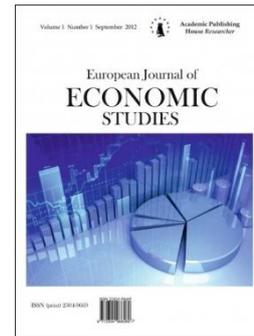


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Articles

Environmental Sustainability in the Development of Resort Areas in Krasnodar Krai

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Abstract

Fostering the sustainable development of a tourism region involves planning and managing the development of areas within it, with a focus on protecting their natural and cultural environments, managing their resort-and-recreation resources, enhancing their environmental condition, improving the quality of life of their population, and ensuring world-class conditions for the comfortable stay of their visitors. The development of resort areas comes with a whole host of implications, both positive and negative. In today's volatile market environment, the need to develop and maintain a competitive tourism product suggests the importance of assessing on a regular basis an area's current environmental condition and the condition of its natural resources. Environmental assessment is crucial to an area's sustainable development. A serious damage to a region's natural-recreational potential is capable of canceling out any of its economic and sectoral achievements, including those associated with the development of the tourism industry in the area.

Research on the dynamics of pollution in Krasnodar Krai (Russia) indicates that its resort areas tend to differ in terms of both particular components of pollution and indicators of the current environmental condition. With that said, for particular resort areas in the region, and for the entire region as a whole, this condition is determined, above all, by the degree to which the following two resources, which are most significant to the successful development of tourism in an area, are polluted – water and air. An analysis indicates that at this point an exacerbation of certain environmental problems in resort areas in Krasnodar Krai appears to be inevitable.

The findings from the research reported in this paper suggest that, while Krasnodar Krai's resort areas are on course for environmental sustainability, there remain issues that need to be addressed. The most serious factors hindering the region from achieving sustainable environmental development include air and seawater pollution, growing volumes of solid and liquid waste, and increased recreational strain on its resort areas, especially in the summertime. Accordingly, there is a need to take an ecosystems approach to integrally assessing the environmental situation in the region's resort areas.

Keywords: sustainable development, resort areas, environmental, indicators, environmental sustainability.

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1. Introduction

What makes the sustainable development of a nation's regions, especially those oriented toward tourism, particularly significant is the importance of preserving their originality. Economic activity in a resort region is primarily aimed at achieving a state of sustainable development in it, normally has territorial limits, and is directly dependent on the region's environmental condition and the condition of its key recreational resources. The significance of the environmental condition of regions focused on tourism-and-recreation activity has grown increasingly due to the implementation of the concept of sustainable development. This kind of activity ought not to lead to the depletion of natural resources in a region but ought to ensure their renewal (Masserov, 2013; Vidishcheva et al., 2019; Vidishcheva i dr., 2020; Ajsanov, 2008; Bobylev, 2007).

Krasnodar Krai's resources-rich and diverse natural environment offers a unique potential for the sustainable development of its resort areas. A major barrier to this development is the relatively high susceptibility of many of the region's ecosystems to anthropogenic impacts on the regional environment, which is affecting the environmental condition of its resort areas.

Factors like the volatile market environment and the need to develop and maintain a competitive tourism product in the resort areas may require assessing on a regular basis the current environmental condition of a region and the condition of its natural resources. Processes related to the development of resort areas have been explored by numerous researchers around the world. Issues of the sustainable development of tourism regions, including the practical assessment thereof, have been researched in a number of works by Russian scholars (Vidishcheva et al., 2019; Vidishcheva et al., 2020; Ajsanov, 2008). Sustainable development implies the balanced long-term development of an area and involves a moderate use of its natural resources. The issue of sustainability appears to be most relevant when it comes to resort areas. Economic activity can cause increased strain on such areas. This may lead to an irrational use of an area's tourism-and-recreation potential and affect the environmental situation in it.

The set of an area's key characteristics is associated with its ability to achieve sustainable dynamics in terms of social, economic, environmental, sectoral, and anthropogenic indicators of growth, with its environmental and anthropogenic characteristics playing a particularly significant role in its development. Indicators of the environmental sustainability of the development of resort areas are crucial indicators reflecting the current condition of the regional economy.

The development of resort areas comes with a whole host of implications, both positive and negative. One of the more comprehensive reviews of the negative impact of the tourism industry on the ecology of resort areas is provided in a work by H. Ceballos-Lascuráin (Ceballos-Lascuráin, 1996). In his book, the scholar identifies the following types of impact on the ecology of tourism areas:

- impact on a tourism region's geological formations;
- impact on its soils (the building of infrastructure in a resort area may cause the movement and disposition of its soils);
- impact on its water resources;
- impact on its flora;
- impact on its fauna;
- change in its sanitary conditions (garbage and other waste from the regional economy, including the tourism industry, may impact on a tourism area's sanitary condition; this impact may extend beyond the resort area and affect all of the local population too);
- change in the aesthetic characteristics of the area's landscape (a significant worsening of the local landscapes' aesthetic qualities may be the result of irresponsible and uncontrolled activity in the resort area).

The extent and nature of the impact of the regional economy on a resort area's ecosystem may depend on factors such as number of tourists, length of their stay in the area, their activity in the area, and the area's distinctive environmental characteristics. As an area's tourism fame grows, visitor flows may increase, which should result in the creation of relevant supporting infrastructure and increased development of transportation services, as transport flows will increase. Problems may arise when the increase in tourism flows is very large and the permissible strain on the area is exceeded, i.e. there is an excessive use of its recreational resources.

The purpose of this study was to assess the environmental sustainability of recreational resources in Krasnodar Krai's resort areas using a special system of indicators (Vidishcheva et al.,

2019; Vidishcheva i dr., 2020; Ajsanov, 2008) and based on a pool of relevant information on the subject. The analysis was conducted based on a set of environmental indicators and a set of indicators of anthropogenic strain.

The study's methodological basis was grounded in the systems approach, with analysis and synthesis employed as well. Use was also made of expert methods of obtaining and systematizing information.

2. Methodology

The methodological basis of the study consists of materials from foreign and Russian periodicals, as well as publicly available Internet resources. To achieve the goals of the study, empirical and theoretical methods were applied, such as data collection, study and analysis, generalization, comparison and classification.

3. Results and discussion

The findings from the research reported in this paper have helped gain a useful insight into some of the key strengths and weaknesses of the development of resort areas in Krasnodar Krai and identify some of the key barriers standing in the region's way to environmental sustainability.

Environmental assessment

Environmental assessment is crucial to an area's sustainable development. A serious damage to a region's natural-recreational potential is capable of canceling out any of its economic and sectoral achievements, including those associated with the development of the tourism industry in the area.

The environmental sustainability of Krasnodar Krai and its key resort areas has been explored using the following environmental metrics (Masserov, 2013; Vidishcheva et al., 2019; Vidishcheva i dr., 2020; Ajsanov, 2008; Bobylev, 2007):

- emissions of various pollutants to the atmosphere from transportation in the region, tons;
- relative share of Black Sea water samples that do not meet hygienic standards;
- dynamics of emissions from stationary sources of pollution in the region, thousand tons;
- combined area of the region's protected nature conservation zones, thousand ha;
- combined discharge of foul wastewater, million m³;
- combined emissions to the atmosphere, thousand tons.
- current (operational) spending on environmental protection, including expenditure covering conservation services, thousand rubles;
- number of facilities with stationary sources of pollution;
- combined emissions to the atmosphere from stationary sources of pollution, thousand tons;
- amount of pollutants emitted by all stationary sources in the region, thousand tons;
- relative share of seawater samples that do not meet hygienic standards (sanitary-chemical indicators, microbiological indicators, and coliphage numbers);
- number of operating control points in the rivers of the Black Sea coast; average suspended solids concentration; extent of pollution in water bodies.

The following two social indicators are closely associated with environmental metrics for the region's resort areas (Bobylev, 2007):

- total solid residential waste taken off the region in a year, thousand m³;
- total liquid residential waste taken off the region in a year, thousand m³.

Below is an analysis of the dynamics of a set of indicators characterizing the environmental sustainability of Krasnodar Krai and its key resort areas (O sostoyanii prirodopol'zovaniya, 2018; O sostoyanii prirodopol'zovaniya, 2019; Ohrana okruzhayushchej sredy; Sbros zagryaznennyh stochnyh; Krasnodarskij kraj v cifrah, 2018).

1. Emissions of pollutants to the atmosphere from transportation. In today's world, it is becoming extremely difficult to curb growth in emissions from transportation, as the number of motor vehicles is growing at an unabated pace. Resort areas may face an additional strain due to tourists using motor vehicles of their own. The average volume of emissions from transportation in Krasnodar Krai is around 560 tons, with the share of the resort cities of Sochi and Anapa in the region's total volume of transportation emissions currently being 4 % and 2 %, respectively.

The region posted an increase in emissions in the period from 2016 to 2018 (Figure 1).

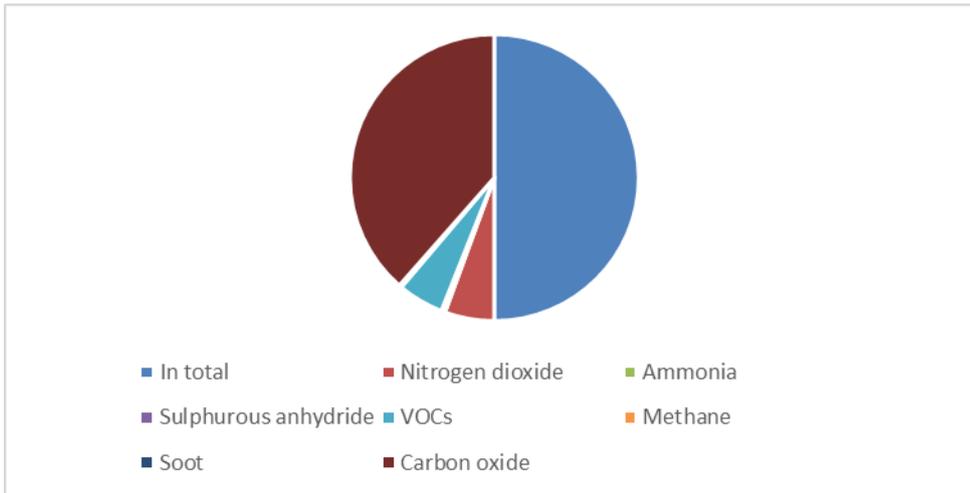


Fig. 1. Dynamics of emissions from transportation in Krasnodar Krai, tons

While the study has identified no pronounced dynamics on this across the region’s resorts, in terms of emissions’ composition the bulk of the region’s transportation emissions is accounted for by carbon oxide – 77 % (Table 1).

Table 1. Dynamics of Emissions from Transportation in Krasnodar Krai, tons

Emissions	2016	2017	2018	Increase, %	Increase in volume terms	Share of each type of emissions, %
Total	562.2	570.8	563.92	100 %	1.72	100 %
Nitrogen dioxide	61.4	63.5	62.8	102 %	1.4	11.1 %
Ammonia	1.5	1.6	1.6	107 %	0.1	0.3 %
Sulphurous anhydride	3.1	3.2	3.2	103 %	0.1	0.6 %
Volatile organic compounds	56.6	59	58.2	103 %	1.6	10.3 %
Methane	2.3	2.3	2.3	100 %	0	0.4 %
Soot	1.01	1.01	1.02	101 %	0.01	0.2 %
Carbon oxide	424.3	440.1	434.8	102 %	10.5	77.1 %

2. Relative share of seawater samples that do not meet hygienic standards. There are no trends governing the way microorganisms emerge and are discovered in the Black Sea’s water environment – it is something that occurs in an unpredictable fashion. For this reason, it is quite difficult to assess the degree to which the dynamics are positive or negative, as the situation may change dramatically in a future reporting period. The region posted a tangible decline in the share of unsatisfactory samples in 2018 compared with 2014. However, the interim periods witnessed not only declines but also major increases in the number of unsatisfactory water samples in the region. This is best illustrated by a 2.8-times increase in coliphage numbers in 2016. The most serious deviation of water samples from the standard in the entire period under review across the region’s resort areas was detected with microbiological indicators. The largest number of cases of the water not meeting the standard parameters in the period under review was detected in the city of Sochi, with Anapa leading the way in water bodies’ cleanliness. However, data on the latest samples indicate that the lowest number of unsatisfactory samples has been registered in the city of Sochi, whilst Anapa and Gelendzhik have posted serious deviations on this.

Based on the dynamics of seawater pollution in the region (Table 2), in the period under review the maximum allowable concentration (MAC) of pollutants in its seawater exhibited a decline in lead content and pollution by oil products. There was an increase in concentration of iron.

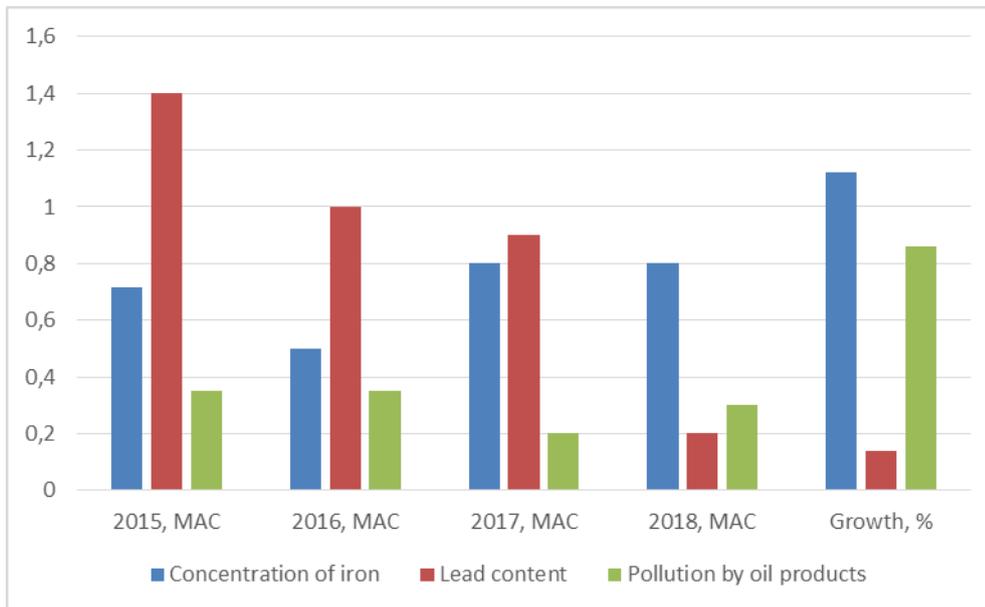


Fig. 2. Dynamics of seawater pollution in Krasnodar Krai. (Krasnodarskij kraj v cifrah, 2018)

Table 2. Dynamics of Seawater Pollution in Krasnodar Krai (Krasnodarskij kraj v cifrah, 2018)

Indicator (average annual value)	2015, MAC	2016, MAC	2017, MAC	2018, MAC	Increase, %	Increase, in volume terms
Concentration of iron	0.715	0.5	0.8	0.8	112%	0.085
Lead content	1.4	1	0.9	0.2	14%	-1.2
Pollution by oil products	0.35	0.35	0.2	0.3	86%	-0.05

3. Dynamics of emissions from stationary sources. As evidenced by the authors' analysis, the region's total emissions in the period 2008–2018 increased 5.6 times (678,000 tons). The most impetuous increase was registered between 2016 and 2018. The largest annual increase (+93 %) was posted in 2018. The share of the region's resort areas in its total volume of emissions has been quite small, as there are no major stationary sources of pollution (e.g., factories and industrial plants) in them.

At 2017, compared with 2014, Sochi posted a tangible decline in the number of stationary sources of pollution in the city. However, there was an increase in the volume of pollution per facility. In Gelendzhik, the number of polluting facilities rose 11 %, the volume of emissions rose 1.6 times, and the volume of emissions per facility rose 43 % for the same period. The largest volume of emissions and the largest number of polluting facilities among the cities examined in the study were posted by the city of Sochi (2017 data). The average volume of emissions per polluting facility in Sochi was, respectively, 1.6 and 3.6 times greater at year-end 2017 than the figures posted by Anapa and Gelendzhik. In 2014, the figures were six times vis-à-vis Gelendzhik and two times vis-à-vis Anapa. Figure 3 illustrates the dynamics of change in the number of stationary sources of pollution across a set of years and with a breakdown into the resort areas.

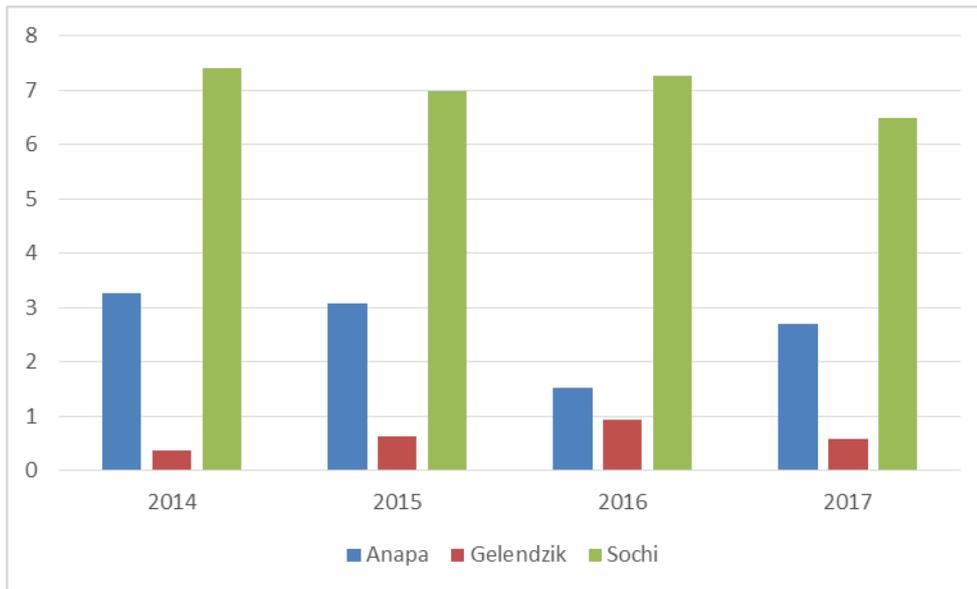


Fig. 3. Number of facilities with stationary sources of pollution to the atmosphere in Krasnodar Krai

The combined relative share of emissions between the three resorts in the region's total volume of emissions dropped from 5.8 % to 2.3 % in the period 2014–2017. It is also worth taking into account that in that period there was a decline in emissions in Anapa (-17 %) and in Sochi (-12 %). However, this drop in emissions was offset by a major increase in emissions in Gelendzhik (+58 %).

That said, the evidence from practice indicates that emissions from stationary sources are not the only (and not the largest) source of pollution in the region. The share of emissions from stationary sources in Krasnodar Krai's total emissions to the atmosphere varied from 18 % to 59 %.

In all of Krasnodar Krai's resort cities, the bulk (98-99 %) of pollutants emitted by stationary sources is accounted for by volatile organic compounds (VOCs). In volume terms, both in 2014 and in 2017 the largest amount of pollutants was registered in the city of Sochi. However, Sochi is the only city among those examined that posted negative dynamics on all the groups of pollutants. The worst situation with increase in emissions was observed in Gelendzhik and Anapa – 4.3 times and two times, respectively.

4. Combined area of protected nature conservation zones. This has been quite a stable quantity with Krasnodar Krai. Over the last few years, the region has not witnessed a significant increase in the combined area of its protected nature conservation zones. The maximum figure is 379.3 thousand ha (Vidishcheva i dr., 2020). Starting in 2015, the combined area of the region's protected nature conservation zones has been gradually shrinking and going back to the figures of 2008.

5. Discharge of foul wastewater. It is worth noting the absence of a pronounced dynamics when it comes to the dynamics of the level of wastewater discharge in the region within the system of environmental indicators of sustainability. This may be testimony to the implementation of restraining conservation policy. Over the last 10 years, the increase has been just 7 %, whilst in the period 2009–2012 alone the region's total volume of wastewater discharge rose 23 %. The figure has been smoothed by declines in foul wastewater discharge. If viewed in terms of fluctuation, the figure can rightfully be regarded as sustainable, as all changes in it in the last 10 years have been in the range of 200 million m³ (from 820 to 1,021 million m³).

6. Emissions to the atmosphere. The volume of Krasnodar Krai's emissions to the atmosphere has been growing rapidly, with an average annual increase of nearly 30 % posted. Over the last 10 years, the volume of pollution released to the atmosphere in the region has grown 69 %. The region's figures in terms of the structure of emissions indicate that the increase in emissions observed in recent years has been mainly associated with a rise in emissions from the activity of stationary sources of pollution (Figure 4). By contrast, the share of emissions from transportation in the region is less than 1 %.

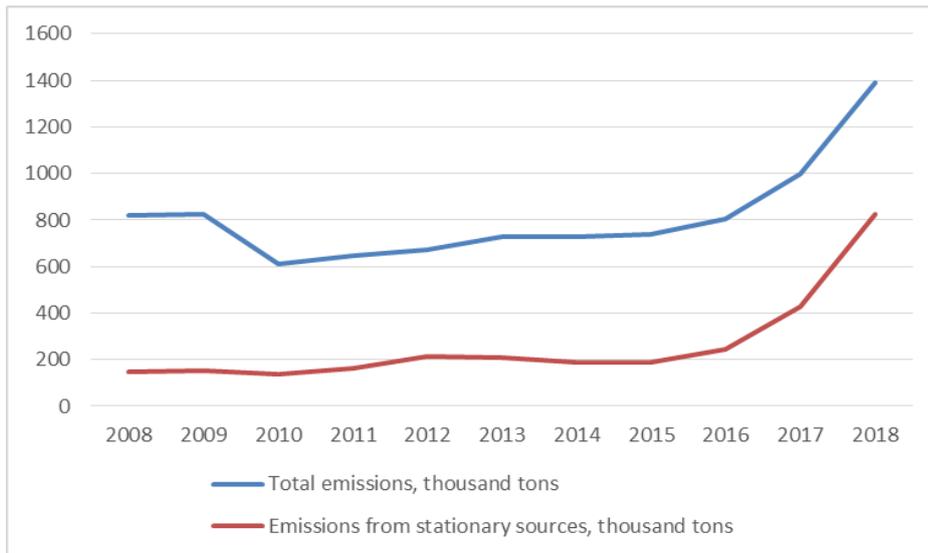


Fig. 4. Comparison of the dynamics of emissions from stationary sources with that of total emissions in Krasnodar Krai, thousand tons (*O sostoyanii prirodopol'zovaniya, 2019*)

7. Spending on environmental protection. The funding and organization of conservation activities is increasingly becoming a topical objective for the region's resort areas. The issue owes its relevance to the significant worsening of environmental situation throughout the region, caused by increased pressure on its hard-to-renew natural-recreational resources. Over the last six years, total operational spending has grown three times. In 2018, the figure was over 14.5 billion rubles. Sochi has been the undisputed leader in spending on environmental protection among the region's resort areas. The largest increase in spending was posted by the city in the period 2012–2014 (when facilities and infrastructure were being built in the area for the 2014 Winter Olympics). In the entire period under review, the city posted an increase of two billion rubles in related spending. However, relative to 2012 the best results were achieved by Anapa and Gelendzhik, which in the period under review posted an increase of 29.9 and 13.3 times in related spending, respectively.

Figure 5 illustrates the dynamics of spending on environmental protection in Krasnodar Krai as a whole and its key resort areas in particular.

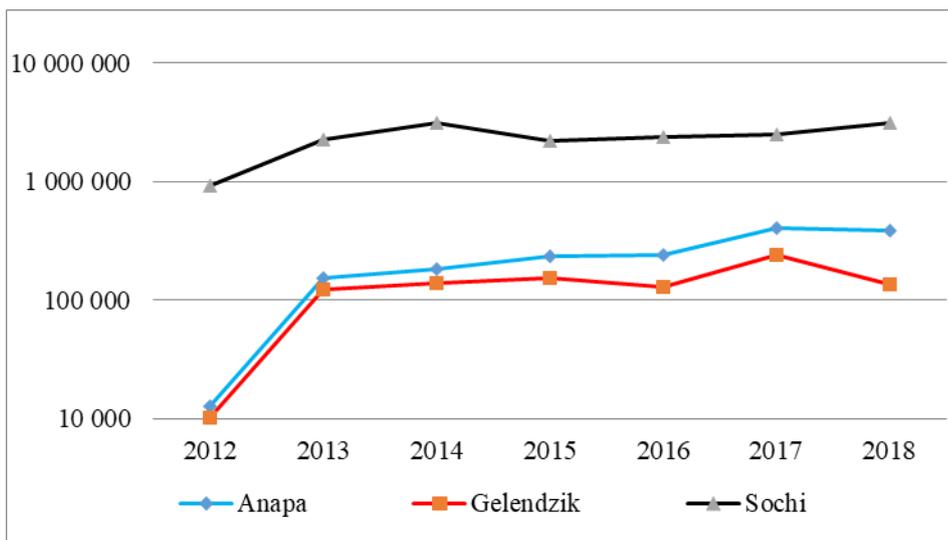


Fig. 5. Dynamics of spending on environmental protection in Krasnodar Krai (*Ohrana okruzhayushchej sredy*)

The need for conservation activities is largely associated with increased anthropogenic strain on the area. In this context, let us examine how much is currently spent on environmental protection per capita in the region. Based on data for the entire region and its key resort areas, the way in spending on environmental protection in the region is currently led, by a considerable margin, by Sochi, which spends on environmental protection four times the regionwide average. The rest of the regions in the sample have been actively posting an increase in related spending, with some periodically spending close to the regionwide average. Overall, on average, Krasnodar Krai's resort areas spend on environmental protection more than its areas with a different specialization.

Since the resort areas' production structure is not expected to change much in the near future (considering their sufficient natural-resource potential), the environmental condition they now are in as a result of economic activity in them (as shown above) cannot be regarded as wholly satisfactory, and the areas have yet to achieve optimum environmental condition. Spending on conservation activity in the region ought to be such as to prevent any damage to the environment whatsoever (Stepanko, 2013; Stepanko, 2016). Without minimizing environmental damage resulting from the large-scale impact of economic activity and transportation on the environment, it will be difficult to ensure effective nature management in and achieve the sustainable development of the region's resort areas.

Eliminating the environmental damage accumulated in Krasnodar Krai's resort areas, reducing the amount of waste, and reusing waste can be possible only via the purposeful attraction of investment toward waste processing, boosting spending on environmental protection, promoting the rational use of natural recreational resources, and ensuring a balanced structure of investment.

Ensuring the successful implementation of these activities will require assessing the environmental condition of the resort areas through the prism of existing industrial and natural processes and the way nature management is currently being handled in them (Stepanko, 2013; Stepanko, 2016).

4. Conclusion

The findings from the research reported in this paper have helped gain a useful insight into some of the key strengths and weaknesses of the development of resort areas in Krasnodar Krai and identify some of the key barriers standing in the region's way to environmental sustainability.

Below is an aggregate assessment of the degree to which the current development of resort areas in Krasnodar Krai is sustainable. The assessment is based on an analysis of data for Krasnodar Krai as a whole and its key resort areas in particular.

Strengths:

- Relatively stable volumes of foul wastewater discharged to the environment;
- Steady increase in spending on environmental protection.

Potential:

Expansion of conservation zones.

Weaknesses:

- Mechanism underpinning the allocation of funding being unstable;
- Significant increase in emissions to the atmosphere from various sources of pollution, including stationary ones and transportation;
- Significant increase in foul wastewater discharged to the environment in Krasnodar Krai.

Threats (barriers):

- Unsatisfactory quality of seawater;
- Increased recreational strain.

To be able to make effective use of data available on the subject, researchers will need to come up with efficient ways to process that information in an integrated fashion and develop efficient methods for modeling the environmental condition of and representing data on the resort region.

Research on the dynamics of pollution in Krasnodar Krai indicates that its resort areas tend to differ in terms of both particular components of pollution and indicators of the current

environmental condition. With that said, for particular resort areas in the region, and for the entire region as a whole, this condition is determined, above all, by the degree to which the following two resources, which are most significant to the successful development of tourism in an area, are polluted – water and air. An analysis indicates that at this point an exacerbation of certain environmental problems in resort areas in Krasnodar Krai appears to be inevitable.

The areas have yet to achieve optimum environmental condition. Spending on conservation activity in the region ought to be such as to prevent any damage to the environment whatsoever. A key focus in optimizing the areas' economic-social and natural relations ought to be on obtaining the required funding for conservation activities, structuring investment in environmental protection, and putting in place a cutting-edge system of technological processes related to economic activity in the areas, including waste treatment and recovery.

Integrated rational nature management ought to be regulated based on the concept of sustainable development, principles and methods of implementing sustainable development from a standpoint of new knowledge on ecology, and a whole new model for nature management itself that will reflect changes in the way one looks at an area's nature and resort-and-recreation resources and in one's notion of the place and role of nature management in the social-economic development of tourism regions and people's life activity.

The research reported in this work helps draw the conclusion that, while Krasnodar Krai's resort areas are on course for environmental sustainability, there remain issues that need to be addressed. The most serious factors hindering the region from achieving sustainable environmental development include air and seawater pollution, growing volumes of solid and liquid waste, and increased recreational strain on its resort areas, especially in the summertime.

Accordingly, there is a need to take an ecosystems approach to integrally assessing the environmental situation in the region's resort areas, which should help achieve the following:

- obtain a more comprehensive and accurate picture of the environmental situation in the resort areas and their tourism-recreational potential;
- monitor and forecast changes in the condition of the region's local ecosystem;
- determine maximum values for environmental strain and factors influencing the condition of the areas' recreational resources;
- ensure efficient decision-making on minimizing the impact of specific negative factors based on the Pressure–State–Response (PSR) framework, with a focus on carrying out effective conservation and restoration activities in the tourism region.

The primary focus in terms of the future development of the region's resort areas ought to be on achieving a state of harmony and balance between its economic, sectoral, and environmental objectives en route to sustainable development.

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