon city" to determine the how the environment-related urban environmental policy developed during different periods in China. Case studies of leading low-carbon cities are examined and analyzed to obtain insights regarding their urban

environmental policies as well as the implications of their successes and limitations. The major findings indicate that government policy and financial support played a significant role in transforming the industrialized city of Kitakyushu into a center of low-carbon sustainable practices in Japan's case. Local autonomy and flexibility in policymaking and civic participation profoundly contributed to the successful switch to renewable energy. These experiences could serve as useful references for China's low-carbon city development from different perspectives.

Next, the literature regarding smart city phenomena is thoroughly reviewed. Despite a lack of universal consensus, there seems to have been two major streams of SC concepts with overarching strategies for comprehensive SC development, with specific focuses on utilizing information and communication technologies to improve the quality of life. Key features and components of smart cities are then summarized, consolidated into a proposed framework consisting of two main objectives, six domains, and two means for implementation. Furthermore, a customized smart city index for the City of Kitakyushu in Japan is proposed as a case example for the application of the proposed framework. The outcomes of this section provide new approaches for understanding smart city concepts and evaluating the on-going smart cities in Japan and potentially in other countries.

As a continuation of the previous section, a further refined selection of indicators from the proposed smart city index based on stakeholder inputs from Kitakyushu City is conducted. These indicators are then weighted by expert opinion surveys using the analytical hierarchy process (AHP) method. This weighted smart city index can be useful for prioritization of policy implementation or selection of key performance indicators (KPIs). More importantly, this integrated approach consisting of three main steps from conceptual understanding to index development and indicator weighting is found to be customizable and potentially applicable to other urban development models in different local settings. This finding would contribute to a more insightful understanding of sustainable urban projects and their evaluations for policy makers, urban planners and city managers.

The findings and outcomes of this dissertation contribute to the existing literature on urban sustainability with elaborated studies on "Eco-city", "Low-carbon City" and "Smart City" in terms of comprehension and evaluation. The conceptualized integrated method for urban development evaluation can offer practical references for policy makers, and urban managers, as well as to academia for further research.