

SHORT-TERM PREDICTIVE ANALYSIS OF CORPORATE ENVIRONMENTAL AND FINANCIAL PERFORMANCE

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Abstract

Subject. The environmental concept has become one of the main objectives in the field of sustainable development of management system. Along with a corporation's financial sustainability, environmental and social sustainability constitute the modern notion of an economic entity's sustainable development. The successful development of a corporation is possible, if there is an equilibrium in all areas of economic entity's operations.

Objectives. This paper investigates the complex interactions of financial and environmental performance at the corporate level. The aim is to develop a methodological approach to predictive analysis of corporate environmental and financial performance, focused on short-term oriented management forecasts.

Methods. The predictive analysis of environmental and financial processes suggests the use of a large number of performance indicators. A statistical model based on a matrix predictor combining econometric and multidimensional prediction methods became the basis of our methodological approach to predictive analysis. In the empiric section, we present a predictive analysis for the environmental and financial performance of AO Minudobreniya.

Results. We developed a methodological approach to the predictive analysis of corporate environmental and financial performance to identify potential risk areas and further plan preventive measures to ensure the desired level of economic sustainability.

Conclusions. The findings can be useful for solving a number of specific problems related to information, organizational and methodological support to both a sustainable performance predictive analysis and formation of relevant information for stakeholders about the level of effectiveness of environmental protection measures.

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Corporate sustainable development is a long-term process of creating, maintaining and expanding financial capital at the level required by investors, achieved through a balanced development of other kinds of capital: social, natural, intellectual and production. The environmental concept has become one of the main objectives in the field of sustainable development of management system. Along with a corporation's financial sustainability, environmental and social sustainability are of importance, which, in the aggregate, constitute the modern notion of an economic entity's sustainable development (O.V. Efimova [1, 2], N.P. Lyubushin et al. [3], N.G. Sapozhnikova [4]). Wei Li et al. [5], provide a complex nature of corporate sustainable development strategy. A corporation's successful development is possible, if there is an equilibrium in all areas of the economic entity's operations.

A central and contentious debate in many literature sources concerns the relationship between financial, environmental and social performance. However, the knowledge on the financial effects of environmental and social performance remains fragmented. M.L. Barnett and R.M. Salomon [6] were the first authors that founded the nonlinear interrelatedness between financial and nonfinancial indicators of corporate sustainable development level and recognized the necessity of examining such effects. G. Friede et al. [7] highlighted not only a positive environmental, social, and effective governance performance impact on corporate financial performance, but also its stable impact over time. B. Cheng et al. [8] found that corporations with better social performance faced significantly lower capital constraints. E. Nicolăescu et al. [9] examined and evaluated the evolving nature of sustainability management in corporations, the significance of environmental protection and sustainability. T. Busch et al. [10] explored the role of financial markets for sustainable development. Since financial market participants increasingly integrate environmental, social, and governance criteria into their capital allocation decisions, more sustainable business practices have been fostering. According to M. Khan et al. [11] these results have implications for asset managers. R.G. Eccles et al. [12] focus on organizational and performance implications of integrating social and environmental issues into a corporation's strategy and business model. We provide evidence that high sustainability corporations significantly outperform their counterparts over the long term, both in terms of the stock market and accounting performance.

D.S. Dhaliwal et al. [13] describe various degrees of impact of environmental and social performance on the corporate financial performance. During examination of the association between sustainability performance and financial performance in Asia, N. Laskar et al. [14] reveal that environmental factor is more dominating in influencing the financial performance in Japan. Whereas, in India, the social factor dominates the financial performance. Corporate environmental sustainability is now under active

consideration in the various science fields. For more than two decades both economists (L.S. Korobeinikova [15, 16], M.V. Tkacheva [17–19], E. Vasilyeva & A. Mottaeva¹) and ecologists (V. Baudrot & S. Charles [20], L.R. Brown [21], W.M. Schaffer [22], A.M. Wilson & W. Jetz [23]) have made a major contribution to the widespread dissemination of the term “environmental sustainability”. However, there is no clear understanding of corporation’s environmental sustainability nature and role in the economic entity’s sustainability system.

This paper for the first time investigates the complex interaction of financial and environmental performance at the corporate level. We contribute to the literature by extending the traditional research on sustainability performance beyond the narrow focus of disclosure issues. The extant finance and accounting papers on financial and environmental performance predictive analysis focus primarily on long-term-oriented management forecasts. In contrast, there is a need for short-term management forecasts to carry out development strategies and performance sustainability at the corporate level. Our results provide evidence on the rationale behind and the consequences of the recent trend in the predictive analysis of corporate environmental and financial performance. We carried out a predictive analysis of environmental and financial performance on the case of AO Minudobreniya (Rossosh, Russian Federation) – a large economic entity of the chemical industry of the Russian Federation. This corporation is the only producer of mineral fertilizers in the Central Black Earth Region. One of the main principles of the policy in the field of quality and ecology is to ensure an open access to information about the environmental activities of AO Minudobreniya and about its impact on the environment. In order to implement this principle, the corporation regularly conducts comprehensive environmental and financial analysis. Our methodological approach is focused on the development of methods for such an analysis. In the framework of the sustainable development, we united financial, social and environmental components, which explain the set of performance indicators under consideration. We used annual values of performance indicators for the period 2012–2018 (*Table 1*).

According to extensive research by D.A. Endovitsky et al. [24, 25], A. Goldfarb and C. Tucker [26], A. Kogan et al. [27, 28], I.V. Zenkina [29], forecasting is really important due to being an immanent feature of corporation management and its development activities. The complex interaction of environmental and financial performance along with multidimensional data are the main problems in providing short-term-oriented management forecasts. D. Scherrer and A. Guisan [30] point to the lack of forecasting models for small samples capable of correct and adequate simulation of real multidimensional and coordinated environmental and financial processes. Many standard statistical methods available have either complex content interpretation, for instance, a vector autoregression model (VAR), or assume a dimension reduction of the input data, leading to the loss of a certain amount of information, which is not desirable.

¹ Vasilyeva E., Mottaeva A. Implementation of ecological audit in the enterprises activities for the benefit of the environment. *E3S Web of Conferences*, 2019, vol. 91, no. 08051. URL: <https://doi.org/10.1051/e3sconf/20199108051>

Regression matrix model provided in V.V. Davnis et al. [31] and Yuan Xue et al. [32] is a suitable alternative for the purposes of short-term predictive analysis. The regression matrix model is a system of regression equations. The interaction of models within the system, or systemic equilibrium in terms of dynamics, is achieved through indirect growth rates reflected by the matrix predictor with an econometric component. The matrix predictor implements the idea according to which the structure of interaction between processes characterized the dynamic state of the corporation is transferred to the future.

Let a corporation's environmental and financial performance be described by indicators $y_{i \leq n}$. In the initial form, each performance indicator is recognized as the AR(1) process. Then a corporation's environmental and financial performance at time t will be described by the system:

$$\begin{cases} y_{t;1} = c_1 + a_1 y_{t-1;1} + \varepsilon_{t;1} \\ y_{t;2} = c_2 + a_2 y_{t-1;2} + \varepsilon_{t;2} \\ y_{t;3} = c_3 + a_3 y_{t-1;3} + \varepsilon_{t;3} \\ \dots \\ y_{t;n} = c_n + a_n y_{t-1;n} + \varepsilon_{t;n} \end{cases}, \quad (1)$$

where c_i and a_i are parameters of the auto-regression equation of the i -th indicator; $\varepsilon_{t;i} \sim N(0,1)$.

The inclusion of an econometric component in the matrix predictor entails the transformation of the system's equations (1). In order to ensure the consistency of the dynamics of all forecasts indicators when calculating the matrix of indirect growth rates, we present a lagged variable $y_{t-1;i}$ in the following form:

$$y_{t-1;i} = y_{t-2;i} + (y_{t-1;i} - y_{t-2;i}). \quad (2)$$

After transforming the system (1) according to this rule, we get:

$$\begin{cases} y_{t;1} = c_1 + a_1 y_{t-2;1} + g_1 (y_{t-1;1} - y_{t-2;1}) + \varepsilon_{t;1} \\ y_{t;2} = c_2 + a_2 y_{t-2;2} + g_2 (y_{t-1;2} - y_{t-2;2}) + \varepsilon_{t;2} \\ y_{t;3} = c_3 + a_3 y_{t-2;3} + g_3 (y_{t-1;3} - y_{t-2;3}) + \varepsilon_{t;3} \\ \dots \\ y_{t;n} = c_n + a_n y_{t-2;n} + g_n (y_{t-1;n} - y_{t-2;n}) + \varepsilon_{t;n} \end{cases} \quad (3)$$

After this transformation, AR(1) equations can be classified as multi-factor regression equations that describe the dynamics of the explainable indicator, depending on its lagged value, where the lag order equals 2, and the growth in the interpretable figure in previous period. Therefore, increases in the explainable indicators are corrected in accordance with the results of the parametric identification of equations (3):

$$\Delta_{g_i} y_{t-1;i} = \hat{g}_i (y_{t-1;i} - y_{t-2;i}). \quad (4)$$

Considering the structure of the mechanism of systemic consistency of indicators related to a corporation's environmental and financial performance in the matrix predictor, we can hardly avoid the discussion concerning the estimation and consideration of the nature of the indirect impact of indicators. The variety of methods to show the nature of indirect impact form two subsets: a subset of *a priori* presentations and a subset of empiric presentations. In the first case, modeling is carried out within the boundaries of hypotheses about the nature of the indirect impact of indicators. In the second case, there is a preliminary sample estimation of the scope and nature of indirect impact of indicators. The two subsets allow for both a unified estimation for the entire group of indicators and individual estimations in terms of each indicator. In this paper, we assume the uniform impact on the increase of the explainable indicator by the explaining indicators. Assuming that

$$\Delta_{g_i} y_{t-1;i} = \frac{1}{n-1} \sum_{j \neq i} \frac{\Delta_{g_i} y_{t-1;i}}{y_{t;j}} y_{t;j}; \quad (5)$$

$$\frac{\Delta_{g_i} y_{t-1;i}}{y_{t;j}} = \theta_{i;j}^{g_i} \quad (6)$$

the system of equations (3) can take the following form:

$$\left\{ \begin{array}{l} y_{t;1} = \hat{c}_1 + \hat{a}_1 y_{t-2;1} + \frac{1}{n-1} \sum_{j \neq 1} \theta_{1;j}^{g_1} y_{t;j} \\ y_{t;2} = \hat{c}_2 + \hat{a}_2 y_{t-2;2} + \frac{1}{n-1} \sum_{j \neq 2} \theta_{2;j}^{g_2} y_{t;j} \\ y_{t;3} = \hat{c}_3 + \hat{a}_3 y_{t-2;3} + \frac{1}{n-1} \sum_{j \neq 3} \theta_{3;j}^{g_3} y_{t;j} \\ \dots \\ y_{t;n} = \hat{c}_n + \hat{a}_n y_{t-2;n} + \frac{1}{n-1} \sum_{j \neq n} \theta_{n;j}^{g_n} y_{t;j} \end{array} \right. \quad (7)$$

The following legend is used to move on to vector form of the system of indicators:

$\mathbf{Y}_t = (y_{t;1} \ y_{t;2} \ y_{t;3} \ \dots \ y_{t;n})$ The vector of the current values of explainable indicators;

$\hat{\mathbf{C}} = (\hat{c}_1 \ \hat{c}_2 \ \hat{c}_3 \ \dots \ \hat{c}_n)$ the vector of estimated parameters;

$\hat{\mathbf{A}} = (\hat{a}_1 \ \hat{a}_2 \ \hat{a}_3 \ \dots \ \hat{a}_n)$ the vector of estimated parameters;

$\mathbf{Y}_{t-2} = (y_{t-2;1} \ y_{t-2;2} \ y_{t-2;3} \ \dots \ y_{t-2;n})^T$ the vector of order of lag values (that equal two) of explainable indicators;

$$\mathbf{\Theta}_{t-1} = \frac{1}{n-1} \begin{pmatrix} 0 & \theta_{12}^{g_1} & \theta_{13}^{g_1} & \dots & \theta_{1n}^{g_1} \\ \theta_{21}^{g_2} & 0 & \theta_{23}^{g_2} & \dots & \theta_{2n}^{g_2} \\ \theta_{31}^{g_3} & \theta_{32}^{g_3} & 0 & \dots & \theta_{3n}^{g_3} \\ \dots & \dots & \dots & \ddots & \dots \\ \theta_{n1}^{g_n} & \theta_{n2}^{g_n} & \dots & \dots & 0 \end{pmatrix} \quad \text{the matrix of indirect growth rates with an}$$

econometric component.

In the vector form, the system (7) will be as follows:

$$\mathbf{Y}_t = \hat{\mathbf{C}} + \hat{\mathbf{A}}\mathbf{Y}_{t-2} + \mathbf{\Theta}_{t-1}\mathbf{Y}_t. \quad (8)$$

The solution to the system (8) involving $\mathbf{Y}_t$

$$\mathbf{Y}_t = (\mathbf{E}_n - \mathbf{\Theta}_{t-1})^{-1} (\hat{\mathbf{C}} + \hat{\mathbf{A}}\mathbf{Y}_{t-2}) \quad (9)$$

where $\mathbf{E}_n$ is a unit matrix of a $n \times n$ size.

To calculate forecasts for corporate environmental and financial performance, it is necessary to determine the lag order of performance indicators and indirect growth rates. We assume that the best decision is a minimum permissible lag order. The use of the latest observations is based on the fact that the latest data better reflect current trends and these trends are very likely to be extended to the future. Forecasting entails recalculating the matrix Θ with the current values of $\mathbf{Y}_t$, using lagged values of $\mathbf{Y}_{t-1}$, and replacing the vector $\mathbf{Y}_{t-2}$ with vector $\mathbf{Y}_{t-1}$

$$\mathbf{Y}_{t+1} = (\mathbf{E}_n - \Theta_t)^{-1} (\hat{\mathbf{C}} + \hat{\mathbf{A}}\mathbf{Y}_{t-1}). \quad (10)$$

Here is the end of the description of the procedure for forecasting the system of indicators of environmental and financial sustainability considering their systemic equilibrium in terms of dynamics. Using data on the dynamics of the volume of SO₂ atmospheric emissions (*Table 2*), we present details of parametric identification of one of the models included in regression matrix short-term forecasting model. Our estimates of AR(1) parameters based on OLS method:

$$y_{t,1} = -824.865^{**} + 1.508^{***} y_{t-2,1} + 1.19^* (y_{t-1,1} - y_{t-2,1}), \quad R_2^2 = 0.991.$$

The R^2 statistics demonstrate the high explanatory power of the obtained equation because the portion of the explained variation exceeds 99%.

The results of the parametric identification of all equations of the regression matrix short-term forecasting model are presented in *Table 3*.

Next we provide corrections of growth rates of the indicator $(y_{t-1,1} - y_{t-2,1})$ by the estimates $\hat{g}$ (*Table 4*). Assuming that increases in every indicator sensitive to the uniform impact of other indicators, we calculate indirect growth rates in the considered period. *Table 5* shows a fragment of calculations related to indirect growth rates. Regarding the concept of the indirect growth rate, zero values are shown in column 1. By performing similar calculations for the rest of the performance indicators we found indirect growth rates for the formation of the matrix of indirect growth rates. To make forecasts for 2019, we form the matrix of indirect growth rates using values obtained in 2018. In this case, the regression matrix model can be shown as follows:

$$\mathbf{Y}_{2019} = (\mathbf{I} - \Theta_{2018})^{-1} (\hat{\mathbf{A}} + \hat{\mathbf{B}}\mathbf{Y}_{2017}) \quad (11)$$

$$\text{where } \Theta_{2018} = \begin{pmatrix} 0 & -0.00019 & -0.00029 & -0.00002 & \dots & -2.38761 \\ -0.63983 & 0 & -0.00229 & -0.00013 & \dots & -18.69038 \\ -0.70934 & -0.00168 & 0 & 0.00093 & \dots & -20.72099 \\ 93.9529 & 0.22291 & 0.33581 & 0 & \dots & 2\,744.52206 \\ \dots & \dots & \dots & \dots & \ddots & \dots \\ -0.00018 & 0.00001 & 0.00001 & 0.00001 & & 0 \end{pmatrix},$$

$$\hat{\mathbf{A}} = \begin{pmatrix} 39.12 \\ -303.192 \\ 567.365 \\ 12\,283.457 \\ \vdots \\ 0.569 \end{pmatrix}, \quad \hat{\mathbf{B}} = \begin{pmatrix} -0.43 \\ 1.017 \\ 0.986 \\ 0.753 \\ \vdots \\ -0.456 \end{pmatrix}, \quad \mathbf{Y}_{2017} = \begin{pmatrix} 8.004 \\ 3\,373.584 \\ 2\,239.326 \\ 1.4 \\ \vdots \\ 0.274 \end{pmatrix}.$$

The results of the forecasting are shown in *Table 6*.

Thus, we obtained a forecast to describe changes in environmental and financial performance indicators of AO Minudobreniya. This predictive analysis was done on the 19-dimension indicator universe. At the same time, the present predictive analysis methodology available for higher dimensions. However, in the article, we aimed to present the predictive analysis methodology.

This paper analyzes the relevance of complex interactions of financial and environmental indicators in the short-term prediction of the corporate sustainability performance. We developed a methodological approach to predictive analysis of corporate environmental and financial performance focused on short-term-oriented management forecasts. Our results support that financial and non-financial information coupled has predictive power against each other. Dataset composed of AO Minudobreniya reporting was gathered for the period of 2012–2018.

Regarding the methodology, we applied the regression-matrix model, a powerful mathematical tool that reflects the complicated multidimensional processes with mutual proportionality in the dynamics of its indicators. At the same time, such a model has prerequisites for application outside of the mechanism of multi-option expectations, allowing one to consider various management scenarios of the future. The regression-matrix model allows for the automatization of the management forecasting process reflecting another important modern trend – a transition to the digital economics. These results have important implications for corporations, regulators, and investors.

As a future research line, we propose the justification of inclusion of additional financial and non-financial performance indicators and the consideration of a wider dataset. Omitting significant indicators can bias the short-term management forecasts and the

significance of the proposed framework, which is a limitation of empirical analysis. Moreover, another promising line of research is the consideration of industrial singularities to better understand how the relationship between variables varies depending on the industrial context.

Table 1
Summary statistics for the variables considered in the research

Indicator	Mean	Standard deviation	Maximum	Minimum
The volume of SO ₂ atmospheric emissions, thousand tons (y_1)	3 708.63	417.04	4 352.9	3 107.18
The volume of NO _x atmospheric emissions, thousand tons (y_2)	20.18	9.21	30.81	7.01
The volume of CO atmospheric emissions, thousand tons (y_3)	1 831.93	608.86	2 854.35	1 002.05
Generation of hazardous waste class 1, thousand tons (y_4)	2.1	0.49	2.8	1.4
Generation of hazardous waste class 2, thousand tons (y_5)	1.59	0.58	2.19	0.68
Generation of hazardous waste class 3, thousand tons (y_6)	418.18	56.04	504.85	332.86
Generation of hazardous waste class 4, thousand tons (y_7)	10 188.05	164.22	10 421.8	9 952.6
Generation of hazardous waste class 5, thousand tons (y_8)	233 414.81	34 202.03	272 416.4	178 678.7
Costs of major repair of the fixed assets of environmental protection, thousand rubles (y_9)	26 360.57	19 779.94	48 829	1 400
Labor and social security contributions, thousand rubles (y_{10})	46 858.14	26 342.6	70 778	8 834
Current environmental protection costs, thousand rubles (y_{11})	506 517.36	76 888.79	602 789.79	402 301.28
The efficiency of environmental protection costs (y_{12})	56.45	5.23	62.94	46.83
Sales, million rubles (y_{13})	32 193.79	4 839.34	40 418.1	26 516.56
Prime costs, million rubles (y_{14})	18 092.82	2 304.56	21 434.6	15 527.78
Economic cost efficiency (y_{15})	1.5	0.2	1.72	1.17
Coefficient of the provision of reserves with own sources of their formation (y_{16})	12.67	9.27	32.34	5.12
Production asset coefficient (y_{17})	0.14	0.09	0.33	0.06
Capital productivity (y_{18})	9.6	1.7	12.69	8.03
Return on sales (y_{19})	0.4	0.12	0.63	0.27

Source: Authoring

Table 2
Data on parametric identification of the equation for the volume of SO₂ atmospheric emissions

Year	$y_{t,1}$	$y_{t-1,1}$	$y_{t-2,1}$
2012	4 352.9	–	–
2013	4 026.48	4 352.9	–
2014	3 863.27	4 026.48	4 352.9
2015	3 700	3 863.27	4 026.48
2016	3 536.99	3 700	3 863.27
2017	3 373.58	3 536.99	3 700
2018	3 107.18	3 373.58	3 536.99
–	–	3 107.18	3 373.58
–	–	–	3 107.18

Source: Authoring

Table 3
Results of parametric identification

Performance indicator	$\hat{c}_i$	$\hat{a}_i$	$\hat{g}_i$
The volume of SO ₂ atmospheric emissions (y ₁)	39.12	-0.43	-3.09
The volume of NO _x atmospheric emissions (y ₂)	-824.865	1.19	1.51
The volume of CO atmospheric emissions (y ₃)	567.37	0.99	-0.51
Generation of hazardous waste class 1 (y ₄)	5.41	-1.37	-1.38
Generation of hazardous waste class 2 (y ₅)	3.49	-1.74	-0.09
Generation of hazardous waste class 3 (y ₆)	895.57	-1.26	-0.98
Generation of hazardous waste class 4 (y ₇)	27 141.34	-1.66	-0.62
Generation of hazardous waste class 5 (y ₈)	304 116.08	-0.32	-0.15
Costs of major repair of the fixed assets of environmental protection (y ₉)	12 283.46	0.75	0.75
Labor and social security contributions (y ₁₀)	25 117.56	0.7	0.42
Current environmental protection costs (y ₁₁)	700 882.63	-0.41	-0.14
The efficiency of environmental protection costs (y ₁₂)	101.76	-0.83	0.01
Sales (y ₁₃)	41 880.38	-0.25	0.2
Prime costs (y ₁₄)	11 972.49	0.37	0.7
Economic cost efficiency (y ₁₅)	101.76	-0.83	0
Coefficient of the provision of reserves with own sources of their formation (y ₁₆)	-3.56	1.93	0.06
Production asset coefficient (y ₁₇)	0.25	-1.03	-0.21
Capital productivity (y ₁₈)	8.14	0.16	0.62
Return on sales (y ₁₉)	0.57	-0.46	0.09

Source: Authoring

Table 4
Data for parametric identification of the modified equation for the volume of SO₂ atmospheric emissions

Year	y _{t,i}	y _{t-1,i}	y _{t-2,i}	g(y _{t-1,i} - y _{t-2,i})
2012	4 352.9	–	–	–
2013	4 189.69	4 352.9	–	–
2014	4 041.48	4 189.69	4 352.9	-163.21
2015	3 868.27	4 041.48	4 189.69	-148.21
2016	3 700	3 868.27	4 041.48	-173.21
2017	3 536.99	3 700	3 868.27	-168.27
2018	3 373.58	3 536.99	3 700	-163.01
–	–	3 373.58	3 536.99	–
–	–	–	3 373.58	–

Source: Authoring

Table 5
Indirect growth rates of the volume of SO₂ atmospheric emissions

Year	$\theta_{1,1}^{g_1}$	$\theta_{1,2}^{g_1}$	$\theta_{1,3}^{g_1}$	$\theta_{1,4}^{g_1}$	...	$\theta_{1,19}^{g_1}$
2014	0	-0.068	-0.066	-0.003	...	-302.598
2015	0	-0.053	-0.004	-0.002	...	-197.665
2016	0	-0.054	-0.003	-0.001	...	-154.735
2017	0	-0.048	-0.002	-0.002	...	-297.365
2018	0	-0.041	-0.002	-0.001	...	-336.427

Source: Authoring

Table 6
Short-term forecast of sustainability performance of AO Minudobreniya

Indicator	Forecast, 2019	Absolute deviation vs. 2018
The volume of NO _x atmospheric emissions	14.03	6.02
The volume of SO ₂ atmospheric emissions	3 197.46	-176.12
The volume of CO atmospheric emissions	2 433.43	194.1
Generation of hazardous waste class 1	0.04	-1.36
Generation of hazardous waste class 2	3.35	1.16
Generation of hazardous waste class 3	452.88	-13.41
Generation of hazardous waste class 4	9 517.37	-731.23
Generation of hazardous waste class 5	226 796.88	-40 619.52
Costs of major repair of the fixed assets of environmental protection	61 016.13	22 286.13
Labor and social security contributions	61 072.57	-9 705.43
Current environmental protection costs	430 312.96	-94 131.17
The efficiency of environmental protection costs	1.43	-0.29
Sales	33 069.85	-575.96
Prime costs	17 823.11	-1 529.19
Economic cost efficiency	49.77	-7.74
Coefficient of the provision of reserves with own sources of their formation	23.04	9.48
Production asset coefficient	0.1	-0.03
Capital productivity	9	-0.18
Return on sales	0.4	0.12

Source: Authoring

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Conflict-of-interest notification

We, the authors of this article, bindingly and explicitly declare of the partial and total lack of actual or potential conflict of interest with any other third party whatsoever, which may arise as a result of the publication of this article. This statement relates to the study, data collection and interpretation, writing and preparation of the article, and the decision to submit the manuscript for publication.