KAUNAS UNIVERSITY OF TECHNOLOGY

EGLĖ KLUMBYTĖ

DEVELOPMENT AND APPLICATION OF MUNICIPAL RESIDENTIAL BUILDINGS FACILITIES MANAGEMENT MODEL

Summary of Doctoral Dissertation
Technological sciences, Civil Engineering (02T)

2018, Kaunas

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KAUNO TECHNOLOGIJOS UNIVERSITETAS

EGLĖ KLUMBYTĖ

SAVIVALDYBĖS GYVENAMŲJŲ PASTATŲ ŪKIO VALDYMO MODELIO SUKŪRIMAS IR PATIKRINIMAS

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Introduction

Following the restoration of the independence of the Republic of Lithuania, the Government and municipalities took over a large quantity of real estate and the associated management problems. Real estate (RE) management in the public sector has long been characterized by lack of knowledge, experience and strategy. Governmental and municipal institutions are often tasked with managing real estate, even though most matters should definitely be handled differently, e.g., governmental functions should be the decisive factor in the need for real estate.

The reduction of RE maintenance costs is one of the key motives behind the goal of attaining a more efficient RE management. This is relevant to both Lithuania and other countries as reduced governmental and municipal RE maintenance costs would help to save the money brought in by tax payers and to use it for other social needs. Hence, the main goal of optimizing governmental and municipal facilities management is to reduce the maintenance costs of the real estate intended for public use. Optimization of RE management results in a decreased need for new buildings, better satisfaction of consumer needs by more efficient buildings, lower energy consumption and reduced pollution. In order to achieve these goals, the application of modern management principles in municipal RE management, i.e., RE acquisition, maintenance and renovation, renunciation of RE via lease or transfer to other commercial entities, acquires major importance.

The second problem lies in the management of newly established RE, i.e., planning and introducing investments for the construction of new buildings. Decisions to construct or purchase new buildings are often made without having assessed the possibilities of building optimization, rent and use of public and private partnership models. Such tendencies reveal definite lack of municipal facilities management tools, e.g., systems for assessing the suitability of buildings for their functions, methods of technical and functional criteria monitoring and assessment, classification of buildings, collection and assessment of data on such buildings, and decision making skills regarding the RE use model.

Aim of the Dissertation

The aim of the dissertation is to develop methods for managing municipal residential buildings.

Objectives

1. To analyze research results of municipal real estate management in Lithuania and foreign countries and to evaluate the accrued practical experience in RE management.

2. To develop a municipal RE strategic management model and prepare facility assessment methods.

3. To develop a criteria system for municipal residential buildings in compliance with municipal functions, respective regulations and other relevant requirements; to establish the relevance of the applicable criteria.

4. To perform technical assessment of 20 buildings forming part of the social housing sector in Kaunas based on the developed criteria system.

5. To use the SAW and MEW methods based on multiple criteria to generate a priority queue of facility compliance with regulations and to issue recommendations on the further management and use of social housing meeting the minimum established criteria on the basis of economic ratio calculations.

Relevance of the Research

1. A criteria system on the establishment of the compliance of municipal residential buildings with the corresponding functions was developed.

2. A methodology for the monitoring and assessment of technical and functional characteristics of the buildings was developed.

3. A model for the classification of municipal residential buildings, accumulation and assessment of data on these buildings and decision making on the use of such property was prepared.

Methods of the Research

Analysis of municipal real estate management relies on scientific publications (both Lithuanian and foreign), regulations governing municipal activities and regulations governing the construction and maintenance of buildings.

The relevance of the criteria on the suitability of municipal residential buildings for municipal functions was determined on the grounds of expert assessment methods.

The provided example of the assessment of municipal residential buildings was based on multi-criteria analysis.

Practical Relevance of the Dissertation

1. The database of scientific research, regulations and legal norms on the use of municipal facilities accumulated and presented in the dissertation could be used to improve municipal real estate strategic management.

2. The technical assessment of 20 social housing buildings of Kaunas City Municipality presented in the dissertation could be used as an example for the assessment of other municipal facilities.

3. Guidelines on the management of the facilities of municipal residential buildings have been prepared.

Statements Presented for Defense

1. Efficient management of residential buildings requires a system of applicable requirements, assessment of the significance of compliance of the buildings with the applicable requirements, a ranking of the buildings based on their compliance with the applicable requirements, and the assessment of the decision-making on alternative possibilities of real estate management.

2. The suitability of municipal residential buildings for the respective functions is assessed and long-term decisions are made by using objective quantitative ratio-based assessment of buildings and by processing the obtained data by employing widely acknowledged methods of analysis.

Scientific Approbation of the Dissertation

Four scientific papers on the topic of the dissertation have been published in periodicals. Two of these articles were included in the *Clarivate Analytics International Scientific Research Database* (one of the articles features a citation index). The dissertation research results have been presented in four international scientific conferences as well as in four conferences of junior researchers.

Structure of the Dissertation

The thesis consists of the following parts: an introduction, three chapters, general conclusions, bibliography, a list of scientific publications, and 4 appendices.

The full version of the thesis contains 108 pages featuring 18 figures, 43 tables, 23 formulas and a list of 137 references.

1. Literature Review

One of the main goals of municipalities is the reduction of real estate maintenance and management costs while carrying out their respective functions. However, instead of focusing on short-term goals geared towards cost reduction and assessing real estate as property, one should concentrate on the long-term real estate management goals with the consideration of future outlook [1, 2].

In many countries, municipalities are not only the owners, but also the managers of real estate (RE). They control a large amount of real estate, including public buildings, infrastructure objects, schools, healthcare institutions, social housing and the surrounding land lots. They also own estate necessary for carrying out their administrative functions. The estate requires maintenance, foreseeing long-term objectives for its use and investment perspectives. By taking into consideration the fact that municipalities perform their functions daily, the real estate management portfolio requires optimization so that the public interests could be fully satisfied [3].

Halfawy (2004) highlights that municipalities are often faced with increasing difficulties arising due to the depreciation of real estate and its constantly deteriorating technical condition. Insufficient funds for RE renovation, regularly increasing requirements for the improvement of service quality, the rising popularity and the environmental requirements which seem to become stricter with each passing day must also be factored in. Foreign organizations operating in the public sector encounter similar real estate management problems, e.g., faults of centralized management, lack of economic actions in managing RE belonging to municipalities, lack of information on the managed RE, knowledge, liability and transparency, all of which combined make up the key problematic matters for city municipalities [4].

The governmental control reports indicate certain regular systematic problems encompassing RE management of all types of municipalities. Such problems are as follows: a portion of the municipality RE not being evaluated or registered in public registers, decentralized municipality RE management, no precise information on the quantity of RE belonging to municipalities or its management processes, and no common efficient state-owned RE management control system. The proper communication and correlation of the available information is of utmost importance in real estate management as municipalities are obliged to know how much real estate they possess, in what condition this RE actually is, the amount of the required investments, the need for RE, etc. The research carried out by Kaganova (2012) revealed that the compilation of a database and a municipal RE inventory is the first step – which is also a key step – towards the development of an efficient RE management system. An extensive municipal database would allow for monitoring and analyzing RE and portfolios, developing and implementing the strategic plan and managing the RE belonging to various municipalities [5].

In Lithuania, municipalities often choose the most expensive method of acquiring housing by building new houses or reconstructing unused buildings. Also, a municipal audit of 2017 revealed that, compared to the average market prices, the average prices of new buildings planned to be built and unused buildings under reconstruction were 2 to 10 times higher in several municipalities. This means that, by using the same financial resources, municipalities are able to provide substantially less social housing to persons and families than they potentially could, were they to be in possession of efficient RE management [6].

According to Wojewnik-Filipkowska et al. (2013), the criteria laid down by municipalities are not the only ones used to evaluate RE. Real estate management is undoubtedly a complex and multifaceted process because RE has both economic and physical characteristics, and its amount and value differs. Also, in their RE management, municipalities must ensure that the economic, social, environmental and functional needs of residents get satisfied [7].

2. Development of Municipal Facilities Management Model

2.1. Strategic Management Plan of Lithuanian Municipal Facilities

On the grounds of the outlined RE management models and strategies of foreign states, having generalized on the results of the research studies of RE management systems, and having analyzed the best management practices, the components of the public RE system were pieced together into a strategic management plan of municipal RE (Fig. 2.1). The essence of practical application of the plan is the assessment and optimization of the exploitation of RE by the means of the developed system of assessment criteria.

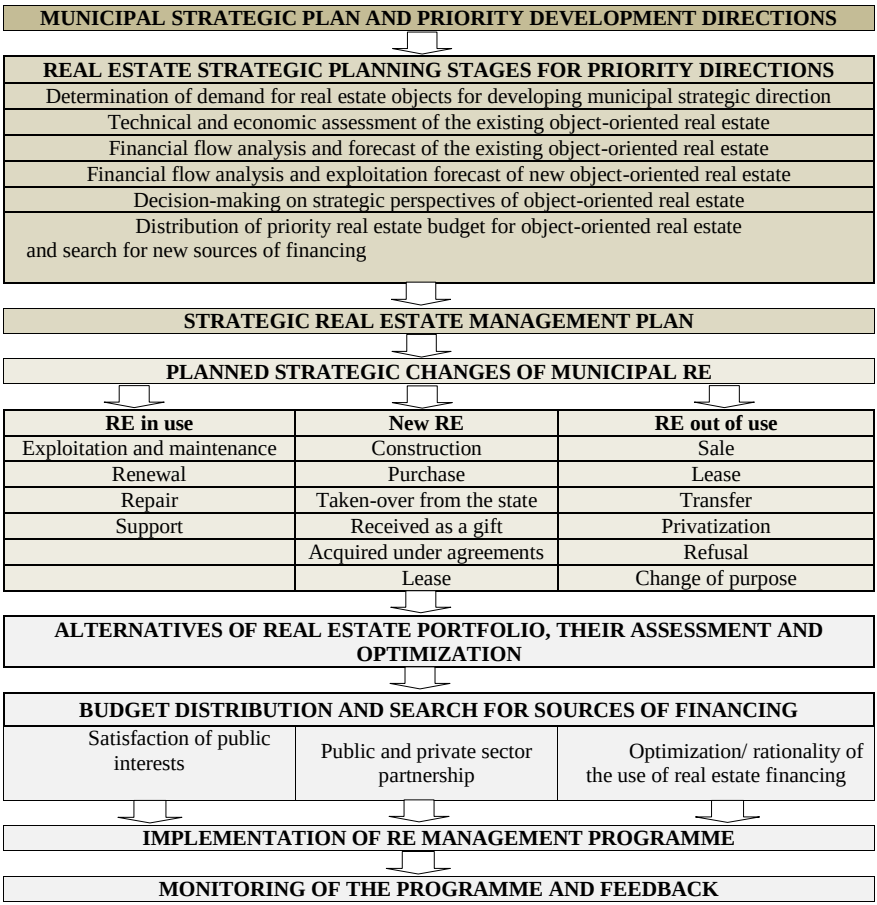

Fig. 2.1 Strategic management plan of municipal RE
(developed by the author)

2.2. SIPOC Model of Municipal Facilities Management

In order to develop a model which could be easily applicable at any institution or company, the interested parties should understand clearly who the participants of the process are, what the input and output data is, what the ongoing processes are and who the beneficiaries are. For this reason, the author itemized the organizational processes of the municipal facilities management by employing the SIPOC (*supplier, input, process, output, and customer*) model (Table 2.1).

Table 2.1 SIPOC model of municipal facilities management process (developed by the author)

Supplier	Input	Process	Output	Customer
Seimas of the RL	Legal requirements	Selection of requirements for facilities	Making the RE priority queue Public access facility management information system Rationally, publicly and effectively managed RE Offers for facilities management Modeling the screening of alternatives Simpler RE management and planning	Municipality Tenants of social housing Society
Ministry of Environment	STR requirements			
Ministry of Health	Requirements of hygiene norms			
Lithuanian Builders Association	Construction regulations			
Municipality	Requirements for facilities			
Experts	Weights and relevance of requirements for facilities	Assessment of requirements following the expert method		
		Selection of facilities assessment criteria		
Technical maintenance managers	Technical facility assessment data	Technical assessment of facilities		
Center of Registers	Statistical data*			
Environmental protection Agency	Air pollution data			
"Kauno Energija" JSC	Statistical data*			
Municipality	Requirements for facilities; data; rent price data; list of the queue for accommodation; financing			
Information Technology and Communications Department	Statistical data *			
Independent RE assessor	Facility price data			
Statistics Lithuania	Statistical data*			

*Statistical output data is discussed in detail in Tables 2.11 and 2.12 of the dissertation

According to Maier *et al.* (2017), the SIPOC method involves making the table of processes with the aim to identify, characterize and assess the processes thus enabling the analysis and assessment of the aspects that should be improved of changed [8]. The method is convenient for the assessment of particular solutions at the organizational level with the aim to increase the effectiveness of the organizational processes. Information on each and every process is useful for the resource management and development of the processes, the desirable results of which are insufficient.

The main goal of the model is that the output data should satisfy customer needs and requirements, i.e., the RE should be managed publicly, rationally and effectively. To achieve the goal, the priority queues of the facilities are made, the selection of alternatives is modeled, the offers for facilities management are made, and a public access real estate management information system is launched, as a result of which, the RE management and planning becomes easier.

2.3. Municipal Facility Assessment Method

The method developed for the assessment of municipal facilities involves the system of requirements applicable to the municipal facilities and the methods of identifying the compliance of the facilities with the applicable requirements and the rating of the facilities on the basis of their compliance with the requirements (Fig. 2.2).

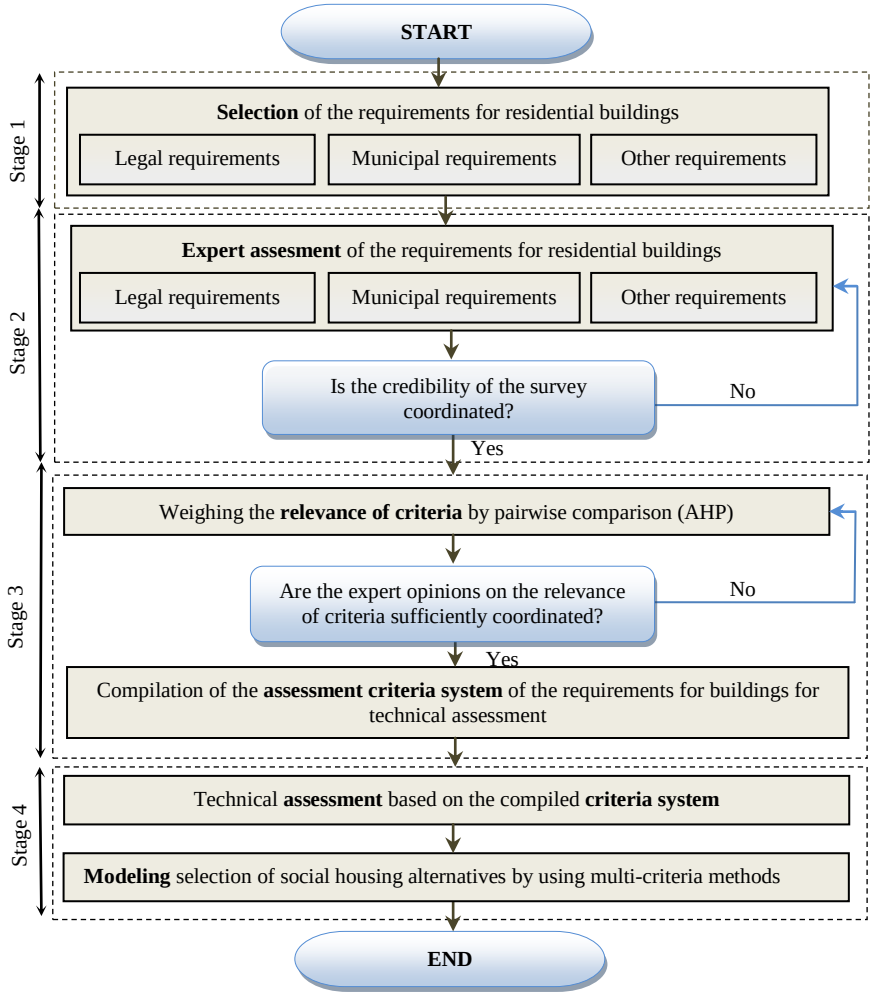

Fig. 2.2 Implementation stages of the municipal facilities assessment model (developed by the author)

The main stages of model use are as follows:

1) Development of the system of requirements applicable to the municipal facilities based on legal regulations, municipal functions and additional requirements describing facilities. The documents related to the use of municipal residential buildings are analyzed.

Firstly, the requirements for municipal social housing were selected from the residential building requirements set forth in the regulations, municipal and

other requirements that make residential housing more attractive and appealing to the residents. The requirements were categorized into groups so that to reduce their quantity, e.g., fire safety requirements encompass the following: access to the building for firefighters, distance to a fire station, emergency exits, compliance of the utility systems with fire safety requirements, lightning protection, autonomic smoke detectors, water supply for fire protection, fire safety reservoirs, possibility to erect fire escape ladders next to the building, apartments for the disabled in the lower floors of the building, elevator for the disabled in case of a fire.

The residential building requirements amounted to a total of 106 requirements which were categorized into the following three groups:

- 43 regulation requirements;
- 26 municipal requirements for residential buildings;
- 37 additional requirements.

2) Expert optimization of the requirement system by discerning the key requirements. Assessment of a building based on 106 requirements would be quite a daunting task, thus it was decided to reduce the number of requirements by selecting 10 key requirements from each group. For this purpose, a questionnaire-based survey was prepared, and a team of 43 experts was selected consisting of certified civil engineers, municipal officers working in RE departments, and RE researchers. The RE characteristics were assessed on the grounds of the general criteria, then analyzed and evaluated as the most relevant (rated 1 if most relevant and rated 10 if least relevant).

Ten requirements of each group scoring the lowest score were selected after summing up the assessments given to the requirements in all the three categories by each and every expert (Table 2.2). The consistency of the survey was verified, and, upon receiving positive results, sets of the selected requirements were defined as criteria and were later used in the next stage of determining the respective relevancies.

Table 2.2. Ratings of the requirements for residential buildings

	Normative requirements applicable to buildings	**Rating**
$\mathbf{m_{1n}}$	Compliance with key requirements for buildings	1
$\mathbf{m_{2n}}$	Energy required for heating and other purposes	4
$\mathbf{m_{3n}}$	Safety of heating devices	2
$\mathbf{m_{4n}}$	Type of buildings	5
$\mathbf{m_{5n}}$	Facility heating and air conditioning	8
$\mathbf{m_{6n}}$	Cold and hot water supply system	9
$\mathbf{m_{7n}}$	Power supply system	7
$\mathbf{m_{8n}}$	Low exploitation costs and compliance with environmental protection requirements	3
$\mathbf{m_{9n}}$	Natural lighting requirements	6

$\mathbf{m_{10n}}$	Driveways and access to the building	10
	Municipal requirements applicable to residential buildings	
$\mathbf{m_{1s}}$	Good technical condition of the building	1
$\mathbf{m_{2s}}$	Low heating costs	2
$\mathbf{m_{3s}}$	The apartment has a kitchen, a toilet and a bathroom	6
$\mathbf{m_{4s}}$	The price of 1 m^2 of usable floor area	5
$\mathbf{m_{5s}}$	Energy performance class of buildings	4
$\mathbf{m_{6s}}$	Access to the building by car	9
$\mathbf{m_{7s}}$	Accessibility for the disabled/people with special needs	8
$\mathbf{m_{8s}}$	Accessibility for families with children	7
$\mathbf{m_{9s}}$	Facilities are free of encumbrances for their use and management	2
$\mathbf{m_{10s}}$	Number of parking places	10
	Other requirements applicable to residential buildings	
$\mathbf{m_{1k}}$	Safety	1
$\mathbf{m_{2k}}$	Comfort	3
$\mathbf{m_{3k}}$	Neighbors	4
$\mathbf{m_{4k}}$	Infrastructure	2
$\mathbf{m_{5k}}$	Parking lots	6
$\mathbf{m_{6k}}$	Environment (plants, children's playgrounds, rest areas)	8
$\mathbf{m_{7k}}$	Entrance to the building	9
$\mathbf{m_{8k}}$	Key room properties	7
$\mathbf{m_{9k}}$	Utilities	5
$\mathbf{m_{10k}}$	Environmental pollution in the district	10

3) Determination of the relevancies of the assessment criteria for municipal residential buildings by pairwise comparison (AHP, Analytic Hierarchy Process) by using pairwise comparison matrices completed by experts [9]. This method was chosen because the relevancy of the criterion revealed the expert's/specialist's opinion on the importance of the criterion when choosing the best alternative from the list of available alternatives. The method is convenient to use as the criteria can be compared in pairs [10, 11].

The third stage is comprised of the following six smaller steps: 1) compilation of the expert group for determining the relevancies of criteria by pairwise comparison; 2) completing the pairwise comparison surveys with the objective to determine the relevancies of criteria; 3) survey assessment (only suitably completed surveys of each group are assessed); 4) calculating the mean value of the relevancies (q_j^k) of the criteria determined by the experts; 5) verification of survey coordination; 6) development of the system of assessment criteria for residential buildings based on the calculated relevancies.

The task of determining the relevancies involved three groups of selected and rated criteria. A team of 34 experts was recruited to complete the pairwise comparison surveys. Each expert had to complete 3 pairwise comparison tables. The relevancies reflecting the opinion of each expert were determined, and the

consistencies of the pairwise comparison matrices were verified by using the pairwise comparison table data and the AHP method. Out of 34 experts:

- 11 experts correctly completed the pairwise comparison matrices and assessed the criteria of the building requirements set forth in regulations;
- 13 experts correctly completed the pairwise comparison matrices and assessed the criteria of the municipal requirements;
- 10 experts correctly completed the pairwise comparison matrices and assessed the criteria of the additional requirements.

Consistency index *S* of the pairwise comparison matrices of the said experts either did not exceed 0.1 or exceeded it only slightly [11, 12, 13, 14, 15, 16]. Any further calculations of criteria relevancies involved only the pairwise comparison matrices of these experts.

Following the criteria relevancies measured on the basis of expert data, the criteria were rated (Tables 2.3– 2.5).

Table 2.3. Criteria of normative requirements applicable to buildings as rated by 11 experts

Expert No.	m_{1n}	m_{2n}	m_{3n}	m_{4n}	m_{5n}	m_{6n}	m_{7n}	m_{8n}	m_{9n}	m_{10n}	*S*
E1	1	3	4	2	6	8	5	7	9	10	0.11434
E2	1	2	4	3	6	8	5	7	9	10	0.066306
E3	1	3	4	2	7	8	5	6	9	10	0.102355
E4	1	3	4	2	5	7	6	8	9	10	0.093
E6	1	10	4	2	5	6	3	8	7	9	0.058
E7	1	3	4	2	6	8	5	7	9	10	0.096
E8	1	4	3	2	6	7	8	5	9	10	0.068
E16	1	8	3	2	6	5	7	4	9	10	0.092
E17	1	3	4	2	7	8	5	6	9	10	0.101
E18	1	3	4	2	5	6	7	8	9	10	0.091
E32	1	4	3	2	5	6	7	8	9	10	0.104

Where: E1 means an expert; m_{1n} means the criteria (*n* represents the criteria of the requirements applicable by regulations, *s* stands for the criteria of requirements applicable by municipalities, *k* denotes the criteria of other requirements applicable to the buildings); *S* is the matrix consistency index.

Table 2.4. Criteria of municipal requirements applicable to buildings as rated by 13 experts

Expert No.	m_{1s}	m_{2s}	m_{3s}	m_{4s}	m_{5s}	m_{6s}	m_{7s}	m_{8s}	m_{9s}	m_{10s}	S
E27	2	3	6	5	4	7	8	9	1	10	0.095
E1	1	2	6	5	4	9	8	7	3	10	0.07
E2	1	2	6	5	4	9	8	7	3	10	0.07
E3	1	2	6	5	4	9	8	7	3	10	0.069
E5	1	2	6	4	5	9	8	7	3	10	0.108
E7	2	3	6	4	5	9	8	7	1	10	0.102
E34	1	3	6	5	4	9	7	8	2	10	0.022

E9	2	3	6	5	4	7	8	9	1	10	0.092
E10	1	3	6	5	4	9	7	8	2	10	0.022
E14	1	3	6	5	4	9	8	7	2	10	0.12
E15	1	4	6	5	3	9	7	8	2	10	0.041
E23	1	2	6	5	4	9	8	7	3	10	0.07
E29	2	3	6	5	4	7	8	9	1	10	0.092

Table 2.5. Criteria of additional requirements applicable to buildings as rated by 10 experts

Expert No.	$\mathbf{m_{1k}}$	$\mathbf{m_{2k}}$	$\mathbf{m_{3k}}$	$\mathbf{m_{4k}}$	$\mathbf{m_{5k}}$	$\mathbf{m_{6k}}$	$\mathbf{m_{7k}}$	$\mathbf{m_{8k}}$	$\mathbf{m_{9k}}$	$\mathbf{m_{10k}}$	**S**
E1	1	3	6	5	4	9	7	8	2	10	0.022
E6	1	10	4	2	5	6	3	8	7	9	0.058
E3	3	5	10	2	8	9	7	4	1	6	0.085
E7	1	3	4	2	6	8	5	7	9	10	0.096
E8	1	4	3	2	6	7	8	5	9	10	0.068
E18	1	3	4	2	5	6	7	8	9	10	0.091
E32	1	4	3	2	5	6	7	8	9	10	0.104
E5	1	4	3	2	5	7	6	8	9	10	0.124
E16	1	8	3	2	6	5	7	4	9	10	0.092
E17	1	3	4	2	7	8	5	6	9	10	0.101

The consistency of all the three expert teams was sufficient with the relevance score of 0.01.

The final stage of determining the criteria relevancies was the computation of the values of the criteria relevancies of the said expert teams and deriving their mean values, which provided the values of the criteria relevancies of each individual team (Tables 2.6 – 2.8).

Table 2.6. Criteria relevancy of normative requirements applicable to buildings

No.	$\mathbf{m_{1n}}$	$\mathbf{m_{2n}}$	$\mathbf{m_{3n}}$	$\mathbf{m_{4n}}$	$\mathbf{m_{5n}}$	$\mathbf{m_{6n}}$	$\mathbf{m_{7n}}$	$\mathbf{m_{8n}}$	$\mathbf{m_{9n}}$	$\mathbf{m_{10n}}$
E1	0.334	0.122	0.113	0.157	0.062	0.056	0.065	0.06	0.018	0.013
E2	0.296	0.143	0.132	0.134	0.067	0.059	0.07	0.062	0.019	0.016
E3	0.302	0.138	0.116	0.165	0.06	0.059	0.067	0.061	0.017	0.015
E4	0.337	0.129	0.085	0.163	0.08	0.059	0.06	0.055	0.017	0.015
E6	0.254	0.043	0.1	0.107	0.098	0.092	0.1	0.073	0.079	0.053
E7	0.34	0.127	0.103	0.16	0.061	0.055	0.062	0.06	0.02	0.013
E8	0.305	0.102	0.119	0.129	0.068	0.068	0.068	0.099	0.029	0.014
E16	0.248	0.061	0.134	0.148	0.08	0.104	0.073	0.113	0.021	0.019
E17	0.333	0.133	0.116	0.163	0.053	0.05	0.062	0.059	0.019	0.013
E18	0.314	0.131	0.118	0.136	0.069	0.067	0.065	0.062	0.021	0.017
E32	0.339	0.116	0.121	0.162	0.071	0.055	0.054	0.052	0.016	0.014
q_j^n	**0.309**	**0.113**	**0.114**	**0.148**	**0.070**	**0.066**	**0.068**	**0.069**	**0.025**	**0.018**

Table 2.7. Criteria relevancy of requirements applicable to buildings by municipalities

No.	m_{1s}	m_{2s}	m_{3s}	m_{4s}	m_{5s}	m_{6s}	m_{7s}	m_{8s}	m_{9s}	m_{10s}
E1	0.235	0.172	0.073	0.127	0.127	0.023	0.033	0.04	0.155	0.016
E2	0.235	0.172	0.073	0.127	0.127	0.023	0.033	0.04	0.155	0.016
E3	0.245	0.164	0.074	0.118	0.138	0.026	0.034	0.043	0.141	0.017
E5	0.222	0.179	0.078	0.125	0.124	0.024	0.029	0.041	0.159	0.021
E7	0.241	0.135	0.069	0.097	0.096	0.025	0.032	0.036	0.251	0.018
E9	0.197	0.108	0.086	0.089	0.1	0.045	0.033	0.033	0.29	0.018
E10	0.278	0.137	0.033	0.109	0.115	0.029	0.033	0.032	0.207	0.028
E14	0.24	0.162	0.069	0.092	0.094	0.033	0.037	0.038	0.223	0.012
E15	0.277	0.105	0.033	0.102	0.12	0.029	0.033	0.031	0.243	0.027
E23	0.235	0.172	0.073	0.127	0.127	0.023	0.033	0.04	0.155	0.016
E27	0.215	0.103	0.084	0.085	0.1	0.045	0.033	0.033	0.285	0.018
E29	0.197	0.108	0.086	0.089	0.1	0.045	0.033	0.033	0.29	0.018
E34	0.278	0.137	0.033	0.109	0.115	0.029	0.033	0.032	0.207	0.028
q_j^s	**0.238**	**0.143**	**0.066**	**0.107**	**0.114**	**0.031**	**0.033**	**0.036**	**0.212**	**0.019**

Table 2.8. Criteria relevancy of additional requirements applicable to buildings

No.	m_{1k}	m_{2k}	m_{3k}	m_{4k}	m_{5k}	m_{6k}	m_{7k}	m_{8k}	m_{9k}	m_{10k}
E1	0.278	0.137	0.033	0.109	0.115	0.029	0.033	0.032	0.207	0.028
E3	0.107	0.099	0.028	0.13	0.035	0.033	0.036	0.106	0.365	0.062
E5	0.294	0.118	0.134	0.176	0.08	0.058	0.058	0.048	0.019	0.015
E6	0.254	0.043	0.1	0.107	0.098	0.092	0.1	0.073	0.079	0.053
E7	0.34	0.127	0.103	0.16	0.061	0.055	0.062	0.06	0.02	0.013
E8	0.305	0.102	0.119	0.129	0.068	0.068	0.068	0.099	0.029	0.014
E16	0.248	0.061	0.134	0.148	0.08	0.104	0.073	0.113	0.021	0.019
E17	0.333	0.133	0.116	0.163	0.053	0.05	0.062	0.059	0.019	0.013
E18	0.314	0.131	0.118	0.136	0.069	0.067	0.065	0.062	0.021	0.017
E32	0.339	0.116	0.121	0.162	0.071	0.055	0.054	0.052	0.016	0.014
q_j^k	**0.281**	**0.107**	**0.101**	**0.142**	**0.073**	**0.061**	**0.061**	**0.070**	**0.080**	**0.024**

The research revealed 30 key criteria. Tables 2.6, 2.7 and 2.8 present the calculated relevancies of the criteria comprising the system of municipal facilities assessment criteria. This system is employed with the objective of carrying out the technical assessment of the buildings while multi-criteria methods are used to perform the modeling of real estate alternatives. It should be noted that the modeling of alternatives can also be carried out by assessing all the 30 criteria at a single time. The consistency within each team separately can also be evaluated for the purpose of carrying out a more detailed analysis. The developed model can be easily adapted to suit buildings of any type, or, in our case, to be applicable to municipal social housing which has been chosen due to the reason that its management seems to raise the majority of problems for municipalities.

4) Technical assessment and rating of buildings in accordance with the requirements of regulations, municipal functions and other facility use requirements. These stages are presented in greater detail in the next chapter of the dissertation abstract.

3. Application of the Developed Model for the Management of the Social Housing of Kaunas City Municipality

This section provides exemplary application of the municipal facilities management model developed by the author for the management of social housing of Kaunas City Municipality. The use of the model would ensure the selection of an effective municipal social housing management strategy in consideration of the goal of social housing and the priorities and aim(s) of the interested parties; the model would also help to prevent incompetent decisions in the field.

The application of the model includes collection and systematization of the data on the alternatives to be assessed, technical assessment of the facilities on the basis of the selected criteria, and preparation of the alternative technical assessment data set for multipurpose calculations. Evaluation of the alternatives by using the multipurpose methods and the use of the technical assessment data allows building the decision and normalized matrixes, identifying the values of the SAW (*Simple Additive Weighting*) [17, 18] and MEW (*Multiplicative Exponential Weighting*) [19] criteria, rating the alternatives on the basis of three groups of the criteria, and forming the priority queues with the help of the SAW and MEW methods per each group of the criteria individually and for all the three groups taken together. The modeling of the facilities management decisions starts as soon as the priority queues have been derived.

3.1. Technical Assessment of the Facilities Following the System of Facilities Assessment Criteria Developed by the Author

The technical assessment of social housing of Kaunas City Municipality is carried out in the following stages:

1) Collection and systematization of data on the alternatives to be assessed;

2) Technical assessment of the alternatives on the basis of the criteria for residential buildings selected by the experts;

3) Preparation of the alternative technical assessment data set for the multipurpose calculations.

A total of 20 facilities of social housing of Kaunas City Municipality were randomly selected for the assessment. Information on the facilities was collected from the following sources: Kaunas City Municipality, the Center of Registers, Environmental Protection Agency, “Kauno Energija” JSC, Information Technologies and Communications Department, an independent RE assessor, as

well as the facilities inspection and condition evaluation data collected by the experts.

The technical assessment of the buildings was performed by the group of experts appointed by the municipality: certified facility expertise specialists, technical maintenance managers, and engineers obliged to do the independent assessment of the particular facilities on the basis of the criteria for residential facilities selected by the experts following the requirements of the Technical Regulation on Construction [20] and other legal acts, previous experience and the required standard expertise methods.

Before initiating the work, the municipality should deliver the existing documents of the facilities to the group of experts and grant them access to the facilities for carrying out the inspection.

The group of experts appointed by the municipality should perform the technical assessment of the facilities thus identifying the purpose and the criteria of the assessment, analyzing the provided documents, inspecting the construction and equipment of each facility and making (as well as delivering) the technical assessment report based on the signs of physical wear of the facilities or parts of the facilities.

The report should include detailed information on each of the following parts of the assessed facility: general information on the facility, the general constructional part, the electrotechnical part, the weak current part, the water supply and sewerage, heating, cooling and air conditioning systems, and the economic part. Conclusions of the report should include generalized assessment of the current condition of the facilities. Photographed images, observed defects, recommendations on the ways to eliminate the noticed defects, etc., can be supplied additionally.

The group of experts should not do the verifying calculations on the construction, equipment and other elements of the facilities. In the case a defect is noticed during the inspection, the experts should give their recommendations on the need for additional expertise to the municipality.

The third stage of the technical assessment should be the identification of the alternative criteria values and the preparation of the system of the criteria for the multipurpose calculations.

The technical assessment data based on the system of the building assessment criteria should be obtained from the sources described above. All the assessment data should be used for the multipurpose calculations.

3.2. Multipurpose Assessment of the Alternatives

The main goal of the developed model is the formation of the priority queue of the alternative facilities of social housing. In order to achieve the goal, multipurpose assessment of the alternatives should be carried out:

1) Matrixes of decisions of the technical assessment data should be made;

2) Normalization of the matrixes, maximization/minimization of the criteria, and identification of the criterion weight should be performed;
3) The SAW and MEW criteria values of the calculated alternatives should be identified;
4) The available alternatives should be rated;
5) Priority queues of the alternatives following the SAW and MEW methods should be made.

The rows of the decision matrix shall signify the analyzed alternatives: Ai, *i*=1,2,.., 20. The columns of the decision matrix shall signify the criteria values of the particular method on the basis of requirements for the facilities provided by the regulations and municipalities, and in accordance to the additional requirements for the facilities. The accrued data is presented in Table 3.1:

Table 3.1 Values of the SAW and MEW criteria falling into the three groups of the requirements (developed by the author)

	Values of the SAW criterion			**Values of the MEW criterion**		
Alt. No.	**Regulations**	**Municipality**	**Additional**	**Regulations**	**Municipality**	**Additional**
A_1	0.649	0.689	0.516	0.490594	0.552998	0.366949
A_2	0.649	0.719	0.454	0.489823	0.619332	0.295839
A_3	0.573	0.658	0.477	0.404379	0.518369	0.336536
A_4	0.692	0.718	0.475	0.558514	0.617695	0.344417
A_5	0.629	0.716	0.43	0.472872	0.638509	0.329958
A_6	0.739	0.739	0.586	0.597251	0.588003	0.463183
A_7	0.547	0.638	0.393	0.397361	0.526885	0.332966
A_8	0.294	0.61	0.425	0.194488	0.526329	0.301445
A_9	0.69	0.705	0.606	0.581844	0.620143	0.480279
A_{10}	0.69	0.716	0.592	0.581844	0.627917	0.472313
A_{11}	0.69	0.705	0.592	0.581844	0.619571	0.472313
A_{12}	0.684	0.698	0.593	0.555826	0.606211	0.464706
A_{13}	0.818	0.77	0.609	0.660392	0.656886	0.47778
A_{14}	0.483	0.617	0.4	0.312694	0.51817	0.236218
A_{15}	0.362	0.485	0.501	0.220018	0.393255	0.3347
A_{16}	0.511	0.624	0.397	0.334937	0.508278	0.243775
A_{17}	0.519	0.656	0.373	0.328269	0.581894	0.243971
A_{18}	0.965	0.897	0.828	0.961454	0.724058	0.786261
A_{19}	0.959	0.897	0.81	0.954788	0.724058	0.768774
A_{20}	0.956	0.873	0.875	0.952336	0.702045	0.827592
Min/max	max	max	max	max	max	max
Weight	1/3	1/3	1/3	1/3	1/3	1/3

Whereas the most rational alternative is the one that optimally satisfies the requirements of all the types, it should also be indicated that the criteria are maximized. In this particular case, it should be emphasized that the requirements of all the three groups are of equal importance, and, therefore, equal criteria weight (that is 1/3) should be chosen for both of the methods.

Then, calculations of the SAW and MEW methods are carried out in order to identify the criteria. For example, in the case of the SAW method, the relevancy of each requirement of the regulations (0.649), municipality requirements (0.689) and other requirements (0.516) applicable to Table 3.1 alternative A_1 should be multiplied by the weight of 1/3, and the multiplication results should be summed up in order to calculate the SAW generalized assessment criterion which should subsequently be entered in Table 3.2. The obtained value is 0.6768. The relevancy of all other criteria should be calculated the same way, and then the generalized queue of the priority alternatives should be made.

The results of the calculations following the SAW and MEW methods show the 20th alternative to be the most advantageous and the most rational in comparison to all the other options.

The results of the calculations of generalized assessments are given in Table 3.2 below.

Table 3.2 Results of the generalized assessment using the SAW and MEW methods and ratings of the alternatives (developed by the author)

Alternative No.	SAW	MEW	SAW rating	MEW rating
A_1	0.6768	0.46347	11	12
A_2	0.6643	0.44772	12	13
A_3	0.6242	0.41319	14	14
A_4	0.6868	0.49162	10	10
A_5	0.6472	0.46358	13	11
A_6	0.7531	0.54588	5	8
A_7	0.5757	0.41156	15	15
A_8	0.4901	0.31366	20	19
A_9	0.7312	0.55752	6	5
A_{10}	0.7299	0.55673	7	6
A_{11}	0.7259	0.55425	8	7
A_{12}	0.7216	0.53899	9	9
A_{13}	0.8007	0.59180	4	4
A_{14}	0.5485	0.33700	18	18
A_{15}	0.4961	0.30709	19	20
A_{16}	0.5596	0.34622	17	17
A_{17}	0.5651	0.35986	16	16
A_{18}	0.9821	0.81801	2	2
A_{19}	0.9732	0.81001	3	3
A_{20}	0.988	0.82096	1	1

3.3. Modeling the Decision-Making Process

The municipal social housing falls into three groups on the basis of the criteria (Table 3.3):

- The municipal social housing in use that satisfies the municipal requirements of all the three groups and the investment in the improvement of the housing is relatively low;
- The municipal social housing obtained newly on demand and satisfying the applicable requirements;
- The unused municipal social housing, i.e., the part of the least requirement-satisfying social housing, the investment in such renewal which is worthless in those cases when the amortization value of the housing is higher than the reconstructive value and the condition is poor or the edifice is essentially broken down.

Table 3.3 Classification of the municipal social housing (developed by the author)

Municipal housing in use	**Newly obtained municipal housing**	**Unused municipal housing**
Exploitation and maintenance	Construction	Sale
Renewal	Purchase	Rent
Repair	Reconstruction	Transfer for use
Support	Taken over from governmental institutions	Privatization
	Gifted	Relinquishing
	Acquired according to contracts	Change of purpose/function
	Rent	Sale

According to the research and municipal management practice data, 25 percent of the facilities at the end of the priority queue are considered as being of the worst condition. In this particular case, these are the 5 facilities of municipal social housing dissatisfying the requirement to the highest extent, which are alternatives No. 8, 14, 15, 16 and 17. The requirements they are incompliant with have been verified, detailed evaluation of the compliance of the alternatives to each group of the criteria has been performed, and the calculation and assessment of economic indices of the social housing has been carried out.

The worst alternatives should be marked (Tables 3.4, 3.5 and 3.6), i.e., the criteria under which the assessed facility falls into the category of poor or broken-down condition and when the damage and/or massive or bulk defects affect the safety and durability of the constructions, the particular relevant elements should be selected and singled out. The housing incompliant to the essential structural requirements falls into the group of unused municipal housings; in this case, the required investment is too high, and the municipalities should sell, rent, privatize or relinquish such housing. In this particular case, the examples of the above are alternatives No. 8 and 15. The condition of the housing is, accordingly, broken down and poor, and the facilities are unfit for living and dangerous for the potential inhabitants, the heating costs are the

highest compared to the other alternatives, and the heating equipment in the case of the alternative 8 is not safe.

The assessment on the basis of the municipal requirements shows that alternative 8 is irrational compared to the other alternatives, since the overall condition of the facility is poor: there is no kitchen, no WC and no bathroom, it is not suitable for a family with small children and the disabled, its accessibility is poor due to the undeveloped infrastructure, and the housing is located far from the city public transport stops, malls, education and healthcare institutions. Alternative 15 is uncomfortable to live in. The amount of energy required for the maintenance and other needs should also be assessed in comparison to the other available social housings; it should be established whether the facility features all the conveniences and is suitable for the disabled and the families with small children, etc., or some elements are lacking.

According to the criteria scales set by the municipality, the municipal housing would fall into one of the groups emphasized by the author. Considering the importance of the criteria, the priorities and the required investment should be identified, and a decision should be made whether to continue using and to improve the facility or to replace it with a new one, or simply to relinquish it. For example, in those cases when the numeric expression of satisfaction of the essential structural requirements ranges from 61% to 100% (e.g., alternatives 8 and 15), the condition of such a facility should be treated as broken-down or very poor. The municipality should relinquish such facilities, and they would fall into the group of unused municipal housings. A decision should be taken what to do with such property in the future, e.g., the value of the lot of alternative 15 falling into the group of unused municipal housings is high since it is located in a prestigious district (Žaliakalnis), potentially by selling such housing, the possibility to obtain housing in a residential district which would satisfy the requirements would become possible, etc.

Table 3.4 Checking criteria satisfaction of the alternatives on the basis of the normative requirements for buildings (developed by the author)

	Criteria									
	$\mathbf{m_{1n}}$	$\mathbf{m_{2n}}$	$\mathbf{m_{3n}}$	$\mathbf{m_{4n}}$	$\mathbf{m_{5n}}$	$\mathbf{m_{6n}}$	$\mathbf{m_{7n}}$	$\mathbf{m_{8n}}$	$\mathbf{m_{9n}}$	$\mathbf{m_{10n}}$
	max	**min**	**min**	**max**	**min**	**min**	**min**	**max**	**max**	**min**
q_j	0.309	0.113	0.114	0.148	0.07	0.066	0.068	0.069	0.025	0.018
$\mathbf{A_8}$	33	18.32	90	65	75	100	51	3	2	1
$\mathbf{A_{14}}$	63	16.68	60	125	61	40	40	4	3	1
$\mathbf{A_{15}}$	28	18.98	85	125	65	61	41	3	4	1
$\mathbf{A_{16}}$	63	14.67	60	125	40	41	41	6	3	1
$\mathbf{A_{17}}$	69	15.97	75	125	40	55	35	6	2.5	1
OPT	**100**	**7.18**	**5**	**125**	**10**	**2**	**1**	**9**	**4.5**	**1**

Table 3.5 Checking criteria satisfaction of the alternatives on the basis of the municipal requirements for buildings (developed by the author)

	Criteria									
	m_{1s}	m_{2s}	m_{3s}	m_{4s}	m_{5s}	m_{6s}	m_{7s}	m_{8s}	m_{9s}	m_{10s}
	max	**min**	**min**	**min**	**min**	**min**	**min**	**min**	**min**	**max**
q_j	0.238	0.143	0.066	0.107	0.114	0.031	0.033	0.036	0.212	0.019
A_8	33	0.71	3	52	7	1	3	1	1	1
A_{14}	63	0.76	1	381	7	1	4	1	1	0.6
A_{15}	28	0.65	3	460	7	1	3	2	1	0.7
A_{16}	63	0.67	1	590	7	1	3	1	1	0.6
A_{17}	69	0.73	1	187	7	1	3	1	1	0.7
OPT	**100**	**0.25**	**1**	**52**	**2**	**1**	**2**	**1**	**1**	**1**

Table 3.6 Checking criteria satisfaction of the alternatives on the basis of the additional requirements for buildings (developed by the author)

	Criteria									
	m_{1k}	m_{2k}	m_{3k}	m_{4k}	m_{5k}	m_{6k}	m_{7k}	m_{8k}	m_{9k}	m_{10k}
	min	**max**	**min**	**max**	**max**	**min**	**min**	**min**	**min**	**min**
q_j	0.281	0.107	0.101	0.142	0.073	0.061	0.061	0.07	0.08	0.024
A_8	39	3	5	6	1	21	80	2	75	3
A_{14}	180	6	5	10	0.6	35	50	1	47	4
A_{15}	65	2	2	10	0.7	5	80	1	56	4
A_{16}	229	5	4	9	0.6	10	35	1	40	4
A_{17}	168	6	3	9	0.7	45	35	2	43	4
OPT	**20**	**10**	**1**	**10**	**1**	**5**	**1**	**1**	**4**	**2**

After completing the assessment of the municipal social housing on the basis of the selected criteria of the three groups, the following economic indices of the structures at the end of the priority queue should be calculated: the construction value of the facility, the apartment reconstruction cost (construction) value, the amortization value, and the reconstruction value (Table 3.7).

Table 3.7 Economic indices of the alternatives (developed by the author on the basis of *Sistela* estimation prices for the construction of the structures as of December 2016 and October 2017) [21, 22]

Alt. No	Facility volume, m^3 / Apartment volume, m^3	Share of apartment volume with respect to facility volume	Reconstruction price per 1 m^3 / Apartment reconstruction price	Construction value of the facility	Amortization (%)	Apartment reconstruction cost (construction) value, EUR	Amortization value, EUR	Apartment reconstruction value, EUR
8	395.28 / 182.31	0.46	233.99 / 42658.72	76012.3	67	34965.68	**23427.01**	11538.67
14	4456 / 74.96	0.02	155.84 / 11681.77	14878.14	37	14878.137	5504.91	9373.23
15	656.06 / 158.61	0.242	205.74 / 32632.42	120261.9	72	29103.40	**20954.45**	8148.95
16	7725 / 167.22	0.022	144.20 / 24113.12	1289534	37	28369.75	10496.81	17872.95
17	2472 / 29,45	0.06	176.36 / 22829,80	453142.3	31	27188.54	8428.45	18760.09

The table above shows that the amortization values of alternatives No. 8 and 15 (EUR 23,427.01 and EUR 20,954.45, respectively) are more than two times higher than the apartment reconstruction values (EUR 11,538.67 and EUR 8,148.95, respectively), and that these are only one third lower than the housing reconstruction cost values (EUR 34,965.68 and EUR 29,103.40, respectively). This confirms the irrationality of the investment in reconstruction of such housing by the municipality. The amortization values of the remaining alternatives are relatively low, and large investment is not required in order to make the housing satisfy the requirements of the three groups. If no possibility exists to invest the full required amount in the reconstruction of the housings, the municipality should prioritize the alternatives of the highest importance. For example, the position of alternatives No. 14, 16 and 17 in the priority queue would change after adding a thermal insulation layer to the exterior walls of the facilities since such insulation would reduce the amount of energy required for heating the facility.

In the process of decision-making, constant analysis of the asset exploitation, upkeep and maintenance costs should be carried out. In the case of newly obtained social housing, the assessment of exploitation and reconstruction costs of the newly constructed real estate obtained on the basis of a transaction, gifted or taken over from the state should be conducted. The remaining unused real estate should be sold, rented, transferred or privatized, or its application should be changed in order to adjust it to other activities. Important aspects of the process include the satisfaction of social expectations, adherence to the legal requirements and an acceptable price of the utilities to be paid by the consumers.

In order to achieve the optimal real estate management results, the process of property management should be well-controlled. The allocation of the budget, the search for the sources of finance, the implementation of the decisions that have been made, the constant technical assessment of the alternatives, and the repeated drafting of the priority queue should be carried out. The alternatives are expected to satisfy the applicable requirements after the implementation of the decisions.

General Conclusions

1. The review of the relevant scholarly literature and regulatory documentation revealed that efficient management of municipal facilities mainly required complete information on the property to be available and demanded public presentation of the correlation of the facilities with the functions entrusted to the municipalities as well as the reliance on the modern decision-making approach when it comes to the analysis of facility management alternatives.
2. The municipal facilities management model included a system of criteria applicable to municipal buildings, the assessment of the relevancy of the compliance of buildings to the set requirements, a rating of buildings based

on their compliance with the requirements in place and the assessment of alternatives of decision-making when it comes to property management. The developed municipality facilities management model could be applied in real estate management in any sector after adapting the criteria system to suit the purpose of the analyzed buildings and the applicable requirements.

3. After the analysis of the requirements of municipal buildings (a total of 106 requirements), the pairwise comparison method was used in order to select and rank 10 requirements of each group (compliance with the regulatory documentation, requirements pertaining to municipal functions and additional requirements) that held the highest impact on the compliance of the facilities with their functions. Finally, a system of these criteria was compiled.
4. The criteria of the relevancy of the compliance of each facility of the social housing of Kaunas City Municipality to the requirements of each group were calculated by using the obtained expert pairwise comparison data. The satisfaction of the main building requirements and low heating costs were the key criteria of the compliance of municipal facilities to the normative requirements, while the access to the building and the number of the available car parking lots had the lowest influence on the decision-making process. The good condition of the building was the most important criterion when complying with municipal functions. The analysis of the compliance with the additional requirements revealed that safety was the top relevant factor.
5. Following the technical assessment and calculations based on the proposed model for social housing buildings (a total of 20 facilities) of Kaunas City Municipality, the priority queue was formed according to the compliance with the criteria of each group. It was found that the poor condition of 25% of the worst buildings was impacted by the failure to meet the essential requirements, the large amounts of energy required for heating, the poor condition of the engineering systems and heating devices, and the high number of crimes recorded in the area.
6. The economic ratios (i.e., the construction, reconstruction and depreciation values) of the buildings complying with the lowest number of criteria were calculated. The priorities of the investments needed for the reconstruction of the buildings were determined, and recommendations on their use were presented. The buildings with the percentage value of compliance with the essential building requirements ranging from 61% to 100% were allocated to the unusable municipal property because their reconstruction would be prohibitively costly for the municipality. The newly acquired facilities of social housing must satisfy the requirements of all the three groups.

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1. **KLUMBYTĖ, E.**, APANAVIČIENĖ, R. (2014). Real Estate Strategic Management Model for Lithuanian Municipalities // *International Journal of Strategic Property Management*. Vilnius: Technika; London: Taylor & Francis. ISSN 1648-715X. 2014, vol. 18, No. 3, pp. 279–291. [Science Citation Index Expanded (Web of Science); Business Source Complete; Inspec]. [IF: 1.192; AIF: 1.748; IF/AIF: 0,682; Q3; 2014 Journal Citation Reports® Social Science Edition (Thomson Reuters, 2017)]. [Contribution: 0.500]

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Reziumė

Disertaciją sudaro 3 skyriai, baigiamosios išvados, cituojamos literatūros bei disertantės mokslinių darbų sąrašas ir trys priedai. Bendra disertacijos apimtis 108 puslapiai, kuriuose yra 18 paveikslų, 43 lentelės ir 23 formulės. Rengiant disertaciją buvo panaudoti 137 literatūros šaltiniai.

Darbo tikslas – sukurti metodiką savivaldybių gyvenamųjų pastatų ūkiui valdyti.

Pirmajame skyriuje pateikiama mokslinės literatūros, straipsnių, teisinių ir kitų šaltinių apžvalga, kuriame išanalizuotas Lietuvos ir užsienio savivaldybių nekilnojamojo turto tyrimų aktualumas ir problematika, valdymo metodai ir sistemos.

Antrajame skyriuje pateiktas sukurtas savivaldybių nekilnojamojo turto valdymo modelis, kuris apima pastatams keliamų pastatams reikalavimų sistemą, pastatų atitikties numatytiems reikalavimams įvertinimą, pastatų reitingavimą pagal atitiktį nustatytiems reikalavimams ir sprendimų priėmimo dėl turto valdymo alternatyvų vertinimą. Sudaryta savivaldybių gyvenamiesiems pastatams vertinimo kriterijų sistema pagal statybos norminių dokumentų, savivaldybės priskirtų funkcijų ir viešojo administravimo reikalavimus bei nustatyti pastatų atitikties šiems reikalavimams reikšmingumai ir matavimo vienetai. Ekspertinio vertinimo metodu nustatyta, kad savivaldybės būsto atitikimo norminiams reikalavimams reikšmingiausias kriterijus – esminių statinio reikalavimų tenkinimas ir mažos išlaidos šildymui, o mažiausią įtaką sprendimų priėmimui turi automobilių stovėjimo vietų skaičius.

Trečiajame skyriuje sukurtas savivaldybių pastatų ūkio vertinimo modelis praktiškai pritaikytas Kauno miesto savivaldybės socialinio būsto pastatams įvertinti. Modelio tinkamumą prioritetinei alternatyvų eilei formuoti pagrindžia gauti objektyvūs pastatų įvertinimo kokybiniai rodikliai, jų apdorojimas taikant pripažintus analizės metodus, ekonominiai skaičiavimai, gautų vertinimo rezultatų tinkamumas naudoti priimant pastatų tinkamumo konkrečioms funkcijoms vykdyti sprendimus. Pagrindinės vertintų pastatų mažos atitikties reikalavimams priežastys: esminių statinio reikalavimų pastatams netenkinimas, didelės išlaidos šildymui, bloga techninė pastato ir inžinerinių sistemų būklė, neišvystyta rajono infrastruktūra. Skaičiavimo rezultatai rodo, kad taikant SAW ir MEW metodus, 5 geriausios ir 5 prasčiausios alternatyvos sutampa, todėl galime teigti, kad parinkti daugiatikslio vertinimo metodai yra patikimi.

Sprendžiami uždaviniai

1.Išanalizuoti savivaldybių pastatų ūkio valdymo Lietuvoje ir pasaulyje mokslinių tyrimų rezultatus ir praktinę patirtį.

2. Sukurti savivaldybių pastatų ūkio valdymo modelį ir parengti šių pastatų vertinimo metodiką.

3. Sudaryti savivaldybių gyvenamųjų pastatų kriterijų sistemą pagal norminių dokumentų, savivaldybėms priskirtų funkcijų ir viešojo administravimo reikalavimus ir nustatyti kriterijų reikšmingumus.

4. Remiantis sudaryta vertinimo kriterijų sistema atlikti 20 Kauno miesto socialinio būsto pastatų techninį vertinimą.

5. Daugiatiksliais SAW ir MEW metodais sudaryti pastatų atitikimo reikalavimams prioritetinę eilę ir pateikti mažiausiai kriterijų sistemą atitinkančių socialinių būstų tolesnio eksploatavimo – valdymo rekomendacijas, pagrindžiant siūlymus ekonominiais pastatų rodiklių skaičiavimais.

Mokslinis darbo naujumas

1. Sukurta savivaldybės gyvenamųjų pastatų atitikties nustatytoms funkcijoms vykdyti vertinimo kriterijų sistema.

2. Sudaryta šių pastatų techninių ir funkcinių kriterijų stebėsenos ir vertinimo metodika.

3. Parengtas savivaldybės gyvenamųjų pastatų klasifikavimo, duomenų apie šiuos pastatus kaupimo, vertinimo ir sprendimų priėmimo dėl šio turto naudojimo modelis.

Tyrimo metodai

Savivaldybių nekilnojamojo turto valdymo analizė atlikta remiantis Lietuvos ir užsienio mokslininkų publikacijomis, Lietuvos savivaldybių veiklą reglamentuojančiais teisės aktais, pastatų statybą ir eksploataciją reglamentuojančiais norminiais dokumentais.

Savivaldybės gyvenamųjų pastatų tinkamumo savivaldybėms priskirtoms funkcijoms vykdyti kriterijų reikšmingumai nustatyti taikant ekspertinio vertinimo metodus.

Pavyzdinis savivaldybės gyvenamųjų pastatų ūkio įvertinimas atliktas taikant daugiatikslius vertinimo metodus.

BENDROSIOS IŠVADOS

1. Mokslinės ir norminės literatūros analizės metu nustatyta, kad pagrindinės efektyvaus savivaldybių pastatų ūkio valdymo sąlygos yra išsamus informacijos apie turimus pastatus sukaupimas, viešas pastatų sąsajų su savivaldybėms priskirtų funkcijų vykdymu deklaravimas ir šiuolaikinių sprendimų priėmimo metodų taikymas pastatų ūkio valdymo alternatyvoms analizuoti.
2. Sukurtas savivaldybių pastatų ūkio valdymo modelis apima savivaldybių pastatams keliamų kriterijų sistemą, pastatų atitikties nustatytiems reikalavimams reikšmingumo įvertinimą, pastatų reitingavimą pagal atitiktį nustatytiems kriterijams ir sprendimų priėmimo dėl turto valdymo alternatyvų vertinimą. Sukurtas savivaldybių pastatų ūkio valdymo modelis

gali būti pritaikytas bet kurio sektoriaus nekilnojamajam turtui valdyti, adaptavus kriterijų sistemą pagal vertinamų pastatų paskirtį ir jiems keliamus reikalavimus.

3. Išanalizavus savivaldybių pastatams taikomus reikalavimus (viso – 106 reikalavimai), ekspertinio vertinimo metodu atrinkta ir suranguota po 10 kiekvienos grupės: statybos norminių dokumentų, savivaldybėms priskirtų funkcijų ir papildomų reikalavimų, labiausiai įtakojančių pastatų atitiktį jų paskirčiai, sudaryta šių kriterijų sistema.
4. Pagal ekspertinio porinio lyginimo duomenis apskaičiuoti Kauno miesto savivaldybės socialinio būsto pastatų atitikties kiekvienos grupės reikalavimams reikšmingumo kriterijai: savivaldybės būsto atitikties norminiams reikalavimams reikšmingiausias kriterijus – esminių statinio reikalavimų tenkinimas ir mažos išlaidos šildymui, o mažiausią įtaką sprendimų priėmimui turi privažiavimai prie pastato ir automobilių stovėjimo vietų skaičius. Atitikties savivaldybės priskirtoms funkcijoms svarbiausias kriterijus – gera pastato būklė, o vertinant papildomus reikalavimus, didžiausias reikšmingumas priskiriamas saugumui.
5. Atlikus Kauno miesto savivaldybės socialinio būsto pastatų (viso – 20 pastatų) techninį vertinimą ir skaičiavimus taikant disertacijoje pateiktą metodiką, sudarytos prioritetinės pastatų eilės pagal atitiktį kiekvienos grupės kriterijams. Nustatyta, kad 25 proc. prasčiausių pastatų yra dėl prastų esminių statinio reikalavimų tenkinimo, didelio šildymui reikalingo energijos kiekio, blogos inžinerinių sistemų, pavojingos šildymo prietaisų būklės ir didelio nusikaltimų skaičiaus rajone.
6. Apskaičiuoti mažiausiai kriterijų sistemą atitinkančių pastatų ekonominiai rodikliai – statybinės, atkūrimo kaštų ir nusidėvėjimo vertės. Nustatyti reikalingų investicijų į pastatų atnaujinimą prioritetai ir pateiktos naudojimo rekomendacijos. Pastatai, kurių esminių statinio reikalavimų tenkinimo skaitinė reikšmė - nuo 61 iki 100 proc., patenka į nenaudotino savivaldybės būsto grupę, nes jų atnaujinti savivaldybei neapsimoka. Naujai įsigyjamas socialinis būstas privalo tenkinti visų trijų grupių reikalavimus.

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