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RESEARCH PAPER

Assessing the ESG Sustainability Strategy of Gazprom Group through the Dynamic Standard Model (DSM)

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Abstract

In modern conditions of instability and complexity in forecasting, methods whose application is associated with a clear understanding of the results are undoubtedly relevant. Such methods are most often mathematical, and one of the most underestimated among them is the dynamic standard method. Its application largely helps avoid the problems of subjectivity and value judgments. In addition, it allows the formation of a long-term adaptive strategy that not only meets forecasting tasks but also enables planning for the future development of the phenomenon. The ESG indicator system is particularly relevant today and is used to assess the investment attractiveness and functioning of enterprises. The energy sector is often heavily influenced by this reporting system. Due to recent events and the global imbalance in energy markets, the importance of planning and understanding the effects of ESG reporting on production activities has become a priority. Indicators of sustainable development underlie several investment criteria and non-tariff export restrictions. The main purpose of the study is to systematize sustainable development indicators using Gazprom Group as an example for the period from 2018 to 2020 and to identify problems and areas for improving the ESG indicator system within the company. The main results indicate the low effectiveness of the ESG strategy of Gazprom Group and show that the investment effectiveness of measures taken in the ecological and social pillars is low and slightly higher in the governance pillar.

Keywords: dynamic standard method, ESG transformation, rank correlation, reporting, similarity measure, strategy, sustainability.
JEL Classifications: F50, F10, Q40.

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Introduction

There are still no comprehensive and widely applicable systems or methodologies that can be used to apply integrated approaches to solving interrelated development challenges. To comprehensively assess the dynamics of achievement of development targets, it is advisable to apply socio-economic models that could serve as a reliable basis for promoting development goals that do not contradict strategic, moral, ethical, and traditional values and are based on the principles of emergence. The task is difficult from both economic and mathematical perspectives. The key problem at present is the subjectivity of approaches to development tasks—often management decisions at all levels are made based on personal views, expert assessments, evaluations by leading specialists, rating agencies, etc. The attractiveness of this approach is that the integral result is highly variable, and it is always possible to change forecasts in light of reality; however, this is also the main disadvantage of the approach—the inability to reliably plan the long-term development of an enterprise or industry. Part of this problem is a more practical question: how, in the context of the Environmental, Social and Governance (ESG) agenda, the enterprise management model will change, since ESG reporting is an important part of it today. For the Russian energy industry, this is extremely important because of the need to ensure competitive export conditions, preserve markets, and enter new markets, which is especially important in today's difficult conditions and the risks arising from the arbitrary behavior of European partners (Solovova, 2022).

In modern science and practice, it is customary to use several well-established approaches to determine how information should be disclosed for ESG reporting. The first approach was developed in the EU and describes the main issues of standardization and information disclosure (Regulation, 2019). However, investors' approaches have a much greater impact on the development of the ESG reporting industry. There are several key organizations whose developments are considered highly relevant, including CFA Institute (Environmental, 2015; Henisz, 2019) and Deloitte (Taylor, 2022). Similarly, it is impossible to ignore the fact that the OECD actively supported the initiative of ESG approaches to investment, highlighting several important problems (OECD, 2022). Thus, there are at least five different approaches to ESG standardization and investment in accordance with these standards. Nevertheless, all the above-mentioned approaches have an important common feature—they rely on an evaluative approach. The proposed study is compatible with any of the proposed approaches; moreover, it is based on ESG reporting developed by a specific company (in this case, Gazprom Group).

The main purpose of the study is to systematize sustainable development indicators using Gazprom Group as an example and to identify problems and areas for improving the ESG indicators system within the company.

Several tasks were carried out to achieve the goal:

1. The ESG reporting indicators of Gazprom Group were systematized, and for this purpose, the most significant of them were selected;
2. The growth models of these indicators were developed and justified, characterized by the best ranking of their growth rate;
3. The dynamic standard model (DSM) was applied to the proposed ranking, and a measure of similarity was identified as an integral indicator of the quality of the company's ESG implementation;
4. Measures were proposed to promote normalization of the situation.

The study was conducted based on open data from Gazprom's financial statements and is limited by data availability. The proposed research methodology can be expanded and supplemented in accordance with practical tasks: a model for comprehensive improvement of ESG reporting indicators can be proposed by identifying a synergistic effect through DSM; several indicators can be expanded, and the indicators themselves can be changed or supplemented in accordance with the logic of their ranking and addition. The novelty of the method lies in the use of a well-known mathematical basis in the sphere of ESG performance, where widely used approaches are hard to compare due to subjective assessments. The method is flexible and can be adapted to fit the specifics of the industry by adjusting the normative rankings of indicators. In addition, the proposed method can be used in any sector or company that has public ESG reports.

Literature Review

The literature on the dynamic standard model (DSM) is mainly mathematical in nature, and most of it dates back to the 1960s and 1970s. The dynamic standard is based on analyzing the links between indicators and determining the correctness of the selected priorities based on the actual dynamics of the corresponding indicators. The idea of constructing dynamic standards to measure the efficiency of economic systems was first expressed in the works of Syroezhin (1986). Later, the works of Eissner (1998) and Sokolov (1998) highlighted the theoretical, methodological, and practical aspects of using the method to assess the effectiveness and balance of economic development. Despite the fact that the key concepts were developed in the USSR, their applicability was tested under market conditions in the works of Georgescu-Roegen (1975), Amin (2015), and Nachane

(2017), who applied the method to developing economies and reviewed its mathematical basis. In addition, the European Bank also referred to DSM as a possible mathematical method for assessing euro area banks' household sectors and estimating the innovative character of firms (Smets, 2022). In this regard, the dynamic standard method is a well-known economic instrument that can be used in any system described by a number of time-series variables.

While the theoretical basis of the method applied in this article is reviewed above, empirical studies estimating ESG transition effects through mathematical methods remain scarce in the literature. It seems that the major discourse focuses on expert assessments of ESG effects. Still, the work by Fu and Li (2023) presents an attempt to construct a linear regression model for ESG effects. The major disadvantage is that either three regressions must be constructed, or the estimation is conducted for one endogenous factor, which does not necessarily represent ESG as a triumvirate of components. Another study (Li et al., 2023) presents a modified difference-in-differences method, where the traditional issues of the control sample arise; in addition, company performance is highly volatile and depends on many factors that are difficult to express mathematically and link to one another. Other methods, such as scoring (Dos Santos and Pereira, 2022), are also frequently used, along with Monte Carlo simulations and many other methods reviewed in the paper by Gaidai et al. (2023). However, their complexity and the need for correct and accurate data limit their applicability for assessing the effects of ESG transformation at the initial stage of implementation in a company. In this regard, DSM is much simpler and has fewer limitations.

Another notable point is that the DSM method can be significantly modified to overcome the obvious issues in forecasting system development under conditions of system reform (Lawrence et al., 2018). For instance, it can be applied in object-oriented programming for predicting the behavior of a group of objects (Dilaver et al., 2018) or improved using Bayesian methods (Kliem and Uhlig, 2016). In this paper, the novelty of the method lies in its application to the effects of ESG strategy on company performance and in the addition of an optimization methodology through the maximization of the target result, as described in the methodology below. Overall, the DSM method appears to be experiencing a revival in scientific discourse.

Methods and Materials

The methodology of the study is based on the dynamic standard model applied to the system of indicators, that is, on a mathematical model. The study of a

mathematical model can be carried out qualitatively and with the help of a computer or simulation experiment. Qualitative research begins with a dimensional analysis of the problem. The allocation of small or large dimensionless parameters makes it possible in some cases to significantly simplify the original mathematical model (Rozanova, 2009; Romanova, 2024). It is worth noting that dynamic economic modeling is quite an old method that is mainly used in conditions where traditional regression methods are inapplicable due to its "more to plan" than "to forecast" nature, based on an equilibrium concept, or, as it is modified in this work, a homeostatic plateau. In a system with complex interactions between its parts, such as a multinational company or an economy as a whole, the management of the system is carried out by exerting influence on the system and analyzing the feedback. Hence, the system is most effective when influence and feedback are correlated, but it should remain steerable so that the slightest influence does not imbalanced it. The homeostatic plateau is precisely this stage (Figure 1).

The complexity of any analysis using mathematical models is an attempt to identify internal dynamics (endogenous variables) by analyzing external influences (exogenous variables) (Draper and Smith, 1998). For a company, this is a significant limitation, since it is a system of internal relations with a management function that is influenced by external forces. It is worth noting that in any system there can be direct influence and feedback; feedback determines how much the system can self-balance and stay on a homeostatic plateau. Such a state is the dynamic standard of the system – a state in which it can develop, but not at the pace that can destroy it (Ionov and Tonkih, 2011). Hence, the analysis of ESG transformation in a company ideally fits into the concept of dynamic standard analysis.

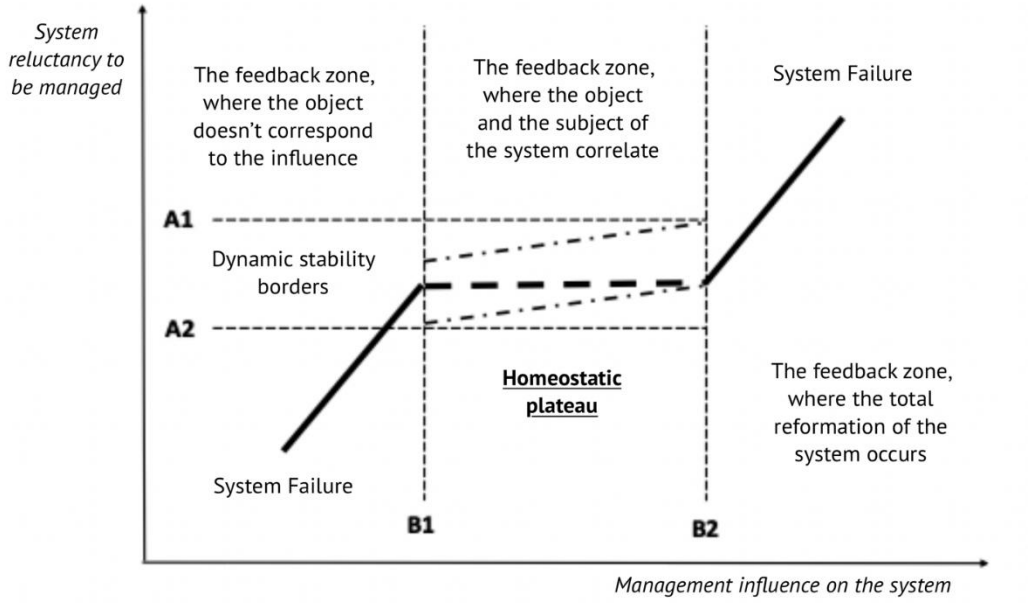

Figure 1. Homeostatic Plateau
Source: Novoseltsev (2003).

The complex integral nature of prioritization makes it a difficult task and requires the choice of criteria and methods for ranking the goals and objectives of the company. This is especially true in a situation with new development conditions or assessment systems, as in the case of ESG transformation. To solve this problem, it is advisable to use the dynamic standard model – a structural-dynamic model describing the effective mode of stability of the functioning of the system from the point of view of the integrated efficiency of the use of its total resources (Boffo and Patalano, 2020).

The dynamic standard is a set of indicators created by the end user to identify the most successful format of the system functioning. Using this method, problems at the tactical and strategic levels are identified, their nature (potential or real) and depth are determined, and the balance of development is assessed. By using this method, we avoid the subjectivity of expert methods, the complexity and data reliability of other econometric models and allow the final user to prioritize the effects most important for the system as a whole.

Assessing the deviation of the actual growth rates of individual indicators from the "ideal" (determined by the dynamic standard) makes it possible to determine priorities in the development of a particular area of corporate governance. If the actual and regulatory procedures do not coincide to a great

extent, then the diagnosis of the problem situation that has arisen is made: it is determined which factors caused this discrepancy (Turko, 2011).

The algorithm for using the method is as follows (the main algorithm and the formulae are described by Ruge-Murcia (2007) and Turko (2011)): indicators of the degree of achievement of the goals are highlighted (in the case of this study – ESG development indicators); the actual growth rates of indicators are calculated; with respect to the indicators of the efficiency of economic activity, the requirement of perpetual increase is imposed, and it is expressed by the condition:

$$n(X) > 0 \quad (1)$$

where *n(X)* – growth rate of *X*.

In case the relative indicators ($\frac{X}{Y}$) are assessed the inequity $n\left(\frac{X}{Y}\right) > 0$ can be substituted by Equation (2):

$$n(X) - n(Y) > 0 \quad (2)$$

on condition growth rate of *Y* is positive Equation (3):

$$T(Y) > 0 \quad (3)$$

where *T(Y)* – growth rate of *Y*.

The result of these transformations is the dynamic standards, which can be visualized using oriented graphs. In the graph of the dynamic standard, the direction of each arrow corresponds to the inequality ">". Such a representation allows one to clearly identify which indicators of the system under consideration introduce dissonance into the development of the country's economy. The graph can also be set in a matrix form. The assessment of the real dynamics relative to the normative one is made by calculating the distance between the corresponding matrices. To do this, the growth rates (gains) are determined for each of the considered indicators for the analyzed period (Syroezhin, 1986).

The matrix of the graph of the dynamic standard is constructed using the growth rates. The value "+1" corresponds to a direct dependence; the value "-1" is set in the symmetrical position; if there is no dependence, then "0" is set in both cells. "+1" is placed on the main diagonal. In addition, an important feature of the method is that when constructing a graph corresponding to some real numerical data, only the orderings that are included in the orders of the graph of the dynamic standard are used, and arbitrary orderings are omitted.

Thus, in order to assess the effectiveness of the strategy being implemented, the necessary steps are the following: 1) collect statistics on predefined indicators; 2) calculate the growth rates of indicators (basic and/or chain); 3) rank the growth rates of indicators according to the importance and economic feasibility of such growth; 4) calculate the coefficients of rank correlation and, on that basis, identify

problematic points of development; 5) propose solutions taking into account the existing system dynamics.

To quantify the degree of compliance of the actual order with the normative one, a measure of similarity between the matrix of the dynamic standard and the matrix of the actual orders is used, calculated by Equation (4):

$$S = (1 - R) * 100\% \quad (4)$$

where S – measure of similarity;

R – measure of the difference between the matrices of the actual order and the dynamic standard.

To quantify the measure of compliance of the actual order with the normative one, the measure of difference between these matrices (R) is used, it is calculated by Equation (5):

$$R = {}^{d}/_{(2 * K)} \quad (5)$$

where K – the number of non–zero cells in the matrix of the dynamic standard, not taking in to account the cells of the main diagonal.

Based on the definition, it is obvious that R can take values from 0 to 1.

The distance between the dynamic standard matrix and the actual order matrix (d) is calculated with the help of Equation (6):

$$d = \sum_{i=1}^{n} \sum_{j=1}^{n} |a_{ij} - b_{ij}| \quad (6)$$

where a_{ij} – element at the intersection of the i–th row and the j-th column of the dynamic standard matrix;

b_{ij} – element at the intersection of the i-th row and the j-th column of the matrix of the actual order; n is the number of indicators under consideration (Turko and Korshunov, 1998).

If the growth rates are equal according to any indicators in the actual order, uncertainty associated with the need to strictly order the growth rates arises. In such situations, the following is supposed: the growth rate is attributed to the order that exists between the corresponding indicators in the graph of the dynamic standard, i.e., the uncertainty associated with the equality of rates is interpreted in favor of the normative order. However, the absolute value of the distance between the dynamic standard matrix and the actual order matrix is not informative enough.

The next step is to use a corrective dynamic standard, which allows one to compare the development of the system in the previous period and in dynamics.

Optimization functions can also be used with the results of DSM. The optimization of the performance based on a 3% lag was performed in the article.

The method is quite simple: we use the above-described method of DSM, but introduce a set of linear programming equations to search for a scenario where d from Equation (6) is minimized, and the set of growth rates n(X) for Equation (1) lie between 0.97n(X) and 1.03n(X) of real n(X). The solution of this system of equations is easily achievable in basic software, i.e., Excel or RStudio, while Python also provides the necessary tools. In this work, the first software was used to optimize calculations.

The major advantages of the method for decision makers are as follows:

1. Transparency and obtaining data from calculations;
2. The ability to identify development priorities independently and quickly assess their significance;
3. Depending on the time, conjuncture, and other factors, the composition of the dynamic standard for indicators may be changed;
4. Based on the dynamic standard, problems and solutions (at least at the level of spheres and segments to be changed) are immediately identified;
5. The dynamic standard can be adjusted with the help of a corrective dynamic standard.

The method itself is not new, but it has not been applied to ESG reporting before. It is important to note that an important part of the results is the justification of the given ranking, which reflects the unique nature of the DSM – it is objective, but the input parameters themselves can be set within the broad boundaries of logic and based on various assumptions.

It is important to note that the DSM is quite simple to calculate and, with the availability of modern equipment at the level of advanced PCs, is available to any user. At the same time, creating a library in Python or even in the form of macros in Excel for integrating DSM into existing software is not a difficult task. Thus, a software product for DSM is easy to create and inexpensive to use. The practical significance of the proposed approach lies in the fact that, based on the analysis carried out, it is possible to significantly improve the accuracy of forecasting and evaluating the effects of mass implementation of the ESG system in the activities of Gazprom or, strictly speaking, any other interested company.

Results

The DSM was extensively used in previous works to assess the development of the economic reporting systems within the framework of the given approaches to the use of data (Sokolov, 2002). The method itself, when setting tasks for forecasting and calculating economic development, was tested by the National Academy of

Sciences of Belarus for forecasting the development of the country's economy, which proves the wide possibilities of its use in practice (Eissner, 1998). Still, the method proposed in the article has the novelty of introducing an optimization function, and its use for the search of better ROI in ESG-transformation of Gazprom (or any other company) allows one to find the economic shortcomings and failures of the company's management.

Let us refer to the analysis of PJSC Gazprom with the help of the described methodology. The calculations assume the existence of synergy between ESG indicators within any company, including the one under study (Sokolov and Kalugin, 1998). For each component of ESG-transformation (Ecological, Social, and Governance), the following patterns were identified: the costs of implementation < intermediate result < integral result. It is this order of growth that allows us to assume the effectiveness of investments and management policy, as well as the presence of a synergistic effect (Guliev et al., 2023). These limits were introduced based on the supposition that the major aim of any company is to fulfill the regulations with the least expense and the highest positive external effects. The equation (graph) above is simplified and represents the logic of the further work. As PJSC Gazprom introduced the ESG system about 5 years before (in 2018), and these years were a time of turmoil for its business, we can assume that the company is at the initial stage of ESG monitoring and the first effects are expected to be significantly higher due to the low base effect.

Calculations of the main indicators of PJSC Gazprom ESG sustainability were made (Table 2) in accordance with the methodology presented above. Statistical data from ESG reports of the company for 2018–2020 was taken as an analytical base (Table 1).

Based on the data in Table 1, the growth rates of every indicator were calculated. The ranking of indicators by growth rates in further tables in this study clearly reflects the idea of the graph mentioned above. The two scenarios were used in the optimization of the model:

• Inertial (I) – the current development model is preserved, the degree of variation of indicators is equal to 0%;

• Positive (P) – the current development model is transformed, the degree of variation of indicators is from 0 to 3%. Such an interval is chosen based on the rules of statistical research, in which the value ±3 is considered an acceptable error.

As a result of this optimization in the positive scenario, some of the indicators can change their position so that the similarity measure is maximized, while in the inertial scenario the only thing to be analyzed is the state of the system.

Before starting the analysis of the environmental indicators of Gazprom ESG strategy, it is necessary to note some more facts: first, it is assumed that any measure taken for the fulfillment of the ESG strategy of the company requires financial resources, so when we mention "attention" to the factor, we consider financial investments and the set of stimulative or prohibitive measures to achieve the result. Secondly, we suppose that ESG is systematic, meaning that the company did not reach these goals by accident. Thirdly, the 3% deviation that is discussed above allows one to conclude, through the analysis of the previous experience on DSM application, that even within a statistical error, the change in effectiveness of a system is dramatic when it is well balanced. It is worth mentioning that the data hereinafter refers to the Gazprom Group.

Table 1. Statistical Data from Gazprom ESG-Reports

E	**2018**	**2019**	**2020**
Investments in fixed assets aimed at environmental protection and rational use of natural resources (million rubles)	29189	20421	13987
Gazprom Group expenses for industrial environmental monitoring and control (million rubles)	2602	2528	2424
Collected, received water, total, million cubic meters	4280.21	3921.41	3236.63
Recultivated disturbed lands during the year, % of the disturbed	0.61145583	0.77212148	0.66434535
Waste generation for the reporting year, total, thousand tons	3555.09	3337.08	3229.83
Greenhouse gas emissions into the atmosphere, million tons of CO2	120.09	117.09	100.97
LNG usage indicator, %	97.7	98.3	98.2
Total reduction of energy consumption	38.8	44	38
Energy production from renewable energy sources, MW*h	12844199	11703054	13281763
S	**2018**	**2019**	**2020**
The average number of hours spent by workers on all types of training during the year	80	82	75
The total number of employed graduates of educational institutions of higher and secondary vocational education (people)	2931	2896	2153
Number of accident victims in Gazprom Group (people)	89	47	39
Number of deaths in accidents in Gazprom Group (people)	3	7	5
The occupational diseases rate (ODR)	0.03	0.062	0.029
Labor protection expenses (million rubles)	15450	17565	16677
Industrial safety expenses (million rubles)	5576	5299	4320
Used to support indigenous peoples (million rubles)	124	154	257
Charity expenses (million rubles)	35020	27724	28771
G	**2018**	**2019**	**2020**
Total contributions of Gazprom to the budgets of the Russian Federation at all levels (billion rubles)	3055	3020	2297
Gazprom's capital investments, billion rubles	1639	1776	1523
The share of material and technical resources of domestic production	99.4	99.5	97.6
Volume of investments in R&D, billion rubles	9	12.1	21.4
Economic effect from the use of R&D results, billion rubles	12.3	10.5	11.2

Number of patents received by Gazprom	26	26	27
The volume of payments under voluntary medical insurance contracts (million rubles) for preventive measures	278.6	145.7	182
Number of employees trained in the field of anti-corruption		1144	3870
The number of Gazprom Group employees who have been trained in corporate ethics standards		4988	111819

Source: Gazprom (2020).

Table 2. Ranking of Gazprom's ESG Indicators by Inertial (I) and Positive (P) Development Scenarios for 2018-2020 for Environment Bloc, Rank

	Indicators	**The limits for the system**	**2018**		**2019**		**2020**	
			Position according to the scenario					
			I	**P**	**I**	**P**	**I**	**P**
	Environmental							
A	Gazprom Group expenses for industrial environmental monitoring and control (million rubles)	I<H<G<F <E<D<C <B<A	2	2	2	2	5	5
B	Waste generation for the reporting year, total, thousand tons		3	3	4	4	6	6
C	Collected, received water, total, million cubic meters		7	5	8	7	1	1
D	Investments in fixed assets aimed at environmental protection and rational use of natural resources (million rubles)		1	1	1	1	7	7
E	LNG usage indicator, %		4	4	3	3	2	2
F	Recultivated disturbed lands during the year, % of the disturbed		9	9	9	9	9	9
G	Energy production from renewable energy sources, MW*h		6	6	7	8	8	8
H	Greenhouse gas emissions into the atmosphere, million tons of CO2		8	8	6	6	3	3
I	Total reduction of energy consumption		5	7	5	5	4	4
	Similarity measure		**69.23%**	**80.77%**	**61.54%**	**65.38%**	**53.85%**	**53.85%**

Source: Research finding.

Table 3. Ranking of Gazprom's ESG Indicators by Inertial (I) and Positive (P) Development Scenarios for 2018-2020 for Social Bloc, Rank

	Indicators	The limits for the system	2018		2019		2020	
			Position according to the scenario					
			I	P	I	P	I	P
	Social							
A	Industrial safety expenses (million rubles)	I<H<G<F <E<D<C <B<A	6	6	6	6	7	7
B	Used to support indigenous peoples (million rubles)		7	7	2	2	9	9
C	Charity expenses (million rubles)		4	4	5	5	4	4
D	Number of deaths in accidents in Gazprom Group (people)		2	1	4	4	3	3
E	Number of accident victims in Gazprom Group (people)		1	2	9	9	5	5
F	Labor protection expenses (million rubles)		8	8	1	1	8	8
G	The average number of hours spent by workers on all types of training during the year		3	3	8	8	2	2
H	The occupational diseases rate (ODR)		4	5	3	3	1	1
I	The total number of employed graduates of educational institutions of higher and secondary vocational education (people)		9	9	7	7	6	6
	Similarity measure		**55.77%**	**61.54%**	**61.54%**	**61.54%**	**42.31%**	**42.31%**

Source: Research finding.

Table 4. Ranking of Gazprom's ESG indicators by Inertial (I) and Positive (P) Development Scenarios for 2018-2020 for Governance Bloc, Rank

	Indicators	The limits for the system	2018		2019		2020	
			Position according to the scenario					
			I	P	I	P	I	P
	Governance							
A	Total contributions of Gazprom to the budgets of the Russian Federation at all levels, billion rubles.	I<H<G<F <E<D<C <B<A	8	5	8	8	5	5
B	Gazprom's capital investments, billion rubles		7	5	3	4	7	7
C	The volume of payments under voluntary medical insurance contracts (million rubles) for preventive measures		9	9	4	3	6	6
D	Number of employees trained in the field of anti-corruption		4	4	1	1	3	3
E	The number of Gazprom Group employees who have been trained in corporate ethics standards		6	5	4	4	1	1
F	Volume of investments in R&D, billion rubles		5	5	4	4	2	2
G	Number of patents received by Gazprom		2	3	9	9	4	4
H	The share of material and technical resources of domestic production		3	2	2	2	8	8
I	Economic effect from the use of R&D results, billion rubles		1	1	7	7	9	9
	Similarity measure		**11.54%**	**19.23%**	**57.69%**	**61.54%**	**61.54%**	**61.54%**

Source: Research finding.

The data in Table 2 indicate that the Group's environmental development measures are non-systemic in nature relative to the benchmark. It should be noted that the possible reasons for this phenomenon are the repeated revision of the desired results under the influence of the European Green Deal and the plans to introduce a cross-border carbon tax. Today, however, it is necessary to clearly identify priority sales markets and focus on their needs, or follow economic logic – the result of investments should grow faster than the investments themselves.

The following conclusions are solely for the E-component of Gazprom ESG strategy.

1. In general, environmental factors are highly dependent on the investments from the Gazprom Group;
2. The energy consumption reflects the positive dynamics of the environmental set of indicators, while the attention to the recultivation of land should be significantly increased;
3. CO2 emissions are decreasing at a fast pace, but the attention to green energy production is the key for further environmental development of the Group;
4. The overall dynamics of growth of other indicators are chaotic, leaving them to be developed on a trend basis.

Let us conduct the same analysis on the social component of Gazprom ESG strategy (Table 3). The company is highly appreciated for its social protection and has been nominated several times in the best employer nomination by different Russian analytical agencies.

The data in Table 3 indicate that the measures for the social development of the Group are ineffective. A significant increase in indicators, expenditures on industrial safety, and support for indigenous peoples is not comparable in importance but is quantitatively quite close. The company's social policy, as well as the environmental one, is trend-driven in nature; the Group is not trying to take advantage of changes in social legislation to build goodwill. Among the other issues, we should stress the following:

1. The two systematic indicators in the social block are the number of employed graduates and the ODR. These indicators demonstrate that the spending on labor protection and the social sphere in the company are ineffective;
2. The similarity measure demonstrates a sharp decrease and the absence of the possibility for low-cost optimization in 2020, with the model performing best in 2018–2019, when the optimization potential was used;
3. The number of deaths and victims in the Group is growing at too fast a rate, with a one-year lag relative to the growth of labor protection expenses. Still, the

latter are not effective, because their growth rate is significantly higher than the decline in the former.

Table 4 reflects the results of the ranking of the growth rates of the governance component indicators of the company.

Based on the results in the table, it can be concluded that the overall similarity measure grows, with a rapid decline in the optimization possibilities. Hence, unlike other components, governance and management decisions in the Group are quite successful and systematic. Noteworthy is the rapid growth of the similarity measure in 2018–2019; however, the potential for extensive growth in 2019–2020 has significantly slowed down. The major results of the analysis of the G-component are the following:

1. A sharp growth of the similarity measure of the governance block demonstrates the better crisis performance of the company;
2. These problems consist in the overassessment of corporate employee training to the detriment of the growth of import substitution and capital investments. At the same time, investments in R&D are significantly higher than their economic effect, which may indicate a long research and implementation cycle or the inefficiency of current R&D directions;
3. The policy of preventive measures within the framework of the VMI brings positive effects to the social subsystem, but within the framework of the corporate governance subsystem it is overestimated.

As is evident from Tables 1–3, although the Group strives to fulfill the goals of the ESG strategy, it makes a number of mistakes, possibly of a trend-driven nature; however, a systemic misunderstanding of the problems of ESG transformation cannot be excluded. In this regard, it is important to highlight opportunities and directions for improving the results of this process for Gazprom PJSC.

Discussion

The first question to discuss, when receiving the results, demonstrating poor performance of the system is to test the method used. The DSM has no specific tests like linear regression, or the similar difference-in-difference method, so the empirical data proves to be the only test to this approach. In the previous projects, based on the method provided (Turko and Korshunov, 2019) the complex economic systems were assessed, including the performance of the industry as a whole, while the results were verified by empiric data for several years after the development of the method. For Gazprom the estimation of the ESG-principles

introduction results is generally critical – from the difficulties, connected with the geopolitical issues, promoted in press (Kirakosian, 2022), to the scientific researches on the theme, concluding, that the ESG-introduction majorly aims at the cost reduction for the company, not public effects (Daroshka et al., 2023) and the overall lack of experience and system on the process (Gusov et al., 2022).

Thus, the obtained results indicate, in general, a low level of efficiency of the ESG reporting system in Gazprom Group. Let's highlight the main problems with the ESG-strategy of the PJSC Gazprom.

The overall similarity measure is declining in ecological and social components, which demonstrates the misunderstanding of priorities and the way to achieve them in the Group. At the same time, several indicators are steadily growing, especially in the governance component which means there is an understanding of the prioritizing one factors over another in the company, leading to a conclusion that the managemental decisions made are enforced by some reasoning (highly likely the reasoning pursues the goals of maximization of most widely used indicators' performance). It's notable, though, that the company management can produce such decisions so that the major positive effects are provided to them, not exposed to the society in general.

The decreasing gap between scenarios proves that the strategy used in the company leaves nearly no chance for optimization with low costs, it proves the implication of non-systematic approach to the environmental block of indicators. Taking it into account, the strategy on ESG transformation of Gazprom is clearly overpriced and interpreted in a specific, majorly trendy manner, pinpointing the investments in nature protection, decrease of the ODR and the anticorruption training. All in all, the same narratives are presented in analysis of the ESG-transformation in Russia (Popova and Strikh, 2022), so we can conclude, that the issue is common for the Russian practice of ESG-introduction.

The points of high interest for Gazprom do not include the issues of importance for a wider public. Such indicators as waste generation, number of young employees, economic effects of R&D, number of voluntary insurances, issues for the workers remains out of focus of the company, resulting in low positive external effects of the ESG strategy.

The method described above gives an objective, mathematically based approach to the ESG-performance of a company. In this regard the usage of the proposed methodology can be proposed for any company, which publishes ESG-reports. This is especially interesting for big businesses, which tend to develop international branches. The only change needed in the method is the assessment of

the limits for the system in compliance with the company goals. The major future implications include the analysis of the other companies ESG-performance in correlation with the national regulation of the ecological and social regulation so that the effects of the corporate ESG-strategies and the aims of the national development are in correspondence with each other.

Conclusion

The major results of the article lie in the identification of the main problems with the ESG strategy of Gazprom. The developed and tested methodology correlates with the empirical results of previous research on the theme and can be considered efficient and cheap in implementation. In addition, based on the applied methodology, it is possible to clearly trace those financial flows that turned out to be non-effective compared to the results achieved in real life.

The example of Gazprom allows one to pinpoint the low external effects of the ESG strategy of the company while the financial costs remain rather high. The results allow one to formulate a number of specific and general issues in the ESG strategy, including low systematic effects, low potential for the increase of its efficiency with low costs, and low external effects of its implementation.

It should be noted that the obtained results may not be fully justified due to a lack of data. Nevertheless, it has been convincingly demonstrated that for a deep analysis of systems within the given constraints and the possibility of setting them, DSM performs the tasks of identifying contradictions and directions for improving the system. The result of the application of DSM to the ESG strategy is that the methodological and annual estimation of the company strategy effectiveness can provide direct financial benefits in terms of higher effects per currency unit spent and better goodwill growth. The practical significance of the proposed approach to assessment of the ESG transformation efficiency through DSM lies in the fact that it allows one to automate and reduce the need to involve third-party experts in assessing the effectiveness of development at almost no cost.

The second important element of the significance of the proposed approach is the rejection of traditional predictive regression models with their disadvantages – isolation from real life and complex and opaque connections between the elements of the regression equation. The proposed approach allows one to get exactly the foreplanned result, i.e., to evaluate the real effectiveness of actions taken to achieve pre-set goals instead of a set of coincidences (both random and non-random). Putting aside theoretical significance, it allows one to demonstrate the specific shortcomings in the ESG strategy of Gazprom, such as the

aforementioned indicators with high external effects. The assessment of the company strategy and its correction can be conducted according to the goals of Gazprom itself, which adds to the possibilities for internal control and audit.

The public utility lies in the fact that DSM is replicable, that is, it can be used in various spheres of public activity while reducing transaction costs. Moreover, the predictability of results and the possibility of planning, rather than predicting results, will reduce uncertainty, and therefore the benefit of using the method is the reduction of uncertainty and risks.

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