

# Foresight as a Tool for Managing the Socio-Economic Development of Mining Regions

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**Abstract.** At the present stage of development in the conditions of constant changes, the socio-economic development of mining areas is an extremely important issue for managers who make decisions, as the effectiveness of management tools depends on the further trajectory. In this aspect, mining regions need the introduction of modern management tools, taking into account the specifics of their functioning. However, the process of implementing such tools in practice can be a daunting task for the public management system. The article aims to explain the concept of using foresight technology in the management of socio-economic development of mining regions as a modern tool and to identify the main directions of its practical use. Based on the in-depth review of the scientific literature, a conceptual framework for improving the management of socio-economic development of mining regions in Ukraine is presented. It includes the gradual development of foresight-center of mining regions and foresight-network, which will improve public management of socio-economic development of mining regions.

## 1 Introduction

The main aim of managing the socio-economic development of mining regions is to create a unified concept of such development, identify and clearly see progressive changes taking into account the specifics of such regions, and, on this basis, form a system of development priorities and their further implementation. According to the authors, this opportunity is provided by foresight technology, which aims to ensure the most accurate and thoughtful approach to the development of regional planning strategies, as well as generating a common vision of society (government, local government, civil society) on socio-economic development of mining regions.

A regional foresight is a foresight with a territorial focus, where the territory is a geographical region of the subnational level that is part of one or more countries. It aims to inform and guide decisions made at this subnational level [1].

It should also be noted that in Ukraine the first thorough look into the future with the use of foresight technology concerned scientific and technological and innovative development. In particular, the information website "Foresight in Ukraine" was created in Ukraine, and

four scenarios of Ukraine's development were presented there [2]. Today, foresight technology is gradually gaining popularity. Also successful in conducting a national foresight is the study "Foresight of Ukraine's economy in the medium (2015-2020) and long-term (2020-2030) time horizons", conducted by the World Data Center for Geoinformatics and Sustainable Development of the International Council on Science (ICSU) [3]. The world experience of foresight development, in particular the organization of the expert environment and communicative connections in social networks, is used in practical activity in this direction.

## **2 Materials and Methods**

A significant contribution to the development of foresight theory was made by foreign experts such as T. Cuosa [4], M. Keenan, R. Popper [5], I. Miles [6], B. Habegger [7] and others. It should be noted that this theory was also developed by representatives of Japan and other countries in Southeast Asia.

A group of British researchers [8] points out that "foresight is a systematic, participatory process that accumulates a shared vision of the future and its construction in the medium and long term, as well as to inform current decisions and mobilize joint action".

According to L. Hochberg [9], foresight is a system of methods for expert assessment of strategic areas not only of socio-economic but also innovative development, identification of technological breakthroughs that can affect the economy and society.

According to [10], foresight is "a systematic attempt to look into the future of science, technology, society and the economy to ensure the prosperity of society, the economy and the environment".

According to the American economist B. Martin [11], foresight is "a systematic attempt to assess the long-term prospects of science, technology, economics and society to identify strategic areas of research and new technologies that can bring the greatest socio-economic benefits".

Recently, the term "foresight" is also gaining popularity as a description of a number of approaches and methods to improve the decision-making process. In particular, V. Tretyak [12] emphasizes that "foresight is not a document, but a process, a vision of the future that is constantly being adjusted". The essence of this process is "the future that is formed by reconciling the particular interests of different layers of civil society". The use of foresight helps to ensure that every active citizen of society would have the opportunity to participate in creating the future not only as an expert or participant in the project, but also as an active creator of the emerging future.

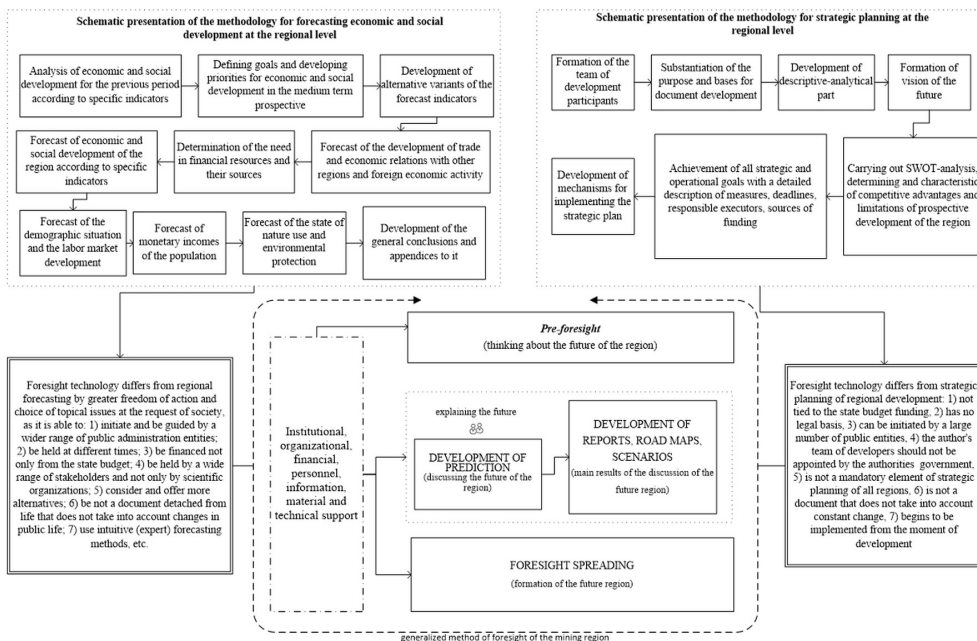
One of the most respected guides to regional foresight is *A Practical Guide to Regional Foresight*, [13] according to which: "Foresight is a systematic, joint process of building an image of the future in the medium and long term, aimed at improving the quality of decisions currently made and the coordination of joint actions".

At the same time, the concept of "regional foresight" is not widely studied in domestic literary sources. At the same time, the handbook on the regional foresight [13] defines it as "a means for those who live in a common area to better control their future development". It should be noted that this key characteristic of foresight, which allows to increase the activity of the population and promotes involvement in this process, is necessary for the socio-economic development of mining regions of Ukraine in today's conditions.

In Ukraine, the use of foresight began in the 90s of the XX century. The main factor hindering the process of its further implementation was the lack of proper interaction in the triad "government - business - science", as well as low efficiency of the public management and weak interdepartmental and intradepartmental coordination [14]. Based on the systematized capabilities of foresight-research, we conclude that foresight is a process of

active and continuous improvement of management, which meets modern requirements and includes a wide range of effective focus.

Consequently, according to the study of scientific sources, foresight technology can rightly be considered an important tool for predicting and building the future in the direction of socio-economic development of mining regions. Summarizing the experience gained, we can identify the method of foresight at the level of mining regions, as it is shown in Fig. 1.



**Fig. 1.** The generalized scheme of formation of a foresight technique of mining region (created by the authors).

It is worth mentioning that today in the domestic legislation there are no documents that would regulate the use of foresight technology at both national and regional levels of management of socio-economic development of mining regions. The experience of conducting regional foresights in Ukraine is still very insignificant, and the methods of conducting them are mostly based on established models of foreign experience. The main approaches to the formation of methods of foresight-research are presented in Table 1.

**Table 1.** The main approaches to the formation of methods of foresight-research.

Source	Methodology
N. Kalyuzhna [15].	1) pre-foresight (description of the current state of the region; definition of goals and rationale for foresight; selection of key areas for analysis); 2) foresight (definition of data collection methodology, data collection, processing, formalization, definition of products and results of foresight, preparation of conclusions); 3) spreading of results (discussion, implementation, evaluation of results)

<p>Regional policy of the European Union [16]</p>	<p>1) thoughts on the future (forecasting development options with the involvement of government, business, public; coordination of the vision of the future by participants; creating networks of highly qualified foresight experts); 2) discussion of the future (coordination of ideas about the future; development of experience of interaction and cooperation of business, the state and scientists; creation of a dialogue educational environment); 3) shaping the future (using the results of foresight to develop strategies and planning documents for the development of countries, regions and corporations).</p>
<p>R. Popper [17]</p>	<p>1) preparation for the study; 2) mobilization of participants; 3) prediction; 4) development of recommendations; 5) implementation of transformations</p>
<p>K. Vyshnevsky [18]</p>	<p>1) pre-foresight (determination of research areas and areas for road map development); 2) analysis of primary sources (preliminary list of promising technologies and products); 3) expert procedures (formation of information for research chains: technologies - products - market); 4) creative analysis (brainstorming); 5) interactive discussion (development of alternative strategies for achieving the goals of the subject area)</p>
<p>O. Verkhoturova [19]</p>	<p>1) preparation of a review of the foresight (preparation of a preliminary report with an overview of both the problem selected for the study and its features); 2) development of predictions (the main task is the selection of experts and the organization of their interaction in accordance with the selected methods; expert panels are formed according to the areas of analysis, experts are interviewed (Delphi method) or experts interact with other foresight methods (expert panels, symposia, organizational and activity games, foresight sessions); the results of surveys and the results of research activities are processed; preparatory material for road maps, possible scenarios that take into account technologies are formed; the impact of technologies on socio-economic processes of the region is analyzed; 3) preparation of reports, road maps, scenarios (documents prepared at the second stage are processed into final documents, scenarios and road maps, technology databases and expert databases are formed); 4) spreading of foresight (use of foresight results in the formation of strategies for the development of specific areas, the formation of research priorities, the development of a mechanism of state support and specific projects).</p>

Thus, in the framework of this study we can offer the following definition: foresight of mining regions is a specific tool of public management, which can be considered as a lever of influence of an integrated body formed by government, local government and civil society and which focuses on development and innovatization of such a region in certain areas, sectors of society or social technologies.

At the same time, the use of various areas of public management of socio-economic development of mining regions, which exist in world practice, should be implemented taking into account not only the current socio-economic situation, but also using the resource potential of such a region.

It should be emphasized that the need to improve the quality of life of the population is due to the low level of socio-economic conditions of mining regions, both in particular, and in the country as a whole. Management systems of such regions develop multi-purpose programs to address priority problems of socio-economic development, taking into account the main features of their not only social and economic, but also environmental conditions,

the quality of which depends on the level of their real development. In our opinion, such programs should be developed using a modern methodology for making effective and necessary management decisions. So, the foresight will improve the process of ensuring the socio-economic development of mining regions. Thus, the set of indicators of such development should reflect various spheres of vital activity of mining region (Table 2).

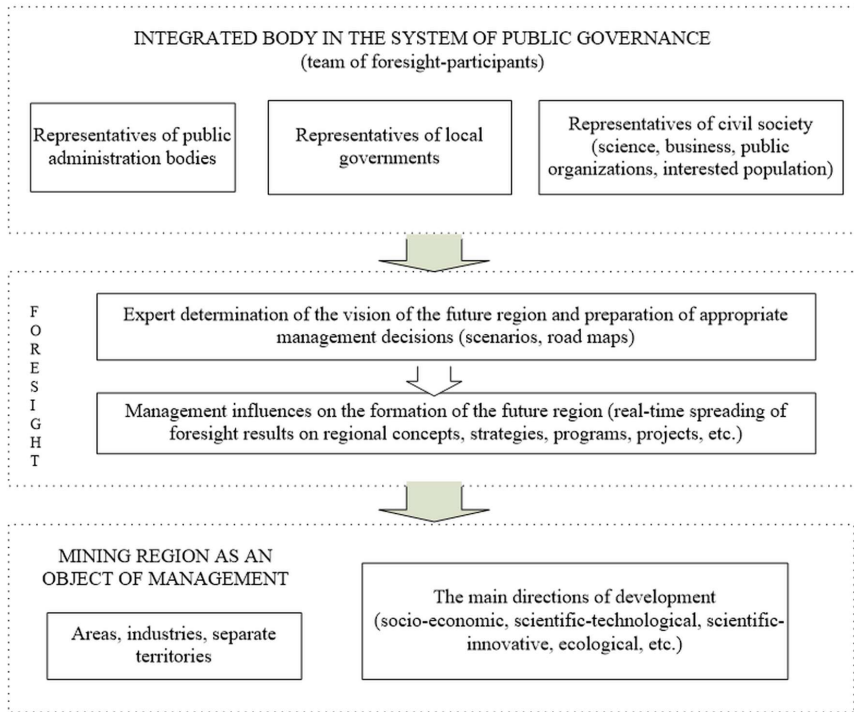
**Table 2.** The main indicators of the effectiveness of public management of socio-economic development of mining regions.

Social indicators of management efficiency	Economic indicators of management efficiency
1. Population	1. Gross regional product per capita
2. The size of the subsistence minimum per month	2. The degree of depreciation of main funds
3. Expected lifetime at birth	3. The volume of shipped goods of own production in the industry per employee
4. Unemployment rate	4. The volume of agricultural production per capita
5. Real monetary income of the population	5. Retail turnover
6. Level of education	6. The volume of paid services to the population
7. Morbidity per 1,000 people	7. Investments in the main capital
8. Activating of the total area of residential buildings	8. The share of state aid in the consolidated budget expenditures
9. Budget security per capita	9. The volume of investment in the main capital per capita
10. Average monthly salary of employees (full list of organizations)	10. The share of investment from abroad in the main capital in total investment in the main capital

The indicators presented in Table 2 are interrelated and will allow to adequately assess the effectiveness of public management. According to the authors, the presented indicators are the most optimal in assessing the effectiveness of management of the socio-economic system of the mining region. The proposed technique allows us to: estimate the actual value of management efficiency; to conduct a comparative analysis of the effectiveness of management of socio-economic development of different regions; identify factors of negative impact on the effectiveness of management in this area; objectively assess the prospects of public management, etc. [20-23].

### 3 Results and Discussion

Based on the study, the authors also proposed a model of foresight of mining regions in terms of its role and place in the public management system (Fig. 2), which can simplify the understanding of foresight, as structured in a familiar and understandable form of governance.



**Fig. 2.** The model of foresight of mining regions in terms of its role and place in the system of public management (created by the authors).

However, it should be noted that the establishment of a legitimate integrated public management body requires its institutionalization. In this case, foresight performs a communication function for its participants, analytical and coordination - for the state and business, information - for society.

At the same time, it is necessary to determine the role of representatives of public authorities and local governments in the process of formation of foresight technology in mining regions: 1) order foresight-research in the development and implementation of socio-economic development strategies, targeted programs, budget justifications, etc.; 2) sponsorship of foresight-research; 3) consulting and expert support; 4) use of the results of foresight-research as an information-analytical base; 5) participation in the creation of foresight-centers, expert platforms for decision-making in the field of socio-economic development; 6) participation in surveys on the development of mining regions; 7) use in educational activities (preparation of advanced training courses for public managers) and more.

According to many authors, the main tasks of foresight are to stimulate the emergence of new alternative ideas and the formation of awareness of the whole set of possible prospectives in the context of strategic priorities, which is due to networking of all foresight participants, which strengthens ties within the mining region.

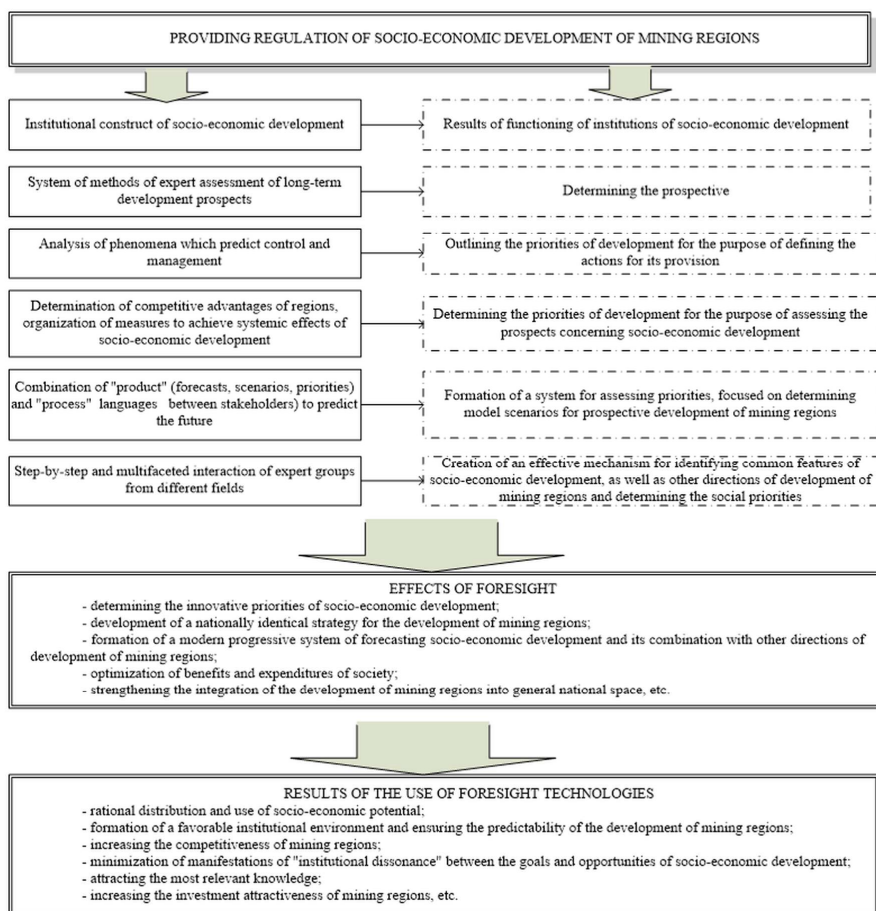
As noted above, foresight is a more comprehensive approach than forecasting, as it involves all important actors in socio-economic development; develops cooperation and collaboration between industry, the state and scientists. That is, the participation of a significant number of experts from all fields of activity, to some extent related to the subject of a particular project or problems, and sometimes conducting surveys of certain groups of the population interested in solving problems. The practical implementation of foresight also takes into account the possible prospects for innovative development of mining regions

associated with the progress of science and technology, outlines possible technological frameworks that can be achieved by investing specific tools and organizational structure of systematic work, as well as possible effects on the economy and society.

It is important that the institutionalization of the proposed methodological construct of monitoring and forecasting the socio-economic development of mining regions, based on the use of foresight, will solve the problem of actively positioning the need to move to investment and innovation model and provide proper information and analytical support.

Substantiating the need to implement foresight methods in the decision-making process for socio-economic development of mining regions, we present possible, achievable results (Fig. 3).

Thus, the foresight approach, according to the author's team, will allow to maximize the potential of mining regions, and most importantly - to ensure their socio-economic development.



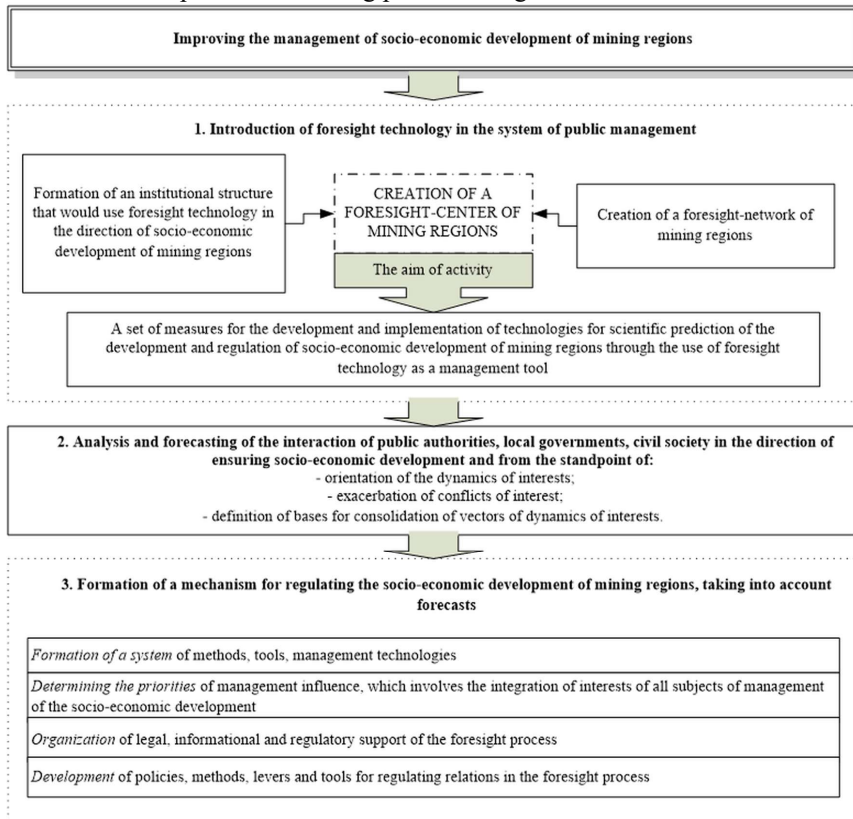
**Fig. 3.** Expected results of the use of foresight in ensuring the socio-economic development of mining regions (created by the authors).

Substantiated results of the use of foresight methodology can enhance the stability of socio-economic development of mining regions, due to the acquisition of opportunities and benefits, in particular in terms of: 1) diversification of sources and mechanisms for financing socio-economic development; 2) the use of relevant innovation and investment technologies; 3) intensification of the involvement of the existing economic and scientific potential of the



mining regions for the creation of innovative products; 4) formation of a stable, effective institutional environment in the direction of ensuring socio-economic development.

It should be noted that the basic stage of conceptual framework formation is the introduction of foresight into the public management system, which provides (Fig. 4): 1) creation of a foresight-center of mining regions - an institutional structure that would introduce appropriate forecasting tools in the strategic planning system and coordination of all interests of subjects of management; 2) creation of a foresight-network of mining regions, the aim of which is to recognize the formation of forecasts, plans, expert assessments, reports for a specified period, including consideration of existing problems and possible solutions, study of endogenous and exogenous change factors, development trends and weak signals; analysis of forecast data; putting forward initiatives for cooperation; improving the efficiency of forecast data in the process of making public management decisions.



**Fig. 4.** Conceptual principles of improving the management of socio-economic development of mining regions (created by the authors).

As a result, it is necessary to analyze and forecast the interaction of public authorities, local governments and civil society from the standpoint of the following: the direction of the dynamics of interests; exacerbation of conflicts of interest; allocation of bases for consolidation of vectors of dynamics of such interests.

## 4 Conclusions

Thus, the study found that foresight technology involves design rather than forecasting and provides answers to the question of what can be done together today to achieve the desired



future. The basis of this is the understanding that the future is variable, and its direction depends on the efforts made. Thus, the article identified the role and place of foresight of mining regions in the system of public management in which the influence is exercised by the relevant body integrated into the system of public management, combining representatives of state power, local government and civil society. The article presents the expected results of the use of foresight technology to ensure the socio-economic development of mining regions, which will contribute to the acquisition of new opportunities and benefits. Conceptual principles of improving the management of socio-economic development of mining regions are presented in the form of successive stages, which are based on the creation of a foresight-center of mining regions and a foresight-network. The results of the study make a contribution to improving the theoretical and methodological foundations of public management of socio-economic development of mining regions.

## References

1. *European Commission. JRC.IPTS. Regional Foresight. 2005-7.* URL: [http://forlearn.jrc.ec.europa.eu/guide/A1\\_key-terms](http://forlearn.jrc.ec.europa.eu/guide/A1_key-terms)
2. *Scenario Development Team 2027: Foresight Ukraine. Four scenarios for the development of Ukraine* (Foundation named after Friedrich Ebert, Vienna, 2018)
3. World Data Center for Geoinformatics and Sustainable Development, *Presentation of the results of the study "Foresight of Ukraine's economy in the medium-term (2015-2010) and long-term (2020-2030) time horizons.* URL: <http://wdc.org.ua/en/sustainable-development/reports>
4. T. Cuosa, *Practicing strategic foresight in government. The cases of Finland, Singapore and European Union* (S. Rajaratnam Studies, Singapore, 2011)
5. R. Popper, M. Keenan, I. Miles, M. Butter, G. Sainz, *Global Mapping Report 2007, European Foresight Monitoring Network report to the EC.* URL: [www.efmn.eu](http://www.efmn.eu)
6. I. Miles, R. Popper, *The Handbook of Technology Foresight* (Edward Elgar, Cheltenham, 2008)
  1. B. Habegger, *Futures*, **42**, 49-58 (2010)
7. *Practical Guide to Regional Foresight in the United Kingdom* (Brussels, EC, 2014)
8. L. Gokhberg, *Foresight*, **1(1)**, 4-5 (2007)
9. Asia-Pacific Economic Cooperation, *Journal of Futures Studies*, **9(1)**, 99-106 (2009)
10. Sokolov A.V. *Foresight: a look into the future - 2007.* RL: <http://www.hse.ru/data/380/621/1234/Whatforesight.pdf>
11. V.P. Tret'yak, *Regional Foresight: Opportunities and Prospects.* URL: [http://www.znanie.org/FLG/Tretyak/22\\_10\\_Forsajt\\_-1.ppt](http://www.znanie.org/FLG/Tretyak/22_10_Forsajt_-1.ppt)
12. *A Practical Guide to Regional Foresight* (Edificio Expo-WTCS, Seville, 2012)
13. N. Tkalenko, T. Shestakovska, I. Zelisko, *International Journal of Advanced Biotechnology and Research*, **SI-1**, 517-524 (2019)
14. N.Y. Kalyuzhnova, V.P. Tret'yak, *Foresight of the region: the experience of the Irkutsk region Procedure for developing a Foresight* (IGU Pub., Irkutsk, 2012)
15. V. Chuzhykov, *Regional policy of the European Union* (KNEU, Kiev, 2016)
16. R. Popper, *Foresight*, **6(2)**, 56-75 (2012)
17. K.O. Vishnevskij, *Foresight as an instrument of state innovation policy: thesis* (MSU, Moscow, 2013)
18. E.V. Verkhoturova) *Foresight as a tool for strategic management of the development of innovations: thesis* (ISU, Irkutsk, 2013)

19. A. Kindrass, M. Dirk, K. Vishnevsky, M. Cervantes, *Regional foresight for connecting national science, technology and innovation with company innovation: Russian experience. Research Paper No. WP BRP/IPP/2014*. URL: <http://ssrn.com/abstract=2513805>
20. S. Grigashkina, O. Garafonova, V. Marhasova, E3S Web Conf., **41**, 04006 (2018)
21. Y. Lazarenko, O. Garafonova, V. Marhasova, S. Grigashkina, O. Kozureva, E3S Web Conf., **134**, 03011 (2019)
22. Y. Lazarenko, O. Garafonova, S. Grigashkina, I. Verezomska, E3S Web Conf., **105**, 04042 (2019)