

# Digital solutions for municipal differentiation of sustainable development in the subject of Russia

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**Abstract.** Using digital technology the municipal differentiation of sustainable development of the subject of Russia - the Samara region - was investigated. The rating of municipal districts according to the digital data of environmental sustainability was compiled. The most favorable environmental environment was characterized by the districts geographically located on the periphery of the region regardless of natural and climatic conditions. Environmental risks and threats to sustainable development developed in the municipal territories adjacent to large urban agglomerations. The authors analyzed the medium-term strategies for sustainable development of the region's municipalities. These documents revealed a significant difference in the number of environmental objectives, which sometimes do not coincide with the real situation. A typology of districts by the number of planned environmental sustainability programs was compiled. In order to reduce municipal differentiation, it was proposed to implement the provisions of state federal, regional and municipal programs of sustainable development in the corresponding territories, taking into account municipal characteristics.

## 1 Introduction

Sustainable development - the modern ideology of the world community. The literature analyzes the experience of localization and implementation of sustainable development goals in the leading countries [1]. It is noted the translation of these goals in strategic documents that determine the main directions of Russia's development in the short and medium term [2]. The impact of digitalization on social systems is widely discussed in developed countries [3-5]. In the sphere of digitalization, certain trends are found in the main dimensions of institutional efficiency [6]. Green and digital economy is considered as a tool for sustainable development [7]. The digital sphere also determines the environmental goals in municipal development [8]. Concepts of strategic environmental assessment are being developed, including a variety of principles, approaches and areas of research [9]. Digitalization of sustainable development of municipalities denotes the use of

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information systems, input, storage, processing and provision of information about the ecological state [10]. A variety of indicators are used to assess the state, including a complex character [11, 12].

## 2 Methodology

The aim of the study is to assess the state of sustainable development in the municipalities of the Samara region and to identify among them leaders and outsiders on environmental indicators. Based on the analysis of strategic documents of territorial development to establish trends and promising areas to improve the environmental situation locally.

In order to achieve this goal, the following tasks were consistently solved in the work:

1. ranking of municipal districts by digital environmental data of sustainable development;
2. Municipal districts with the most favorable ecological environment and increased ecological threat were identified;
3. A comparative assessment was made of the environmental objectives to be achieved in the medium-term development strategies of municipal districts;
4. The state federal, regional and municipal programs of sustainable development in the Samara region were analyzed.

The objects of the study were 27 municipal districts of the Samara region. In determining the rating we proceeded from the fact that it is a tool of information transparency, acts as a numerical and ordinal indicator of the importance and significance of the characteristic determined. The less harmful objects, emissions, discharges, waste generation, water intake, the larger the area of SPNA, the higher the rating, the lower its numerical value. As numerical data we used gross and specific indicators given in the official statistical handbooks and annual reports of the Ministry of Forestry, Nature Management and Environmental Protection of the Samara region [13-15]:

- 1- Objects of negative impact on the environment, units.
- 2- Emissions of pollutants from stationary sources, thousand tons per year.
- 3-Emission of pollutants from stationary sources, t/year per 1 person.
- 4-Emission of pollutants from stationary sources, t/year per 1km<sup>2</sup>.
- 5-Water withdrawal from natural water bodies, m<sup>3</sup>/year/per person.
- 6-Discharge of polluted sewage into surface objects, m<sup>3</sup>/year/per person.
- 7-Proportion of SPNA of regional importance in the total area of the territory (%).
- 8-The volume of waste generation, tons/year/per 1 person.
- 9-Waste generation, tons per year/per 1km<sup>2</sup>.

The materials for the study were the official strategic documents of socio-economic development, valid for the medium term until 2025-2030. These documents are placed in the digital field of the sites of administrative districts.

Methods of grouping, description, comparison, mathematical analysis and logical construction were used.

The ranking of municipal areas in terms of numerical data on sustainable development shows a significant differentiation (Table 1)

**Table 1.** Rating of municipal districts by digital data of sustainable development.

Municipal districts	Digital data and the place of the municipal district									Overall ranking
	1	2	3	4	5	6	7	8	9	
Alekseevsky	3	11	14	13	9	7	5	16	11	9
Bezenchuk	19	12	8	12	21	17	17	13	15	16
Bogatovsky	4	20	19	22	14	14	6	24	21	18

**Table 1.** Continued.

Bolsheglushitsky	5	9	11	7	13	1	5	8	6	6
Bolshechernigovsky	16	22	22	20	6	1	14	12	9	15
Borsky	10	5	3	4	4	1	1	11	11	2
Volzhsky	21	27	20	27	17	6	15	18	23	22
Elkhovsky	3	3	5	5	26	21	3	2	1	7
Isaklinsky	12	16	18	19	1	1	6	9	7	9
Kamyshlinsky	11	21	23	23	5	3	16	7	8	13
Kinelsky	17	26	25	26	20	9	19	25	22	24
Kinel-Cherkasskiy	20	17	12	16	23	4	6	23	18	17
Klyavlinsky	8	6	7	6	7	11	4	5	4	4
Koshkinsky	15	15	15	18	10	12	9	15	13	15
Krasnoarmeisky	9	14	16	14	15	1	3	14	12	11
Krasnoyarsky	23	13	6	11	18	16	8	20	19	16
Neftegorsky	6	23	21	25	25	18	7	21	20	21
Pestrovsky	13	4	4	3	11	1	11	26	17	10
Pohvistnevsky	14	10	9	10	19	5	13	22	16	14
Privolzhsky	1	1	1	1	27	13	5	1	2	3
Sergievsky	22	18	13	15	24	19	5	17	19	19
Stavropolsky	24	24	16	21	22	8	20	10	10	20
Syzransky	9	25	24	24	16	20	18	27	24	23
Khvorostyansky	2	2	2	2	3	2	2	19	14	1
Chelno-Vershinsky	5	8	10	9	8	10	12	4	4	8
Shentalinsky	18	7	8	8	2	1	10	3	3	5
Shigonsky	7	19	17	17	12	15	16	6	5	12

Source: author's calculations

So, Bezenchuksky district, being in 21st place for water intake from natural water bodies, was in 8th place for the emission of pollutants from stationary sources. Syzran district was in 27th (last) place by the volume of waste generation, but in 9th place by the number of objects of negative impact on the environment.

The districts with the most favorable ecological environment, according to the aggregate data, can include: Khvorostyansky, Borsky, Privolzhsky, Klyavlinsky, Shentalinsky. Geographically these districts are located on the periphery of the region regardless of the natural and climatic conditions. Environmental risks and threats to sustainable development have developed in the following municipal districts: Kinelsky, Syzran, Volzhsky, Neftegorsky, Stavropolsky. They are confined to relatively large urban agglomerations and concentration of potentially hazardous industries.

The vision of the future is laid out in the medium-term Strategies of sustainable socio-economic development of municipalities [16]. The comparative assessment and analysis of the documents collectively identified 13 environmental objectives (directions). At the same time, a significant difference in the frequency of occurrence of these directions was revealed. We have divided them into four groups (Table 2).

**Table 2.** Frequency of occurrence of environmental sustainability objectives in municipal strategies.

Group	Environmental objectives	Number of municipal strategies, pcs.
First	Health saving, water supply, sewage, waste management	27
Second	Parks development, surface water rehabilitation, environmental education	17-21
Third	Protecting water, forests, and land	8-12
Fourth	Reducing emissions, increasing biodiversity, improving and expanding protected areas	1-6

Source: author's calculations

The first group with ubiquitous occurrence in municipal strategies includes the solution of the problem of the health of the population of the territory, and closely related to it, environmental-engineering tasks (modern water supply, wastewater disposal and waste management). The fourth group of the minimum number of presentation plans in the strategic documents is devoted to the reduction of emissions, preservation and increase of biodiversity, improvement and expansion of the areas of protected areas. Two intermediate groups in terms of the prevalence of environmental objectives are also identified.

Municipal districts differ significantly in the number of environmental objectives (directions) of sustainable development, which can be divided into three groups (Table 3).

**Table 3.** Grouping of districts according to the number of environmental sustainability tasks.

Group	Number of tasks, pcs.	Number of districts, pcs.	Municipal districts
First	9-10	8	Bolsheglushitsky, Kamyshlinsky, Krasnoarmeisky, Alekseevsky, Bezenchuksky, Borsky, Kinelsky, Krasnoyarsky
Second	7-8	10	Bogatovsky, Bolshechernigovsky, Volzhsky, Klyavlinsky, Neftegorsky, Pestravsky, Koshkinsky, Pohvistnevsky, Syzranovsky, Shentalinsky
Third	5-6	9	Elkhovsky, Isaklinsky, Privolzhsky, Sergievsky, Stavropolsky, Khvorostyansky, Shiginsky, Kinel-Cherkassky, Chelno-Vershinsky

Source: author's calculations

The largest number, 9-10 of the 13 identified tasks, was identified in 8 district strategies (Bolsheglushitsky, Kamyshlinsky, Krasnoarmeisky, Alekseevsky, Bezenchuksky, Borsky, Kinelsky, Krasnoyarsky). The smallest number (5-6 directions) - in 9 districts (Elkhovsky, Isaklinsky, Privolzhsky, Sergievsky, Stavropolsky, Khvorostyansky, Shigonsky, Kinel-Cherkassky, Chelno-Vershinsky).

On the territory of Samara region the national project "Ecology" is implemented quite effectively. The region participates in six federal projects: "Improvement of the Volga", "Clean Water", "Conservation of Forests", "Clean Country", "Conservation of unique water bodies", "Integrated System of Solid Waste Management" (Table 4).

**Table 4.** Degree of implementation of regional projects of NP "Ecology" in the Samara region, as of 2020.

Federal projects	Regional projects and facilities
"Clean Country"	- design and estimating
"Preservation of unique water bodies"	- design and estimating
"Recovering the Volga"	- Construction and installation work for the reconstruction of sewage treatment facilities was started, - Design work for the reclamation of the Rozhdestvenno settlement area was started.
"Conservation of Forests"	- reforestation on a total area of 716.6 ha, while the plan was 689.3 ha (104%), - the ratio of the area of reforestation and afforestation to the area of felled and dead forest plantations" amounted to 289.9 % (98.6% of the plan), - 7.77 tons of forest seeds were harvested, while the plan was 2.96 tons (262% of the plan), - 5.13 mln planting stock of forest plants were harvested (100.1 % of the plan, 5.1 mln plants were planted according to the plan). (100.1 % of the plan - 5.12 mln. pcs), - 7 pieces of silvicultural equipment and 59 pieces of forest fire-fighting equipment were purchased

**Table 4.** Continued.

"Clean Water"	<ul style="list-style-type: none"> <li>- the construction of water supply networks in the village of Kandabulak was completed, the construction of water supply networks in the village of Kalinovka in Sergievsky municipal district was started, - work began on the reconstruction of the water intake, NFS and water pipeline in the settlements of Glushitsky and Penzeno in Bolsheglushitsky municipal district,</li> <li>- The percentage of the region's population "supplied with quality drinking water from centralized water supply systems" was 85.7% (the plan was 84.2%),</li> <li>- share of urban population of the region "provided with quality potable water from centralized water supply systems" - 88,67% (plan fulfilled).</li> </ul>
«Integrated Solid Waste Management System»	<ul style="list-style-type: none"> <li>- Stage of using the electronic model of the regional scheme of waste management,</li> <li>- A waste-sorting complex was commissioned near Novokuibyshevsk with a capacity of 40,000 tons per year,</li> <li>- Share of the municipal solid waste sent for utilization in the total volume of the generated municipal solid waste - 24,2 %, the target value - 37,6 %,</li> <li>- Share of solid waste sent for utilization in the total volume of generated MSW - 7.1%, the target figure being 3.8%,</li> <li>- Share of imported equipment for treatment and disposal of MSW - 10% (100% of the plan)</li> </ul>

Source: Compiled by the authors on the basis of open source materials

The implementation of these projects are at various stages and at a relatively high level of performance of the planned indicators.

For realization of ideas and perspectives of sustainable development in Samara region there are state regional programs of ecological orientation (Table 5).

**Table 5.** State regional programs of ecological orientation in the Samara region

N	Program name	Period of validity	Approval document*
1.	Environmental protection of Samara region	2014-2025 and 2030	27.11.2013 № 668
2.	Clean water	2019-2024	24.07.2019 № 508
3.	Improvement of the waste management system, including solid municipal waste in Samara region	2018-2022	31.08.2018 № 522
4.	Revitalization of the Volga. Construction and reconstruction (modernization) of treatment facilities of centralized water disposal systems	2019-2024	26.07.2019 № 514
5.	Development of communal infrastructure in the Samara region, Subprogram "Development of water supply, water treatment and wastewater disposal systems	2014-2021	29.11.2013 № 701
6.	Development of forestry in the Samara region	2014-2030	14.11.2013 № 621
7.	Development of the water management complex of Samara region	2014-2030	30.10.2013 № 579
8.	Elimination of accumulated environmental damage and reclamation of former industrial sites in the Samara region	2014 -2020	29.11.2013 № 703
9.	Protection of population and territories from emergencies, fire safety and safety of people on water bodies in the Samara region	2014-2021	27.11.2013 № 678
10.	Sustainable development of rural areas of Samara region	2014-2017 and to 2021	13.11.2013 № 616
11.	Health care development in the Samara region	2014-2021	27.11.2013 № 674

Source: Compiled by the authors on the basis of open source materials (\* - Resolutions of Samara Region Government)

### 3 Discussion

Digital data on the environmental component of sustainable development allowed us to conduct a rating assessment of municipalities. The territories with the most favorable ecological environment include the districts geographically located on the periphery of the oblast, regardless of natural and climatic conditions. Environmental risks and threats to sustainable development were formed in the municipal districts confined to relatively large urban agglomerations and the concentration of potentially hazardous industries.

A comparison of the rating and the number of planned directions in the strategic documents of the sub-regions' environmental development indicates a significant difference in the municipal approaches to determining the goals of sustainable development. In the Borsky Municipal District, despite its relative environmental well-being, the maximum possible number of environmental programs is planned for implementation. Other districts from this group (Klyavlinsky and Shentalinsky) outlined a moderate number of programs, and Privolzhsky and Khvorostyansky districts - the minimum number. Among the environmental outsiders only Kinelsky district follows the logic of accelerated improvement of the ecological environment and has put in place for the future implementation of the maximum accepted in the region variety of environmental projects. Other ecologically disadvantaged districts (Syzransky, Volzhsky and Neftegorsky) are among the "mediocre" in the number of environmental programs. Stavropolsky District, despite its relatively high anti-rating, planned the minimum number of environmental initiatives in the municipal development strategy, and found itself in the third, last group.

As of 2020. Samara region is actively involved in the implementation of the national project "Ecology". In the region there are 6 federal projects with the definition of specific objects and numerical targets at a relatively high level of implementation. To implement the ideas and prospects for sustainable municipal development there are 11 state regional programs of environmental orientation, some of which require adjustments and transformation.

### 4 Conclusion

1. The rating on the basis of digital environmental data reflects the differentiation of municipal districts of the Samara region in terms of sustainable development. Relatively prosperous territories are located on the periphery of the region.

2. The strategic documents of socio-economic development together establish 13 environmental objectives (directions). At the same time, a significant difference in the frequency of occurrence of these directions has been revealed. Municipal districts differ significantly in the number of environmental objectives planned for implementation.

3. Municipal authorities should make considerable efforts to implement the ideas and prospects of sustainable development in their territories. First and foremost, to join state federal and regional environmental programs and to implement the requirements of the programs in municipal strategic documents. This requirement is especially important for municipal districts that are inferior in environmental rating to effectively developing sub-regions.

4. Digital solutions must be more widely used in the information field of sustainable development. This will significantly improve the environmental and social environment, both in each individual municipal district and in the Samara region as a whole.

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