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Research paper

Monitoring of Territories in the Management System of the Hotel Complex Construction

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Abstract

The aim of the work was to study the management system for the construction of a hotel complex, to develop a structural and logical model of a management system, to study the monitoring of territories, to assess the ecological state of territories for choosing a location for the construction of a hotel complex.
In the process of preparing the publication, a systematic approach and an integrated assessment of the territories characteristics were used. The study determined that the construction of hotels is formed under the influence of a significant number of different factors of the external and internal environment and is a complicated process.
It is necessary to take into account the tendencies of customer demand during the formation of the construction management system. At present, among the basic wishes, there is a need for recreation in ecologically clean areas.
Therefore, it is proposed to consider the management system for the construction of a hotel complex as an extended system, which consists of four main components. These are territories for the location of the complex, design organizations, contractors and investors.
In the developed structural-logical model of the management system for the construction of a hotel complex, special attention was paid to the choice of the territory for construction. It was suggested to make a choice on the basis of assessing the ecological state of the territories. The main characteristics of the assessment are the ecological stability of the territories, anthropogenic load, plowing of territories, agricultural development of territories and recreational capacity. In this paper, the assessment of the ecological status of the territories of the Poltava region districts was carried out and integrated indicators were determined. According to the results of the research, three groups of ecological stability of the territories were identified. The first two groups have a moderate and medium ecological stability of the territories. They are attractive for investment for the construction of a hotel and restaurant. Further research should be directed to the assessment of the quality of soils, which will enable to increase the efficiency of the use of territories in the construction of hotel complex.

Keywords: *building, hotel, management, monitoring, territories.*

1 Introduction

Construction is the most complicated organizational and technological process, which can involve enterprises of various industries.
The global construction industry market has a tendency to expand its segments. Particular attention is paid to the construction of hotel complexes.
Hospitality enterprises is one of the main components of the tourism industry infrastructure. They form and provide services that meet the physical, spiritual and moral needs of the population and, as a rule, enjoy increased consumer demand, regardless of the social status and monetary wealth of citizens.
A number of services of the hospitality industry enterprises, as well as the technological process of their production, carry an increased social responsibility to citizens. A particularly important factor is the territory, which is a socio-economic space in which hotel complexes operate.
In these conditions, the complexity of the construction organization lies in the diversity of organizational and economic methods of constructing production, a large number of participants who have different functional purposes and tasks, the dependence of the process of construction production on natural conditions.
Therefore, it is necessary to take into account peculiarities of hospitality services in the formation of a management system for the construction of hotel complex.
Particular attention should be given to the choice of territory for construction.
This requires an assessment of the ecological condition of the territories, which will provide an opportunity to ensure the effective functioning of the hotel complex for the provision of hospitality services.

2 Main Body

Modern construction is based on the formation of an effective management system. This system unites many components of the construction industry, which are in interaction and interdependence. In scientific research, the construction industry is considered as a dynamic component of the construction management system. The dynamism of the construction industry is expressed in its degree of freedom, which can potentially save a large number of options and new solutions. The components of the management system face various interaction problems, and thus contribute to the diversity of the development of the construction industry and the use of innovations in the development of projects [1].

An important factor in the success of construction projects is labor productivity in the construction industry [2, 3]. Motivational processes of construction projects are also important for their success [4, 5]. Analysis of the work features and qualification of project agents showed that the effectiveness of construction projects depends on their successful work [6]. Attention is also focused on the importance of motivational employment factors for disparate professional groups in the construction sector [7]. At the same time, construction managers should pay more attention to motivation of employees, which positively affects the projects success [8].

The modern construction of hotel complexes is aimed at ensuring high standards for hospitality facilities, which must be of high quality in terms of accommodation, decoration, and also satisfaction of clients' needs [9]. Recently there has been an increased demand for the construction of hotels with ecologically clean stylish rooms, which use local artistic features [10], as well as with enclosing constructions that take into account the territorial zoning of the winter temperature of the atmospheric air [11]. This requires the development of new approaches to the construction management system.

One of the important factors affecting the development of the management system for the construction of a hotel complex is the ecological one. This factor determines the degree of customer satisfaction with service, rest, a sense of comfort, an atmosphere of hospitality, safety and health benefits.

The construction management system for such a complex should take into account the trends in the demand for hospitality. One of the main trends is the ecological condition of the territories. Therefore, special attention in the formation of the management system for the construction of a hotel complex should be given to the choice of the construction site [12].

According to the research, it was determined that many factors influence the choice of hotels location [13, 14, 15, 16]. These include factors such as accessibility of communication, transport infrastructure, accessibility of recreational areas, tourist assets [17].

In the studies of several territories [13, 14], the degree of location factors dependence on the hotel characteristics was noted: its category, size, conformity of the provided hospitality services with the demand for these services.

The process of choosing a territory should also take into account the trend towards increasing customer demand for the sophistication of restaurant services. Therefore, it is necessary to consider the possibility of organic products growing. The purchase of such products can constitute a significant expense item for the hotel. It will be rational to grow most of the products on the territory of the hotel complex. Therefore, the choice of the territory for construction requires an assessment of the ecological condition of the territory.

Matthew Hansen and Thomas Loveland have reviewed the large-scale monitoring of the change of territories [18].

The research of J. Rawat and M. Kumar illustrates the processes of spatio-temporal dynamics of land use. [19].

In scientific works consider the directions improvement and development of landscape spacious [20].

Anne Vernez Moudon and Michael Hubner conducted a study on urban land-use. The authors studied the processes of urbanization and their negative impact on urban lands [21, p. 187].

Tobias Kruger, Gotthard Meinel Ulrich Schumacher argue that it is necessary to reduce the land area allocated for construction [22].

Land degradation is the greatest environmental problem due to the use of land resources and economic activity.

In the works of Kingwell R., John M. and Robertson M., attention was paid to the degradation of land [23, p. 51].

In studies of Alfred Awotwi, Geophrey Kwame Anornu, Jonathan Arthur Quaye-Ballard, an assessment of land degradation under the influence of anthropogenic factors was carried out. 24].

Studies of Francesco Nex, Luca Delucchi, Damiano Gianelle, Markus Neteler, Fabio Remondino and Michele Dalponte show that monitoring of territories is a valuable tool that is needed to determine their state of use [25].

Thus, management in construction is of a diverse nature and cannot be fully realized in a separately taken construction organization.

This necessitates the transition to the construction management system formation based on integration processes, which unites organizations that directly or indirectly affect the efficiency of construction. Due to the variety of construction objects, the formation of a construction management system requires consideration of the specifics of erection and functioning, as well as their competitiveness.

As a result of the analysis, the authors singled out the components and determined the interrelations between them in the construction management system of the hotel complex. The corresponding structural-logical model of the management system has been developed, Figure 1.

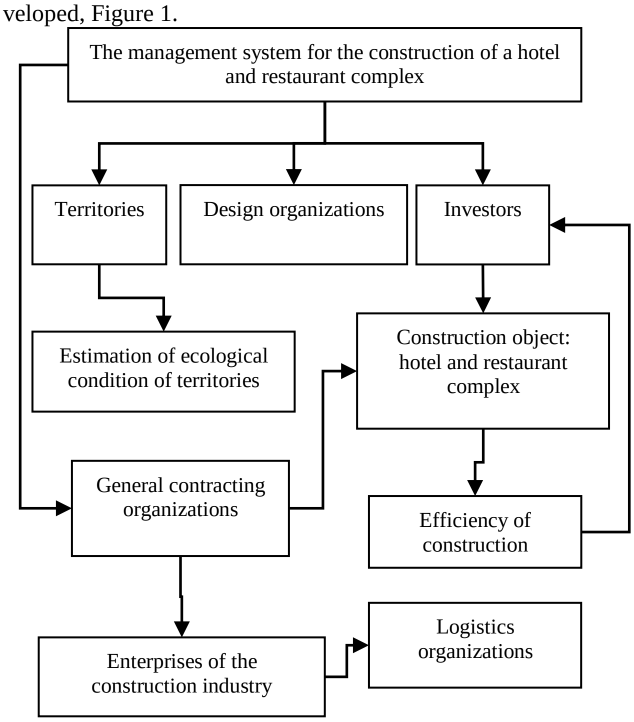

Fig. 1: Structural-logical model system for the construction of a hotel complex

The proposed model represents a management system, which consists of four main components. These are the territories monitoring for the location of the complex, the design organizations, contstruction and investors management. All components are in interaction and interdependence.

In the work the authors paid special attention to the study of the ecological condition of the territories, the assessment of which is necessary in the process of choosing a place for the construction of a hotel complex.

3. Assessment of the ecological status of territories

The main characteristics of the ecological state of the territory are such signs as ecological stability of territories, anthropogenic loading, territories plowing, agricultural development of territories and recreational capacity.

To assess the ecological status of the territories of the Poltava region, the following indicators were applied: the ecological stability of the territories, the coefficient of anthropogenic load, the coefficient of plowing of the territories, the coefficient of agricultural development of territories and recreational capacity.
The evaluation was carried out on the basis of the integral estimation method [26]. The basis of such a technique is the interaction and interdependence of characteristics, which makes it possible to provide maximum reliability of the assessment of the ecological state of the territories.
This technique takes into account the objective and subjective weight of each sign.
Objective significance is determined on the basis of the use of natural indicators that characterize the signs.
Subjective one is based on a pairwise comparison of signs for their significance. This approach provides an opportunity to comprehensively assess the ecological state of the territories.
At the first stage of the evaluation, the natural values of the indicators (coefficients) were calculated according to the corresponding formulas [27].
Coefficient of the territories ecological stability:

$$X_1 = \frac{\sum_{i=1}^{n} X_i \times S_i}{\sum_{i=1}^{n} S_i}. \quad (1)$$

Where, X_1 – coefficient of the territories ecological stability;
X_i – coefficient of the territories stability of the i-th type;
S_i – area of the territory of the i-th type, ha;
n – the sum of the areas of the i-th type, ha.

The values of the coefficients for assessing the ecological status of the territories are given in Table 1.
The coefficient of anthropogenic load characterizes the impact of human activities on the state of the environment, including land resources. The values of the coefficient are calculated by the formula:

$$X_2 = \frac{\sum_{n=1}^{n} B_i \times S_i}{\sum_{n=1}^{n} S_i}. \quad (2)$$

Where, X_2 – coefficient of anthropogenic load;
B_i – indicator of anthropogenic load of the i-th type of territories, points.

To calculate the coefficient of anthropogenic load, the indicator of anthropogenic loading of the i-th type of territories is used, Table 1.

Table 1: The values of the coefficients of stability of the territory and the points of the anthropogenic load

Title	Coefficient of stability, K_i	Indicator of anthropogenic load, B_i
Built-up area	0	5
Lands of industry	0	5
Arable land	0,14	4
Hayfields	0,62	3
Pastures	0,68	3
Inland waters	0,79	2
Forests	1,00	2

The coefficient of plowing of the territories is defined as the ratio of arable land (S_a) to total land area (S_l).

$$X_3 = \frac{S_a}{S_l}. \quad (3)$$

The coefficient of agricultural development (X_4) is the ratio of agricultural land area (S_c) to total land area (S_l).

$$X_4 = \frac{S_c}{S_l} \times 100\% . \quad (4)$$

Recreational capacity (X_5) - the ratio of areas of natural and biological reserves S_b to the total area of the territory:

$$X_5 = \frac{S_b}{\sum_{i=1}^{n} S_i}. \quad (5)$$

Natural and biological reservations include lands occupied by forests, hayfields, pastures, swamps and lands under water.
According to the results of the calculations, the table with the calculated values of the coefficients is formed, Table 2.

Table 2: Indicators for assessing signs by area*, $X_{i,j}$ **

Option	Administrative district, *Ri*	Indicators, G_j				
		X_1	X_2, *points*	X_3, %	X_4, %	X_5
1	Velyka Bahachka	0,37	3,35	67,0	81,1	0,28
2	Gadyach	0,41	3,25	62,4	75,5	0,33
3	Globino	0,44	3,06	80,0	90,0	**0,43**
4	Hrebinka	0,27	3,54	82,0	87,5	0,13
5	Dikanka	0,35	3,44	68,8	84,9	0,27
6	Zinkiv	0,36	3,40	67,9	81,2	0,28
7	Karlivka	0,28	3,54	78,8	88,8	0,16
8	Kobeliaky	0,43	3,14	65,1	80,1	0,37
9	Kozelshchina	0,32	3,47	72,1	89,1	0,22
10	Kotelva	**0,45**	3,18	**56,6**	**72,7**	0,39
11	Kremenchug	0,45	**3,05**	60,5	75,6	0,38
12	Lohvytsa	0,38	3,23	64,3	79,8	0,27
13	Lubny	0,38	3,26	64,4	79,8	0,28
14	Mashivka	0,26	3,61	82,4	91,5	0,14
15	Myrgorod	0,35	3,39	70,2	83,7	0,25
16	Novissanzhary	0,36	3,34	68,0	81,8	0,26
17	Orzhytsa	0,30	3,43	76,4	86,1	0,16
18	Pyriatin	0,37	3,22	67,0	77,9	0,23
19	Poltava	0,38	3,26	65,6	76,6	0,27
20	Reshetylivka	0,32	3,43	71,8	87,1	0,21
21	Semenivka	0,37	3,23	65,5	85,6	0,26
22	Chorol	0,32	3,37	73,7	85,4	0,17
23	Chornukhy	0,42	3,18	60,6	75,5	0,32
24	Chutiv	0,31	3,50	75,4	86,5	0,20
25	Shyshaki	0,39	3,31	64,4	78,2	0,32
		max	min	min	min	max

* Calculated by the authors according to the source [28].
** X_1 – coefficient of territories ecological stability; X_2 –coefficient of anthropogenic load; X_3 – coefficient of plowing of the territories; X_4 – coefficient of agricultural development, X_5 – recreational capacity.

At the second stage, the conversion of indicators into relative ones was performed, since the values of the characteristics have different units of measurement.
The results of calculations are given in the table of relative values of $\overline{X}_{ij}$ indicators, Table 3.
At the third stage, the internal significance of the characteristics was evaluated on the basis of the entropy determination method (level of ordering).

Table 3: Relative values of indicators, $\overline{X}_{ij}$

Option	Administrative district, *Ri*	$\overline{X}_1$	$\overline{X}_2$	$\overline{X}_3$	$\overline{X}_4$	$\overline{X}_5$
1	Velyka Bahachka	0,82	0,91	0,85	0,90	0,66
2	Gadyach	0,90	0,94	0,91	0,96	0,76
3	Globino	0,97	1,00	0,71	0,81	1,00
4	Hrebinka	0,59	0,86	0,69	0,83	0,31
5	Dikanka	0,77	0,89	0,82	0,86	0,64

6	Zinkiv	0,80	0,90	0,83	0,90	0,66
7	Karlivka	0,61	0,86	0,72	0,82	0,38
8	Kobeliaky	0,95	0,97	0,87	0,91	0,85
9	Kozelshchina	0,70	0,88	0,79	0,82	0,51
10	Kotelva	0,99	0,96	1,00	1,00	0,90
11	Kremenchug	1,00	1,00	0,94	0,96	0,89
12	Lohvytsa	0,84	0,94	0,88	0,91	0,63
13	Lubny	0,85	0,94	0,88	0,91	0,65
14	Mashivka	0,57	0,84	0,69	0,79	0,33
15	Myrgorod	0,77	0,90	0,81	0,87	0,57
16	Novissanzhary	0,80	0,91	0,83	0,89	0,60
17	Orzhytsa	0,67	0,89	0,74	0,84	0,36
18	Pyriatin	0,83	0,95	0,85	0,93	0,54
19	Poltava	0,85	0,94	0,86	0,95	0,63
20	Reshetylivka	0,72	0,89	0,79	0,83	0,50
21	Semenivka	0,83	0,95	0,86	0,85	0,61
22	Chorol	0,70	0,90	0,77	0,85	0,40
23	Chornukhy	0,94	0,96	0,93	0,96	0,74
24	Chutiv	0,68	0,87	0,75	0,84	0,47
25	Shyshaki	0,88	0,92	0,88	0,93	0,73
	Total	20,04	22,96	20,64	22,12	15,33

In accordance with this method, the total amount of each column in Table 3 was originally found. Then the resulted values of indicators were defined as the ratio of each characteristic to the total amount.

The results of calculations are shown in Table 4.

Table 4: The adduced values of indicators, (P_{ij})

Option	Administrative district, *Ri*	P_1	P_2	P_3	P_4	P_5
1	Velyka Bahachka	0,04	0,04	0,04	0,04	0,04
2	Gadyach	0,04	0,04	0,04	0,04	0,05
3	Globino	0,05	0,04	0,03	0,04	0,07
4	Hrebinka	0,03	0,04	0,03	0,04	0,02
5	Dikanka	0,04	0,04	0,04	0,04	0,04
6	Zinkiv	0,04	0,04	0,04	0,04	0,04
7	Karlivka	0,03	0,04	0,03	0,04	0,02
8	Kobeliaky	0,05	0,04	0,04	0,04	0,06
9	Kozelshchina	0,03	0,04	0,04	0,04	0,03
10	Kotelva	0,05	0,04	0,05	0,05	0,06
11	Kremenchug	0,05	0,04	0,05	0,04	0,06
12	Lohvytsa	0,04	0,04	0,04	0,04	0,04
13	Lubny	0,04	0,04	0,04	0,04	0,04
14	Mashivka	0,03	0,04	0,03	0,04	0,02
15	Myrgorod	0,04	0,04	0,04	0,04	0,04
16	Novissanzhary	0,04	0,04	0,04	0,04	0,04
17	Orzhytsa	0,03	0,04	0,04	0,04	0,02
18	Pyriatin	0,04	0,04	0,04	0,04	0,04
19	Poltava	0,04	0,04	0,04	0,04	0,04
20	Reshetylivka	0,04	0,04	0,04	0,04	0,03
21	Semenivka	0,04	0,04	0,04	0,04	0,04
22	Chorol	0,04	0,04	0,04	0,04	0,03
23	Chornukhy	0,05	0,04	0,05	0,04	0,05
24	Chutiv	0,03	0,04	0,04	0,04	0,03
25	Shyshaki	0,04	0,04	0,04	0,04	0,05

Then the entropy value for each sign was determined, and the adduced objective significance of the j-th characteristic.

At the next stage, an assessment of the subjective significance of the signs was carried out. Signs were compared in pairs for significance.

For this purpose, a corresponding table was formed, where the signs were columns and rows, Table 5.

Table 5: Matrix of pairwise comparisons of signs *

Signs	G_1	G_2	G_3	G_4	G_5	Сума
G_1	–	3	3	3	1	10
G_2	1	–	3	3	1	8
G_3	1	1	–	2	1	5
G_4	1	1	2	–	1	5
G_5	3	3	3	3	–	12

* G_1 – territories ecological stability of, G_2 – anthropogenic load, G_3 – plowing of the territories, G_4 – agricultural development, G_5 – recreational capacity.

If the subjective weight of this sign is greater than that of the compared one, then 3 is written to the corresponding cell of the matrix, if less – 1, if they are equivalent – 2. On the received results the sum of values of each line of a table is determined and the sum of these summs is calculated. Then their ratio is determined, which characterizes the subjective weight of the corresponding sign. On the basis of the obtained objective and subjective weight of each sign, the generalized weight and its magnitude were determined. The calculation results are summarized in Table 6.

Table 6: Indicators of entropy and weight of indicators for assessing the ecological status of the territories of the Poltava region districts

Signs *	E_j	d_j	$\bar{d}_j$	g_j	q_j	$\bar{q}_j$
G_1	0,996	0,004	0,003	0,250	0,003	0,187
G_2	1,000	0,000	0,000	0,200	0,000	0,016
G_3	0,999	0,001	0,001	0,125	0,001	0,076
G_4	0,999	0,001	0,001	0,125	0,001	0,032
G_5	0,986	0,014	0,013	0,300	0,013	0,689

* E_j - entropy; d_j - objective subjective significance; $\bar{d}_j$ - adduced objective significance; g_j - subjective significance; q_j - general significance; $\bar{q}_j$ - adduced general significance.

At the final stage, integral indicators according to the signs and the general integral indicator of the ecological status of the territory for each district of the Poltava region were calculated. The value of the integral indicator varies from 0 to 1. The higher indicator shows the better ecological status of the evaluated territories. The obtained results of integral indicators are summarized in Table 7.

Table 7: Integral indicators (L_j) and general integral indicator (L_{ij})

Administrative district, *Ri*	L_1	L_2	L_3	L_4	L_5	L_{ij}
1 group						
Kotelva	0,27	0,04	0,15	0,07	0,38	0,91
Kremenchug	0,27	0,04	0,14	0,07	0,37	0,90
Globino	0,27	0,04	0,10	0,06	0,42	0,89
Kobeliaky	0,26	0,04	0,13	0,07	0,36	0,85
Chornukhy	0,26	0,04	0,14	0,07	0,31	0,82
Gadyach	0,25	0,04	0,13	0,07	0,32	0,81
Shyshaki	0,24	0,04	0,13	0,07	0,31	0,78
2 group						
Lubny	0,23	0,04	0,13	0,07	0,27	0,74
Poltava	0,23	0,04	0,13	0,07	0,27	0,73
Lohvytsa	0,23	0,04	0,13	0,07	0,26	0,73
Velyka Bahachka	0,22	0,04	0,12	0,07	0,28	0,73
Zinkiv	0,22	0,04	0,12	0,07	0,28	0,72
Semenivka	0,23	0,04	0,13	0,06	0,26	0,71
Dikanka	0,21	0,04	0,12	0,06	0,27	0,70
Novissanzhary	0,22	0,04	0,12	0,07	0,25	0,70
Pyriatin	0,23	0,04	0,12	0,07	0,23	0,69
Myrgorod	0,21	0,04	0,12	0,06	0,24	0,67
3 group						
Reshetylivka	0,20	0,04	0,12	0,06	0,21	0,62
Kozelshchina	0,19	0,04	0,12	0,06	0,21	0,62
Chutiv	0,19	0,04	0,11	0,06	0,20	0,59
Chorol	0,19	0,04	0,11	0,06	0,17	0,57
Orzhytsa	0,18	0,04	0,11	0,06	0,15	0,54
Karlivka	0,17	0,04	0,11	0,06	0,16	0,53
Hrebinka	0,16	0,04	0,10	0,06	0,13	0,49
Mashivka	0,16	0,03	0,10	0,06	0,14	0,49

According to the results of the analysis, three groups of ecological status of territories according to the districts of the Poltava region are distinguished. The first group included areas with moderate ecological stability of the territories. These are 7 districts: Kotelva, Kremenchug, Globino, Kobeliaky, Chornukhy, Gadyach, Shyshaki. The general integral indicator of this group is greater than 0.75. The second group includes 10 districts with an medium ecological stability of the territories: Lubny, Poltava, Lohvytsa, Velyka Bahachka, Zinkiv, Semenivka, Dikanka, Novissanzhary, Pyriatin, Myrgorod. The general integral indicator is within the range of 0.65-0.75. The third group is characterized by low ecological stability of the territories. The general integral value is less than 0.65. These are 8 districts: Reshetylivka, Kozelshchina, Chutiv, Chorol, Orzhytsa, Karlivka, Hrebinka, Mashivka, Table 8.

Table 8: Groups of ecological status of territories of Poltava region districts

№ group	Ecological status	Administrative districts
1	moderate ecological stability	Kotelva, Kremenchug, Globino, Kobeliaky, Chornukhy, Gadyach, Shyshaki
2	medium ecological stability	Lubny, Poltava, Lohvytsa, Velyka Bahachka, Zinkiv, Semenivka, Dykanka, Novissanzhary, Pyriatin, Myrgorod
3	low ecological stability	Reshetylivka, Kozelshchina, Chutiv, Chorol, Orzhytsa, Karlivka, Hrebinka, Mashivka

The boundaries of the quantitative values of indicators for each group of ecological status of territories are formed, Table 9.

Table 9: The boundaries of the quantitative values of indicators for each group of ecological status of territories

Indicators, X_i	Groups of ecological status of territories		
	1	2	3
	Moderate	medium	Low
	Boundaries of the quantitative values		
General integral indicator	> 0,75	0,65–0,75	< 0,65
Coefficient of ecological stability of territories, (X_1)	> 0,39	0,34–0,39	< 0,33
Coefficient of anthropogenic load, (X_2), points	< 3,3	3,3–3,4	> 3,4
Coefficient of plowing of the territories, (X_3), %	< 65	65–70	> 70
Recreational capacity, (X_5)	> 0,30	0,23–0,30	< 0,23

The results of the analysis showed that the territories of the first group have a coefficient of ecological stability greater than 0.39; anthropogenic load factor less than 3,3 points; the area plowing coefficient is less than 65%; recreational capacity greater than 0.3. The territories of the second group are characterized by the coefficient of ecological stability within the range of 0.34-0.39; coefficient of anthropogenic load - within the limits of 3,3-3,4 points; the area plowing coefficient – 65% -70%; recreational capacity – 0.23-0.3. The territories of the third group have a coefficient of ecological stability less than 0.33; coefficient of anthropogenic load greater than 3.4 points; the area plowing coefficient – greater than 70%; recreational capacity – less than 0.23-0.3. These territories have a low stability of the ecological state.

Thus, territories with a moderate and medium stability of the ecological state can be recommended for construction of the hotel-restaurant complexes, as well as for the rest of hospitality services consumers.

4. Conclusions

- Studies have shown that the management system for the construction of a hotel complex is a complicated system, the components of which are in interaction and interdependence.
- A structural and logical model of the management system for the construction of the hotel complex has been developed. The main components are the territories for the location of the complex, design organizations, contractors and investors.
- A special feature of the management system for the construction of a hotel complex is the organization of monitoring of territories as the basis for choosing a site for development.
- Based on the assessment of the ecological status of the territories of the Poltava region, three groups of ecological status of territories are distinguished: moderate, medium and low stability.
- The territories with moderate and medium ecological stability have an investment attractiveness for financing the construction of the hotel complex.
- Further research should be directed to the assessment of soil quality. This will increase the efficiency of the use of territories for the construction of hotel complex.

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