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## 主 論 文 の 要 旨

論文題目

Sustainable City Development under Urbanization in China  
(中国における都市化と持続可能な都市の開発に関する研究)

氏 名

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## 論 文 内 容 の 要 旨

For decades, human activities have profoundly changed our living environment. In the last century, economic development was given high priority in both developed countries and developing countries. During the past decades, both developed countries and some successful developing countries have made great progress in poverty reduction, GDP growth and technological innovation. In addition, along with the high economic growth, the urban population has undergone historically unprecedented increase. Currently, in the world, over half of the people are settling in urban areas and this data will increase by approximate 70% by the year of 2050 (UN,2012).

This dissertation has tried to address potential urban development policies to promote sustainable development encompassing economic, social and environmental development. To be specific, four goals were established in this research. The first was to provide a composite index for sustainable city development based on a casual-relation framework of urbanization to track the sustainable development trend of Chinese cities for decision makers to monitor urban sustainability. Secondly, it identified the principal development patterns of major Chinese cities and described the main characteristics of each urban form. Moreover, the study attempted to link the urban forms and urban sustainability to provide empirical evidence of the significant role of urban design in realizing sustainable city development. Finally, this research has tried to stress the importance of cooperation among government, institutions and the public in achieving a sustainable urban future.

In Chapter I, I briefly illustrated the background of the research, state the problems, specified the objectives and significance of the research, and explained the research methodology. Chapter II reviewed the definition and assessment of sustainable development and sustainable cities in the first section. The second section then introduced the theories about urbanization and environmental impacts. The third section discussed the concepts and assessment framework of urban morphologies.

In Chapter III, I applied the DPSIR model to assess the sustainability of 49 Chinese cities in 2008 and 2013. The DPSIR model is a tool to analyze sustainable development based on a causal relationship between each sector. It was found that from 2008 to 2013 all selected cities show an increase in terms of the level of sustainability and eastern cities remain better performing than central and western cities. All of the cities perform well in economic development and such development drives sustainable development; however, the pressures from economic growth on environmental protection and social development is increasing. In addition, the sustainable development of Chinese cities is weak sustainable development where the economic growth is sacrificing the natural resources and environment. Moreover, the sustainable development is unbalanced among Chinese cities, the eastern cities perform better due to the earlier opening up, and western cities are approaching central cities for recent years due to the China western development strategy. Therefore, in order to reach the goal of equity, the central government needs more effort to develop the central and western areas, and cooperation between local governments is also needed. Moreover, DPSIR can be utilized for analyzing special environmental issues based on the actual situation of each city to formulate targeted policies.

In Chapter IV, 277 Chinese prefectural-level cities are divided into five groups through SOM. The results show that there is an apparent relationship between urban forms and economic development. Urban morphology one includes the majority of municipalities and capital cities. Urban morphology one is an urban form with high overall population density, low residential density, a convenient public transportation system, high mixed-use of land, and a high level of green area development. With the rapid economic growth, these cities have good infrastructure and the residential areas develop rapidly. Urban morphology two is a kind of urban form with monotonous land use. In this category, the majority of the cities are resource-based, heavy industrial or tourism cities. Urban morphology three shows the characteristic of high density in the built-up areas or central urban areas, while the surrounding areas is sprawling with low density at a rapid speed due to high population pressure in the central urban areas. Urban morphology four and five represent the urban forms of the majority of central and western cities. The economic development level of these cities is lower and they are still at the primary stage of urbanization. Therefore, the sprawl trend of these cities could not be avoided, while the development of urban morphology one is always inside the developed areas.

On the basis of Chapter III and Chapter IV, Chapter V further discussed the relationship between urban development patterns and urban sustainable development. Frankly speaking, this research simply analyzes the sustainability of 49 Chinese cities and is limited by the sample size. The inverted-U shape relationship is not significant in statistics, therefore the results of this chapter can only show a trend of the sustainable development level with the change of urban development

patterns. However, through the analyses of representative cities of each development pattern, the findings can also make sense. The results show that there is an inverted-U shape relationship between urban compactness and urban sustainability and the relationship between urban sprawl and sustainable urban development shows the same trend as well. At low levels of urban sprawl, the population concentrates into built-up areas, which therefore results in the high compactness of urban areas. In contrast, if the cities sprawl at a high level, the compactness will necessarily decrease and therefore result in low density in the built-up areas. Based on the analysis, compared with finding the proper level of compactness or sprawl, the balanced development of each aspect of urban forms is more crucial.

In addition, different urban morphologies show different levels of sustainable development. The sustainability of urban morphology one is driven by the economic development level while the environmental state contributes significantly to the sustainable development level of urban morphology four. In terms of social development, morphology three performs best due to the high availability of doctors and education results, since both hospitals and schools are highly compact in built-up areas. Urban morphology five performs the worst in the metric of sustainable development level because of high dependence on natural resources and the monotonous industrial structure. Limited by the scarcity of natural resources and disadvantages of location.

Chapter VI provided a review of this dissertation and concludes the main findings of previous chapters. Through the findings of the research, specific policy recommendations were provided. In addition, the limitation of the study and possible extensions were listed in the final part of this chapter. Based on the findings, the policy implications are listed as follows:

Chinese cities should balance the development of economics, society and environment. To be specific, Chinese cities should transform from blindly pursuing economic growth and urbanization to environmentally friendly urban development. Social development should be given equal importance as economic development and environmental protection in realizing urban sustainability. In addition, the cooperation between the government, urban designers, and research institutions is important in realizing sustainable development.

Chinese cities should enhance sustainable lifestyles. For all Chinese cities, to realize a new type of urbanization and green development, sustainable lifestyles, in particular in central urban areas, should be one of the major strategies for realizing low-carbon and sustainable development during rapid urbanization with a high rate of economic development.

Targeted policies should be formulated for different development level of cities. For central and western cities, policy makers should focus on improving resource efficiency and decreasing energy

intensity as well as pollutant emission intensity in pursuing high rates of economic and social development. For eastern cities, the local governments should continue to control population growth rate, optimize urban design, improve the proportion of green energy and circular economy and increase investment in technology innovation.

Sustainable urban design is needed in Chinese cities. In the area of urban design, a balanced development of density, transportation system, mixed-land use and built-up area development is needed to achieve a more sustainable urban form. Targeted policy should be formulated on the basis of the different development patterns of cities.