



# Assessing the suitability of regional human settlements environment from a different preferences perspective: A case study of Zhejiang Province, China



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## ABSTRACT

This paper constructs a comprehensive evaluation index to assess the suitability of human settlement based upon the ecological environment superiority, economic development vitality and convenience of public services. These measures are combined with an assessment of resident's preferences to comprehensively evaluate the suitability of human settlements. The spatial pattern of human settlements environment suitability and the spatial relationship between the suitability and population distribution in Zhejiang Province under different preference models were explored. The results showed that: under the ecological environment preference mode, human settlements environment suitability in Zhejiang declined from the south to the north, and the current population was mainly distributed in areas where human settlements environment suitability was lower. Under the economic development preference mode, human settlements environment suitability was higher in the northeast than the southwest, higher at the coast than inland areas, and the regional differentiation was significant. Under the public service preference mode, human settlements environment suitability in Zhejiang showed a basic pattern which was higher in the southwest than the northeast, better in the plains than mountain areas, and most of the population was distributed in areas with higher suitability. Based on different preferences, the optimization path of human settlements environment was explored. In this study, the objective entity environment and the subjective experience of the residents were combined to evaluate the suitability of regional human settlements environment according to different preferences, so as to offer a new analysis perspective for comprehensive research on human settlements environment.

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## 1. Introduction

Human settlements are the main place for human beings to consume and transform nature, which is an important determinant of regional social and economic sustainable development. Over the past few decades, large-scale industrialization and urbanization has taken place in developing countries, and human settlements have also seen dramatic environmental change, such as air pollution, the urban heat island effect (Wu, Lung, & Jan 2013), and vegetation loss (Taubenböck et al., 2012). For the next 20 years, developing

countries headed by China, India, Brazil et al., will continue to be the important engine for rapid development of the world's modernization. Dramatic changes of ecological environment system appearing in the process of modernization, will still be mainly embodied in human settlements environment which is extremely closed with us (Liu et al., 2015). Along with economic development, people pay more and more attention to the health of living environment, and human settlements have become a great concern for residents, scholars and governments all over the world.

A growing body of literature in geography, architecture, sociology and urban planning has begun to focus on the human settlement environment. Some studies have evaluated the nature suitability for human settlement based on gridded data in different regions (Li, Liu, & Zhang, 2011; Zhu, Tian, & Tan, 2016). Others have analyzed the livability of cities and its impact factors in various

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countries (Chiang & Liang, 2013; Kotus & Rzeszewski, 2013). Furthermore, many scholars have assessed the degree of residential satisfaction regarding the inhabitants' residential environment (Salleh, 2008; Jansen, 2014). The findings of these studies offer a better understanding of the human settlement environment in several ways. Firstly, they provide an understanding of the connotation of human settlements and their focus at different scales. Secondly, they provide analytical frameworks and methods for the nature suitability of human settlements. Lastly, these studies provide evidence and guidance on the various influencing factors of human settlements.

Although the existing studies provide rich insights, there is little empirical research focused on human settlements which takes a comprehensive perspective combining both objective and subjective methods of assessment. Most of the previous studies are based on an objective view of the physical environment (Baiocchi, Creutzig, Minx, & Pichler, 2015; Feng, Tang, Yang, & Zhang, 2007; Wei et al., 2013), or on the subjective perception of the residents living there (Chen, Zhang, Yang, & Yu, 2013; Jansen, 2014; Saumel, Weber, & Kowarik, 2016). A comprehensive and accurate evaluation of the regional human settlement environment can be obtained only by combining subjective analysis with objective analysis. In addition, little research has considered personal preferences when conducting meta-synthesis on the suitability of human settlement environment in terms of aspects such as natural environments, infrastructure, and economic development. Consequently, it is difficult to reveal the regional differences of human settlements based on the preferences of different groups of people.

Therefore, this paper, taking Zhejiang Province, China, as a research case, assesses the suitability of regional human settlements environment from different preferences perspective. Based on five types of data collected from the government sector and questionnaire surveys, this study aims to answer the following questions:

- (1) What is the spatial distribution characteristic of the main factors of the suitability of human settlements environment in Zhejiang Province?
- (2) How should we conduct meta-synthesis on the suitability of human settlements environment from the personal preferences perspective? What are the spatial characteristics?
- (3) What are the spatial relationships between the suitability and population distribution under different preference modes?

The next section is literature review which outlines the relevant literature on human settlement. The research design section describes the study area, data resource and analytical methods. The section on findings presents the results of the analysis and a discussion. The conclusion offers a summary of the findings and as well as the inadequacies of the existence and future research prospects.

## 2. Literature review

Since the 1950s, when Doxiadis (1975) founded the science of human settlement, scholars of different disciplines have joined the debates and contributed to this research topic. The upsurge of research on the human settlement environment has been rising gradually. Currently, academic research on the human settlement environment mainly focuses on the following four aspects.

Human settlement environment: concept and connotation. The United Nations (1976) "Vancouver declaration" first proposed the concept of 'human settlement environment', which defined it as a collection of human society, including social, material,

organization, spiritual and cultural elements, covering the city, town or village. At the beginning of 1990s, Chinese scholar Wu (2001), who was enlightened by Doxiadis, put forward the sciences of human settlements. In this, Wu (2001) proposed the hierarchical research method, and comprehensively investigated the human settlements from the aspects of society, economy, ecology, culture, art, technology, and so on, thus creating a theory system of human settlements sciences based on China's experience. Currently, the human settlement environment is considered as the spatial dimension and material embodiment of social and economic activities, and its meaning has both a broad and narrow sense. The former refers to surface space that is closely related to all kinds of human activities, while the latter is the geographical space of human settlements' activities (Zhang, Yu, Li, & Dang, 2016). There is no fully recognized definition of human settlement environment at present, and the concept and connotation of it will be constantly expanded and deepened with time.

Nature suitability for human settlement: impact factors and measurement. The natural environment is the background of the formation and development of human settlement. The scientific evaluation of the natural suitability for human settlement will promote coordinated regional development among population, resources and environment. Although human settlements are influenced by many natural factors, the most fundamental factors are terrain and landforms, climate, hydrological conditions, land use/land cover, etc., which play leading roles in the natural suitability evaluation (Li, Liu, & Zhang, 2011). The assessment and measurement of the nature suitability for human settlement involve two perspectives: one is to evaluate the suitability under a single natural factor (Emmanuel, 2005), and the other is to evaluate the comprehensive suitability under many factors through GIS and RS (Li, Liu, Zhang, & Gao, 2011; Zhu, Tian, Tan, & Du, 2016). As the level of homogenization is very high within small districts, nature suitability for human settlement is not the focus for researching the inner spaces of cities or towns. For the large-scale areas, however, researching the nature suitability for human settlement can provide guidance for selection of location of cities or towns as well as the population agglomeration. Therefore, studies concerning nature suitability of human settlement are mainly conducted at the national, regional or provincial scale, especially in different areas in China (Feng et al., 2007; Yang & Zhang, 2016).

Human settlement quality evaluation. Human settlement quality is of great significance for regional development, and its evaluation is a main focus of human settlement research. Assessing and measuring the human settlements' quality involves considering both urban and rural areas. The evaluation of human settlement quality in urban areas mainly refers to the livable evaluation, which includes two scales: among different cities (Savageau, 2007; Wang, Su, & Chen, 2011) and different areas within a given city (Lazauskaitė, Burinskienė, & Podvezko, 2015; Yassin, Althaqeb, & Al-Mutiri, 2012). For example, Savageau (2007) constructed a comprehensive index system which included nine aspects: cultural atmosphere; housing; employment; crime; transportation; and, education, and evaluated the quality of human settlement in the metropolitan areas of the United States. Also, some scholars have studied the influence of the physical properties of streets on its suitability from the perspective of the livable streets (Mahmoudi, Ahmad, & Abbasi, 2015). Rural human settlement has also raised the concerns of scholars (Kumar, 2012). For example, by choosing the infrastructure, public service facilities, energy consumption structure, living conditions, and environmental sanitation as the evaluation factors, Yang and Wang (2013) built an evaluation index system of the rural human settlement quality.

Residential satisfaction: definition and impact factors. The concept of residential satisfaction originates from the idea that

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