Analysis of ecotourism development prospects in the Northwest region

Oksana Pirogova[1*], *Vilena* Zasenko [1], *Dmitry* Semenenko [1], and *Mariya* Tihomirova [1]

[1] Peter the Great St. Petersburg Polytechnic University, 29 Polytechnicheskaya str., St. Petersburg, Russia, 195251

Abstract. Today, the study of environmental and economic analysis in the hospitality industry is of great importance for the industry. Global problems associated with environmental degradation require different approaches to solution. Studying the regional market is an important strategy for the development of this industry. The relevance of the study is the influence of environmentally friendly technologies in different spheres of life. Current statistical data on environmental and economic indicators were selected for analysis. The purpose of the study is to find areas in the northwestern region for the construction of a modern eco-hotel. To achieve the goal, factors influencing the ecological state of the territory and its economic components were selected. Environmental factors will include the number of large and medium-sized reservoirs in the area, the distance of the nearest point of the areas from the airport, the number of large highways, as well as the area of greenery in the area. To compare districts, a 5-point scoring system was used, depending on the quantitative and qualitative indicators of the above factors. As a result of the study, the most suitable areas for the implementation of the project according to the selected indicators were identified.

1 Introduction

Problems associated with environmental degradation require different approaches to solution. In addition to the obvious pollution of the air, soil and water environments, there are less monitored, but no less dangerous types of pollution that negatively affect the physical and emotional state of a person. The influence of these factors can haunt a person not only during workdays, but also during rest. That is why people are increasingly using such a direction as ecotourism for this purpose, and the concept of an eco-hotel is being modified, fitting even into the urban sphere to increase accessibility [1].

Despite the fact that eco-hotels have appeared a long time ago, there is no exact definition of this concept at the moment. The first definition of eco-hotels differs little from the general definition of hotels we are used to; the key difference is in minimizing the

* Corresponding author: kafedra17@rambler.ru

negative impact on the environment. The second definition, like the second type of eco-hotels, is distinguished by its structural content. This type of eco-hotel is aimed not only at interconnection with the environment, but also at creating an ecofriendly environment for the guest, excluding the influence of urban factors [2].

To choose the most favorable location for the construction of an eco-hotel, it is worth deciding in advance on the choice of one of two types of such hotels [3]. The first type of eco-hotels is typically located in the central areas of the city, in the most popular areas among tourists; eco-hotels of the second type, in turn, are located on the outskirts of large cities or in close proximity to them [4].

This study will examine the second type of eco-hotels, also known as Eco Lodges [5]. To determine the best area for the construction of this type of hotel, it is necessary to identify factors that must be relied upon when choosing. The work will consider factors of two types - environmental and socio-economic [6].

Environmental factors will include the number of large and medium-sized reservoirs in the area, the distance of the nearest point of the areas from the airport, the number of large highways, as well as the area of greenery in the area. To compare districts, a 5-point scoring system was used, depending on the quantitative and qualitative indicators of the above factors.

2 Materials and Methods

The central region of the Northwestern District of Russia was chosen for analysis. The approximate boundaries of the region were designated as a radius of 250 km from St. Petersburg.

The radius was measured by the “Ruler” tool through the Yandex Maps service; in the summary tables, the value of the distance from St. Petersburg can be more than 250 km since the value of the automobile route is taken.

The sample included the entire Leningrad region, partially the Novgorod region, the Pskov region and the Republic of Karelia. The list of areas for analysis is presented below.

1. Republic of Karelia:
1.1. Lakhdenpokh district
1.2. Sortavala district
1.3. Pitkyaranta district
1.4. Olonetsky district
2. Pskov region:
2.1. Gdovsky district
2.2. Pskovsky district
2.3. Pechora district
2.4. Porkhovsky district
2.5. Dnovsky district
3. Novgorod region:
3.1. Chudovsky district
3.2. Lyubytinsky district
3.3. Khvoyninsky district
3.4. Novgorod district
3.5. Starorussky district
3.6. Valdai district
3.7. Krestetsky district
3.8. Okulovsky district
3.9. Parfinsky district
4. Leningrad region

4.1. Boksitogorsk municipal district
4.2. Volosovsky municipal district
4.3. Volkhov municipal district
4.4. Vsevolozhsk municipal district
4.5. Vyborg municipal district
4.6. Gatchina municipal district
4.7. Kingisepp municipal district
4.8. Kirishi municipal district
4.9. Kirovsky municipal district
4.10. Lodeynopolsky municipal district
4.11. Lomonosovsky municipal district
4.12. Luzhsky municipal district
4.13. Podporozhye municipal district
4.14. Priozersky municipal district
4.15. Slantsevsky municipal district
4.16. Tikhvin municipal district
4.17. Tosnensky municipal district
4.18. Sosnovoborsky urban district

3 Results and Discussion

Based on the results of the study, the following environmental factors were identified [7].

1. The number of large and medium-sized reservoirs in the area was assessed using physical map analysis. The criterion was assessed using a 5-point system, where the score "1" is the amount in the range 0-10, "2" is the amount in the range 11-20, "3" is the amount in the range 21-30, "4" is the amount in range 31-40, and "5" – for quantities from 41. A weight of 0.25 is assigned.

2. Distance from the airport was calculated as the shortest distance, according to the map, to the nearest point on the border of the area in question. The criterion was assessed using a 5-point system, where score "1" is a distance from 0 to 20 kilometers, score "2" is a distance from 21 to 50 kilometers, score "3" is a distance from 51 to 100 kilometers, score "4" – distance from 101 to 150 kilometers, and rating "5" – from 151 kilometers. Assigned a weight of 0.25.

3. The number of major highways in the area was estimated using topographic map analysis. The criterion was assessed using a 5-point system, where the score "5" is the amount in the range 0-3, "4" is the amount in the range 4-6, "3" is the amount in the range 7-9, "2" is the amount in range 10-12, and "1" – when the quantity is 12 or more. A weight of 0.25 is assigned.

4. The green space area in the area was estimated using physical map analysis. The criterion was assessed using a 5-point system, where score "1" is the percentage of green space in the range of 0-20%, "2" is the percentage of green space in the range of 21-40%, "3" is the percentage of green space in the range of 41-60%, "4" is the percentage of green space in the range of 61-80%, and "5" is the percentage of green space in the range of 81%. Assigned a weight of 0.25.

The results of the assessment of environmental factors by areas of the northwestern region are presented in tables 1-4.

Table 1. Assessment of environmental factors in the Leningrad region.

Area	Concentration of large bodies of water	Distance from the airport	Concentration of major highways	Green space area	Average rating
Boksitogorsk municipal district	5	5	5	4	4.75
Volosovsky municipal district	1	2	4	4	2.75
Volkhov municipal district	4	3	4	4	3.75
Vsevolozhsk municipal district	3	1	2	3	2.25
Vyborg municipal district	2	1	2	2	1.75
Gatchina municipal district	4	2	3	4	3.25
Kingisepp municipal district	2	3	5	4	3.5
Kirishi municipal district	1	3	4	5	3.25
Kirovsky municipal district	2	2	5	4	3.25
Lodeynopolsky municipal district	3	5	5	5	4.5
Lomonosovsky municipal district	1	1	2	4	2
Luzhsky municipal district	2	3	4	5	3.5
Podporozhye municipal district	3	5	5	5	4.5
Priozersky municipal district	5	3	3	5	4
Slantsevsky municipal district	2	3	4	4	3.25
Sosnovoborsky urban district	2	3	4	3	3
Tikhvin municipal district	3	4	4	5	4
Tosnensky municipal district	1	1	3	5	2.5

As a result of assessing all municipal districts according to four criteria, which is presented in Table 2, three districts can be distinguished. Thus, Boksitogorsky, Podporozhsky and Lodeynopolsky municipal districts are the most favorable for the implementation of an “eco” hotel project in terms of environmental indicators.

Table 2. Assessment of environmental factors in the Republic of Karelia.

Area	Concentration of large bodies of water	Distance from the airport	Concentration of major highways	Green space area	Average rating
Lakhdenpokh district	2	3	5	5	3.75
Sortavala district	2	4	5	5	4
Pitkyaranta district	2	5	5	5	4.25
Olonetsky district	5	5	5	5	5

In the Republic of Karelia, the undoubted leader among the districts is Olonetsky with an average score of 5. Pitkyaranta district also has good indicators with a score of 4.25.

Table 3. Assessment of environmental factors in the Pskov region.

Area	Concentration of large bodies of water	Distance from the airport	Concentration of major highways	Green space area	Average rating
Gdovsky district	2	3	4	4	3.25
Pskovsky district	1	1	3	3	2
Pechora district	1	1	4	4	2.5
Porkhovsky district	1	1	4	3	2.25
Dnovsky district	1	3	5	3	3

The environmental indicators of the districts of the Pskov region are significantly inferior to those of the Republic of Karelia. The most favorable in terms of environmental indicators in the Pskov region is the Gdovsky district with an average score of 3.25.

Table 4. Assessment of environmental factors in the Novgorod region.

Area	Concentration of large bodies of water	Distance from the airport	Concentration of major highways	Green space area	Average rating
Chudovsky district	1	3	5	4	3.25
Lyubytinsky district	1	4	4	5	3.5
Khvoyninsky district	1	5	5	4	3.75
Novgorod district	1	3	4	4	3
Starorussky district	1	4	4	4	3.25
Valdai district	3	5	4	3	3.75
Krestetsky district	1	5	5	5	4
Okulovsky district	1	5	5	5	4
Parfinsky district	1	5	5	4	3.75

In the Novgorod region, the Krestetsky and Okulovsky districts have the best indicators on environmental factors with an average score of 4.

In addition to environmental factors, for a project such as an eco-hotel, it is important to evaluate economic factors [8].

A comprehensive study of socio-economic factors that could influence the decision to open an eco-hotel in a particular area was carried out, which included an analysis of supply on the hotel business market for each municipal district, identifying the share of supply in the “eco” segment. Calculations of the municipal districts distance from the center of St. Petersburg by car were also made and the available options for public transport routes were distinguished [9].

Additionally, the open offer for sale of land plots in each district was analyzed, and the average value of the cost of one hundred square meters of land was calculated [10].

In addition, open supply in the hotel services market was studied and the average cost of providing services in each municipal district was determined to assess the level of competition [11].

Based on the obtained complex analytical indicators, socio-economic criteria for assessing the feasibility of implementing an eco-hotel project were compiled; each criterion was assigned a weight and assessed using a 5-point system. As a result, one or more municipal areas with the highest weighted average will be recommended as the most favorable from a socio-economic point of view [12].

During the analysis, a study of the hotel market in municipal districts of the Leningrad region was carried out. The following evaluation criteria are considered [13]:

1. Competition in the segment in the area was assessed through an analysis of the total volume of supply in the segment, the share of supply falling on the segment of "eco" hotels, as well as their relationship. The criterion was assessed using a 5-point system, where 1 is high competition, and 5 is low. Assigned a weight of 0.2.

2. The distance from St. Petersburg was calculated as the distance by car from the Alexandria Pillar on Palace Square to the center of the area under consideration along federal roads and highways. The criterion was assessed using a 5-point system, where 1 is very far, and 5 is close. Assigned a weight of 0.25.

3. The transport accessibility criterion included the number of possible routes to the municipal area in question by regular or regular buses, trains, swallows, and electric trains. Both the total number and variety of routes, as well as their regularity and frequency, were assessed. The criterion was assessed using a 5-point system, where 1 is one route or long breaks in flights, and 5 is different route options and regular frequent flights. Assigned a weight of 0.1.

4. The criterion for the average cost of land contains analyzed prices on open real estate aggregators (Yandex, Cian), current as of the end of December 2023. The criterion was assessed using a 5-point system, where 1 means the cost of land is high, and 5 means the cost of land is low. Assigned a weight of 0.35.

5. The criterion for the average cost of providing services in the hotel segment is compiled from analyzed open offer data on relevant aggregators [10]. The calculation of the average cost includes all offers in the area, both hotels within the city and countryside complexes. This implies a wide range of price dispersion, however, within the framework of this study, when choosing at the level of municipal districts, it is acceptable. The criterion was assessed using a 5-point system, where 1 is low cost of services, and 5 is high cost of services. Assigned a weight of 0.1.

Table 5. Assessment of economic factors of the Leningrad region.

Area	Level of competition	Distance from Saint-Petersburg by car	Transport accessibility	Average land cost	Average hotel services cost	Area rating
Boksitogorsk municipal district	5	1	1	4	2	2.95
Volosovsky municipal district	5	4	2	3	1	3.35
Volkhov municipal district	4	2	2	3	4	2.95
Vsevolozhsk municipal district	2	5	5	1	5	3
Vyborg municipal district	1	3	5	1	5	2.3
Gatchina municipal district	3	4	4	2	4	3.1
Kingisepp municipal district	3	3	2	4	4	3.35
Kirishi municipal district	1	2	2	5	3	2.95
Kirovsky municipal district	2	5	2	3	3	3.2
Lodeynopolsky	3	2	5	5	4	3.75

municipal district						
Lomonosovsky municipal district	1	5	4	1	5	2.7
Luzhsky municipal district	2	3	3	4	2	3.05
Podporozhye municipal district	1	1	4	5	3	2.9
Priozersky municipal district	5	3	5	2	4	3.35
Slantsevsky municipal district	1	2	3	5	1	2.85
Sosnovoborsky urban district	1	3	5	5	5	3.7
Tikhvin municipal district	2	1	3	5	3	3
Tosnensky municipal district	1	4	2	2	2	2.3

As a result of assessing all municipal districts according to five criteria, which is presented in Table 4, two districts can be distinguished. Thus, the Sosnovoborsky municipal district and the Lodeynopolsky municipal district are the most favorable for the implementation of the “eco” hotel project in terms of socio-economic indicators.

Table 6. Assessment of economic factors of the Leningrad region.

Area	Level of competition	Distance from Saint-Petersburg by car	Transport accessibility	Average land cost	Average hotel services cost	Area rating
Lakhdenpokh district	3	3	4	2	3	2.75
Sortavala district	1	2	5	2	4	2.3
Pitkyaranta district	2	1	1	4	2	2.35
Olonetsky district	3	1	2	5	2	3

In the Republic of Karelia in general, and in particular in the areas we are considering, ecotourism and the hotel services market are quite well developed [14]. In each of the regions considered, the share of eco-hotels in the hotel business segment is 10% or more [15].

Multivariate analysis was performed on the collected data, the weights and scoring criteria were described above. Based on the results of the analysis, the Olonetsky district can be identified, the advantage of which is the relatively low cost of land.

It is also worth noting that the Olonetsky district borders the Lodeynopolsky district, which we noted as part of the analysis of the municipal districts of the Leningrad region.

In the Pskov region, the strong centers of gravity are the city of Pskov (Pskovsky district) and the city of Pechory (Pechora district), the rest of the Pskov region we are considering is occupied by workers’ settlements, where the segment of hotel services is either not represented at all (Plyussky and Strugokrasnensky districts), or is poorly represented.

Table 7 – Assessment of economic factors in the Pskov region.

Area	Level of competition	Distance from Saint-Petersburg by car	Transport accessibility	Average land cost	Average hotel services cost	Area rating
Gdovsky district	4	4	4	4	1	3.7
Pskovsky district	2	2	5	1	3	2.05
Pechora district	3	1	4	3	4	2.7
Porkhovsky district	4	3	3	2	1	2.65
Dnovsky district	4	2	5	4	1	3.3
Gdovsky district	4	4	4	4	1	3.7

Based on the results of multifactor analysis, we can highlight the Gdovsky and Dnovsky districts, the advantages of which are the relatively low cost of land and a well-developed transport infrastructure. However, due to the general underdevelopment of the market for hotel services and tourism in a broad sense and despite the high ratings, using these areas in further comparison is not advisable, since it will distort the result.

In general, we can say that the direction south of St. Petersburg, both in the Leningrad region and in the Pskov region, is not considered popular among tourists with the exception of local centers. There is potential for development of the area, particularly in the field of ecotourism. It is necessary to develop local cultural sites and enlist the support of government programs aimed at popularizing domestic tourism, which could lead to the emergence of hotel services and tourism in the next 10-15 years.

In the Novgorod region, we can similarly identify strong centers of gravity, which are the Novgorod, Starorussky and Valdai districts and areas in which the hotel services market is not developed at all (Malovishersky and Batetsky districts).

We can highlight the Chudovsky and Parfinsky districts, which have a relatively low land cost and a well-developed transport infrastructure. However, there is also a question about the appropriateness of accepting the data obtained. The development potential of the Novgorod region is great, especially due to the large number of railway routes.

To determine the most suitable area for both factors, a final score table was compiled (Table 8).

Table 8 – Assessment of economic factors of the Novgorod region

Area	Average score for environmental factors	Average score for economic factors	Overall score
Leningrad region			
Boksitogorsk municipal district	4.75	2.95	3.85
Volosovsky municipal district	2.75	3.35	3.05
Volkhov municipal district	3.75	2.95	3.35
Vsevolozhsk municipal district	2.25	3	2.625
Vyborg municipal district	1.75	2.3	2.025
Gatchina municipal district	3.25	3.1	3.175
Kingisepp municipal district	3.5	3.35	3.425
Kirishi municipal district	3.25	2.95	3.1
Kirovsky municipal district	3.25	3.2	3.225

Lodeynopolsky municipal district	4.5	3.75	4.125
Lomonosovsky municipal district	2	2.7	2.35
Luzhsky municipal district	3.5	3.05	3.275
Podporozhye municipal district	4.5	2.9	3.7
Priozersky municipal district	4	3.35	3.675
Slantsevsky municipal district	3.25	2.85	3.05
Sosnovoborsky urban district	3	3.7	3.35
Tikhvin municipal district	4	3	3.5
Tosnensky municipal district	2.5	2.3	2.4
Republic of Karelia			
Lakhdenpokh district	3.75	2.75	3.25
Sortavala district	4	2,3	3.15
Pitkyaranta district	4.25	2.35	3.3
Olonetsky district	5	3	4
Pskov region			
Gdovsky district	3.25	3.7	3.475
Pskovsky district	2	2.05	2.025
Pechora district	2.5	2.7	2.6
Porkhovsky district	2.25	2.65	2.45
Dnovsky district	3	3.3	3.15
Novgorod region			
Chudovsky district	3.25	3.5	3.375
Lyubytinsky district	3.5	2.9	3.2
Khvoyninsky district	3.75	3	3.375
Novgorod district	3	2.55	2.775
Starorussky district	3.25	2.95	3.1
Valdai district	3.75	2.4	3.075
Krestetsky district	4	2.3	3.15
Okulovsky district	4	2.6	3.3
Parfinsky district	3.75	3.15	3.45

In the Leningrad region, we can distinguish Lodeynopolsky (score 4.125) and Boksitogorsk (score 3.85) municipal districts. In the Republic of Karelia, the Olonetsky district can be considered the undisputed leader (score 4). In the Pskov region, the Gdovsky district received the highest rating for environmental and economic factors (score 3.475). In the Novgorod region, Parfinsky district (3.45) and Chudovsky district (3.375) can be distinguished.

4 Conclusion

As a result of the study, the most favorable areas for the construction of a modern eco-hotel in the northwestern region are the Lodeynopolsky municipal district of the Leningrad region and the Olonetsky district of the Republic of Karelia bordering each other.

Based on the results of the study, summary assessments of environmental and economic factors were determined, thanks to which we can name the most favorable areas for the construction of eco-hotels in the northwestern region. Thus, the clear leaders in terms of the selected factors are the Lodeynopolsky municipal district of the Leningrad region and the Olonetsky district of the Republic of Karelia, which border each other. The districts perform excellently on many factors. With good transport accessibility and relatively low land costs, the areas have excellent landscaping indicators, the number of major highways and distance from the airport that create noise pollution, and are also rich in cultural and historical sites and opportunities for recreational rest.

References

1. Pirogova O., Zasenko V. (2023). *Comparative analysis of digital services and their impact on the trade segment development.* E3S Web of Conferences. (ERSME-2023). Rostov-on-Don, 2023. C. 05003. https://doi.org/10.1051/e3sconf/202337605030
2. Pirogova O., Dovganeva Yu., Pogorelov N. (2023). *Approach to the assessment of the competitiveness of real estate objects in retail.* E3S Web of Conferences. (UESF-2023). Chelyabinsk, 2023. C. 09024. https://doi.org/ 10.1051/e3sconf/202338909024
3. Yoshida, J. (2020). Pacific-Basin Finance Journal. **61,** 101290 https://doi.org/10.1016/j.pacfin.2020.101290
4. Martín-Peña, M., Sánchez-López, J. and Díaz-Garrido, E. (2019). Journal of Business & Industrial Marketing, **35(3),** 564–574. https://doi.org/10.1108/JBIM-12-2018-0400
5. Fang, E., et.al., (2008) Journal of Mark. **72**, 1-14. https://doi.org/10.1509/jmkg.72.5.1
6. Li, Ya., Zhu, D., Zhao, J., Zheng, X., Zhang, L. (2020) China. Land Use Policy **94**. 104528. https://doi.org/10.1016/j.landusepol.2020.104528
7. Skribans, V., Jurušs, M., Demianchuk, M., Maslii, N., Pastory, D. (2020). Data in Brief. **28**. 105064. https://doi.org/10.1016/j.dib.2019.105064
8. Pirogova O., Lubochkin M. (2022). *Digitalization in the global stock market in the post Coronavirus Era.* XV International Scientific Conference "INTERAGROMASH 2022". Springer, 2023. **Vol. 74**. pp. 1605-1613.
9. Carmichael, B. and Coën, A. Finance Research Letters **32**, 101172, (2020) https://doi.org/10.1016/j.frl.2019.04.029
10. Hasan, M. Journal of Contemporary Accounting & Economics **13**. 20-36 (2017) https://doi.org/10.1016/j.jcae.2017.01.002
11. Kravchenko, O., Leshchenko, M., Marushchak, D., Vdovychenko, Y., Boguslavska, S. (2019). The 8th International Conference on Monitoring, Modeling & Management of Emergent Economy 65, 07004. https://doi.org/ 10.1051/shsconf/20196507004
12. Eggert, A., Hogreve, J., Ulaga, W., Muenkhoff, E. (2014). Journal of Service Research **17(1),** 23-39. https://doi.org/ 10.1177/1094670513485823
13. SHkvarya, L. & Frolova, E. (2022). Comparative Analysis of Foreign Trade Development in the Digital Segment by World Regions. Economy of Region. 18. 479-493. 10.17059/ekon.reg.2022-2-13.
14. Ho, Kim & Muhammad, Faishal. (2010). Journal of Property Investment & Finance. **28**. 77-108. 10.1108/14635781011024845.
15. Kaiser, Carina & Freybote, Julia. (2021). Journal of Property Research. **39**. 1-18. 10.1080/09599916.2021.1996447.