

## Organization Structure of Towns and Villages System in County Area Based on Fractal Theory and Gravity Model: A Case Study of Suning, Hebei Province, China

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**Abstract :** With the rapid development in China, the urbanization has entered the transformation and promotion stage, and its direction of development has shifted to overall regional synergy. China has a large number of towns and villages, with comparative small scale and scattered distribution, which always support and provide resources to cities leading to urban-rural opposition, so it is difficult to achieve common development in a single town or village. In this context, the regional development should focus more on towns and villages to form a synergetic system, joining the regional association with cities. Thus, the paper raises the question about how to effectively organize towns and villages system to regulate the resource allocation and improve the comprehensive value of the regional area. To answer the question, it is necessary to find a suitable research unit and analysis of its present situation of towns and villages system for optimal development. By combing relevant researches and theoretical models, the county is the most basic administrative unit in China, which can directly guide and regulate the development of towns and villages, so the paper takes county as the research unit. Following the theoretical concept of 'three structures and one network', the paper concludes the research framework to analyse the present situation of towns and villages system, including scale structure, functional structure, spatial structure, and organization network. The analytical methods refer to the fractal theory and gravity model, using statistics and spatial data. The scale structure analyzes rank-size dimensions and uses the principal component method to calculate the comprehensive scale of towns and villages. The functional structure analyzes the functional types and industrial development of towns and villages. The spatial structure analyzes the aggregation dimension, network dimension, and correlation dimension of spatial elements to represent the overall spatial relationships. In terms of organization network, from the perspective of entity and ono-entity, the paper analyzes the transportation network and gravitational network. Based on the present situation analysis, the optimization strategies are proposed in order to achieve a synergetic relationship between towns and villages in the county area. The paper uses Suning county in the Beijing-Tianjin-Hebei region as a case study to apply the research framework and methods and then proposes the optimization orientations. The analysis results indicate that: (1) The Suning county is lack of medium-scale towns to transfer effect from towns to villages. (2) The distribution of gravitational centers is uneven, and the effect of gravity is limited only for nearby towns and villages. The gravitational network is not complete, leading to economic activities scattered and isolated. (3) The overall development of towns and villages system is immature, staying at 'single heart and multi-core' stage, and some specific optimization strategies are proposed. This study provides a regional view for the development of towns and villages and concludes the research framework and methods of towns and villages system for forming an effective synergetic relationship between them, contributing to organize resources and stimulate endogenous motivation, and form counter magnets to join the urban-rural integration.

**Keywords :** towns and villages system, organization structure, county area, fractal theory, gravity model

**Conference Title :** ICEUP 2020 : International Conference on Environment and Urban Planning

**Conference Location :** Budapest, Hungary

**Conference Dates :** August 19-20, 2020