

Assessment of the Effect of Using Geographic Information Technologies in Identifying Taxation Objects and Violations of Land Legislation

Irina V. Gavrilenko ¹[ORCID 0000-0002-6530-473X],
Artem O. Rada ¹[ORCID 0000-0001-7678-8402],
Elena A. Fedulova ¹[ORCID 0000-0002-1820-3848]

¹ Kemerovo State University, Kemerovo, Russia
irinakalacheva@mail.ru

ABSTRACT

Digitalization and informatization of processes are an integral part of the society development. The industrial sector is also undergoing continuous improvement and implementation of new technologies. One of them is territorial planning based on geographic information systems. The study has been carried out according to the GIS AIS Kuzbass database. The aim is to identify taxation objects and violations of land legislation using geographic information technologies and to calculate the economic effect of using the data obtained on the region's economy. The objectives of the research are the following: determine the directions of using the geographic information systems; identify the advantages of geographic information systems; the possibility to identify taxation objects and violations of land legislation using GIS technologies; determine the economic effect of using the separate GIS-Kuzbass analytical layers on the region's economy. The object of the research is the GIS-Kuzbass geographic information systems. The subject of the research is a set of GIS-Kuzbass analytical layers. Descriptive, analytical and comparative methods have been used in the work. As a result of the study, the theoretical foundations of constructing and using geographic information systems have been studied, the directions of using geographic information systems have been determined, and the advantages of using these systems have been identified. The geographic information systems of the Kemerovo region (Kuzbass) GIS-Kuzbass has been considered, several directions of this system positive influence on the on the region's economy have been identified, namely (1) an increase in budget revenues of the region urban districts by increasing tax revenues from objects identified using GIS-Kuzbass, (2) an increase in the budget revenues of the region urban districts due to the income of fines for detected violations from objects discovered using GIS-Kuzbass. The use of GIS technologies in industry will have a positive effect and help to manage the available resources correctly.

Keywords: *geographic information system, digitalization in industry, analytical layers, GIS information blocks, GIS AIS Kuzbass, economic effect from implementing the GIS-technologies*

1. INTRODUCTION

For the purpose of managing space-time systems, the territorial planning tool has been actively used recently. With its help, regions can optimize the territorial distribution of production and socio-economic systems, determine the spatial distribution of resources [1-3]. Territorial planning has a fairly large impact on the region's economy and the possibilities of its interaction with the environment.

Today, territorial planning is impossible without the using the geographic information technologies, which have firmly entered our life in the wake of general informatization and globalization of all processes. GIS (geographic information system) is aimed at effective territory management by accumulating a large array of multifactor information.

Based on the results of studying the scientific literature, it was revealed that the use of geographic

information technologies in territorial planning has been studied quite extensively in such works as “Development of territorial management based on the use of geographic information systems” by V. Schepak [4], “Planning for territorial sustainability using geographic information systems” by A. Kaganovich [5], “Geographic information systems as new automated control systems” by V. Tsvetkov [6], which reveals the substantive aspects of GIS technologies. All mentioned works are focused on the description of introducing geographic information technologies in territorial planning, but they do not consider the possibilities of wider application of these technologies and the positive effect that territories can get from their use [7-10].

In connection with the above, the purpose of the study is to determine the possibility of using GIS technologies to identify taxable objects, violations of land legislation and, on this basis, to calculate the economic effect from the using the individual analytical layers of geographic information systems on the example of GIS-Kuzbass and Kuzbass economy.

2. MATERIALS AND METHODS

Descriptive, analytical and comparative methods have been used in the work.

To reach the purpose of the study, the data obtained using the Geographic Information System of the “Kuzbass” Automated Information System, which has been operating since 2019, have been used. This system is used by users to obtain the most detailed information about objects throughout the region for carrying out a set of activities by both the authorities and other companies – executors through the cartographic complex and the software and hardware part of the system.

GIS-Kuzbass is aimed at digitalizing all information data about the region in order to increase the effectiveness of control measures for careful operation, restoration and, if necessary, emergency response of the services responsible for the region’s infrastructure, as well as natural resources in this territory.

GIS-Kuzbass consists of several information blocks, each of which is divided into information subsections and layers. Information that can be analyzed in order to identify economic effects is contained in the “Analytical information” block, as it includes subsections related to monitoring the targeted use of land within the boundaries of

subsurface use, the targeted use of forest resources within the boundaries of forestries, and the use of land by linear infrastructure, the state of agricultural land.

The study has been carried out using the equipment of the Center for Shared Use of Scientific Equipment of Kemerovo State University (KemSU), within the framework of agreement No. 075-12021-694 dated 05.08.2021, concluded between the Ministry of Science and Higher Education of the Russian Federation and the Kemerovo State University (unique contract identifier RF---2296.61321X0032).

3. RESULTS

As a result of displaying the “Cadastral land parcels: coal” layer in the GIS AIS Kuzbass geographic information system in the urban district territory, the following have identified:

- 1) objects with clear signs of the land parcels use for purposes other than that intended (2 units);
- 2) objects for which revision of title documents is required for conducting open mining operations on a land parcel (28 units).

Information about these objects is presented in reports in GIS AIS Kuzbass in Excel format. We present this information in *Table 1*. The table compiled on the basis of reports from the GIS AIS Kuzbass will allow determining the potential amount of fines that can be collected from legal entities (coal companies) for objects with clear signs of using land parcels for purposes other than that intended and for objects for which a revision of title documents is required for conducting open mining operations on a land parcel, which will further increase the budget revenues of one of the region urban districts.

Table 1 allows you to calculate the volume of unpaid taxes for the objects indicated above, namely the volume of the tax on the mineral resources exploitation, as well as the land tax, subject to the provision of additional data. This fact will make it possible to recover the amounts of unpaid taxes, as well as fines for non-payment of these taxes from coal companies, which will lead to an increase in the budget revenues of the urban district in terms of land tax.

For objects with clear signs of the land parcels use for purposes other than that intended, a fine may be imposed for the use of the land parcel for purposes other than that intended according to its

belonging to a particular land category and (or) permitted use in the amount of 1.5-2% of the land parcel cadastral value for legal entities, but not less

than 100.000 rubles (Art. 8.8, clause 1 of the Code of Administrative Offenses of the Russian Federation).

Table 1. Subsurface use objects in the urban district territory

No.	Land Category	Permitted Use	According to the Document	Status	Form of Property
Objects with clear signs of the land parcels use for purposes other than that intended					
1	Forestry fund lands	For the forest parks placement	For the forest management implementation	Recorded	Property of public law entities
2	Forestry fund lands	For the forest parks placement	For the forest management implementation	Recorded	Property of public law entities
Objects for which revision of title documents is required for conducting open mining operations on a land parcel					
1	Lands of settlements	For the industrial facilities placement	For the industrial facility placement (for the mineral resources exploitation)	Recorded	Property of public law entities
2	Lands of settlements	For the industrial facilities placement	Subsurface use	Recorded	-
3	Lands of settlements	For the mineral resources extraction and exploitation	Subsurface use	Recorded	-
4	Lands of settlements	For the industrial facilities placement	For mining and industrial structures	Recorded	Property of public law entities
5	Lands of settlements	For the industrial facilities placement	For the mineral resources exploitation	Previously recorded	Property of public law entities
6	No category	-	-	Previously recorded	-
7	No category	-	-	Previously recorded	-
8	No category	-	-	Previously recorded	-
9	No category	-	-	Previously recorded	-
10	No category	-	-	Previously recorded	-
11	No category	-	-	Previously recorded	-
12	No category	-	-	Previously recorded	-
13	No category	-	-	Previously recorded	-
14	No category	-	-	Previously recorded	-
15	No category	-	-	Previously recorded	-
16	No category	-	-	Previously recorded	-
17	No category	-	-	Previously recorded	-
18	No category	-	-	Previously recorded	-
19	No category	-	-	Previously recorded	-
20	No category	-	-	Previously recorded	-
21	No category	-	-	Previously recorded	-
22	No category	-	-	Previously recorded	-
23	No category	-	-	Previously recorded	-
24	No category	-	-	Previously recorded	-
25	No category	-	-	Previously recorded	-
26	No category	-	-	Previously recorded	-
27	No category	-	-	Previously recorded	-
28	Lands of settlements	-	For energy facilities, substation	Previously recorded	-

Source: Compiled by the authors

Several types of fines may be imposed on objects for which revision of title documents is required for conducting open mining operations on a land parcel:

- 1) a fine for unauthorized occupation of a land parcel or part of a land parcel, including the use of a land parcel by a person who does not have the rights to the specified land parcel provided for by the legislation of the Russian Federation in the amount of 2-3% of the land parcel cadastral value for legal entities, but not less than 100.000 rubles (Art. 7.1, clause 1 of the Code of Administrative Offenses of the Russian Federation);

- 2) a fine for the use of subsoil without a license for the use of subsoil in the amount of 800.000 to 1.000.000 rubles (Art. 7.3, clause 1 of the Code of Administrative Offenses of the Russian Federation);
- 3) a fine for non-payment of tax on the mineral resources extraction mined in this territory in the amount of 40% of the unpaid tax amount (Art. 122, clause 2 of the Tax Code of the Russian Federation).

The calculation results are presented in *Table 2* and *Table 3*.

Table 2. Calculation of the fines amount for the first group objects

No.	Land Category	Permitted Use	According to the Document	Status	Form of Property	Cadastral Value, thousand rubles	Estimated Fine Amount for Using a Land Parcel for Purposes other than that Intended, thousand rubles	
							Option 1	Option 2
							1.5%	2%
Objects with clear signs of the land parcels use for purposes other than that intended								
1	Forestry fund lands	For the forest parks placement	For the forest management implementation	Recorded	Property of public law entities	50492.9	757.4	1009.8
2	Forestry fund lands	For the forest parks placement	For the forest management implementation	Recorded	Property of public law entities	50492.9	757.4	1009.8
Total fines amount							1514.8	2019.7

Source: Compiled by the authors

Table 3. Calculation of the fines amount for the second group objects

No.	Land Category	Permitted Use	According to the Document	Status	Form of Property	Cadastral Value, thousand rubles	Estimated fine amount, thousand rubles			
							for Using a Land Parcel by a Person Who Does Not Have the Rights to the Specified Land Plot Provided for by the Legislation of the Russian Federation		for the Lack of a License for Subsurface Use	
							Option 1	Option 2	Option 1	Option 2
							2%	3%	800.0	1000.0
Objects for which revision of title documents is required for conducting open mining operations on a land parcel										
1	Lands of settlements	For the industrial facilities placement	For the industrial facilities placement (for the mineral resources exploitation)	Recorded	Property of public law entities	-	-	-	800.0	1 000.0
2	Lands of settlements	For the industrial facilities placement	Subsurface use	Recorded	-	458 389.3	9 167.8	13 751.7	800.0	1 000.0
3	Lands of settlements	For the mineral resources extraction and exploitation	Subsurface use	Recorded	-	658 298.9	13 165.9	19 748.9	800.0	1 000.0
4	Lands of settlements	For the industrial facilities placement	For mining and industrial structures	Recorded	Property of public law entities	-	-	-	800.0	1 000.0
5	Lands of settlements	For the industrial facilities placement	For the mineral resources exploitation	Previously recorded	Property of public law entities	-	-	-	800.0	1 000.0
6	No category	-	-	Previously recorded	-	56 438 .7	1 128.7	1 693.1	800.0	1 000.0
7	No category	-	-	Previously recorded	-	56 438.7	1 128.7	1 693.1	800.0	1 000.0
8	No category	-	-	Previously recorded	-	69.4	100.0	100.0	800.0	1 000.0
9	No category	-	-	Previously recorded	-	2 317.5	100.0	100.0	800.0	1 000.0
10	No category	-	-	Previously recorded	-	75.9	100.0	100.0	800.0	1 000.0

11	No category	-	-	Previously recorded	-	1 101 795.2	22 035.9	33 053.8	800.0	1 000.0
12	No category	-	-	Previously recorded	-	2 317.5	100.0	100.0	800.0	1 000.0
13	No category	-	-	Previously recorded	-	56 438.7	1 128.7	1 693.1	800.0	1 000.0
14	No category	-	-	Previously recorded	-	56 438.7	1 128.7	1 693.1	800.0	1 000.0
15	No category	-	-	Previously recorded	-	2 317.5	100.0	100.0	800.0	1 000.0
16	No category	-	-	Previously recorded	-	1 101 795.2	22 035.9	33 053.8	800.0	1 000.0
17	No category	-	-	Previously recorded	-	3 434 550.3	68 691.0	103 036.5	800.0	1 000.0
18	No category	-	-	Previously recorded	-	2 992 079.4	59 841.6	89 762.4	800.0	1 000.0
19	No category	-	-	Previously recorded	-	209 386.8	4 187.7	6 281.6	800.0	1 000.0
20	No category	-	-	Previously recorded	-	56 438.7	1 128.7	1 693.1	800.0	1 000.0
21	No category	-	-	Previously recorded	-	3 772 368.1	75 447.3	113 171.0	800.0	1 000.0
22	No category	-	-	Previously recorded	-	11 775 908.6	235 518.2	353 277.2	800.0	1 000.0
23	No category	-	-	Previously recorded	-	70 950.1	1 419.0	2 128.5	800.0	1 000.0
24	No category	-	-	Previously recorded	-	4 531 467.0	90 629.3	135 944.0	800.0	1 000.0
25	No category	-	-	Previously recorded	-	2 223 576.3	44 471.5	66 707.3	800.0	1 000.0
26	No category	-	-	Previously recorded	-	451 730.4	9 034.6	13 551.9	800.0	1 000.0
27	No category	-	-	Previously recorded	-	1 203 566.3	24 071.3	36 106.9	800.0	1 000.0
28	Lands of settlements	-	For energy facilities	Previously recorded	-	5 371.9	107.4	161.1	800.0	1 000.0
Total fines amount							685968.5	1028702.8	22400.0	28000.0

Source: Compiled by the authors

Therefore, depending on the assigned level of the administrative fine for the objects presented above (1.5% or 2% of the cadastral value), due to the payment of these fines by legal entities, the budget revenues of the urban district can be increased by 1.514.788 rubles at a time (1.5%) or 2.019.718 rubles (2%). Therefore, when assigning fines for all the 28 objects above for unauthorized occupation of a land parcel or a part of a land parcel, including for using a land parcel by a person who does not have the rights to the specified land plot provided for by the legislation of the Russian Federation, depending on the assigned fine level (2% or 3% of the cadastral

value) budget revenues of the urban district can be increased by 658.968.549 rubles (2%) or 1.028.702.823 rubles (3%). What is more, when a fine is imposed for the lack of a license for subsurface use, depending on the assigned fine level (800.000 or 1.000.000 rubles), the budget revenues of the urban district may be increased by 22.400.000 rubles or 28.000.000 rubles. Also budget revenues of the urban district can be additionally increased by paying fines for non-payment of land tax. The potential amount of an increase in the budget revenues of the urban district is presented in *Table 4*.

Table 4. Potentially possible amounts to increase the city district budget revenues

Objects Group	Fine Name	The Amount of the Fine, Depending on the Assigned Option, thousand rubles	
Objects with clear signs of the land parcels use for purposes other than that intended	Fine for using a land parcel for purposes other than that intended	1 514.8	2 019.7
Objects for which revision of title documents is required for conducting open mining operations on a land parcel	Fine for using a land parcel by a person who does not have the rights to the specified land plot provided for by the legislation of the Russian Federation	685 968.5	1 028 702.8
	Fine for the lack of a license for subsurface use	22 400.0	28 000.0

Source: Compiled by the authors

Depending on the fines imposed and their level, the total increase in the budget revenues of the urban district may vary.

It should be noted that in the long term, when using geographic information systems on a permanent basis, a potential reduction in the fines collected is expected both in absolute amounts and in percentage for the same violations as a result of an increase in the collection level of both the land tax and a reduction in the use of land for purposes other than that intended, without the stipulated rights to a land parcel or in the absence of a license for the subsurface use.

4. DISCUSSION

There, the introduction of digitalization in territorial planning makes it possible to analyze a large array of data and track all areas of activity in a particular region in a more detailed way. This, in turn, will contribute to the development of not only industrial potential, but also the regional economy.

Analyzing the data obtained from the geographic information system GIS AIS Kuzbass, directions that have a positive impact of this system on the region's economy have been identified:

- 1) increase in budget incomes of the region urban districts due to an increase in tax revenues;
- 2) increase in budget incomes of the region urban districts due to the receipt of fines for detected violations.

5. CONSLUSION

As a result of the study carried out on the basis of the GIS AIS Kuzbass database, the possibilities of using geographic information systems in the digitalization of industry have been identified and the advantages of their use for regional economy have been determined.

The goal achieved in the process of the study emphasizes the importance of introducing geographic information systems in the regions territory.

The use of geographic information systems in industry will allow to achieve better results, and its application in the urban districts territory, from an economic point of view, as well as the correct interpretation of information obtained through the use of such systems, will further improve the economic condition of both urban districts and the

region. In the future, this will contribute to the improvement of the economic condition of the country as a whole.

AUTHORS' CONTRIBUTIONS

The authors made an equal contribution to the study: collection and analysis of material; definition of goals and objectives, research methods; formulation and scientific substantiation of conclusions, registration of key research results in the form of an article.

ACKNOWLEDGMENTS

The study has been carried out using the equipment of the Center for Shared Use of Scientific Equipment of Kemerovo State University (KemSU), within the framework of agreement No. 075-15-2021-694 dated 05.08.2021, concluded between the Ministry of Science and Higher Education of the Russian Federation and the Kemerovo State University (unique contract identifier RF---2296.61321X0032).

REFERENCES

- [1] O.A. Nesterova, "Geoinformation systems as the tool of creation of ground information systems", *Izvestiya of Saratov University. Earth Science*, 2007, vol. 7(2), pp. 35-37. (In Russ.). DOI: 10.18500/1819-7663-2007-7-2-35-37
- [2] A. Karmanov, A. Knyshev, "Geographic information systems of territorial administration", St. Petersburg: ITMO University, 2015. (In Russ.).
- [3] D.T. Vu, L.H. Trinh, T.H. Tong, "Application of remote sensing technology and GIS for monitoring the change of land cover due to the impact of bauxite extraction. Case study in Tan Rai bauxite project. Lam Dong province. central highlands region of Vietnam", *Sustainable Development of Mountain Territories*, 2021, vol. 1(47), pp. 58-65. DOI: 10.21177/1998-4502-2021-13-1-58-65
- [4] V.V. Shchepak, "Development of territorial management based on the use of geographic information systems", *Business Inform*, 2015, vol. 10(453), pp. 74-79. (In Russ.).
- [5] A.A. Kaganovich, "Planning for territorial sustainability using geographic information systems" [Planirovaniye territorial'noy ustoychivosti s ispol'zovaniyem

- geoinformatsionnykh sistem], Izvestiya Saint-Petersburg State Agrarian University, 2017, vol. 46, pp. 203-207. (In Russ.).
- [6] V.Ya. Tsvetkov, “Geographic information systems as new automated control systems” [Geoinformatsionnyye sistemy kak novyye avtomatizirovannyye sistemy upravleniya], *Izvestia Vuzov. Geodesy and Aerophotography*, 2003, vol. 1, pp. 115-124. (In Russ.).
- [7] O.Y. Smyslova, T.V. Bashlykov, I.V. Osipova, D.V. Lakomova, “Monitoring features of the spatial development of Russia using geoinformation systems”, *International Research Journal*, 2020, vol. 6-4(96), pp. 98-102. DOI: 10.23670/IRJ.2020.96.6.131
- [8] E.S. Zakiev, S.K. Kozhakhmetov, “Prospects for using remote sensing data in the armed forces. other troops and military formations of the Republic of Kazakhstan”, *Military Technical Courier*, 2021, vol. 69(1), pp. 196-229. DOI: 10.5937/vojtehg69-28698
- [9] R. Tomlinson, “Thinking about GIS: Geographic Information System Planning for Managers”, New York: ESRI Press, 2007.
- [10] U.S. Rodina, “The essence and concept of geographic information systems”. (In Russ.). Retrieved from <https://scienceforum.ru/2017/article/2017029794>