Foresight Technologies in the Formation of a Sustainable Regional Development Strategy

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 Abstract:

In the modern regional management system, new principles, methods and tools should be used. The purpose of this paper is to substantiate theoretical and methodological approaches to the application of foresight technologies as a modern tool for optimizing the system of regional management in the formation of a strategy for sustainable development.

The paper analyzes the Russian and international experience of foresight formation and identifies the features of foresight introduction at the meso level; a roadmap for the sustainable development of a region, developed based on an analysis of long-term forecast and program regional documents, as well as a SWOT analysis of the socio-ecological and economic system of the Republic of Tatarstan.

The study determines the significance of foresight technologies in the context of the formation of sustainable development strategies for regional and municipal administrations.

Recommendations on the developed "Roadmap for the Sustainable Development of the Republic of Tatarstan" were studied and used in implementing measures to ensure the sustainable development of the urban economy.

Keywords: Foresight, foresight technology, sustainable regional development, regional administration.

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1. Introduction

In recent years, Russia's economy has been under unprecedented external pressure and is facing serious internal challenges, characterized by a significant decline in industrial production, environmental degradation, growing social inequality, unstable political situation and other factors affecting the formation of the trajectory of sustainable development of regions (Gapsalamov *et al.,* 2018). When managing the socio-ecological and economic processes in a region, it is necessary to develop and use a strategic approach (Korableva and Kalimullina, 2016). The most important role here is played by the competent formation of target guidelines and priority areas of regional development. This cannot be done without sound management decisions that are oriented toward a long-term period. Undoubtedly, in the modern management system of a region, new principles, methods and tools need to be used. Foresight technologies can fully meet the goals and objectives of increasing competitiveness, as well as contribute to the sustainable development of a region.

2. Literature review

A review of academic literature devoted to studies of foresight technologies has shown that this topic is relevant and is widely discussed in online sources and various academic journals.

One of the first scientists who discovered the essence and provided the interpretation of foresight was Ben Martin (Martin, 1993; 2002). In his works, and later in the fundamental two-volume UNIDO, the following interpretation of the concept of foresight is presented: *"Foresight is the systematic attempt to look into the longer-term future of science, technology, the economy and society, with the aim of identifying the areas of strategic research and the emerging of generic technologies likely to yield the greatest economic and social benefits"* (UNIDO, 2005).

Keenan and Miles (2008) in their work studied the influence of various factors on the choice of the foresight method. These factors include: the availability of resources (primarily time and finance); the results to be obtained; sponsorship preferences; the nature of the subject domains in question; and target groups.

Among the Russian scientists who also studied the methodology and methods of foresight, one can note the work of Sokolov (2007). This paper analyzes the methods used in foresight projects, presents an analysis of implemented foresight projects in the leading economies of the world, and assesses the prospects for foresight development in Russia (Sibirskava *et al.,* 2016; Kovalenko *et al.,* 2016).

Despite the significant contribution of scientists and practitioners who studied foresight technologies and their application at the meso level, the topic of the influence of foresight technologies during the formation of a regional strategy in the light of the principles of sustainable development was not fully studied.

3. Methodology, Characterization and Analysis of Foresight Technology

Foresight differs from virtually all known tools of scientific prediction as it assumes the involvement of many interested strata of a civil society, not only in forming a picture of prediction but also in actively implementing the changes foreseen. At the same time, it is necessary to establish the subject of some agreement in the emerging civil initiatives. Even though foresight contributes to the desire to develop a consensus among active representatives of interested social strata, it still does not incline to disregard its interests. Dozens of applied methods of foresight research are described in academic literature as shown below:

1) The expert panel method: The application of the expert panel method is possible in almost all foresight projects. An expert group is invited for several months to think about possible options for the future in accordance with established themes, applying the most up-to-date information and analytical materials and developments (Sokolov, 2007).

2) The *scenario method*: One of the most effective technologies for projecting the future, which involves creating a detailed analysis, to be implemented under certain conditions, is the scenario method. The essence of this method is in the collection of multivariate texts, arranged around the detailed points. In this case, the prospective future is predicted and projected in parallel.

3) The Delphi method: For the purposes of forecasting and expertise, it is possible to use the Delphi method, which was developed by Gordon and Helmer in 1953 in RAND Corp. (USA) (Higgins, 1994). The essence of this method is to structure the process of collective communication, aimed at creating an enabling environment for the effective work of an expert commission over a complex task. Using independent expert panel polls in the Delphi method allows identifying the probability, significance and consequence of factors, trends and events associated with the task at hand. All answers, anonymously given by the participants in the expert group, are transferred to other participants according to the results of the survey, which enables experts to detail and adjust their own positions.

4) The method of brainstorming: One of the effective methods for solving a problem is the method of brainstorming developed by A. Osborn in 1953. The basis of this method is to stimulate creative activity, while the task of the participants in the discussion is to offer the maximum number of options for the solution. Subsequently, of all the claimed options, the most effective, suitable for use in practice are selected.

5) The trend extrapolation: Another widely used method of forecasting is trend extrapolation. This method is based on extrapolation, or, in other words, extension of the past trend towards the future.

6) The method of a technological roadmap: To develop long-term strategies for technology development, "Motorola" in the late 1970s was the first to introduce the method of a technological roadmap. Technological roadmaps mean the development of a visual representation of a technology development plan-scenario that captures plausible plots and critical decision points (Clayton, 2005),

(Andreeva *et al.,* 2018). The method of a technological roadmap gives an opportunity to prepare for the transformations and to take advantage of new opportunities.

In addition, it is necessary to mention several alternative methods for foresight, such as simulation and game modeling, singling out of critical technologies, analysis of global trends, multicriteria analysis (Miles *et al.,* 2003).

Thus, because of the analysis of several methods, a wide range of strengths and weaknesses of their application can be identified, while it is still problematic to choose and, especially, to combine the techniques of foresight research and this problem will remain among the core ones in researching this technology. The following principles should be considered when implementing foresight projects, regardless of the territory's level (Ladykova *et al.,* 2015):

- ✓ Interaction of different target audiences during the discussion and making long-term forecasts, strategies;
- ✓ Interconnection between participants;
- ✓ Aim for a long period;
- ✓ Approval;
- ✓ Systemic nature of the process based on the organized thinking of experts.

4. Strategy for a Sustainable Regional Development

It should be noted that, according to the authors, the use of foresight technologies can positively contribute to the formation of a strategy for the development of regions and municipalities, considering the principles of sustainable development. In modern Russia, the situation is such that the regions play a major role in its development. A favorable socio-economic situation in the regions is the key to the development of a strong and competitive state, as well as its sustainable development (Hassan *et al.,* 2018). At the same time, as the authors noted earlier (Nagimov, 2013; 2017) in recent years there has been a tendency to increase the independence of the regions, which are increasingly responsible for their own results. Regions should cope with the growth of social obligations; however, they are often in a situation where there is a shortage of own resources and making the budgets scarce.

This is the peculiarity of regional development of many constituent entities of the Russian Federation. Each region seeks to ensure social and environmental stability, and, at the same time, create conditions for economic growth and improve the quality of people's life (Kolmakov *et al.,* 2015). Thus, the concept of sustainable development is becoming increasingly relevant due to crisis trends in the socio-ecological and economic system of regional entities of the Russian Federation, which once again confirms the need for the speedy introduction of foresight projecting into the practice of regional governance. The introduction of foresight in

regions assumes the formation of a possible future in the present, considering available resources, conditions and opportunities, and the goals set for the region's development, as well as the possibility of managing the future.

It is sustainable development characterizing the course of socio-economic processes at different levels of the economy that should be sought, considering the specifics of the current situation (Gaponenko, 2008; Ekimova *et al.,* 2017). In addition, it is necessary to consider that the area of the territory of the Russian Federation is very large and there may be problems on consensus among different groups of foresight entities. Therefore, first, it is rational to implement foresight technologies at the regional level. Since the foresight horizon can be observed in the range of 10-100 years, foresight technology improves the quality of strategic planning. Nevertheless, each region has specific conditions and different resources, and, based on this, development and sustainable development programs can have a distinctive character.

5. Results

The authors developed a SWOT-analysis of the socio-ecological and economic system of the Republic of Tatarstan (Table 1).

Table 1. *SWOT-analysis of the socio-ecological and economic system of the Republic of Tatarstan (Nagimov, 2013)*

STRENGTHS:	WEAKNESSES:
– Advantageous geographical position; – Natural resource potential, which includes oil reserves, local building materials, agricultural land, water resources; – Stable political situation; – Interethnic and interdenominational consent; – Richness of the region with a variety of attractions; – Leading positions in expert ratings on many indicators of regional development; – Diversified sectoral structure of the economy; – Availability of competitive enterprises in the petrochemical and engineering industries; – Developed network of technoparks; – High scientific potential.	– High level of environmental pollution in the region; – Low degree of development and implementation of major environmental projects; – Relatively low levels of money income of the population; – Low level of small business development; – Low share in the regional economy of local high-tech; – Significant differences in the social and economic situation and economic potential between different municipalities of the region; – Significant depreciation of fixed assets.
OPPORTUNITIES:	THREATS:
– Improvement of the environmental situation, due to the implementation and operation of major regional projects; – Stimulating enterprises to switch to green technologies; – Stimulation of innovation through the	– Low investment attractiveness of non-primary sectors of the economy; – Reduction of support from the federal center in favor of other regions; – High dependence on the impact of

| implementation of various forms of public-private partnership;
– Integration with world leading enterprises;
– Creation of the largest educational and sports center;
– Implementation of large regional projects;
– Creating a favorable investment climate;
– Strengthening of the financial base of local self-government;
– Development of the event-driven economy;
formation and development of the region's brand. | fluctuations in the world market;
– Continuing instability of tax and budget legislation. |

This SWOT analysis considers local, regional and federal features, the multidimensionality of which fully indicates the strengths and weaknesses, as well as the opportunities and threats of the socio-ecological and economic system of the Republic of Tatarstan. The authors developed the *"Roadmap for Ensuring the Sustainable Development of the Republic of Tatarstan until 2050"* (Table 2, Figure 1).

Table 2. *Roadmap for the Sustainable Development of the Republic of Tatarstan until 2050*

Indicators	2018-2028	2028-2038	2038-2050
Gross regional product (million rubles)	3400000	5000000	7500000
Investments in fixed assets (million rubles)	1000000	1500000	2000000
Degree of depreciation of fixed assets (%)	28	20	10
Unemployment rate (%)	2,5	1,8	1,3
Average monthly nominal accrued wages of employees of organizations (thousand rubles)	75	140	225
Consumer spending on average per capita (thousand rubles)	33	48	63
Population with cash income below the subsistence level (% of the total population)	2,8	1,8	0,8
Volume of innovative goods, works, services (% of the total volume)	37	57	77
Total area of residential premises on average per one inhabitant (m^2)	36	47	54
Number of registered crimes per 100,000 people	960	770	550
Number of people involved in sports (% of the total population)	52,5	66,5	81,5
Morbidity per 1,000 people	660	515	350
Emissions of pollutants into the atmospheric air, departing from stationary sources (thousand tons)	180	130	80
Discharge of contaminated sewage into surface water bodies (millions of cubic meters)	270	125	5
Volume of circulating and consecutively used water (millions of cubic meters)	7200	9200	11200
Forest restoration (thousands of hectares)	8,7	13,7	18,7

Target guidelines for the development of the socio-ecological and economic system	Targeted research and development	Enhancing the region's competitiveness	Ensuring sustainable development

The benchmarks reflect generalized indicators that are ultimately aimed at improving the quality of life of the population and ensuring sustainable development of the region. In the values of 2050 in relation to 2018, there is a significant growth of socio-ecological and economic indicators. The importance of such indicators as *"population with cash incomes below the subsistence level", "unemployment rate"* and *"discharge of contaminated sewage into surface aquatic bodies"* will tend to decrease during the forecast period. Such a forecast is objective in the context of implementing measures aimed at ensuring sustainable development.

Figure 1. *Priority directions of regional development*
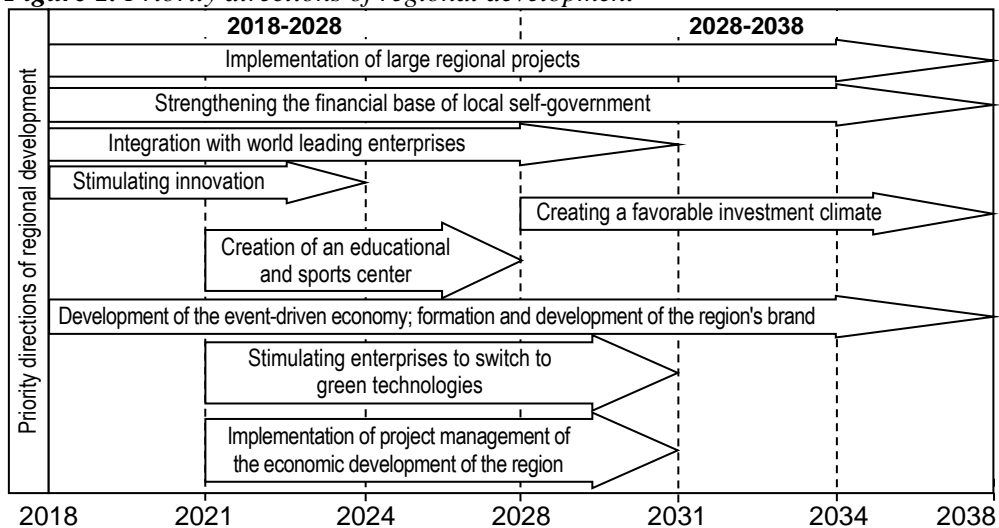

Figure 1 shows those areas of regional development, the development and implementation of which will enhance the region's ability to ensure sustainable development. The directions for implementing major regional projects and strengthening the financial base of local self-government should be held throughout the period. The future of all factors of the development of economy and quality of life of people will directly depend on the effectiveness of implementing priority areas.

The implementation of priority areas involves ensuring the process of their effective management. Modern tools of branding and project management strategies are aimed at creative formation of a strategy for managing regional development processes (Figure 2, Table 3).

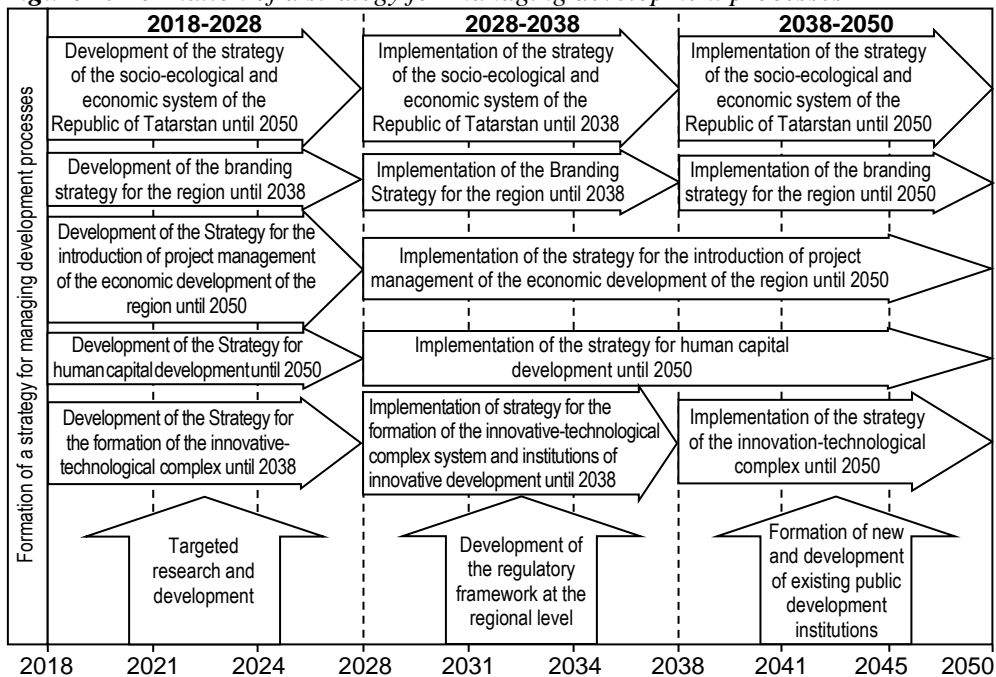**Figure 2.** *Formation of a strategy for managing development processes*

Table 3. *Formation of a strategy for managing development processes*

Targeted research and development	Development and amendments to the regulatory framework of the region	Formation of new and development of existing public regional development institutions
– Foresight project of development of the socio-ecological and economic system of the Republic of Tatarstan up to 2050 – Foresight project "Branding of the Republic of Tatarstan" – Development of a concept for the introduction of project management of the region's economic development – Development of social policy in the Republic of Tatarstan until 2050 – Formulation of a concept for the development of the education system in the Republic of Tatarstan until 2050 – Research of the technological chain and cluster approach in the	Laws and regulations: – "On conducting foresight on the socio-ecological and economic system of the Republic of Tatarstan" – "On the development of branding of the Republic of Tatarstan" – "On approval of the regulation on project management in the executive bodies and state bodies of the Republic of Tatarstan" – "On social policy in the Republic of Tatarstan" – "On education in the Republic of Tatarstan" – "On supporting enterprises switching to	– Formation of a working group coordinating the foresight projects – Development of discussion sites for foresight entities – Creation of a commission for project management in the executive bodies and state bodies of the Republic of Tatarstan – Creation of a regional agency for the development of branding of the Republic of Tatarstan – Development of institutions to support entrepreneurial activities – Establishment of a support fund for

leading sectors of the economy of the Republic of Tatarstan – Research of institutions of innovative until 2038 – Development of the concept of a regional innovation-technological complex – Foresight project "Republic of Tatarstan – 2050" – Research on the potential of large regional projects	green technologies" – "On the support of innovation development institutions" – "On the formation of an innovation-technological complex" – "On preparation and implementation of major regional projects in the Republic of Tatarstan"	enterprises, switching to green technologies – Forming a council for the implementation of major regional projects – Creation of public programs "Our teacher", "Our doctor", etc. – Development of scientific forums, media forums, conferences

Targeted research and development include concepts, research, foresight projects that can achieve the set goals. Attention should be paid to foresight technology, which involves engaging in the process of predicting the future and finding a consensus between officials, businessmen, the scientific community, journalists and others. The main task of developing and supplementing the regulatory framework at the regional level is to prepare a legal framework for the development of concepts, programs, development institutions, etc. Competent development of the regulatory framework will be a significant help in the formation of public development institutions and targeted research. Public development institutions are an integral part of effective management of processes, resources, implementation of potential programs (Kurbanova *et al.*, 2018). Increasing the role of public institutions in the future will play an important role in the development of the region's economic policy (Tarman and Chigisheva, 2017).

6. Discussion

In the research by scientists, various foresight technologies practices of different levels are analyzed. In the authors' opinion, before implementing full-fledged foresight technology when forming a sustainable development strategy for Russia, it is more rational to introduce foresight technologies at the meso level, in view of different conditions and different levels of socio-ecological and economic development of the regions.

Many scientists conclude that foresight optimizes the regional management system. Zolotukhina (2010) objectively stresses that it is foresight technology, as a management tool, that contributes to a great effect in the transition to sustainable development, since it can be achieved only with a clear understanding of its content and goals by all elements of the regional socio-economic system and awareness of the need for this transition.

Gibson *et al.* (2018) note with caution that the rapid development of technologies, tools and methods requires that organizers of foresight research use a specific conceptual framework in the preparation, execution and completion of such projects. Methods that have been successfully used during foresight research earlier may not

be suitable for solving today's problems. In addition, several authors, such as Georghiou and Cassingena (2013) and Bootz (2010), note and describe the gap between the theory and practice of foresight. This once again confirms one of the authors' hypotheses that it is necessary to apply a comprehensive approach in the preparation and implementation of the use of foresight technologies in the formation of a sustainable development strategy.

At the same time, Seidl da Fonseca (2016; 2017) researches emphasize that foresight, as well as the analysis of promising technologies, serves as a reliable tool for developing and monitoring scientific, technological and innovation policies based on preventive work with information. To improve the quality of expertise throughout the entire strategic foresight cycle, a logical structure consisting of three stages should be applied: design, implementation and assessment.

In this study, based on currently topical research and development in the field of the introduction and improvement of foresight technologies, the authors used the most successful economic methods and management tools. The study of statistical data, their comparison, as well as the interpretation of the results obtained, allowed the authors to develop and propose a "*Roadmap for the Sustainable Development of the Republic of Tatarstan until 2050"* (Table 2, Figure 1). The work defines the value of foresight technologies in the context of forming strategies for the sustainable development of regions and municipalities.

7. Conclusion

A feature of the modern regional economy is the desire to formulate a strategy for the sustainable development of a territory. Regions make their own decisions on which instruments to turn to realize their goals. The paper examined modern methods that enable a region to ensure further development considering the concept of sustainable development. The realities are such that public administration should become more transparent and open to the public. Foresight technologies, which presuppose the consensus of foresight parties (representatives of government, business, civil institutions, public organizations, scientists, etc.), allow forming ways and concrete steps for ensuring the sustainable development of a region. Consequently, a strategic approach to implementing sustainable development of regions is used, implying coherence with innovative, scientific, technical, political and other guidelines for the development of the socio-ecological and economic system.

In the authors' opinion, the combination of foresight technologies and project management will help to optimize the regional management system. The main advantages of the application of this method include a more accurate forecast of the scenario of social and economic development of the region, coordinated activity of executive authorities, including with federal executive bodies, optimized distribution of human, financial and time resources, timely response to changes in the socio-

ecological economic system of the region. It is still too early to provide practical results on the use and implementation of foresight projects in the national economy; nevertheless, the authors consider it as a promising direction for studying foresight tools in the context of ensuring the sustainable development of the region. This study determines the importance of foresight technologies in the formation of strategies for the sustainable development of regions and municipalities, as well as the effect of optimizing the regional management system, the multidimensionality of which fully indicates the strengths and weaknesses, as well as the opportunities and threats of a region's socio-ecological and economic system.

Thus, the concept of sustainable development is becoming more urgent due to the crisis trends in the socio-ecological and economic system of regional entities of the Russian Federation in modern conditions, which once again confirms the need for the speedy introduction of foresight in the practice of regional management. The developed practical recommendations on the content of management decisions, considering the specifics of the introduction of modern regional tools in the Russian economy, will facilitate the shift of regional entities onto the trajectory of sustainable development.

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