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Assessing the Sustainability of Russian Iron and Steel Companies Amid a Structural Crisis

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Abstract

In the present paper the authors developed and tested the sustainability index of Russian iron and steel companies against the background of a structural crisis caused by the sanctions of 2022. Six companies with public reporting, including Nornickel and United Company RUSAL, were analyzed. The index comprises financial sustainability (Altman's Z-score), operation flexibility, strategic planning horizon, economic value added (EVA), as well as environmental and social aspects. It was established that companies that actively adapt such strategies as market and commodity diversification, supply chain management and environmental standard integration exhibit stronger sustainability. For example, Nornickel managed to redirect export from Europe to Asia, maintaining its financial stability despite a reduction in EBITDA by 17%. When RUSAL came up against supply chain disruption and an increase in costs, it recouped a part of losses by expanding in Asian markets and domestic operations. Practical recommendations based on the research comprise extending the planning horizon, reducing reliance on a single product or region and reinforcing the environmental and social sustainability. These conclusions confirm the hypothesis that companies that have gained experience in crisis management overcome new challenges with greater success.

Keywords: strategic sustainability, operational sustainability, financial sustainability, Altman's Z-score, economic value added, emerging capital markets, company's horizon, metallurgical industry, structural crisis.

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Introduction

The topic of corporate sustainability has gained popularity due to a large scale of the crises which have occurred over the recent years. The increasing complexity of the business environment and growing competition entails greater volatility of companies' operations. Besides, there is no common approach to measuring sustainability. The purpose of the paper is to solve the applied problem of tracing the Russian companies' sustainability during crises, especially against the background of macroeconomic events of 2022. In order to achieve our purpose, we: 1) analyzed academic literature dedicated to defining and measuring sustainability, economic profit, planning horizon and stability indices; 2) determined the business indicators of sustainability; 3) chose the sustainability evaluation method on the basis of analysis of various parameters; 4) defined the objects for a case study in the metallurgical industry; 5) created the sustainability index for Russian public companies; 6) assessed the influence of macroeconomic factors on the company's sustainability indicators; 7) provided recommendations for improvement of the company's standing in volatility periods.

The research objects are iron and steel companies: Mining and Metallurgical Company Norilsk Nickel, United Company RUSAL, PAO Magnitogorsk Iron and Steel Works, Mechel Group, PAO Severstal. Our case study places more attention on MMC Norilsk Nickel and UC RUSAL.

The research subject in our paper is the indicators that manifest the sustainability of Russian iron and steel companies with publicly available reports for 2022–2023.

Bloomberg and *Capital IQ,* as well as the data published by the companies that serve as research subjects, are the main data sources.

The research is performed by means of case study. This method was chosen because we wish to emphasize adaptation strategies in the circumstances of macroeconomic uncertainty. The paper is of practical significance since the case study results may be useful both for company managers and similar companies from the same industry, allowing them to assess their ability to adapt when macroeconomic volatility emerges.

Sustainability as a Company Management Component

Crisis and emergency situations have become an integral part of the present-day world and are one of the key factors that influence a company's operations and survival capability.

The researchers [1] believe that apart from outperforming their competitors in handling a recession and recovery, sustainable companies also accelerate their growth under new circumstances.

In a broad sense, sustainability refers to a company's ability to overcome crises without serious losses. In a narrower sense, sustainability is the capability to cope rapidly and efficiently with the effects of a crisis [2]. Traditionally, companies focus on financial indicators when considering sustainability. However, researchers from *McKinsey* [3] point out that, for example, due to climate changes companies have to adjust themselves to expectations of governments, shareholders and the society in general. Adaptation entails changes in the business model, so it is necessary to achieve sustainability and flexibility in a new context. Another example is when digitalization requires creation of a mechanism of mass cyberattack defense, which also causes changes in the business model.

These changes imply a broader view on sustainability and necessitate the measuring of its six parameters: finance, operations, technology (digitalization), company structure, reputation and business model.

Financial sustainability means that companies have to manage both long-term and short-term financial objectives efficiently.

Operational sustainability consists in the ability to respond to changes in demand when operating activity is impeded, i.e., to improve supply chains used to deliver the materials necessary to manufacture products, as well as the finished products to consumers.

Technological (digital) sustainability consists in avoidance of faults in technological chains, ensuring cybersecurity, etc.

Organizational sustainability means the company's ability to foresee and respond to events by means of adaptation to them and natural recovery, aligning the structure with business goals.

Reputational sustainability consists in company's capability to maintain or improve its image in the partners' and consumers' opinion. If a company determines its mission correctly it meets public expectations and handles criticism easier.

Business model sustainability is the ability to adapt to significant changes in a competitive environment.

In addition, some researchers also consider **strategic sustainability**.

As noted in the studies by *McKinsey* [4], companies already address sustainability ensuring the following:

- Balance sheet restructuring, i.e., an increase in the debt that a company may service under stress in order to enhance the credit rating.
- Analyzing the supply chain to detect the suppliers that involve high risk and expenses in order to achieve operational sustainability.
- Fixed asset decarbonization as part of sustainable development integration along the value chain in the core business.
- Using a crisis as a growth opportunity. For example, disruption of supply chains and rendering services during COVID-19 resulted in offering services via virtual channels.

Sustainable companies apply several methods to deal with a crisis – foresight, response and adaptation.

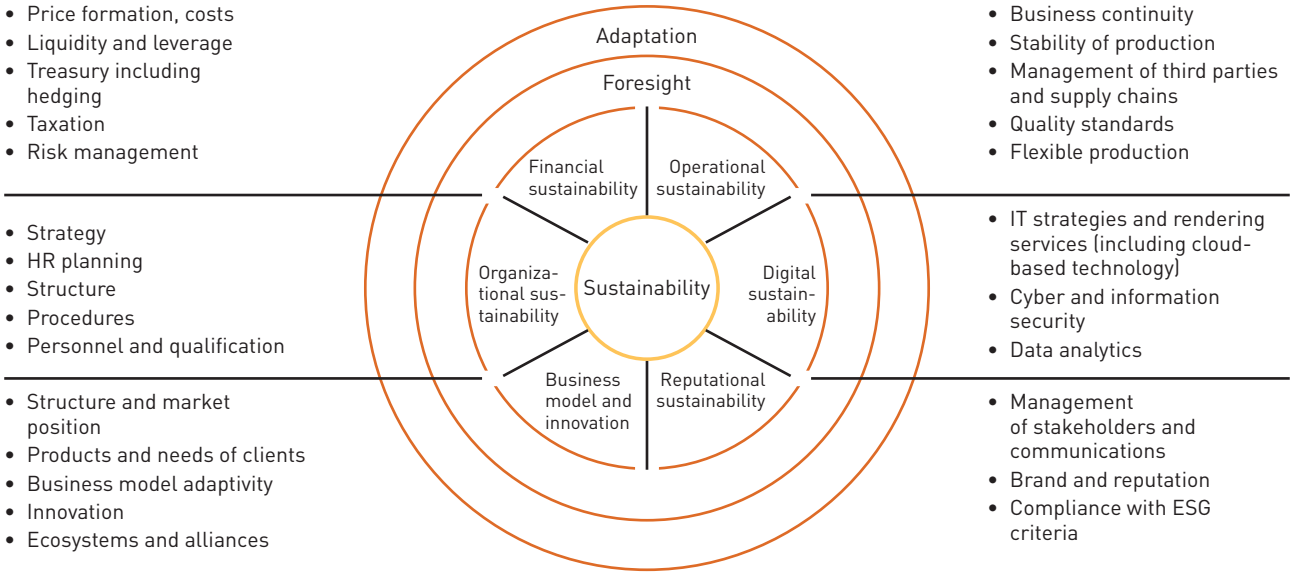
Foresight (scenario analysis) consists in creating hypothetical scenarios (for example, technology breakdown or market crash) followed by the evaluation of the potential impact on business and sustainability. Such analysis may offer geographic diversification as a solution in order to reduce dependence.

A response, i.e., a possibility to solve the encountered problem quickly and effectively, paves the way for a company's success.

Adaptation is the company's capability to avail of growth opportunities in unfavorable conditions.

The key sustainability factors may be presented as a matrix (Figure 1).

Figure 1. Key factors of corporate sustainability



Source: [1, p. 10].

In order to make the company sustainable, it is necessary to construct a crisis response strategy and develop a number of scenarios, using which companies may test their capital structure and cash flows. Such actions may assist in overcoming the recession without losses and purchasing assets during crises at lower prices.

Composite Sustainability Index of an Iron and Steel Company

Definition of the Index Components and Calculation Methodology

On the basis of literature analysis [5–7], we decided to use the following parameters for the composite sustainability index (each parameter will be assigned a value from 1 to 3): 1) planning horizon; 2) economic component; 3) efficiency; 4) flexibility; 5) environmental and social components of the industry.

1. Planning Horizon as a Sustainability Indicator. Strategic planning of a company is a determining factor in building a sustainable company because it defines the company's development trend, besides, the strategies may be either long-term or short-term. To assess the efficiency of the chosen strategies, the McKinsey Institute performed a study based on the data on 615 US public companies in 2001–2015 by means of constructing the index that showed the investment level, growth rates, quality of profit and their management [8].

On the basis of the McKinsey methodology, Russian authors calculated the index of a company's strategic planning horizon according to four parameters [5] as at a certain date, as well as their industry average. Then they compared the index value of a certain company to the industry average value (Table 1). To ensure the validity of the results, the companies were compared only to their industry peers.

Table 1. Financial indicators used in index calculation

Factor	Formula	Description
Investment	Capital expenditures$_t$ / Depreciation$_t$	Companies with a long-term planning horizon invest resolutely and in larger amounts

Factor	Formula	Description
Quality of profit	(Net profit$_t$ – Free cash flow$_t$) / Revenue$_t$	Ratio of accrued future income to revenue
Profitability growth	Revenue$_t$ / Revenue$_{t-1}$ – Net profit$_t$ / Net profit$_{t-1}$	Difference between growth of revenue and net profit
Earnings per share	Net profit$_t$ / Net profit$_{t-1}$ – Earnings per share$_t$ / Earnings per share$_{t-1}$	Difference between growth of net profit and the indicator of net earnings per share

Source: [5, p. 475].

The formula for the index is as follows:

$$CHI_{average}^{IndustryX} = \frac{\sum_{i=2016}^{2023}\left(Factor1 - 4_i^{Industry\ X} * 25\%\right)}{number\ of\ companies\ in\ industry\ X}. \quad (1)$$

Calculation of the index provides an opportunity to classify companies as "far-sighted" (i.e., using a long-term strategy) or "short-sighted" (i.e., using a short-term strategy).

2. The Economic Component of Sustainability. To assess this component, a five-factor Altman's Z-score was used [7]. The results offered by this model allow to analyze financial strategies. The model formula is as follows:

$$Z = 0{,}717X_1 + 0{,}847X_2 + 3{,}107X_3 + 0{,}42X_4 + 0{,}998X_5. \quad (2)$$

Description of the formula components is presented in Table 2.

Table 2. Key coefficients of the Altman's Z-score

Coefficients	Components	Description
X_1	NWC$_t$ / TA$_t$, where NWC$_t$ – net working capital as at the end of period t; TA$_t$ – company assets as at the end of period *t*	The coefficient is of importance in defining liquidity; a decrease in net working capital as compared to assets often occurs in the companies with weakening financial sustainability
X_2	RE$_t$ / TA$_t$, where RE$_t$ – undistributed profit for period *t*	The higher this coefficient, the more opportunities the company has to develop products and projects inside the company
X_3	ROA$_t$ = EBIT$_t$ / TA$_t$, where EBIT$_t$ – earnings before interest and taxes	The coefficient is indicative of efficiency of management decisions in relation to corporate asset management
X_4	Equity$_t$ / Debt$_t$, where Equity$_t$ – book value of equity as at the end of period *t*; Debt$_t$ – book value of debt capital as at the end of period *t*	The lower the financial leverage of the company (the indicator is higher), the lower the probability that the company will encounter difficulties with financial sustainability caused by credit payments
X_5	S$_t$ / TA$_t$, where S$_t$ – company revenue for period *t*	The indicator shows asset turnover

Source: [7].

The value of the Altman's Z-score below 1.23 is indicative of a low level of corporate financial sustainability. The range of 1.23 to 2.9 manifests moderate financial sustainability. A value exceeding 2.9 shows high financial sustainability.

To analyze the financial sustainability of large Russian businesses, we offer the following parameter ranking:

- change for the worst (value 1);
- absence of changes (value 2);
- change for the better (value 3).

3. Company Efficiency as a Component of Sustainability. In general, economic value added (*EVA*) is closely related to business resilience. The companies that generate consistently positive *EVA* are usually more sustainable and better prepared to prosper in a dynamic and complex business environment.

To evaluate the dynamics of the company status, we construct the financial strategies matrix.

So, we have to calculate the indicators presented in Table 3.

Table 3. Indicators of the financial strategies matrix

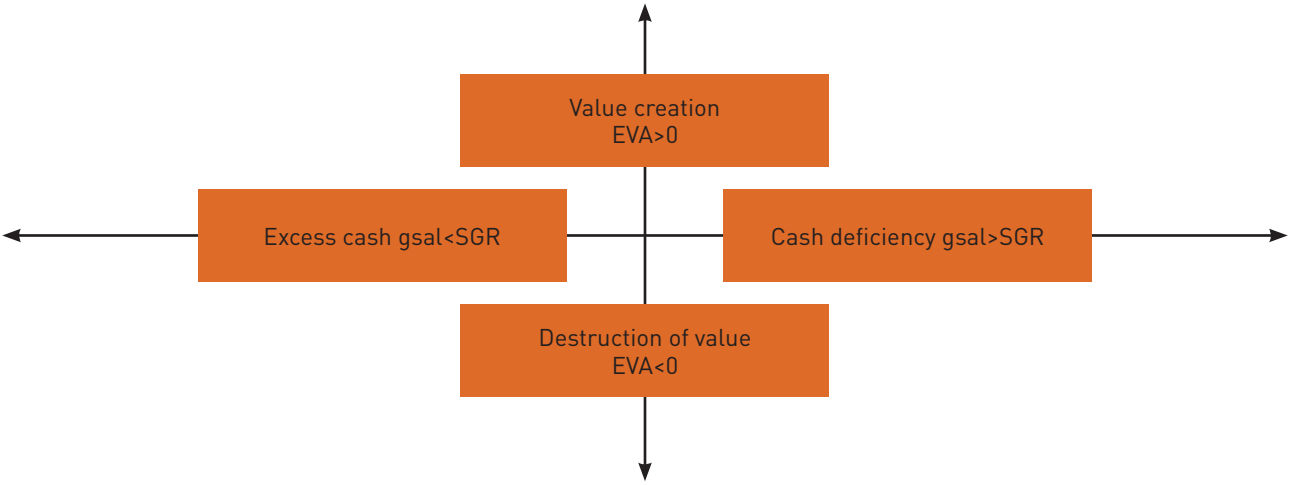
Indicators	Designation	Calculation
Return on equity	*ROE*	Net profit / Equity
Rate of return	*RR*	(Net profit – Dividends) / Net profit
Sales growth rate	*Gsal*	Forecasting/Actual when there is no forecast
Sustainable growth rate	*SGR*	*RR•ROE*
Spread	*Spread*	*Gsal-SGR*

Source: [9].

Analysis of the matrix provides an opportunity to determine the possible areas for business development. If a company is located in the upper right quadrant, it is recommended to reduce dividends or raise additional capital; in the lower right quadrant – to consider changing the strategy and perform business process reengineering; in the lower left quadrant – to use excess cash to improve profitability and/or reconsider the capital structure, in the upper left quadrant – to use excess cash to accelerate growth or repurchase the company's own stock/pay dividends to the owners.

The matrix is presented in Figure 2.

Figure 2. Matrix of corporate financial strategies



Source: [9].

We offer the following ranking of the results:

- the company has aggravated its position (value 1);
- the company's position has not changed (value 2);
- the company improved its position (value 3).

4. Strategic Flexibility as a Component of Sustainability. It allows to take into consideration the efficiency of decision-making related to the functioning of an entire group of companies and implementation of fresh capacities (capital investment). We propose to add several components to this parameter, the average value of which will be the parameter value.

1) capital expenditures/revenue:

- the indicator is below the sample average (value 1);
- the indicator equals the sample average (value 2);
- the indicator exceeds the sample average (value 3);

2) revenue diversification:

- regional revenue is over 75% of the consolidated revenues (value 1);
- regional revenue is over 50% and less than 75% of the consolidated revenues (value 2);
- regional revenue is less than 50% of the consolidated revenues (value 3).

3) diversification of revenue by product:

- the share of the product is over 75% of the consolidated revenues (value 1);
- the share of the product is over 50% and less than 75% of the consolidated revenues (value 2);
- the share of the product is less than 50% of the consolidated revenues (value 3).

The values of the product and geographical diversification parameters for Magnitogorsk Iron and Steel Works (MMK), Mechel and Severstal in 2022–2023 were assumed to be equivalent to the value calculated in 2021 because information was unavailable.

5. Environmental and Social Industry-Related Components of Sustainability. Amid a structural crisis or introduction of sanctions, integration of the environmental and

social components into the crisis sustainability index becomes crucial.

In order to evaluate sustainability from the environmental point of view, we are going to use indicators from reports made according to *GRI*. It comprises the tracing of eight key indicators: raw materials; energy; water; biodiversity; emissions; sewage and wastes; environmental compliance; environmental assessment of the supplier [10]. In most cases, the quantitative evaluation of these indicators and their comparison between companies is impeded because the necessary information is only partly available from official sources. Therefore, in the absence of sufficient empirical data to evaluate sustainability of industrial companies, the score-based evaluation method is often applied [11].

Sustainability from the social point of view is, in the first instance, assessed against staff turnover, which may increase during a crisis or sanctions due to uncertainty in the labour market and changes in the workplace environment. We offer the following ranking of staff turnover:

- above the industry average (value 1);
- equal to the industry average (value 2);
- below the industry average (value 3).

We use the value of 2022 for staff turnover in 2023 because there is no data.

The index will be calculated on the basis of the abovementioned sustainability parameters by the geometric mean formula according to the existing methodic practice [12]:

$$I_R = \sqrt[5]{HI \cdot Alt \cdot EVA \cdot I_{Strategy} \cdot I_{ES}}, \quad (3)$$

where I_R – the composite sustainability index of an iron and steel company; *HI* – company horizon; *Alt* – value of the parameter of the five-factor Altman's Z-score; *EVA* – dynamics of the position in the financial strategies matrix (see Figure 2); $I_{Strategy}$ – strategic component of sustainability; I_{ES} – environmental and social component of sustainability.

Characteristics of the Russian Companies' Sample

The sample of iron and steel companies comprises the data which has been uploaded from the *Bloomberg* and *Capital IQ* analytical databases and also obtained from companies' consolidated statements. Based on the sample, we calculated the values of the five-factor Altman's Z-score, economic profit, planning horizon index, strategic and environmental components of sustainability.

The sample comprises the following companies:

- Mechel is one of the largest Russian companies engaged in coal mining and conversion, as well as in production of steel and other metallurgical products. The company holds a significant share in the coal and metal market; however, it faces financial and operational challenges, including a high debt ratio.
- Magnitogorsk Iron and Steel Works (MMK) is one of the global leaders in the iron and steel industry. Iron and Steel Works specializes in the manufacture of a wide range of steel products including hot-rolled, cold-rolled, zinc-coated and varnish-and-paint sheets, pipes and other articles.
- Mining and Metallurgical Company Nornickel is one of the leading global manufacturers of nickel, palladium, platinum and copper. The company makes a significant impact on the global market of metals and products of metal processing and ranks among the key players in the industry.
- United Company RUSAL is one of the largest global aluminum manufacturers with assets all over the world, including Russia, North and South America, Europe and Asia. It specializes in bauxite mining (raw materials for aluminum production), manufacture of rolled aluminum, aluminum alloys and other products.
- Severstal is a large Russian manufacturer of steel and steel products, including rolled sheet, profile and pipes. The company owns assets in Russia and abroad.

All the above companies are the leaders in their sector with public reporting available up to and including 2021 (not all of them disclosed information in 2022).

For the case study we are going to consider the two largest public players of the Russian iron and steel market: MMC Norilsk Nickel and United Company RUSAL.

3.Case Study: Sustainability of Russian Companies and Adaptation Strategies against the Background of Crisis

Results of the Composite Index Construction

Analyzing companies' sustainability according to several parameters, we constructed a composite index that comprises financial, economic, strategic and environmental indicators. Analysis of pre-crisis data allowed to assess historical dynamics and the level of preparedness of companies to possible operational instability caused by sanctions in 2022.

As a result of the performed analysis, we created the sustainability index as at the end of 2021, which is a combination of the factors indicative of a company's capability to maintain sustainability during a structural crisis.

According to the obtained index, Mechel is in the least favourable position, while Severstal has the highest index value as at the end of 2021. For further analysis we chose RUSAL and Nornickel premised on data availability for 2022.

Case Study Hypotheses

Based on the analysis of the iron and steel industry in Russia, as well as financial and operational analysis of Nornickel and RUSAL, we may suggest the following hypotheses:

Hypothesis 1: In the midst of a crisis, sustainability may be enhanced because the company avails of the opportunities emerging in periods of uncertainty.

Hypothesis 2: More sustainable companies lose less of their estimated sustainability value during a crisis than less prepared ones.

Hypothesis 3: Antecedent sanctions pressure on the company enhances the likelihood of applying response strategies in case of subsequent challenges.

Sustainability Indicators as Exemplified by UC RUSAL

In 2022–2023 UC RUSAL faced a lot of challenges, which forced the management to change the business model. Negative changes are as follows: disruption of production and commodity chains; lower availability of imported raw materials and equipment; changes in the target markets, demand fluctuations and increasing cost of production.

According to the index, since 2021 the company's sustainability decreased, however, it remained above the values of 2020 due to, among other things, the prompt measures that transformed the supply chains (Table 4), as well as target market extension. The general negative influence of sanctions and core product's (aluminum) price volatility resulted in reduced indicators [13].

Table 4. RUSAL revenue diversification

Revenue by types of products, %	2017	2018	2019	2020	2021	2022	2023
Aluminum	85	82	84	84	85	85	85
Alumina	15	18	16	16	15	15	15
Total, %	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Revenue by regions, %	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Europe	42	47	49	42	37	36	28
Asia	24	29	27	29	33	29	32
Americas	17	10	8	7	9	7	1
Russian Federation and CIS	16	14	14	21	21	27	38
Total, %	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: [13]

Among other things, the company determined the following risks for itself, taking into consideration the considered structural crisis:

1) hard-to-predict change in demand for virgin metal and alloys due to the sanctions and trade restrictions imposed on a range of Russian industries;
2) loss of company's control over foreign assets and tightening of restrictions;
3) rise in the prices for transportation services caused by disruption of global supply chains, sanctions restrictions;
4) inability to supply and/or repair equipment and components due to sanctions restrictions, resulting in suspension of operations.

To analyze strategic measures, we propose to consider the factors that influenced the index components and their current value (in 2022–2023). As for the first index component –Altman's Z-score – there are no significant changes; the company retains the financial sustainability level achieved in 2021. Besides, the company's revenue in 2023 dropped by 13% after an increase by 17% in 2022. Discontinuation of alumina production at the Nikolaev Alumina Refinery disrupted the company's usual supply chains. However, RUSAL management succeeded in promptly reorganizing the raw materials delivery and supply chains redirecting the flows to the domestic and Asian markets, thus preserving the aluminum sales volume at the 2021 level. In October 2023 the company signed an agreement for the purchase of a 30% stake in a Chinese iron and steel company, thus ensuring access to a stable source of alumina. Therefore, RUSAL is looking for new ways to save on imported raw materials, including company acquisitions in friendly countries, and sets a goal to ensure strategic security [14].

The company's operating profit decreased by 41%, and the net profit – by 44%. It was caused by a rise in price for energy commodities and raw materials. Additionally, alumina purchase costs grew mainly due to an increase in the cost price. The factors that influenced the corporate operating results led to a decrease in the operating income margin.

In 2023, the company continued to focus on reorganizing logistic routes, developing the domestic market, and implementing sustainability programs. At the same time, the annual company revenue dropped by 12.6%, up to $12 bln due to a decrease in the price for aluminum in the London Metal Exchange (*LME*) by 16,8%. Revenue from sales of alumina and foil reduced for the second year running (by 38.2% and 5.3%, respectively), while purchase prices of raw materials (except for alumina and bauxites) and electrical energy decreased by 20% and 14%, respectively [15].

According to our calculations, the company's economic value added decreased in 2022 and continued to decrease in 2023 as a result of both reduced cash flow from operations and an increased weighted average cost of capital. In 2022, the company moved to the left part of the financial strategy matrix, which represents excess cash because it practically did not pay out dividends and had ROE of 16%, while revenue showed almost no growth. However, when in 2023 revenue grew by 14% with ROE of 2%, the company showed cash deficiency. Based on the company's

current position in the financial strategies matrix, it is recommended to reengineer its business processes in order to improve EVA. Excess cash in 2022 was a result of low growth rates caused by sanctions.

Inasmuch as no sanctions were imposed on the company, in 2022 RUSAL continued deliveries to Europe (revenue +13%) and America (revenue –5%) and simultaneously increased its revenue in Asia by 53%. However, in 2023 revenue in Europe dropped by 32%, in America – by 83%, and continued to grow in Asia (25%). Due to the specific nature of its business, the company is focused on a single product and depends completely on this product's price fluctuations.

In the challenging 2022, staff turnover remained at the 2021 level because the company promotes a social policy aimed at improving employee welfare and working environment. In 2022, as part of professional development and vocational training, 27,000 employees were trained both in internal programs and by external providers and experts.

As for environmental issues, the company continues to disclose and assess the parameters considered in *GRI*, and openly demonstrates the results and plans of its environmental and climate activities. In 2022, the Board of Directors adopted a revised environmental policy, which sets out that RUSAL will focus on land reinstatement, promote preservation of biological diversity and complete the carbon-neutral transition by 2050.

The company implements a long-term program for updating the process control systems in order to reduce electric energy and raw materials consumption. For this purpose, automated systems are designed. Also, development is performed using Russian platforms as part of imports phase-out. Additionally, the company benefited from the sanctions imposed in 2018, and in 2021 it began to use mainly Russian equipment for its plants when constructing Boguchansky Aluminum Smelter in the Taezhny settlement in the Krasnoyarsk Region.

In 2022, the company increased its revenue, unlike Nornickel, but in 2023 its revenue declined. The fluctuations are largely caused by the aluminum price volatility. It is recommended to take note of low capital expenditures relative to depreciation, as well as revenue, whose growth rate is lower than the profit growth rate.

Thus, in 2022, company sustainability was enhanced due to the change of the position in the financial strategies matrix (the company moved to the excess cash area by means of higher net profit growth rates). According to financial statements, in the five-factor Altman's Z-score the value of sustainability decreased, approaching the threshold but not crossing it. From the strategic point of view, the company faced difficulties, but managed to redirect commodity flows and circumvent restrictions.

Sustainability Indicators as Exemplified by MMC Norilsk Nickel

In the annual report for 2022, the management of MMC Norilsk Nickel noted that the company had already recovered from the effects of the COVID-19 pandemic and work-related incidents at the Taimyrsky and Oktyabrsky mines. Nevertheless, the sanctions imposed in 2022 produced a significant negative impact on business because the company had to elongate its supply chains and switch to new target markets. The company redirected commodity flows: the share of the European region in its revenue decreased from 47 to 24%, while the share of the Asian region grew from 31 to 53%. The company's EBITDA dropped by 17%, down to $9 bln, as a result of a decrease in consolidated revenue by 5%, down to $17 bln, and the price rise caused by increased staff and repair costs [16].

Thus, for example, the amount of ore produced by Kola MMC was 2% (7 mln tons) less than in the previous year, which is directly related to the sanctions restrictions: insufficient amount of self-propelled diesel equipment, lack of spare parts for it and stoppage of maintenance service of mining machinery in Russia by western companies (Table 5).

Table 5. Diversification of Norilsk Nickel revenue (%)

Revenue by type of product	2017	2018	2019	2020	2021	2022	2023
Europe	54	52	45	45	53	47	24
Asia	27	25	35	35	27	31	53
North and South America	15	18	16	16	15	15	10
Russian Federation and CIS	5	5	4	4	4	8	12
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Output plans	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Nickel, thousand tons	217	217	217	233	190	219	204
Platinum group, mln oz	3,5	3,5	3,5	3,5	3,2	3,5	3,0
Copper, thousand tons	457	457	457	487	407	453	417

Source: [16].

Besides, company debt increased by 12%, up to $12 bln as a result of refinancing when the external factors deteriorated. At the same time, the National Rating Agency Expert RA confirmed the company's credit rating at the highest investment level of ruAAA.

On 29 June 2022, the UK imposed personal sanctions on Vladimir Potanin, however, the sanctions are not applied to the company (some contracting parties may reconsider their relationship with the company in order to comply with the restrictions concerning interaction with Russian legal entities).

Historically, financial stability was characteristic of Nornickel, and it is confirmed by the past values of the Altman's Z-score model. This long-term trend also manifested itself during the crisis – the company's position did not change for the worse because it maintained its financial indicators (for example, working capital) at the same level. Besides, in 2022, company revenue dropped by 10%, up to $16.1 billion. The company EBITDA margin lowered by 7% (to 52%), thus, combined with the revenue decline, reducing EBITDA by 17%, to $8.7 bln. In spite of the changing dynamics in the target markets, in 2022 the company boosted the manufacturing of its core products.

In 2022, the company's economic value added decreased by 33%, up to $2.9 bln, and in 2023 – by 54%, up to $1.3 bln. The reason is a simultaneous increase in the weighted average cost of capital (WACC) and a decrease in the return on invested capital (*ROIC*). The first factor may be explained by an increase in the risk-free rate represented by the yield on 20-year Federal Loan Bonds, growth in the sector's unlevered beta and borrowed capital's cost increase. In its turn, *ROIC* decreased as a result of a reduction in *NOPAT*. Based on the financial strategies matrix, the company is recommended to allocate cash aiming at accelerating revenue growth and redemption of stock/dividend payout. Given that company revenue decreased as a result of the sanctions restrictions we propose to apply funds towards restoring sales channels and increasing revenue [16].

Unlike RUSAL, the company is less exposed to price risks because it has multiple partners in various regions and industries due to its diversified product range.

In 2022, staff turnover decreased by 1% (up to 11%), which is indicative of the company's ability to retain employees. As part of the training strategy for 2022-2025, Nornickel defined the creation of an ecosystem of proactive training for personnel development as one of its important goals. At the same time, the company regularly holds events aimed at the implementation of its corporate programs (65,500 employees have taken courses in digital skills development), it has expanded the area of its corporate university and implements a set of measures intended to support employees when they move to another region.

The company also addresses other aspects of social development – corporate culture development – by means of promoting volunteering activities and involvement, labor compensation, which comprises a comprehensive employee motivation system, it cooperates with trade unions, has operating social councils and maintains sports, medical, and housing programs, and pension plans. The company is committed to a zero-tolerance policy in relation to industrial injuries. This decreases the number of fatal cases and lost time incidents.

In the sphere of climate development, the company reveals and monitors numerous parameters in compliance with the environment management system. In general, it achieved improvements, such as reduced carbon dioxide emissions and sewage discharge into water bodies, and maintained biodiversity.

Following its risk management strategy, Nornickel considers imports phase-out a factor protecting from the risks related to equipment and services supply by foreign vendors. In particular, the company is highly interested in the use of Russian technology solutions, so it selects, tests and implements them. For instance, Nornickel cooperated with the First Bit team and *PIX Robotics* vendor to phase out the imported software robots in the *UiPath* platform, preserving functionality.

Additionally, as part of managing this risk, the company actively engages Russian manufacturers in order to expand the competitive environment, signs long-term agreements that lock in the best prices for materials, determines critical suppliers and monitors the state of their activity.

Some western engineering companies and equipment suppliers terminated agreements, including the ones for performance of works under the comprehensive Sulphur Program project at the Copper Plant. The company intensively searches for import substitution solutions for this project. The company's investment program implies investing over RUB 2 trillion in asset development and modernization.

According to the planning horizon, it was historically characteristic of the company to use long-term planning, however, in 2021 the company was characterized as implementing short-term planning. In this case, it is recommended to pay attention to the growth rate of revenue relative to net income, as well as the *EPS* growth rate, which exceeds the net income growth rate. Besides, after the main phase of the crisis, the company switched its focus to the long-term horizon.

Within the observation period, according to financial statements, the sustainability value in the five-factor Altman's Z-score decreased and approached the threshold without crossing it. In 2022, the company increased its debt, similar to the companies from *McKinsey* studies [17]. The company partially changed its supply chains, however, as long as its products are in demand, no volume-related restrictions were applied in the form of sanctions. At the same time, the company's revenue decreased as a result of price fluctuations. Sustainability remained at the pre-crisis level.

The research results are presented in Table 6.

Table 6. Research results

Hypothesis	Result
1. In the midst of a crisis sustainability may be enhanced because the company avails of the opportunities emerging in periods of uncertainty	Nornickel managed to adapt to the emerging difficulties and redirect rapidly the flows to Asia. This, together with creation of economic value and financial sustainability, resulted in enhancement of general sustainability. The hypothesis is confirmed
2. More sustainable companies lose less of their estimated sustainability value during a crisis than less prepared ones	Based on the overall sample and case study it was revealed that each company has its own vector of development, and comparison of dynamics of indices may be misinterpreted due to the multifactorial nature of the parameters it comprises. The hypothesis is not confirmed
3. Antecedent sanctions pressure on the company enhances the likelihood of applying response strategies in case of subsequent challenges	Using RUSAL as an example, we considered the adaptation on the basis of past experience: elimination of foreign companies, which may withdraw services because the company had already faced restrictions when sanctions were imposed on it, from the list of suppliers. The hypothesis was confirmed

Conclusion

In our research we assessed the sustainability of Russian iron and steel companies, developed the sustainability index, considered in detail the index components as exemplified by case study of the leaders of the metallurgical sector. The probability of use of the development index for other industries is evaluated. The following theoretical and practical conclusions have been made.

We also considered various sustainability concepts. As a result of the analysis, sustainability was defined as the ability to cope with crises without significant losses and recover within an optimal period. Besides, the indicators that may determine sustainability and the ways to create it in a company were identified.

We have analyzed empirical studies by *McKinsey,* which show that sustainability is of importance, that sustainable companies demonstrate high performance during market volatility periods and macroeconomic shocks.

For the purposes of group analysis of the developed index, the sample comprised data about five companies for 2017–2023. We considered the five-factor Altman's Z-score, economic value added, which was used to construct financial strategy matrices for case study, environmental and social factors, corporate strategies of product and target market diversification as well as the company horizon.

We chose case study as the most suitable research method taking into account the specifics of our goal.

The influence of sanctions imposed during 2022–2023 and affecting the considered companies was pointed out. Companies' operations were considered over a period of time in order to analyze negative events and companies' adaptation to them, changes in supply chains, imports phase-out etc.

Recommendations were provided regarding possible strategic solutions based on the evaluation of economic profit and elongation of the planning horizon. Other index components which are to be taken into consideration when assessing company sustainability were pointed out.

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