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**TOOLS FOR MANAGING THE EFFICIENCY OF THE UTILITY
INFRASTRUCTURE OF THE REGION**

Specialty: 5.2.3 - Regional and sectoral economics

Abstract

dissertation for the degree
of Candidate of Economic Sciences

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The relevance of the research topic. The communal infrastructure and the housing and communal complex as a whole have an indisputable socio-economic significance due to their scale and indispensability. Every citizen living in Russia is a consumer of domestic utilities, the characteristics of which directly affect the quality of life of any person, as well as production and the economy.

Before the reforms, the economic relations system in the housing and communal sector was based on budgetary financing of organizations as suppliers of communal resources to consumers. This system had significant problems and proved to be ineffective for a number of reasons: unprofitable financing of a huge area, lack of proper quality control, inadequate or missing consumer influence on the quality and quantity of services received, and the complete lack of competition, which resulted in little incentive to improve efficiency and quality.

Since the beginning of the 21st century, the system of public utilities management has undergone significant changes. One of the most important reforms was the creation in 2013 of the Ministry of Construction and Housing and Utilities of the Russian Federation, and the implemented Comprehensive Program for the Modernization and Reform of Housing and Utilities for 2010-2020. Over the past decade, the housing and communal complex has come to be regarded as an object of the market relations system, in which the state has been assigned the regulating and controlling function. But this in no way limits the responsibility of the state system for managing communal infrastructure or its enormous potential to influence the quality and efficient functioning of the infrastructure.

Despite the reform and development of the communal infrastructure management, there remains a wide range of problems that need to be solved to satisfy all the participants in this area. Undoubtedly, the difficulty of providing high-quality universal functioning of the housing and communal complex can be explained in the framework of geographical determinism. The vast territories, the marked climatic difference, the specific features of particular territories, the various population densities, with a quarter of Russian population residing in remote settlements – unlike comparatively small European countries – make highly

efficient management an extremely elusive task. Consequently, scientific research that contributes to improving the efficiency of public utilities management is especially relevant and timely.

This situation calls for developing communal management methods, the assessment of the functioning efficiency of the territorial communal infrastructure at the local level being an integral tool. This aspect of management is especially relevant in the light of the National Project «Labor Productivity and Employment Support» and, based on it, the regional project "Effective Region". These projects set the course for the development and implementation of modern management practices.

At the legislative level, there is no system for evaluating the functioning efficiency of the communal infrastructure. Decree of the President of the Russian Federation No. 68 approves the list of indicators for assessing the performance of senior officials and the executive authorities in the constituent entities of the Russian Federation, but unlike the previous decrees it does not include any indicators for the communal sector. The methods developed at the federal level for calculating such performance indicators and those elaborated in many domestic studies offer an integral assessment obtained using the index method, or are calculated by the ratio of the achieved indicators to the planned ones, which reflect obtaining a value of effectiveness, not efficiency. The surveys of the population, at the municipal level, on the performance of the local government heads, as well as organizations providing housing and communal services are subjective, unreliable and difficult to verify.

Evaluation and performance management is the most important, integral element of any management system. Of key interest for this study is the relative efficiency assessment method – DEA (Data Envelopment Analysis), as one of the bestperformance assessment tools to date.

For the above reasons, the public utilities sector is in need of introducing tools that can give an objective assessment of economic efficiency and set the right

management trajectory. Thus, in view of the above argumentation, the choice of the topic of the dissertation research was made.

The purpose of the dissertation research is to develop methodological approaches and practical recommendations in managing the efficiency of the regional municipal infrastructure using economic tools. To achieve this goal, it is necessary to solve the following **tasks**:

1. Clarify the socio-economic essence of public services and determine how communal infrastructure fits in the regional economy.
2. Explore the current state of the communal infrastructure in Russia, the peculiar features of the management system and its genesis.
3. Analyze the interrelationships of factors that make up the spectrum of problems in the communal infrastructure management in Russia.
4. Study theoretical approaches to the definition of efficiency and clarify the basic concepts in the field of economic efficiency assessment.
5. Consider and analyze the methodological tools of economic methods used to assess the efficiency of the municipal economy functioning in the region.
6. Develop a system of communal infrastructure indicators as a tool for managing the efficiency of the region's communal services.
7. Model and test the methodology for assessing the efficiency of the municipal infrastructure functioning of the region (on the example of the Rostov region).

The object of the study is the system of state management of the regional communal infrastructure.

The subject of the study is a methodological toolkit for managing the efficiency of the region's communal infrastructure as an economic and organizational structure.

Compliance of the research with the passport of the scientific specialty. The research topic **corresponds to** the passport of the specialty 5.2.3 «Regional and sectoral economics».

Theoretical and methodological basis of the study. The theoretical framework used includes the scientific works of domestic and foreign scientists on the development of housing and communal services, and research in the field of managing the efficiency of socio-economic systems.

The methodological framework of the study is a set of general scientific methods of cognition of socio-economic phenomena and processes: a systematic approach, modeling, methods of logical, factorial and comparative analysis, formal logic (induction, deduction, analysis, synthesis, extrapolation, etc.), as well as parametric and deterministic methods.

Information base of the study. The information framework of the study is derived from official statistics by the Federal State Statistics Service and its territorial bodies (in particular, the Rostov Region), the Housing and Utilities Reform Assistance Fund, official materials by the Ministry of Construction and Housing and Communal Services of the Russian Federation, the Ministry of Housing and Communal Services of the Rostov Region, legislative and regulatory legal acts of the Russian Federation, latest monographs and analytical reports, articles and other publications in the scientific and business press, including those on the Internet, as well as the author's own calculations obtained using Microsoft Excel software and the «R» software environment (downloadable library «DeaR»).

The scientific novelty of the research results lies in developing theoretical and methodological foundations and elaborating methodological tools for a comprehensive assessment of the efficiency of the municipal infrastructure management system in the region, including the possibility of managing efficiency by using the proposed tools.

The scientific results obtained in the study personally by the author are as follows:

1. Defining the modern specificity of the public utilities sector, analysing the set of concepts fixed by law, which made it possible to identify gaps and insufficiency of legal regulation of the basic definitions in the field, addressing the regulatory and legal aspects of the transition to the public sector of the new service

– «MSW management»; clarifying and supplementing the main elements of the communal infrastructure system, the analysis of which viewed as a system resulted in identifying its fundamental features as an object of management.

2. Analyzing the genesis of the public utilities management system over the past 30 years, with the results obtained at each stage of the reform, special attention is paid to delineating powers between the regional authorities and local self-government in matters of utilities infrastructure management, the thorough analysis revealed promising management mechanisms that can have a positive effect on the communal infrastructure development and highlighted a number of organizational measures contributing to the effect.

3. A systematization of pressing issues in the Russian communal sector allowed to group problematic aspects according to their specifics, analyzing cause-and-effect relationships made it possible to identify the root causes and respectively explore ways to develop the sector to overcome "chronic" weaknesses stemming from territorial and historical peculiar features of the Russian communal infrastructure.

4. Elaborating a categorical-conceptual toolkit as a necessary element of the methodological system for assessing and managing the efficiency of the economic and organizational structure, analyzing the approaches of various authors who provide a detailed explanation of such concepts as efficiency, effectiveness, costs, output and result; substantiating the need of differentiating between the output and outcome indicators, which is necessary for designing a methodology for changing relative economic efficiency.

5. As a result of the study of the mathematical apparatus and application features, the advantages and disadvantages of the methods for assessing economic efficiency were identified, which in turn made it possible to compare the capabilities of the methods and choose the best combination for use in the next stage of the study.

6. Developing a step-by-step algorithm of research to achieve the study goal, within the framework of which the following operations were performed:

- selection and grouping of relevant indicators that characterize the condition of the region's communal infrastructure functioning;
- collection of data on the communal infrastructure in the Rostov region, the main sources of which were: the territorial body of state statistics for the Rostov region (Rostovstat), the database of indicators of municipalities posted on the official website of Rostovstat;
- an analysis of the completeness of the obtained data, based on thorough research of methodology for programmatic recovery of missing values, since performance evaluation methods require the availability of complete datasets, hence the selection of cutting-edge, accurate methods of multiple recovery using chain equations (MICE);
- developing a number of relevant methodological solutions in the course of the data recovery process, in addition to the expected result; elaboration of three methods applicable, in combination, to various types of data gaps, the obtained methodological developments can serve as a guide for solving the problem of missing values while working with data.

7. Developing calculation and analytical procedures aimed at measuring relative economic efficiency by a combination of DEA methods and the Malmquist Index, as well as efficiency management:

- carrying out the process of testing modifications of the DEA model and identifying a number of problems (which are not covered in publications) during the program use of models, such as: multicollinearity, zero values, which led to the search and successful solution-finding, namely, the method of principal components; other results at this research stage being a reasoned choice in favor of the non-radial "slake-on-based" DEA model, practical difficulties in software implementation are identified and methodological recommendations are proposed for overcoming them and setting the model parameters based on the type of data and the specifics of the variables;
- validation and analysis of the estimates obtained using the DEA method, which provided opportunities to identify the causes of inefficiency in the

communal infrastructure management systems of particular urban and municipal districts, with a number of developed meta-indicators proposed to simplify the identification of problem factors;

- the implementation of the Malmquist Index algorithm to calculate the net efficiency, abstracted from the effects of the external environment, which is an essential condition for obtaining the second row of recommended values for inefficient objects, so the final table provides a range of values for the indicators of each object, reaching given values, the urban district or municipality will achieve a level of relative efficiency within the regional environmental framework.

The theoretical significance of the study lies in the development of the theoretical provisions of the methodology for managing the efficiency of the regional municipal infrastructure.

The practical significance of the study lies in the fact that the main provisions, conclusions and recommendations can be used by management structures for an objective assessment of efficiency on a given scale. The proposed methodology can serve as a reliable standard to accurate values of indicators, which will optimize costs and build the most correct priorities in development directions. Thus, the proposed methodology, as a management tool, may contribute to the achievement of high efficiency of the communal infrastructure management system.

Certain provisions and proposed recommendations can be used in training programs and advanced training courses for workers in the housing and communal services sector, as well as in management activities of housing and communal services entities.

List of publications.

The author published 15 scientific papers relevant to the research, with a total volume of 19.9 p. 1. (personal contribution - 6.25 p. 1.), including 5 articles, with a total volume of 3.2 p. 1. (personal contribution - 2.6 pp.), in journals included in the list of publications recommended by the Higher Attestation

Commission of the Ministry of Science and Higher Education of the Russian Federation.

The structure of the dissertation work is built in accordance with the logic and sequence of achieving the goal, solving research problems and contains an introduction, three chapters, a conclusion, a bibliographic list (includes 159 titles) and applications. The dissertation is presented on 248 pages, illustrated with 12 tables and 17 figures.

