Analysis of the implementation of sustainable development goals and information support systems using the example of the Rostov region

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Abstract. The purpose of the study is to analyze the compliance of the information support system with the goals of the transition to sustainable development of the territory. The object of the study is the Rostov region and the regional center - Rostov-on-Don. The article presents the dynamics of indicators from official statistics characterizing environmental pollution and its consequences. In response to the promotion of tax initiatives related to carbon footprints in different countries, Russia is implementing plans to develop a system for monitoring and accounting for pollutant emissions to improve the efficiency and timeliness of information. At the first stages of accounting for carbon dioxide emissions, the objects of monitoring are large stationary sources of pollution. At the same time, an important element of information support for making management decisions for the transition to sustainable development of a territory is information about the potential of the territory to resist environmental pollution (for example, the assimilation potential of the ecosystem of the main pollutants of the territory, the maximum permissible load on the ecosystem). The disadvantages of the assessment, verification and control methodology, the small number of pollutants involved in regulation, can significantly limit a number of alternatives that can be effectively used to transition to sustainable development of the territory. In addition, limitations in the methodology for collecting data and assessing pollution (for example, from motor vehicles) reduce the effectiveness of the information system and the adequacy of the analysis of the situation and decisions made in general.

1 Introduction

Sustainable development is not a fixed state of harmony, but rather a process of transformation in which the exploitation of resources, the direction of investment, technological development and institutional change are oriented towards the needs of both present and future generations [1].

While progress has been made on a number of targets (such as decarbonisation), the impacts of the climate crisis, geopolitical conflicts, a weak global economy and the lingering effects of the COVID-19 pandemic have exposed weaknesses and hampered progress towards achieving the 2015 UN Goals [2]. A recent study that analyzed data from 163...
countries found the following relationship between environmental sustainability and country risk: Environmental Performance Index scores correlate with country risk scores because both measures reflect good governance and effectiveness [3].

The transition to sustainability is critical. This is primarily due to environmental problems, namely unfavorable environmental conditions, which negatively affect public health and significantly increase government spending on health care. Environmental factors are known to influence a person's susceptibility to non-communicable diseases (eg asthma, cancer or diabetes). Non-communicable diseases account for more than 70% of premature deaths worldwide and also increase the burden on the immune system and susceptibility to infectious diseases [4].

Fine solid particles (PM2.5) and nitrogen dioxide (NO2) provoke diseases of the lungs, respiratory systems (such as allergies, bronchial inflammation and bronchial asthma, etc.) among children, increase the risk of premature birth and the birth of children with low body weight among women. Damage to health can be reduced by achieving “net-zero” emissions, a state in which greenhouse gas emissions are balanced by removals through greenhouse gas sinks [5].

Also, unfavorable environmental factors can lead to a weakening of the human immune system and reduce the body's protective functions. Increased long-term particulate air pollution is one of the external causes of lung disease and, in turn, an increase in the number of COVID-19 cases. Long-term air pollution may also contribute to increased mortality rates from COVID-19. An experiment covering air pollution data from 2002 to 2020 in Germany found that a 1 µg/m increase in average long-term air pollution 3 particulate matter PM2.5 correlates with an increase of 199 cases of COVID-19 per 100,000 inhabitants [6].

In many countries, transport is the main source of air pollution. To monitor the implementation of the sustainable development strategy in the EU countries, a system of indicators is used, including a number of transport indicators [7].

In Germany, vehicles emit critical groups of pollutants and significantly reduce air quality in large cities. As a result, the government is testing measures to reduce traffic-related pollutant emissions by introducing legal bans on driving diesel vehicles and providing more environmentally and climate-friendly public transport [8].

To achieve net-zero emissions, the EU has developed the Euro 7 standard, which sets rules for vehicle emissions and aims to improve air quality. It covers cars, vans and heavy vehicles in one piece of legislation [9].

Assessing the economic burden is of particular importance for policy making and mitigation of the impacts of transport pollution. The implementation of a sustainable development strategy in the long term can significantly reduce government spending on healthcare by reducing the level of morbidity among the population [10].

Achieving sustainability is only possible through the implementation of measures in a number of areas. Government intervention is critical to addressing environmental issues. Of particular interest is the study of the experience of China, where state influence on economic processes is great. Government reforms are critical to solving environmental problems. There has been a decrease in the level of pollutant emissions by 4% in the districts of China which implemented the state environmental social reform [11]. A 2018 experiment in China, covering data collected from 19,000 companies across the country, found a direct relationship between tax rates and the level of air pollutants released into the atmosphere. When the tax rate was increased, a decrease in emissions of some pollutants was observed [12]. To create effective incentives for polluters, it is important to take into account the amount of impact on the environment and the negative consequences of this.

Making smart, consistent and transparent decisions about sustainable consumption and production requires relying on science-based information. There are several methods for assessing environmental sustainability: the planetary boundaries method (Planetary
boundaries, PB), life cycle assessment method (Life Cycle Assessment, LCA) and sustainable development goals (Sustainable Development Goals, SDGs). For each of these methods, individual indicators must be developed, based on a “standard quality” that must be maintained or a goal that must be achieved [13]. In turn, indicators of sustainable cities can become a guide for areas that have just embarked on the path of transformation. For example, to address environmental issues, Norway’s standardized sustainable cities indicators have been adapted to the municipal level, and indicators have been proposed to track progress and monitor the status of specific environmental issues. A new approach, which is to use targets, proposes to include social and economic aspects in them. This will allow decision makers and stakeholders to prioritize actions to ensure urban sustainability [14].

Various factors influence performance. For example, digital transformation has a significant impact on optimizing production, business processes, increasing the efficiency of organizations, as well as reducing the concentration of pollutants in the atmosphere [15]. Approaches to assessing the consequences of decisions made largely determine their significance [16]. Methodological limitations of the transition to sustainable development of territories reduce the effectiveness of decisions made at different levels and stages of management [17]. The bias of published research leads away from the search for key problems of territorial sustainability and essentially duplicates known conclusions for different territories [18-21]. At the same time, one of the key stages of decision-making is their information support. As part of the research, after receiving the results, the authors pay attention to possible distortions associated with the information support system and the need for its development [19].

Also noteworthy is the dominance of economic goals in the formation of strategic environmental guidelines for the transition to sustainable development of the territory [22]. Such goals are mainly determined on the basis of the existing level of pollution in the territory [23]. Such an artificial “brake” of development is used to preserve the existing socio-economic system and the status quo between different territories. In the context of increasing changes in the external environment, the task of analyzing the implementation of sustainable development goals and information support systems in various territories is relevant.

2 Methods and data

Within the framework of this study, methods such as abstraction, system analysis, and synthesis were used. The initial data of official statistics on emissions of pollutants in the Rostov region, air pollution in the city of Rostov-on-Don, overall mortality and mortality by cause of death in the city of Rostov-on-Don are considered.

This study presents an analysis of information from official statistics on environmental pollution and its consequences in the Rostov region. Determining the compliance of the collected data with the environmental goals of the transition to sustainable development of the territory will be presented in the conclusion. In conclusion, a systematic analysis of trends in the development of information systems for the transition to sustainable development and existing in the Rostov region, an analysis of the program for changing the information support system is presented.

3 Results

We considered the dynamics of indicators presented within the existing information system (official statistics) and characterizing environmental pollution and its consequences.
The statistical data presents emissions from stationary and mobile sources of pollution [24]. The dynamics of the total mass of emissions of several pollutants is presented in Figure 1.

![Emissions of pollutants into the atmospheric air, thousand tons](image)

**Fig. 1.** Emissions of pollutants into the atmospheric air of the Rostov region, thousand tons (the diagram is based on information from [24])

According to official data, in 2022 there was a decrease in the mass of emissions of major pollutants. At the same time, the documents continue to generalize data on environmental pollution of the territory without taking into account the relative danger of pollutants [24], which reduces the adequacy of the analysis and decisions made.

From the point of view of assessing the consequences of pollution on the territory, the concentration of pollutants in the air and its deviation from the maximum permissible concentration are important. From the point of view of the impact on public health, the concentration of pollutants in the air and their excess of the maximum permissible concentration are important. Average values for a large area will distort the characterization of the situation. Therefore, we will consider data for the regional center and the largest populated area of the Rostov region - Rostov-on-Don. Figure 2 shows changes in pollutant concentrations.
Figure 2 shows the trend for the period 2018-2022. Air pollution levels from sulfur dioxide, nitrogen oxide and ammonia have increased. There has been a decrease in the level of pollution by suspended solids, carbon monoxide, phenol, carbon-containing aerosol (soot), hydrogen fluoride and benzo(a)pyrene [24]. A more adequate analysis from the point of view of management and sustainable development of the territory is an assessment of the deviation of actual concentrations of pollutants from the maximum permissible concentration.

The consequences of environmental pollution can be assessed using the dynamics of mortality (Figure 3) and detailing the causes of mortality (Figure 4).
The increase in mortality in 2020 and 2021 is likely due to the consequences of the spread of covid-19. Mortality increased due to diseases of the circulatory system and respiratory organs.

![Mortality by cause of death class](https://61.rosstat.gov.ru/storage/mediabank/%D0%95%D0%B6%D0%B5%D0%BE%D0%B4%D0%BD%D0%B8%D0%BA%202022(4).pdf)

Fig. 4. Mortality by cause of death classes in the Rostov region

Source: https://61.rosstat.gov.ru/storage/mediabank/%D0%95%D0%B6%D0%B5%D0%BE%D0%B4%D0%BD%D0%B8%D0%BA%202022(4).pdf

The information provided allows us to determine the general trends in the situation in the region. However, in order to evaluate alternatives and make effective decisions aimed at increasing the sustainability of the territory, it is necessary to detail information for local territories, increase the efficiency and accuracy of information.

4 Conclusion

The relevance of this study lies in the aggravated socio -ecological and economic problems in various territories. In the context of crisis global trends, economic development in the territory may experience negative consequences, which in the future may affect both the economic indicators of the region and the quality of life of the population. The main method of research and drawing conclusions is system analysis.

The dynamics of indicators directly or indirectly characterizing the quality of the environment of the Rostov region and the regional center - Rostov-on-Don are presented in Figures 1-4. The following official statistics data are considered: the masses of pollutant emissions on the territory of the Rostov region, the concentration of the main pollutants for the territory in the air of Rostov-on-Don, mortality and causes of mortality by enlarged groups.

Emissions from mobile sources are assessed using a methodology based on specific emissions, the values of which have not been updated for more than 5 years. Also, the methodology does not fully take into account the peculiarities of vehicle operation [22]. This may generally bias emissions estimates and limit the ability to analyze reduction alternatives.
At the same time, data on the concentration of pollutants in the air of Rostov-on-Don are presented from no more than 7 sampling posts [24]. For such a large city with more than a million people and an area of more than 348 square kilometers, the scale of research is clearly insufficient.

In the context of trends towards introducing taxation on greenhouse gases during the life cycle of all products entering the market (produced locally and abroad), there is a need to create a basis for assessing the carbon footprint of various types of goods. A pilot project involving such a system is currently being implemented in several regions of Russia. The Sakhalin Region was chosen as the first region to implement the experiment. The purpose of the experiment is to achieve carbon neutrality in the territory and develop tools for scaling the system (Federal Law "On Conducting an experiment to limit greenhouse gas emissions in certain subjects of the Russian Federation" dated 03/06/2022 No. 34-FZ. Source: https://www.consultant.ru/document/cons_doc_LAW_411051/). At stage 1, large production facilities with emissions of more than 50,000 tons of carbon dioxide per year will be subject to the accounting system (Federal Law No. 296-FZ of 07/02/2021 "On Limiting Greenhouse Gas Emissions". Source: https://www.pnp.ru/law/2021/07/02/federalnyy-zakon-296-fz.html).

The regulatory framework has been prepared in general. The system of accounting for carbon dioxide emissions is reduced to the provision of information by large stationary sources of pollution and verification of the data provided by authorized organizations. The specificity of the verification process makes it difficult to unify it. At the same time, the formation of law enforcement practice of verification involves a long process of adaptation. In addition, in order to achieve carbon neutrality at the regional level, in addition to reducing emissions, it is allowed to develop and implement "climate projects". It is assumed that such projects will increase the absorption capacity of the ecosystem of the region. The resulting effect in the form of emission quotas can be redistributed by project participants among interested polluter organizations.

In 2024, on March 1, the law on the state environmental system comes into force. In accordance with the law, Russia plans to transform the environmental information system. It is planned to increase the efficiency and complexity of information by combining information from several government services into a single database. At the same time, the set of indicators that will characterize the situation in the territories is limited to assessing the consequences. The new system continues to ignore the assessment of the territory’s natural potential to resist environmental pollution (for example, the assimilation potential of the ecosystem, the maximum permissible load on the ecosystem (more details in [16, 25]). According to our data, this direction in the plans for the development of the information system is provided only for carbon dioxide emissions, the methodology for evaluating and verifying data has not yet been sufficiently developed. This gap reduces the incentives to increase the natural potential of the territory and limits the ability to use such indicators in the emerging mechanisms of sustainable development at various levels of government).

Elements of the management system that reflect and form the conditions for the transition to sustainable development, including the methodology for assessing and reducing damage from environmental pollution [16, 22], targets and criteria for assessing environmental quality [25], an information support system for the adoption of management decisions, a system for the formation, implementation and evaluation of the effectiveness of management decisions [26] and others. In the context of the implementation of the agenda for reducing greenhouse gas emissions in different countries, it is planned to introduce fiscal economic instruments for any products that enter the market and do not take carbon footprint taxes into account in the price. To implement such tax instruments on your territory, you need an appropriate information system. Today, the information system lags behind emerging management tasks.
Summarizing what has been said, it can be noted that the element that determines the effectiveness of the entire management system is the information support system for making management decisions. It should include both the collection of initial data and an analysis of the situation based on methods adequate to the target guidelines. If the key goal for a territory is the transition to sustainable development, then it is necessary to create an adequate system for collecting primary data (monitoring and accounting) and a methodology for analyzing the situation in accordance with the target settings. The criteria for assessing the results of strategy implementation, in addition to tasks reflecting the degree of achievement of the goal, should take into account the economic efficiency of all alternatives. As a result, the limitations and gaps of any of the elements of the information support system for making management decisions hinder the transition to sustainable development and overcoming them is an important scientific and practical problem.

References

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