

Assessment of the Sustainability of the Development of the Regions of the Siberian Federal District According to the Degree of Achievement of Goal 7 of the MDGs

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This work presents the analysis of Siberian Federal District regions major social-ecological-economic statistics based on research of the indicators of the Goal 7 “Ensuring Environmental Sustainability” of UN Millennium Development Goals (MDG). The results are analysed and discussed. Goal 7 contains three objectives and eight indicators. Energy intensity can be considered a key indicator of sustainability. The analysis of the social-economic development programs of the Siberian Federal District regions shows that most of the regions have not yet achieved the indicator levels of Goal 7, and the progress towards the goals is uneven. The regional authorities need to correct the programs of social-economic development in order to achieve the UN MDG goals. The comparison between Goal 7 indicators and goal progress results makes clear that the regions should pay more attention to the social-economic development directions as a basis for the development of the natural, economic and societal capital.

1. Introduction

In 2000, the UN Millennium Summit adopted a program to improve the lives of mankind, called the Millennium Development Goals (MDGs), reflected in the 2015 MDG report (UN, 2015). The program identified the eight goals aimed at improving people's welfare, including social, economic and environmental components. A system of targets and indicators for the MDGs has been developed, which is designed to assess the effectiveness of actions to implement human development policies in the world and in individual countries. Specific targets, including quantifiable ones, are identified for each goal. A set of statistical indicators has been developed for each task. “Environmental Goal 7” aims to ensure the environmental sustainability of our planet and individual countries. The “Goal 7” objectives (UN, 2015) reflect two main challenges of environmental sustainability: (1) Reduce human impact and depletion of natural resources; 2) Improve environmental conditions for human development, reduce environmental threats to human safety, health and residence.

The problem of achieving the Sustainable Development Goals (SDG) is relevant both within the framework of the international agenda (Giannetti et al. 2020) as well as for the socio-economic development of the Russian Federation. The fundamental principles of Russia's transition to sustainable development were laid down in the Concept of the Russian Federation's transition to sustainable development, adopted by the 1996 Presidential Decree (PRAVO.GOV.RU, 1996).

Russia actively participated in shaping the UN sustainable development agenda, taking into account its priorities. In this regard, an assessment of the sustainable development of the Russian Federation regions is of great importance. The results of the assessment should help to optimise the development of regional socio-ecological and economic systems. Approaches to assessing sustainable development have been developed

by many authors. In the work of Bobylev et al. (2011), the issues of measuring sustainable development have been studied. Korchagina (2012) overviewed several methods for assessing the sustainable development of regional socio-economic systems. Abazova et al. (2014) considered the factors of sustainable development of Russian regions. Sakharov and Kolmar (2019) analysed the prospects for the implementation of the UN Sustainable Development Goals in Russia. Smeshko (2020) studied the regional aspects of sustainable development. Nikonorov et al. (2020) considered the aspects of sustainable development of the regions of the Volga basin. The authors sought to balance the interests of the various social groups with the other two pillars of sustainable development – the preservation and development of natural and economic capital. Smirnova (2019) proposed a rating assessment of the economic and industrial development of the Siberian Federal District (SFD) regions based on a generalised indicator. The same approach was applied to a case study (Smirnova, 2020) assessing the sustainable development of the SFD regions.

Unfortunately, there are very few works devoted to the comparative assessing the sustainable development of individual regions of the Russian Federation (RF). Official statistics that allow calculating indicators of sustainable development are published belatedly and not in full. These works showed that sustainability assessment and sustainable development indicators could be an effective tool to support decision-making for the progress toward the SDG of the region.

The Siberian Federal District of the Russian Federation is well endowed with natural resources. Large amounts of oil and gas, coal, uranium, ferrous, non-ferrous and precious metals, wood, water and hydropower resources are concentrated in the area. The large Siberian rivers and Lake Baikal deserve the status of strategic resources of the entire Earth. The natural resource base provides for the development of the mining and processing industry, mechanical engineering and metalworking, energy, gold, coal and uranium mining, the construction materials industry, the timber industry, the production of electrical machinery, the food and light industry, and the development of the agro-industrial complex. The SFD plays a significant role in the economy of the Russian Federation (RF). Its Gross Domestic Product (GDP) is 7.5 % of the GDP of Russia.

The extraction and processing of natural resources are associated with a simultaneous effect of the negative anthropogenic impact on the environment and its components (Klemeš, 2015). Emissions of pollutants into the atmosphere, originating from the RF in 2017 amounted to 7,578.4 kt according to the report (ZAPOVED.RU, 2017). The document also summarises that the share of the urban population living in cities with high and very high levels of atmospheric air pollution is 42 %, 1,640×10⁶ m³ of contaminated wastewater was discharged into natural reservoirs, 4,417 kt of production and consumption waste were formed. Another finding is that, compared to 2010, the area of specially protected natural territories has decreased.

Evaluations of SDG compliance worldwide are available (Cernev and Fenner, 2020) but studies on the issues in the RF are scarce. The goal of the work is to perform a comparative assessment of the environmental sustainability of the development of the regions of the Siberian Federal District on the basis of achieving the target values of the indicators of Goal 7 of the MDGs.

2. Method

The assessment of the achievement of Goal 7 was carried out on the basis of an analysis of the dynamics and target values of the indicators. In the course of the work, official statistical information for the period from 2008 to 2018 was collected and analysed. These include the state reports "On the state and environmental protection of the Russian Federation" (ZAPOVED.RU, 2017) prepared by the Ministry of Natural Resources of the Russian Federation, as well as the statistical collections "Regions of Russia. Socio-economic indicators" (ROSSTAT, 2019), strategies and programs for the development of the regions of the Siberian Federal District. Objectives, indicators, their type, targets in Goal 7, adapted for Russia, are presented in Table 1. Considering the capabilities of Russian statistics, eight indicators were identified, of which 2 are environmental, 2 are environmental-economic, and 4 are socio-environmental.

To compare the relative achievement of MDG Goal 7 by the regions of the Siberian Federal District, an integral indicator is proposed that considers the relative contribution of each indicator. At the same time, the achieved value of each indicator is initially normalized within each year for all regions of the Siberian Federal District with respect to the best indicator. For indicators expressed in percentages, for which an increase in the value corresponds to an improvement, the normalization was carried out according to Eq(1):

$$\tilde{I}_{ij} = \frac{I_{ij}}{\max(I_{r1}, I_{in})} \quad (1)$$

where I_{ij} is the achieved value of the i -th indicator in the current year of the j -th region, \tilde{I}_{ij} is the normalized value of this indicator, n is the number of indicators available for the current year, $\max(I_{i1}, I_{in})$ is the maximum achieved value of the indicator in all regions of the Siberian Federal District.

Table 1: Millennium Development Goal 7 targets and indicators for the Russian Federation

MDGs targets for Russia	Indicators of progress towards the goal for Russia (I_i)	Indicator type	Target for Russia in 2015
Target 1 Include sustainable development principles to country strategies and programs and to prevent loss of natural resources	1. Area with forest cover (I_1)	Ecological	At least 47 %
	2. Percentage of protected territories to maintain terrestrial biodiversity of the environment (I_2)	Ecological	18-20 %
	3. Power intensity (I_3)	Environmental-and-economic	Not more than 78 % to the 2005 level
	4. Carbon dioxide emissions (I_4)	Environmental-and-economic	Decrease by 27-28 % to the 1990 level
	5. Population rate living in highly polluted cities (I_5)	Socio-ecological	28 million people.
Target 2 Provide the population with clean drinking water	6. Percentage of the housing stock equipped with water supply (I_6)	Socio-ecological	95 % of urban housing stock; 53-54 % of the rural housing stock
Target 3 Improve the quality of housing conditions of the population	7. Percentage of housing stock equipped with sewage (I_7)	Socio-ecological	87 % of urban housing stock 44-45 % of the rural housing stock
	8. Share of emergency housing stock (I_8)	Socio-ecological	1.5-1.6 %

For indicators expressed in percentages, for which a decrease in the value corresponds to an improvement, the normalization was carried out according to the equation:

$$\tilde{I}_{ij} = \frac{100 - I_{ij}}{100} \quad (2)$$

since for these indicators, the best result corresponds to the minimum value (in the limit of zero).

For indicators expressed in dimensional units, the best value of which corresponds to the smallest value, the normalization was carried out according to the formula:

$$\tilde{I}_{ij} = \frac{\min(I_{i1}, I_{in})}{I_{ij}} \quad (3)$$

The normalised indicators were summed up for all years for which their values were available according to statistical reports, with subsequent normalization to the maximum achieved value within each year:

$$\tilde{\tilde{I}}_{ij} = \frac{\sum_i \tilde{I}_{ij}}{\max(\tilde{I}_{i1}, \tilde{I}_{in})} \quad (4)$$

3. Results

3.1 Assessment analyses indicators of Millennium Development Goal 7 targets description

The dynamics of indicators in achieving Goal 7 was analysed for the regions of the Siberian Federal District. The percentage of the area with forest cover is a key ecosystem criterion. The SFD fully meets the requirements of MDG Goal 7, and the prospect of forest wealth conservation and expansion is favourable. The value of the indicator for Russia in 2015 should be at least 47 %, and in most regions of the Siberian Federal District, the forest cover is higher than this value. The highest level of this indicator has been revealed in Irkutsk Region (82.8 %). That is followed by the Trans-Baikal Territory (68.2 %), Tomsk Region (61.6 %) and

the Republic of Buryatia (63.7 %). Below the average Russian value of the indicator fall the Altai Republic, in the Altai Territory, Krasnoyarsk Territory, in the Novosibirsk and Omsk Regions.

Another key criterion is the share of protected territories to maintain the terrestrial biodiversity of the environment. According to this indicator, the Altai Republic, Irkutsk and Kemerovo Regions are the most prosperous. In these regions, the value of the indicator is higher than the Russian average, which should be 18 % in 2015. In the Altai Republic (26.5 % share), the indicator already exceeds the target value of 2015.

Energy intensity of Gross Regional Product (GRP) is a major indicator of environmental sustainability, reflecting both economic and environmental aspects. Its target value is reflected in the main target indicators in the strategic documents of the country's development, for example, decrees of the President of the Russian Federation (PRAVO.GOV.RU, 2008). This indicator should be included in the regional socio-economic development programs. The power industry development is closely linked to environmental and economic indicators. According to (ROSSTAT, 2020), the highest energy intensity (in t OE/10 M RUB) is observed in the Republics of Khakassia (372.56) and Tyva (373.41), Irkutsk (255.38) and Kemerovo (449.23) regions. Tomsk (114.76) and Novosibirsk regions (104.27) and the Altai Republic (129.28) achieved the lowest impacts.

The decrease in the power intensity of GRP may indicate a decrease in the consumption of natural fuel resources and related products due to energy-saving technologies. On the other hand, the decrease in the indicator may be partly resulting from an increase in the added value of the final products. Concerning the CO₂ emissions criterion, it was not possible to estimate the released CO₂ emissions by regions of the SFD due to the lack of sufficient information. CO₂ emissions are not recorded in the regions yet.

The percentage of the housing stock equipped with water supply reflects the proportion of the population with sustainable access to a source of quality drinking water. The regions with a sufficiently high share of water-supplied housing were Kemerovo (by 31.3 %), Novosibirsk (by 24.9 %) and Tomsk (by 11.5 %) regions. The other regions show a positive trend in the indicator too. The regions with a small share of the housing stock with water supply were the Altai Republic, the Republic of Buryatia and the Republic of Tuva.

The percentage of housing stock provided with sewage was evaluated. The regions with a low share were the Altai Republic, the Republic of Tuva and the Republic of Buryatia. A high share was found in Kemerovo (by 31.3 %), Novosibirsk (by 24.9 %) and Tomsk (by 11.5 %) regions.

The share of the population living in highly polluted cities allows monitoring the main factor which leads to an increase in morbidity and mortality. A significant reduction in this share is needed. The target value of the indicator was exceeded in the Republics of Buryatia (by 71.9 %), Tyva (by 40.8 %), Khakassia (by 77.3 %), Altai region (by 24.6 %), Trans-Baikal (by 24.6 %) and Krasnoyarsk (by 77.7 %) regions, Irkutsk (by 40.4 %) and Novosibirsk (by 126.2 %) regions. In the Altai Republic, Omsk and Tomsk regions, there no population lives within a high level of pollution. In the other regions, the population living in cities with high levels of pollution is dropping, denoting a positive development in the Siberian Federal District.

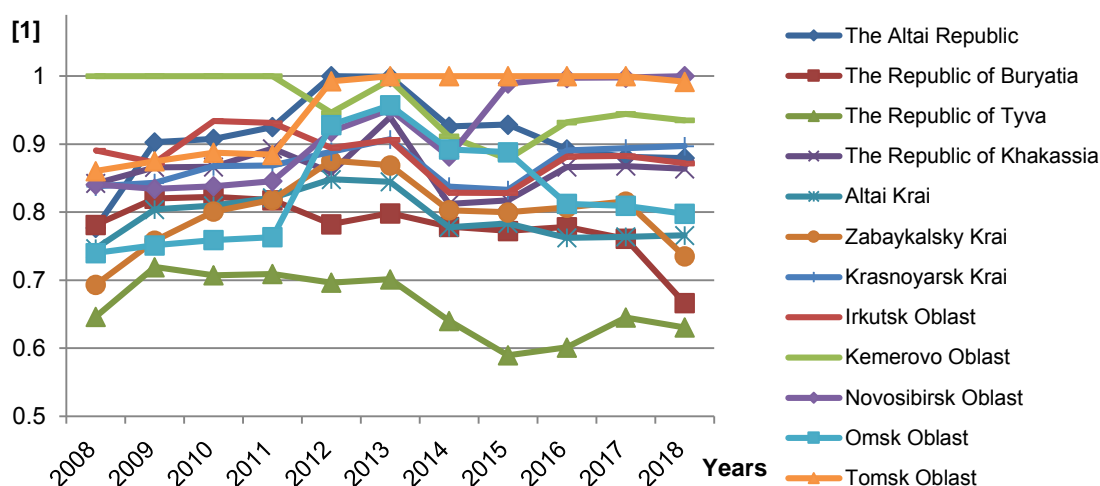


Figure 1: Variation of the integral indicator of sustainable development for the regions of the SFD

The share of degraded and dilapidated housing stock reflects the proportion of the population living in unfavourable housing conditions. In general, in the Siberian Federal District, there is an increase in the share of housing in an emergency condition. The problem may be related to the lack of sufficient funds in the budget

for the maintenance of the housing stock. The Novosibirsk and Omsk regions have the lowest share of emergency housing stock. The target value of the indicator was achieved only in the Omsk region (1.3 %). In other regions, the target value of the indicator was not yet achieved. In summary, the analysis established that partial compliance with the target values of MDG Goal 7 was achieved in Kemerovo (compliance with 2 indicators) and Tomsk regions (2 indicators), as well as in the Trans-Baikal Territory (in 2 indicators).

3.2 Comparison of achievement of MDG Goal 7 by regions of the Siberian Federal District

To compare the relative achievement of Goal 7 of the MDGs by the regions of the SFD, the integral indicators for all regions from 2008 to 2018 were calculated using Eq(4). For indicators h_1, h_2, h_6, h_7 , the normalisation was carried out by applying Eq(1), for indicators h_5, h_8 , — Eq(2), for indicator h_3 (GRP energy intensity) — Eq(3). The integral indicators have been evaluated, which enables one to trace the relative dynamics of the aggregate achievement of MDG Goal 7 for each region of the Siberian Federal District. Figure 1 shows the graphs of the variations in these indicators for all regions of the SFD from 2008 to 2018.

4. Discussion

The analysis of strategies and programs for the social-economic development of the regions of the Siberian Federal District shows that in most regions, there are no indicators of achieving Goal 7 of the MDGs. One indicator is included in the programs of the Republic of Buryatia and Irkutsk Oblast. The program of socio-economic development of the Tomsk Oblast, which includes 6 indicators, is most focused on achieving MDG Goal 7. The analysis of the regional strategies and programs after 2015 showed that the corresponding environmental indicators are present in these documents in a slightly larger number (Table 2).

Table 2: Number of environmental indicators of sustainable development in regional strategies and programs

Regions	Number of MDGs	Number of SDGs
The Altai Republic	0	1
The Republic of Buryatia	1	4
The Republic of Tyva	0	4
The Republic of Khakassia	0	1
Altai Krai	0	5
Zabaykalsky Krai	0	3
Krasnoyarsk Krai	0	4
Irkutsk Oblast	1	2
Kemerovo Oblast	0	4
Novosibirsk Oblast	0	9
Omsk Oblast	0	3
Tomsk Oblast	6	7

In the regions, there are almost no special documents on the Sustainable Development Goals implementation. Most of the tasks of sustainable development at the regional level are addressed through strategies and programs of social-economic development. The 2030 agenda by the UN (2015) provides for the continuation of the work that had begun during the period of the Millennium Development Goals (Millennium Development Goals) and sufficient compliance with those goals that have not been achieved (Bedritsky, 2017).

5. Conclusion

The migration to the sustainable development of the regions of the Siberian Federal District makes it necessary to include environmental indicators in the system of basic social-economic indicators of strategies and programs for regional development. The highest degree of compliance with the target values of the MDG Goal 7 indicators in industrialised regions has been achieved by the Novosibirsk and Tomsk regions and the Altai Krai. Most of the SDG indicators are included in the development strategies of those regions. This has to be further strengthened, to attract investments and federal subsidies to the problematic areas, for example, in the housing renovation, the water supply infrastructure, energy efficiency improvement programs. In the less developed regions, the level of achievement of the target values of the Goal 7 indicators is lower. This is because in the absence of indicators of the Sustainable Development Goals, it is difficult to implement investment programs due to the limited possibility of obtaining federal support. These include practically all republics and regions that do not have strong economic development and live mainly on federal subsidies.

The analysis of regional strategies and programs after 2015 showed that they are poorly focused on achieving sustainable development goals. To solve this problem, it is necessary to include relevant indicators in strategies and programs for the socio-economic development of regions and the publication of annual reports on the achievement of the SDGs.

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