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METHODICAL APPROACHES TO STATE POLICY FORECASTING OF SUSTAINABLE DEVELOPMENT OF UKRAINE'S REGIONS

Abstract. The model of long-term planning of sustainable regional development in the context of providing a effective state regional policy is developed in the article. The received model is simulated and it's involves the coordination of macro and micro indicators of sustainable development. The GRP value is calculated with the forecasted values of these indicators, and then their equilibrium is estimated which is possible, as was noted above, on the basis of the Gini coefficient. This allows to receive an agreed forecast for all indicators.

To ensure the effectiveness of the state policy influence on sustainable development is possible by systematizing the activity and formalization of the state regional policy and improving its organizational, legal and methodological support, in particular, correction of the defining and adjusting parameters of the sustainable development in the scale of separate regions and the state. Since the normatively fixed criteria for evaluating such a development differ significantly among themselves (applied for the quarterly and annual evaluation).

The main stages of planning of regional development processes in the social and economic directions are specified. In view of them, information and analytical technology is built. The forecasting technology should provide a refinement of the system of indicators of the sustainable development of regions and expansion of those indicators that are necessary to describe the conditions of this development in relation to the state as a whole. In our view, the realization of this task should take place provided that the correlation analysis of the indicators is applied.

The choice of a method of research of development of regional processes is proved. The adequacy of the model of long-term planning of sustainable regional development in Ukraine is estimated.

The results received are the basis for working out of a complex of actions for indicative plans and monitoring of the development of the state regional policy.

Keywords: state policy, sustainable development, region, forecasting, model, indicators.
JEL Classification G21, F29, L41
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МЕТОДИЧНІ ПІДХОДИ ДО ПРОГНОЗУВАННЯ ДЕРЖАВНОЇ ПОЛІТИКИ СТАЛОГО РОЗВИТКУ РЕГІОНІВ УКРАЇНИ

Анотація. Установлено, що в контексті забезпечення результативної державної регіональної політики варто здійснювати довгострокове прогнозування сталого розвиту регіонів. З огляду на це обґрунтовано відповідну прогнозну модель, що має імітаційний характер, передбачає здійснення узгодження макро- і мікропоказників сталого розвитку. Зважаючи на прогнозні значення цих показників, підраховується значення ВРП, потім оцінюється їхня збалансованість, що можливо, як зазначалося вище, на основі коефіцієнта Джині. Це дозволяє отримати узгоджений прогноз за всіма показниками.

Підвищити результативність впливу державної політики на сталий розвиток можливо шляхом систематизації дії та формалізації державної регіональної політики й удосконалення її організаційно-правового і методичного забезпечення, зокрема корекції визначальних і налаштувальних параметрів сталого розвитку в масштабах окремих регіонів і держави, оскільки нормативно закріплені критерії оцінювання такого розвитку суттєво різняться між собою (які застосовуються для щоквартального і щорічного оцінювання).

Уточнено основні етапи прогнозування процесів регіонального розвитку за соціально-економічними напрямами. Саме з їх урахуванням побудована інформаційно-аналітична технологія. Технологія прогнозування має забезпечити уточнення системи показників сталого розвитку регіонів і розширення тих показників, що потрібні для опису стану цього розвитку відносно держави в цілому. Вважаємо, що реалізації цього завдання має відбуватися за умови застосування кореляційного аналізу показників.

Доведено вибір методу дослідження розвитку регіональних процесів. Визначено адекватність моделі довгострокового планування сталого регіонального розвитку в Україні.

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Отримані результати є основою для розроблення комплексу заходів для індикативних планів та моніторингу розвитку державної регіональної політики.

Ключові слова: державна політика, сталий розвиток, регіон, прогнозування, модель, показники.

Формул: 17; рис.: 1; табл.: 1; бібл.: 17.

Introduction. World practice [1—4] demonstrates that the existing contradictions in the field of effective sustainable regional development are most appropriate to overcome using the purposeful mechanisms of the state forecasting and stimulating influence. In this case, the specific mechanisms of such influence should be developed solely on the basis of the scientifically substantiated and methodically verified theoretical positions. In this context, the development of methods for forecasting, assessing and stimulating a stable development of the region with the purpose of activating Ukrainian domestic and foreign investment potential is becoming particularly acute. At the same time the methodology that ensures the adoption of the public administration decisions in the long-term perspective, that is, those that are accompanied by the forecasting of the consequences of the implementation of these decisions, capable of ensuring the stability of the processes of economic development of the region in particular and of the state as a whole, are taking the significative place.

At the national level, the need for an assessment of the state policy effectiveness on ensuring the social and economic regional development of Ukraine is identified (see the Law of Ukraine «On the Principles of State Regional Policy» [2]). It occurs, firstly, in the periodic monitoring, measurement and comparison of the actual results with the indicators of achieving the goals and priorities of the regional development, stated in the relevant strategy. And secondly, on the basis of the methodology for assessing the effectiveness of the state regional policy developed by the Government of Ukraine [2]. However, in the domestic legal and regulatory framework there is no scientifically justified methodology for the adoption of the public administration decisions which is based on the forecasting of the regional development processes. All this testifies to the relevance of the chosen topic of research and the feasibility of its conducting.

Publication analysis and paper objective. The issues of the methodical and methodological approaches to the level of regions development forecasting and assessing have been considered by such scholars as V. Bakumenko, H. Balabanov, S. Bozhko, V. Halushchak, Z. Herasymchuk, B. Danylyshyn, A. Dehtyar, I. Dehtyareva, S. Dombrovska, M. Zgurovsky, B. Karpynsky, I. Lyashenko, S. Maistro, T. Maksimova, L. Melnyk, V. Stepanov, J. Forester, L. Tsaryk, L. Shostak etc. [4]. At the same time, despite a fairly significant number of scientific works on this issue and the existing nationwide methodology for assessing the effectiveness of the state regional policy, a comprehensive methodology for the social and economic development forecasting of the regions, and, therefore, ensuring their safety has not been yet developed in Ukraine.

Therefore, the main objective of this study is the substantiation and development on the basis of the systematic analysis of the theoretical and methodological principles and methods of forecasting the development of the regions of Ukraine in the context of ensuring its social security and the effectiveness of the relevant state policy.

Results. *Determination of the methodological base for forecasting of the sustainable development of the state and the region*

Analysis of the scientific developments in the specified sphere [ibid.] suggests that forecasting and modeling, as public administration functions, are used, first of all, in relation to the nation-wide socio-ecological-economic systems (that is, at the highest level). At the same time, they are characterized by the complex nature of functioning, in particular by the regional one. The region is a part of the country's territory which covers the areas of production and consumption which are formed by the redistribution of resources within a single territory and the state as a whole. The one-way account of these features makes it impossible to form a complete picture of the regional development and limits the use of models of the forecasting processes associated with it.

A system of the socio-economic development forecasting, developed by the scientist J. Forester [8], can serve as the confirmation of the thesis expressed above. The considered approach can be used as a basis for solving the tasks of the socio-economic development forecasting at the level of the

region and its systems that requires additional scientific substantiations and modifications.

Consequently, the existing multidimensionality and interdependence of the processes, which are taking place in the economy, with the existing uneven financial opportunities of regions and the varying degrees of complexity of their social, economic and environmental problems, determine the need for the development of an analytical model that characterizes the conditions of functioning of the regional and public socio-ecological-economic systems. In this view, there is a need to create a hierarchical system of the forecasting statistical integrals, generalizations and private assessments of the socio-economic development of regions for interterritorial forecasting and analysis in statics and dynamics which meets the requirements of comparability and modernity. This algorithm of assessments, which makes it possible to characterize the state of the regional and state socio-ecological-economic systems development, is presented in *Fig.*

Components of the modeling and forecasting of the sustainable regional development

The key point in the proposed algorithm of the long-term forecasting of the regional development takes the creation and application of the appropriate simulation model. It is designed to provide technological prognostication of the regional development processes. In our opinion, its foundation is, on the one hand, the equals of the system dynamics, which are the variables of the first type, and on the other – the functional components of the region's development, by which the level of its security can be determined. As O. Koval, R. Lukysha and others rightly point out, these components are nothing but its preconditions, that is, they provide «security on the part of society» [9, p. 14—15; 10]. Having analyzed the available scientific-theoretical and practically oriented approaches to assessing the status of the sustainable regional development [11—15] and given the subject of our study, we can confidently attribute the following to these variables:

1) material component (MC) and intellectual capital (IC);

2) the share of intellectual capital in agriculture, industry, etc. (ICinA / C, ICinI);

3) Gross Regional Product (GRP), etc.

In addition, the choice of these variables as the basis is due to the fact that the material component is dialectically associated with intellectual (skilled labor) as far as complexity and modernity of production technologies and equipment require their application by highly skilled specialists. Therefore, the study substantiates the need to consider and take into account the IC. In addition, we note that J. Forester [16] proves the degree of dependence of the level of modernity of production technologies, equipment and the share of funds in one or another economy sector and industry. In view of this, it is proposed in the paper to introduce the variables ICinA/C and ICinI.

It is important to consider the GRP, as its distribution within the regional socio-ecological-economic system is necessary, as well as its interconnectedness with the external environment. The GRP can be modeled using the production function (*f*).

Each variable component can be determined from the point of view of dynamics, that is, the rates of its increase (growth) or decrease (disposal). At the same time, the dynamics of the regional socio-ecological-economic systems development can be determined by the following formula (1):

$$\mathrm{A}_n\left(\mathrm{T}_{n+1}\right)=\mathrm{A}_n\left(\mathrm{T}_n\right)+\Delta\mathrm{A}_n\left(\mathrm{T}_n\right)k, \tag{1}$$

where k — is a step of discretion,

and $\Delta\mathrm{A}_n(\mathrm{T}_n)$ — the growth rates or deterioration of one or another component of the regional development.

The growth rates or deterioration of the condition of each component of the regional development, that is, its dynamics, is determined separately with the purpose of a detailed description of those processes that are associated with this development, depending on the direction of the sustainable development — economic, social and environmental (*Table*). In this case, we have to specify that the indicators of the internal processes of the regional development in the indicated directions can be determined by the following formula (2):

$$B(T_n)=\left\{b_j(T_n),\ j\in J\ \right\}\frac{1}{2}. \tag{2}$$

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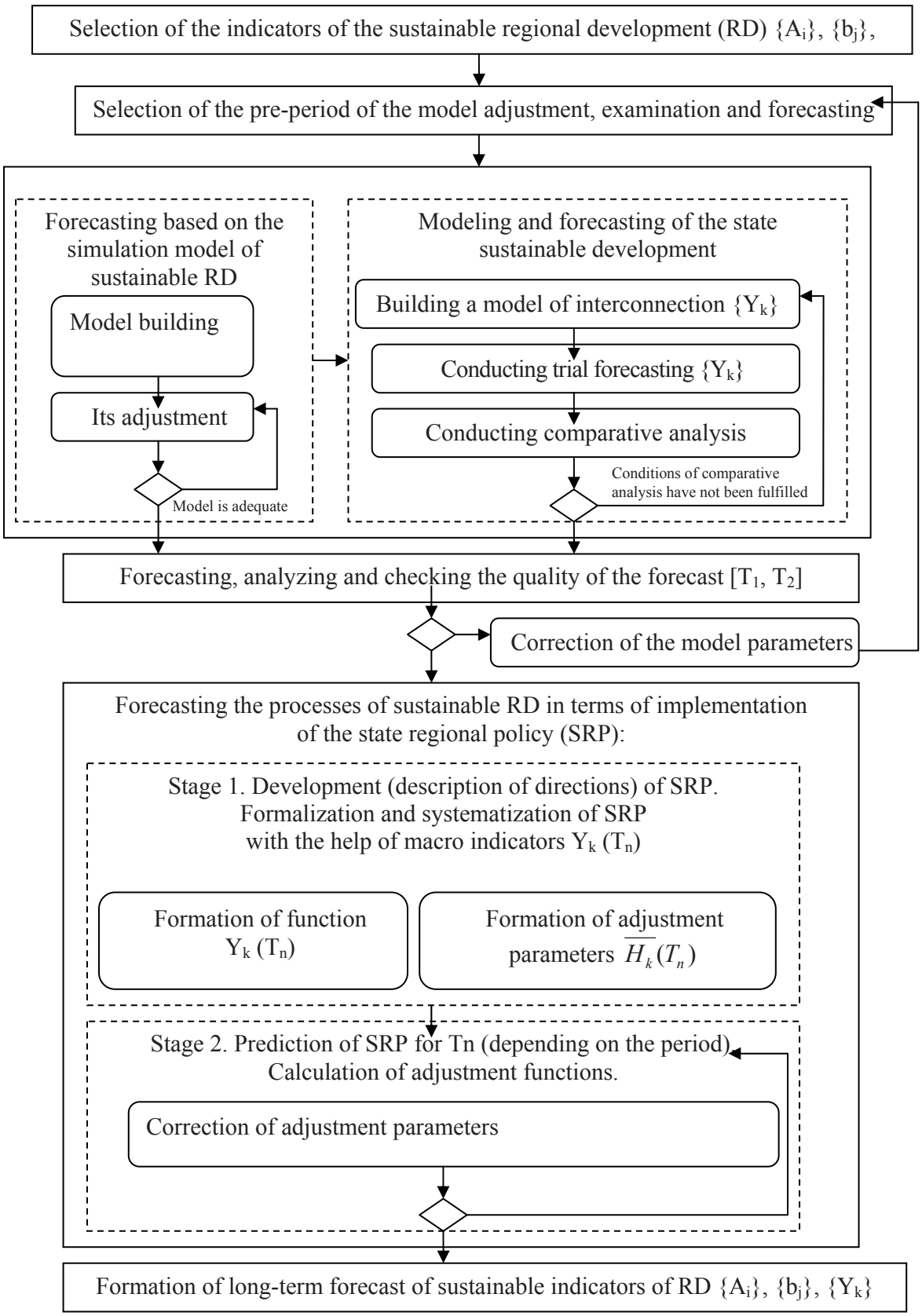

Fig. **Analytical model of development of the regional and state socio-ecological-economic systems**
Source: own representation.

The description of the model and its adjustment to the regime of the regional socio-ecological-economic systems involves the use of the following adjustment parameters (3):

$$\mathrm{H} = \{H_1, ..H_k .., H_n\},\ n = \overline{1,\ k} \quad (3)$$

These adjustment parameters are presented in *Table* and include the definition of cause-and-effect relationships within the regional socio-ecological-economic systems by applying the following function: $f_i(b_j(T_n))$.

Table

The components of the sustainable regional development necessary for its forecasting during social, economic and environmental modeling

№	The name of the component of the sustainable regional development	Calculation formula
1	Population number and density	$b_1(T_n) = A_1(T_n) / H_1 \cdot H_2$ (4)
2	The volume of regional funds	$b_2(T_n) = A_2(T_n) / A_1(T_n)$ (5)
3	The volume of funds (in agriculture, industry, etc.)	$b_3(T_n) = (b_2(T_n) \cdot A_5(T_n)) / H_7$ (6)
4	The level of the region territory pollution	$b_4(T_n) = A_4(T_n) / H_7$ (7)
5	Natural resources belonging to the region	$b_5(T_n) = A_2(T_n) / H_{11}$ (8)
6	The level of nutrition of population of the region	$b_6(T_n) = (f_{18}(b_3(T_n)) \cdot f_{19}(b_1(T_n)) \times \times f_{20}(b_4(T_n)) \cdot f_{21}(b_{12}(T_n))) \cdot H_{14} / H_{13}$ (9)
7	Population life quality	$b_7(T_n) = f_{22}(b_1(T_n)) \cdot f_{23}(b_6(T_n)) \times \times f_{24}(b_4(T_n)) \cdot f_{25}(b_{10}(T_n)) \cdot H_{15}$ (10)
8	The level of productive forces (material component — MC)	$b_8(T_n) = (b_2(T_n) \cdot \frac{(1 - A_5(T_n))}{(1 - H_7)} \times \times f_{17}(b_5(T_k))) / H_6$ (11)
9	The level of productive forces (intellectual component — IC)	$b_9(T_n) = (b_{11}(T_n) \cdot \frac{(1 - A_7(T_n))}{(1 - T_{16})} \times \times f_{18}(b_5(T_n))) / H_{18}$ (12)
10	General state of productive forces development	$b_{10}(T_n) = (b_8(T_n) \cdot b_9(T_n))^{1/2}$ (13)
11	The level of IC of population of the region	$b_{11}(T_n) = A_6(T_n) / A_1(T_n)$ (14)
12	The level of IC in agriculture, industry, etc.	$b_{12}(T_n) = (b_{11}(T_n) \cdot A_7(T_n)) / H_{16}$ (15)
13	The correlation of MC and IC within the level of productive forces development	$b_{13}(T_n) = b_8(T_n) / b_9(T_n)$ (16)
14	The amount of capital spent on the development of agriculture, industry, etc. (depending on the available level of nutrition)	$b_{14}(T_n) = f_{26}(b_{10}(T_n)) / f_{24}(b_6(T_n))$ (17)

Source: own representation.

Stages of the sustainable regional development forecasting

Taking into account the general public administration concept [17—19], we can state that forecasting of the processes of development of the regional socio-ecological-economic systems should take place taking considering the following time intervals: 1) adjusting (involves adjustment parameters); 2) checking; 3) adaptation-pre-plan (covers the implementation of the forecast only, which does not contain a mandatory indication of the achievement of these or other values, and requires the «adequacy» from the model and compliance with the time requirements).

Defining these time limits for the regional development forecasting is important for the simulation modeling both at the stage of setting its parameters, and during the checking of the forecast model for adequacy. At the setup stage, the formation of the initial values of all parameters

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of the forecast regional development model takes place. This formation of the values $f_i(b_j(T_n))$ of tabular functions can be done in two ways: 1) «scaling» (of the corresponding values of the system dynamics); 2) expert way.

It should be noted that the main tool for the forecasting model adaptation to internal and external conditions (i.e. micro and macro environment) are the adjustment parameters. It is possible to estimate the success of such adjustment, both for the individual components of the regional development (variables) and for the entire forecasting model, on the basis of the Gini coefficient. In fact, the criterion of success is the complacency of the estimates with the forecasting model adequacy.

Discussion of the results and forecasting consistency of sustainable development in Ukraine. The system method and the dynamics method should be used in parallel to ensure completeness while forecasting the conditions of functioning of the socio-ecological-economic systems of the region and the state. Taking into account the imperfection of the regulatory framework on the criteria for the effectiveness of the state regional policy applied for the quarterly and annual evaluation [6, Appendix 1 and 2] we can insist on the following: the forecasting technology should provide a refinement of the system of indicators of the sustainable development of regions and expansion of those indicators (in particular, social and economic) that are necessary to describe the conditions of this development in relation to the state as a whole.

In our view, the realization of this task should take place, firstly, provided that the correlation analysis of the indicators is applied. And secondly, towards the formation of the interdependence between the micro- and macro indicators of sustainable development. The GRP value is calculated with the forecasted values of the macro indicators, and then their equilibrium is estimated which is possible, as was noted above, on the basis of the Gini coefficient. This allows to receive an agreed forecast for all indicators [ibid].

Forecasting the consequences of the state policy on ensuring the sustainable development of the regions in particular and of the state as a whole should be based on the application of the simulation model for the development of socio-ecological-economic systems. To ensure the effectiveness of the state policy influence on these systems is possible by systematizing the activity and formalization of the state regional policy and improving its organizational, legal and methodological support, in particular, correction of the defining and adjusting parameters of the sustainable development in the scale of separate regions and the state. Since the normatively fixed criteria for evaluating such a development differ significantly among themselves.

Conclusions. In the course of the research, it has been found that in the context of ensuring effective state social policy in the regions, the long-term forecasting of sustainable development of these regions should be carried out. In view of this, the appropriate forecasting model, which is of the simulation character, is substantiated in the paper, it involves the coordination of macro and micro indicators of the sustainable development, which in its turn requires the changes in the legal and methodological provision of the state social policy in the regions.

The practical significance of the implementation of this simulation model for forecasting sustainable regional development lies in the fact that it can be used to form the effective indicative plans for the development of the state regional policy.

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