Research on Saving and Intensive Evaluation Indicator System of Rural Infrastructure Construction

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Abstract. This paper proposed an indicator system to the saving and intensive of infrastructure. The evaluation indicator system was built from three dimensions - transportation facilities evaluation indicator, water supply and drainage facilities evaluation indicator, safety and disaster prevention facilities evaluation Indicator. The saving and intensive extent of rural infrastructure would be quantitatively evaluated by this indicator system to build livable living environment.

Introduction

Existing research of saving and intensive evaluation indicator basically focus on in urban areas with high concentration of resources. Most of them take land use as research objects, which lead to omit the research on villages. Disorderly and lowly intensive construction of rural generally caused two extreme results - infrastructure allocation is low/zero or overdone, humane living environment is not humanized and resources are wasted\textsuperscript{[1]}. From this perspective, research to intensive on village level has importantly practical significance. This paper committed to establish infrastructure evaluation indicator system.

Saving and intensive evaluation indicator system of rural infrastructure

Infrastructure is mostly permanent construction which is long duration, large investment and high risk\textsuperscript{[2]}. The World Bank pointed out that in order to respond to some social issues such as social stability, rapid urbanization, climate change and natural disasters, food and energy security, departments need to be linked through infrastructure’s complexity and connectivity\textsuperscript{[3]}.

Conformed to the high demand by new urbanization for the intensive use of resources, it is necessary and urgent to build the index system for saving and intensive of infrastructure\textsuperscript{[4]}. For its unique nature and urban evaluation system to distinguish, research on village differs from that in urban. This paper attempts to establish an indicator system of rural infrastructure construction to provide a quantitative evaluation method to evaluate the intensive degree of rural infrastructure.

In this paper, infrastructure sharing rate evaluation system were proposed with three aspects - transportation facilities evaluation indicator, water supply and drainage facilities indicator, safety and disaster prevention facilities evaluation indicator. The infrastructure sharing rate evaluation system could be set in accordance with Table 1.
Table 1 Infrastructure sharing rate evaluation system

| Target Layer | Criterion Layer                                      | Evaluation Layer                  |
|--------------|-----------------------------------------------------|-----------------------------------|
| Saving and Intensive Evaluation Indicator System of Rural Infrastructure Construction | Transportation facilities evaluation indicator | Road quality indicators          |
|              | Water supply and drainage facilities indicator      | Traffic indicators                |
|              | Safety and disaster prevention facilities evaluation indicator | Resource utilization            |
|              |                                                     | Structures sharing rate           |
|              |                                                     | Facilities coverage              |
|              |                                                     | Flood control                    |
|              |                                                     | Firefighting                     |
|              |                                                     | Relief lifeline engineering      |
|              |                                                     | Peace and disaster combined      |

Complexity and connectivity evaluation indicator system on rural infrastructure

Transportation facilities evaluation indicator. As one of the most important construction projects, transportation facilities are prerequisites for regional development. Furthermore, rural road infrastructure is an important indicator to evaluate the development of socio-economic. Existing road infrastructure in rural areas is insufficient and fragmented which leads to disconnection between village and village, villages and regional center. As a result, the development of the region is hesitated. Considered to build road quality indicators with area density of road network, road paved rate and road greening rate. In the same way, build traffic indicators with road network load degree, connectivity rate and mastery rate. Transportation facilities evaluation could be set in accordance with Table 2.

Table 2 Share-ratio-based indicator system for the assessment of road transport infrastructure

| Target Layer | Criterion Layer | Evaluation Layer | Index Description                                                                 |
|--------------|-----------------|------------------|-----------------------------------------------------------------------------------|
| Road transport infrastructure sharing rate index | Road quality indicators | Area density of road network | The total length of roads / The total land area                                      |
|              |                  | Road paved rate  | Road surface has hardened area / The total area of the road                         |
|              |                  | Road greening rate | Reach the green standard of the road edge area / The total area of the edge of the road |
| Traffic indicators | Road network load degree |                  | Actual traffic / Capacity                                                             |
|              | Road Network Connectivity | C = \[ \frac{m}{n} \] | The sum of the number of residents in points and patches of land to meet the transport needs of the road / Residents sum of points and number of patches of land |
|              | Road network accessibility rate |                  |                                                                                     |

The Water supply and drainage facilities evaluation indicator. Water supply and drainage facilities evaluation is evaluated from three levels—resource utilization, structures sharing rate,
facilities coverage. Taking into account both indicators and access to data, water supply and drainage facilities evaluation could be set in accordance with Table 3.

Table 3 Share-ratio-based indicator system for the assessment of water supply and drainage facilities infrastructure

| Target Layer | Criterion Layer | Evaluation Layer | Index Description |
|--------------|-----------------|------------------|-------------------|
| Water supply and drainage facilities evaluation | Resource utilization | Effective irrigation rate | Effective irrigation area / Arable land |
| | Structures sharing rate | Per capita occupancy to water pipeline | The length of water pipeline / The number of actual coverage |
| | | Per capita occupancy to drains | The length of drains / The number of actual coverage |
| | Facilities coverage | Water supply network coverage | The number of people covered by water supply network / Total population |
| | | Drainage network coverage | The number of people covered by water drainage network / Total population |
| | | Sewage collection and treatment system coverage | The number of people covered by sewage collection and treatment system / Total population |

Safety and disaster prevention facilities evaluation indicator. Build safety and disaster prevention facilities evaluation indicator comprehensively from four indexes - flood control, firefighting, relief lifeline engineering, peace and disaster combined. Considering to the index data access to factors, safety and disaster prevention facilities evaluation could be set in accordance with Table 4.

Table 4 Share-ratio-based indicator system for the assessment of safety and disaster prevention infrastructure

| Target Layer | Criterion Layer | Evaluation Layer | Index Description |
|--------------|-----------------|------------------|-------------------|
| Safety and disaster prevention infrastructure sharing rate index | Flood control | Flood control equipment building rate | Number of build equipments / Number of equipments have been built |
| | | Drainage facilities building rate | Area of drainage facilities covering / Area of administrative region |
| | Firefighting | Fire exits connectivity | Width of more than four meters of road length / The total length of roads |
| | Relief lifeline engineering | Per capita area of relief square | Area of relief square / Resident population |
| | Peace and disaster combined | Usage of disaster prevention park/square in peace | Time per visitor stay in relief square for once / Resident population |

Summary

The main objective of infrastructure construction in rural area is upgrade of existing facilities. This paper proposed the scheme of the evaluation indicator in three dimensions with six aspects - transportation facilities, water supply and drainage facilities, energy and power facilities, post and telecommunications facilities, ecological environment facilities, safety and Disaster prevention facilities. Through establishing a scientific conservation and rural infrastructure construction intensive evaluation
indicator system, investigate and quantify the way for the construction of country to guide the building of beautiful towns and villages.

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