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Оригинальная статья

Institutionalization of ESG-principles at the international level and in the Russian Federation, their impact on ferrous metallurgy enterprises. Part 2

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Abstract. Currently, a new development trend is being formed in the world associated with the decarbonization of economies. This process is based on the institutionalization of ESG-principles – an approach to doing business, characterized by the involvement of companies in solving environmental, social and governance problems. The process of institutionalization of ESG-principles at the international level was initiated in 1948 with the adoption of the Universal Declaration of Human Rights under the auspices of the UN. The active involvement of Russia in the formation of the institutional framework in the field of ESG has begun only in 2020. The reason for this was the ratification of a number of international documents, as well as the active promotion of climate policy by many countries of the world. The stages of the institutionalization process at the international level discussed in detail in Report 1. The decarbonization of economies creates development risks for industries whose products are characterized by high carbon and energy intensity. Ferrous metallurgy also belongs to them. This report presents the results of a study of the effectiveness of measures taken by the Russian Government in the field of reducing atmospheric air pollution in large industrial centers of the ferrous metallurgy based on data from the Unified Information System for Monitoring Air Quality, as well as the results of an analysis of the ESG-practices of the largest Russian ferrous enterprises and compliance with carbon intensity and energy intensity of their products according to the criteria of sustainable (including green) development projects established in our country. As a result of the study, it was found that despite the use of ESG-principles in their activities, the specific emissions of CO_2-equivalent of the largest iron and steel enterprises significantly exceed the criteria for sustainable (including green) development projects established by the Russian Government.

Keywords: institutionalization, ESG-principles, carbon intensity, energy intensity, ferrous metallurgy, ferrous metallurgy products

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Институализация ESG-принципов на международном уровне и в Российской Федерации, их влияние на деятельность предприятий черной металлургии. Часть 2

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Аннотация. В настоящее время в мире формируется новый тренд, связанный с декарбонизацией экономик. В его основе – принципиально новый подход к ведению предпринимательской деятельности с учетом соблюдения принципов ESG (*Environmental – Social – Governance*), характеризующийся вовлеченностью компаний в решение экологических, социальных и управленческих проблем. Начало процессу институциализации ESG-принципов на международном уровне было положено в 1948 г. с принятием Всеобщей декларации прав человека под эгидой ООН. Активное включение России в формирование институциональных рамок в области ESG произошло только в 2020 г. Основанием для этого послужила ратификация ряда международных документов, а также активное продвижение многими странами мира климатической политики. Подробно этапы процесса институциализации ESG-принципов

на международном уровне и в России рассмотрены ранее. Декарбонизация экономик формирует риски развития для отраслей, продукция которых характеризуется высокой углеродоемкостью и энергоемкостью (например, черная металлургия). В работе представлены результаты исследования эффективности принятых Правительством РФ мер в области снижения уровня загрязнения атмосферного воздуха в крупных промышленных центрах черной металлургии на основе данных Единой информационной системы мониторинга качества атмосферного воздуха, а также результаты анализа ESG-практик крупнейших российских предприятий черной металлургии и соответствия углеродоемкости и энергоемкости выпускаемой ими продукции установленным в России критериям проектов устойчивого (в том числе «зеленого») развития. В результате исследования установлено, что, несмотря на использование ESG-принципов в своей деятельности, удельные выбросы CO_2-эквивалента крупнейших предприятий черной металлургии значительно превышают установленные Правительством РФ значения критериев проектов устойчивого (в том числе «зеленого») развития.

Ключевые слова: институциализация, ESG-принципы, углеродоемкость, энергоемкость, черная металлургия, продукция черной металлургии

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Introduction

Since 2020, Russia has been actively developing its institutional framework in the field of ESG. In addition to ratifying international documents such as the UN Framework Convention on Climate Change (1992), the Kyoto Protocol (1997), and the Paris Climate Agreement (2015), this initiative is driven by the global trend of many countries actively advocating for climate policies aimed at mitigating greenhouse gas emissions.

One of the objectives outlined in the Strategy for the Development of Russia's Ferrous Metallurgy for the period 2014 – 2020 and the prospective plan until 2030 [1] is to diminish the adverse environmental impact of the industry's enterprises. This involves reducing emissions of harmful substances into the atmosphere, minimizing pollution discharges, and advancing climate protection through mechanisms that enhance the energy efficiency of metallurgical production, consequently reducing the carbon footprint.

Russian and international scholars are currently directing their attention towards investigating the environmental impact of ferrous metallurgy enterprises. The study presented in [2] delves into the analysis of air pollutant emissions from ferrous metallurgy enterprises, considering the influence of external factors. In [3], there is a discussion on the influence of contemporary environmental initiatives on the international trade of ferrous metallurgy products. Notably, [4 – 6] provide evidence that China's metallurgical industry has the potential to transition to low-carbon production, thereby reducing carbon oxide (CO_2) emissions into the atmosphere. These papers also affirm the effectiveness of novel taxation instruments in achieving this goal. Papers [7; 8] disclose issues related to the management of sustainable development within metallurgical enterprises, while work [9] specifically examines the environmental challenges associated with the development of ferrous metallurgy in the European North of Russia. The current trends in the development of ferrous metallurgy and efforts to enhance its energy and environmental efficiency are comprehensively analyzed in [10]. The research presented in [11] delves into technologies aimed at optimizing the recycling of waste generated by ferrous metallurgy. Paper [12] addresses the challenges associated with energy efficiency and environmental management within the ferrous metallurgy sector. The outcomes of studies[1, 2] focused on decarbonization of economies, including the utilization of carbon emission trading, are discussed. Furthermore, the effectiveness of carbon tax in reducing carbon oxide (CO_2) emissions into the atmosphere is explored in studies[3, 4, 5, 6, 7]. Additionally, the impact of the volume of carbon oxide (CO_2) emissions on companies' P/E ratio is investigated in study[8].

[1] Ellerman A.D., Jacoby H.D., Decaux A. The Effects on Developing Countries of the Kyoto Protocol and Carbon Dioxide Emissions Trading (December 1998). https://ssrn.com/abstract=569250 (Accessed: 15.03.2022).

[2] Milunovich G., Stegman A., Cotton D. Review of Carbon Trading Theory and Practice. https://ssrn.com/abstract=989271 or http://dx.doi.org/10.2139/ssrn.989271. (Accessed: 15.03.2022).

[3] Felix P. Does a Carbon Tax Reduce CO_2 Emissions? Evidence From British Columbia. https://ssrn.com/abstract=3329512 or http://dx.doi.org/10.2139/ssrn.3329512. (Accessed: 15.03.2022).

[4] Rivers N., Schaufele B. Salience of Carbon Taxes in the Gasoline Market (October 22, 2014). https://ssrn.com/abstract=2131468 or http://dx.doi.org/10.2139/ssrn.2131468 (Accessed: 15.03.2022).

[5] Elliott J., Foster I., Kortum S.S., Khun J. G., Munson T.,Weisbach D. Unilateral Carbon Taxes, Border Tax Adjustments, and Carbon Leakage (February 27, 2012). University of Chicago Institute for Law & Economics Olin Research Paper No. 600, https://ssrn.com/abstract=2072696 or http://dx.doi.org/10.2139/ssrn.2072696 (Accessed: 15.03.2022).

[6] Metcalf G.E., Weisbach D.A. Design of a Carbon Tax (January 8, 2009). U of Chicago Law & Economics, Olin Working Paper No. 447, U of Chicago, Public Law Working Paper No. 254, https://ssrn.com/abstract=1324854 or http://dx.doi.org/10.2139/ssrn.1324854 (Accessed: 15.03.2022).

[7] Hsu Shi-Ling. Nine Reasons to Adopt a Carbon Tax (May 17, 2009). https://ssrn.com/abstract=1405944 or http://dx.doi.org/10.2139/ssrn.1405944 (Accessed: 15.03.2022).

[8] Bolton P., Kacperczyk M.T. Do Investors Care about Carbon Risk? (October 30, 2020). Columbia Business School Research Paper Forthcoming, Journal of Financial Economics (JFE), Forthcoming. European Corporate Governance Institute – Finance Working Paper 711/2020. https://ssrn.com/abstract=3398441 or http://dx.doi.org/10.2139/ssrn.3398441 (Accessed: 15.03.2022).

Materials and methods

This study employs both chronological and institutional approaches, allowing for a coherent examination of the evolution of the ESG institutional framework on both international and Russian levels. Throughout the research, we scrutinized the content of international documents adopted under the auspices of the UN and other international organizations, which reflect the development of ESG-principles. Additionally, we analyzed Russian legislation in the field of ESG. The investigation relied on methods such as analysis, synthesis, comparison, and grouping. We examined climate, ecological, corporate social responsibility, and sustainability reports from major Russian ferrous metallurgy enterprises, ESG rankings, official statistical reports published by the Federal State Statistics Service, and the Enerdata statistical yearbook.

Results and discussion

Russia is currently conducting an experiment on setting quotas for emissions of atmospheric pollutants involving the implementation of emission quotas for atmospheric pollutants in 12 major urban industrial areas designated as cities with high and very high levels of atmospheric air pollution. A comprehensive system of compensatory measures has been developed, focusing on the reduction of negative environmental impacts. These measures include the renovation, technical re-equipment, and remodeling of facilities.

In 2020, Russia launched the Unified Information System for Monitoring (UISM) atmospheric air quality [13]. Over the ensuing period, statistics on the initial monitoring results have been accumulated [14]. The air quality is actively monitored in twelve cities across the Russian Federation, such as Cherepovets, Novokuznetsk, Lipetsk, Chelyabinsk, Nizhniy Tagil, Magnitogorsk, and others, where major ferrous metallurgy enterprises are operational. Monitoring is conducted in real-time through Roshydromet observation posts situated in close proximity to major metallurgical facilities, including Cherepovets Steel Mill, United West Siberian Metallurgical Plant, Novolipetsk Steel, Nizhniy Tagil Iron and Steel Works, Chelyabinsk Metallurgical Plant, and Magnitogorsk Iron and Steel Works – recognized as primary sources of pollution. In Cherepovets, Novokuznetsk, and Lipetsk, both average daily and average monthly Standards Index (SI) values for atmospheric air pollution are recorded during monitoring, while in Chelyabinsk, only the SI average daily value is registered. The monitoring of air quality includes the assessment of the average daily concentration of various pollutants such as suspended solids, sulfur oxide (SO_2), carbon oxide, nitrogen oxides (NO and NO_2), ozone, hydrogen sulfide, ammonia, and particles of 1, 2, 5, and 10 microns in size. As of now, the UISM does not record the average daily concentration of carbon oxide (CO_2). During the survey period (January – March 2022), data on air quality in Nizhniy Tagil and Magnitogorsk were unavailable due to ongoing technical works on the websites. The measurement results are interpreted based on the SI values, where a range from 0 to 1 indicates low atmospheric air pollution, 2 to 4 signifies pollution higher than normal, 5 to 10 indicates high pollution, and values above 10 represent very high pollution levels. Table 1 provides the interpretation of the average monthly SI values for atmospheric air pollution in Cherepovets, Novokuznetsk, and Lipetsk for the years 2020 – 2021.

In 2020, an average monthly SI value for atmospheric air pollution in Chelyabinsk was not recorded. The average monthly SI values for atmospheric air pollution in Chelyabinsk in 2021 are presented in Table 2.

The analysis of the obtained results leads to the conclusion that the primary focus in improving the environmental well-being of major industrial centers is the technical upgrading and remodeling of metallurgical enterprises. Despite the ongoing experiment involving the setting of quotas for harmful emissions and the implementation of compensatory measures, there are still instances of high, very high, and higher-than-normal SI values for atmospheric air pollution. In 2021, Cherepovets recorded an average monthly SI value corresponding to very high and high pollution levels for 7 out of 12 months. Novokuznetsk experienced this for 4 months out of 12, while Lipetsk recorded such values for 6 months out of 12. Additionally, Chelyabinsk had higher-than-normal average daily SI values from June to December 2021, with recurrence rates ranging from 1 to 19 days per month. In July, August, and October 2021, the values were high, occurring 1 to 2 days per month, and in August and October, they were very high, occurring once per month.

It is evident that the existing financial mechanisms, such as the state program of the Russian Federation "Environmental Protection," inclusive of the national project "Ecology" and the federal project "Clean Air," will likely fall short of adequately addressing the identified problem. Consequently, Russia is presently in the process of establishing an institutional framework designed to enhance the motivation of economic entities to incorporate ESG principles into their operations. Additionally, this framework aims to provide incentives for investors, including institutional investors, to make responsible investment decisions.

Given the current realities and the potential introduction of transboundary carbon regulation mechanisms, it becomes evident that carbon-intensive industries, including ferrous metallurgy, must genuinely adopt environmentally friendly practices rather than merely express-

Table 1

Interpretation of the average monthly SI values of atmospheric air pollution

Таблица 1. **Сведения об интерпретации среднемесячных значений СИ загрязнения атмосферного воздуха**

Month	Cherepovets (Cherepovets Steel Mill of PJSC Severstal)	Novokuznetsk (EVRAZ United West Siberian Metallurgical Plant)	Lipetsk (PJSC Novolipetsk Steel)
Interpretation of the average monthly SI value of atmospheric air pollution in 2020			
January	n/a	n/a	n/a
February	n/a	High	n/a
March	Very high	Higher-than-normal	Very high
April	Higher-than-normal	Higher-than-normal	Higher-than-normal
May	High	Low	Higher-than-normal
June	Low	Low	High
July	Low	Low	Very high
August	Higher-than-normal	Low	Low
September	High	Low	Higher-than-normal
October	Low	High	Higher-than-normal
November	High	Higher-than-normal	n/a
December	n/a	Very high	n/a
Interpretation of the average monthly SI value of atmospheric air pollution in 2021			
January	n/a	Higher-than-normal	n/a
February	Higher-than-normal	Very high	n/a
March	Higher-than-normal	Higher-than-normal	High
April	Low	Higher-than-normal	Very high
May	Very high	High	Very high
June	Very high	Low	Very high
July	Very high	Low	High
August	Very high	Higher-than-normal	Higher-than-normal
September	Very high	Higher-than-normal	n/a
October	High	Higher-than-normal	Higher-than-normal
November	High	Very high	Very high
December	Higher-than-normal	High	Low

Table 2

Data on the average daily SI values of atmospheric air pollution in Chelyabinsk[9]

Таблица 2. **Сведения о среднесуточных значениях СИ загрязнения атмосферного воздуха в городе Челябинск[9]**

Month (2021)	Number of days per month in which the atmospheric air pollution corresponded to the respective SI scale value			
	Low	Higher-than-normal	High	Very high
January	n/a	n/a	n/a	n/a
February	28	–	–	–
March	31	–	–	–
April	30	–	–	–
May	31	–	–	–
June	17	13	–	–
July	15	15	1	–
August	9	19	2	1
September	–	15	–	–
October	22	6	2	1
November	29	1	–	–
December	29	2		

ing commitment in words. Ongoing applied research is exploring the use of hydrogen in cast iron and steel production. However, experts indicate that the time frame for the initiation of the first pilot projects in this domain spans from three to five years, with the adaptation of this technology for full-scale production expected to require a considerably longer duration[10].

Analysis of ESG-practices of the major metallurgical companies in Russia

PJSC Severstal (Cherepovets Steel Mill, Cherepovets)

The company's official website features a dedicated "Sustainable Development" section providing insights into its strategy with short-, medium-, and long-term targets for reducing greenhouse gas emissions:

1. Abating greenhouse gas emissions by 3 % per 1 ton of liquid steel by the end of 2023, compared to 2020 (projected to be 2001 tons of CO_2 equivalent per ton of steel in 2023).

[9] Unified information system for monitoring atmospheric air quality. URL: http://www.feerc.ru/uisem/portal/ (Accessed: 20.03.2022).

[10] By 2023, Novatek and Severstal are to launch a joint hydrogen project. URL: https://www.vedomosti.ru/business/articles/2021/06/03/872835-novatek-severstal (Accessed: 20.03.2022).

2. Reducing greenhouse gas emissions per 1 ton of liquid steel by 10 % by the end of 2030 compared to the 2020 baseline.

3. A long-term goal is currently under development, with plans to present the concept in 2022. These objectives align with the criteria for sustainable (including green) development in the Russian Federation and the requirements for the verification system of the projects for sustainable (including green) development in the Russian Federation, as outlined in the Decree of the Government of the Russian Federation No. 1587 of 21.09.2021.

4. Reducing air pollutant emissions by 13 % by 2025 compared to the 2020 baseline.

5. Main energy saving objective: achieve an energy intensity of 5.55 Gcal/t of steel produced by 2026 through the implementation of an energy-saving program.

According to the website, the company is considering According to the company's website, PJSC Severstal is actively considering scenarios for implementing climate policies. These scenarios include:

1. SSP126 scenario: Aligned with the Paris Agreement, anticipating a global average temperature increase of +1.8 ℃ by 2100).

2. SSP245 scenario: An intermediate scenario projecting a temperature increase of +2.8 ℃ by 2100;

3. SSP585 scenario: The worst-case scenario, envisioning a temperature increase of +4.4 ℃ by 2100. It's noteworthy that achieving the long-term goal outlined in these scenarios is uncertain and beyond the control of current climate policy stakeholders, including signatories of the Paris Agreement, given the extremely distant time horizon.

The company has published an updated climate report for the year 2021, available on its official website[11], continuing a tradition of regularly releasing sustainability reports since 2010[12]. PJSC Severstal has established an in-house climate-related risks and energy management system. The company's climate memorandum, outlining five principles of its climate policy, is accessible on its website[13].

Severstal has developed an occupational health and safety strategy[14].

[11] PJSC Severstal's 2021 Climate Report. URL: https://www.severstal.com/contant-static/file/82493/Climate-report-rus.pdf (Accessed: 16.03.2022).

[12] PJSC Severstal's 2010 – 2020 Sustainability Reports. URL: https://www.severstal.com/rus/sustainable-development/documents/reports (Accessed: 18.03.2022).

[13] PJSC Severstal's Climate Memorandum. URL: https://www.severstal.com/rus/sustainable-development/climate/ (Accessed 30.03.2022).

[14] Updated PJSC Severstal's strategy on occupational health and safety (January 2022). URL: https://www.severstal.com/contant-static/file/82240/Severstal_HSE_Strategy_update_RU.pdf (Accessed: 17.03.2022).

EVRAZ United West Siberian Metallurgical Plant, Novokuznetsk

EVRAZ Nizhniy Tagil Iron and Steel Works, Nizhniy Tagil

EVRAZ has established five-year environmental targets spanning from 2018 to 2022. One of these targets is to reduce greenhouse gas emissions to below 2.0 tons of CO_2-equivalent per 1 ton of steel by 2022.

In alignment with global efforts to address climate change, EVRAZ has set an additional target to decrease the energy intensity of steel production by 15 % by 2025, using the 2018 baseline as a reference point, aiming for 24.23 GJ per 1 ton of steel.

EVRAZ Group outlines various scenarios for the implementation of its climate policy, including:

1. RCP 2.6 scenario: The most innovative and low-carbon trajectory, illustrating global efforts to limit emissions and restrict the temperature rise to 0.4 – 1.6 °C by 2100.

2. RCP 4.5 scenario: This scenario aligns closely with the Paris Agreement, implying a temperature increase from 1.1 to 2.6 °C by 2100.

3. RCP 8.5 scenario: Considered a business-as-usual scenario, it represents the most intensive use of fossil fuels with minimal actions to combat climate change. This scenario projects an average global temperature increase of 2.6 – 4.8 °C by 2100.

In October 2020, EVRAZ published its first Climate Change Report[15], signaling the company's commitment to addressing climate-related risks. The company has established a comprehensive energy management system, and sustainability reports have been regularly published since 2018. Reports for the years 2018 – 2020 are currently accessible on the EVRAZ Group's public website[16].

PJSC Novolipetsk Steel, Lipetsk

PJSC Novolipetsk Steel in Lipetsk has established a medium-term goal to reduce greenhouse gas emissions to 1.84 tons of CO_2-equivalent per 1 ton of steel by 2023, as reported by public sources.

Despite this goal, the official reports available on the company's website do not provide detailed scenarios

[15] EVRAZ Climate Change Report. URL: https://www.evraz.com/ru/sustainability/data-center/climate-change-reports/ (Accessed: 17.03.2022).

[16] EVRAZ 2018 – 2020 Sustainability Reports. URL: https://www.evraz.com/ru/sustainability/data-center/sustainability-reports/ (Accessed: 17.03.2022).

outlining the implementation of Novolipetsk Steel's climate policy.

The company has not made a separate climate report available on its official website. Instead, information related to the mid-term strategic goal of its climate policy until 2023, as well as results achieved in abating greenhouse gas emissions, can be found in the 2019 "Ecology" Report.

PJSC Novolipetsk Steel announces the implementation of an integrated system addressing climate-related risks and energy management. While the company's website includes the Environmental Protection Report for the year 2019, there is an absence of a more recent report[17]. Corporate Social Responsibility Reports have been published on the official website since 2009. The reports "On Environmental Activities" have been accessible on the official website since 2013, with the first report "On Sustainable Development" presented in 2015, and the first "Ecology" Report posted in 2016[18].

MECHEL (Chelyabinsk Metallurgical Plant, Chelyabinsk)

As per the information available on the official website, there is a stated objective to achieve a 17 % reduction in the intensity of greenhouse gas and pollutant emissions into the atmospheric air at the Chelyabinsk production site by 2025. However, the baseline period for this reduction target is not specified.

The official website of the MECHEL Group does not provide any detailed information on the implementation scenarios of the company's climate policy, and it lacks climate reports. Additionally, there is no indication of whether the company has established a climate-related risks and energy management system.

While the MECHEL Group's official website contains general documents regarding environmental policy and energy efficiency, it does not offer specific environmental protection reports[19], ecological reports, or integrated reports as of now.

PJSC Magnitogorsk Iron and Steel Works, Magnitogorsk

The enterprise's website includes a "Sustainable Development" section, outlining a target to reduce the intensity of greenhouse gas emissions into the atmospheric air by 20 % by 2025 compared to the 2018 baseline, aiming for 1.8 tons of CO_2-equivalent per ton of steel. The specified criterion for achieving this goal is defined as reducing the comprehensive air pollution index to 5.0 units by 2025.

The 2019 Sustainability Report[20] and the 2020 Integrated Annual Report[21] do not provide information on the implementation of the company's climate policy. Although these documents declare the mid-term strategic goal of the climate policy until 2025 and highlight achievements in greenhouse gas emission reduction, a dedicated climate report as a separate document is currently not accessible on the official website of PJSC Magnitogorsk Iron and Steel Works.

Open data analysis

The analysis of the official websites of the major Russian cast iron and steel producers reveals that most of these companies align with the principles of sustainable development and engage in monitoring greenhouse gas emissions and energy intensity of their products, as shown in Table 3. However, MECHEL stands out as an exception, as its official website lacks GRI climate or other relevant reports. Similarly, these reports are not available on the official website of the Russian Union of Industrialists and Entrepreneurs. It remains unclear whether MECHEL does not assess the carbon and energy intensity of its products or does not disclose this information to all stakeholders.

Despite the integration of ESG-principles into their activities, the specific emissions of major ferrous metallurgy enterprises in 2020 ranged from 1.90 to 2.18 tons of CO_2-equivalent per 1 ton of steel (Table 3).

These figures are significantly higher than the criteria established by the Decree of the Government of the Russian Federation No. 1587 of 21.09.2021. According to these criteria, the carbon intensity of carbon steel should be less than 0.283 tons of CO_2-equivalent per 1 ton of products, and that of high-alloy steel should be less than 0.352 ton of CO_2-equivalent per 1 ton of products. This implies that the actual emissions of CO_2-equivalent are 5 to 8 times higher than the values set by the sustainable development project criteria established by the Decree of the Government of the Russian Federation No. 1587 of 21.09.2021.

RAEX analytical agency provided information on ESG ranking as of 15.03.2022 for 160 Russian compa-

[17] The 2019 Environmental Protection Report of PJSC Novolipetsk Steel. URL: https://nlmk.com/upload/iblock/8d4/NLMK_ecology_22.04.pdf (Accessed: 18.03.2022).

[18] PJSC Novolipetsk Steel Corporate Social Responsibility Reports; PJSC Novolipetsk Steel Sustainability Reports; PJSC Novolipetsk Steel "Ecology" Report. URL: https://nlmk.com/ru/ir/results/csr-reports/ (Accessed: 18.03.2022).

[19] MECHEL official website. URL: https://www.mechel.ru/development/environmental/ (Accessed: 18.03.2022).

[20] Sustainability Report of PJSC Magnitogorsk Iron and Steel Works. URL: https://mmk.ru/ru/sustainability/social-responsibility/ (Accessed: 18.03.2022).

[21] The 2020 Integrated Annual Report of PJSC Magnitogorsk Iron and Steel Works. URL: https://mmk.ru/ru/investor/results-and-reports/sustainability-reports/ (Accessed: 18.03.2022).

Table 3

Analysis of greenhouse gas emissions and energy intensity of steel production of the largest Russian metallurgical enterprises[12–21]

Таблица 3. **Анализ выбросов парниковых газов и энергоемкости производства стали крупнейшими металлургическими предприятиями России[12–21]**

Enterprise	Environmental costs, RUB bn			Volume of greenhouse gas emissions, mln tons of CO_2 e				Specific emissions, t of CO_2-equivalent per 1 t of steel*****					Energy intensity of steel production, GJ/t of cast steel		
	2018	2019	2020	2017	2018	2019	2020	2017	2018	2019	2020	2021	2018	2019	2020
PJSC Severstal (Cherepovets Steel Mill, Cherepovets)	3.4	3.8	5.6	27.53	27.77	28.11	27.86	2.097	2.056	2.084	2.063	2.093	24.08****	24.45****	24.7****
EVRAZ (EVRAZ United West Siberian Metallurgical Plant, Novokuznetsk; EVRAZ Nizhniy Tagil Iron and Steel Works, Nizhniy Tagil)	59.9**	59.1**	89.8**	36.68	34.56	39.06	н/д	2.02	2.01	1.97	1.970	n/a	28.50	27.50	25.6
PJSC Novolipetsk Steel	175.0**	202.0**	n/a	33.60	34.20	32.00	н/д	1.95	1.92	1.92	1.900	n/a	22.88****	23.60****	n/a
MECHEL (Chelyabinsk Metallurgical Plant, Izhstal, Urals Stampings Plant, Vyartsilya Metal Products Plant, Bratsk Ferroalloy Plant)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PJSC Magnitogorsk Iron and Steel Works	8.9	8.7	7.2	31.07	29.49	27.49	25.20***	2.40	2.25	2.13	2.180	n/a	25.40	26.08	21.9

N o t e s . ** – environmental costs for EVRAZ and PJSC Novolipetsk Steel are presented in mln USD;

*** – the 2020 Integrated Report of PJSC Magnitogorsk Iron and Steel Works presents the predicted value of greenhouse gas emissions for 2020;

**** – Severstal›s 2020 Sustainability Report provides data on the energy intensity of producing 1 ton of steel in Gcal (data on energy intensity of cast iron and steel in similar units are presented by PJSC Novolipetsk Steel in the 2019 “Ecology” Report); to ensure comparability of data on energy intensity of steel at other Russian metallurgical enterprises, the authors of the article converted the energy intensity of producing 1 ton of steel into GJ;

***** – according to the criteria of the projects for sustainable (including green) development in the Russian Federation and the requirements for the verification system of the projects for sustainable (including green) development in the Russian Federation approved by the Decree of the Government of the Russian Federation No. 1587 of 21.09.2021, the carbon intensity of carbon steel should be less than 0.283 t of CO_2-equivalent per 1 t of products, and that of high-alloy steel should be less than 0.352 t of CO_2-equivalent per 1 t of products; in 2017, the global average level of specific emissions from the production of 1 ton of steel amounted to 2.3 t of CO_2 e/t; in 2018, this value was 2.29 t of CO_2 e/t; in 2019 – 2.31 t of CO_2 e/t; and in 2020 – 2.33 t of CO_2 e/t.

Table 4

Position of the largest Russian metallurgical enterprises in the ESG-ranking dated 03/15/2022[22]

Таблица 4. **Позиция крупнейших российских металлургических предприятий России в ESG-рэнкинге от 15.03.2022 г.**[22]

Enterprise	Rating position in the area			Total ranking
	"Environment" (*E*)	"Social sphere" (*S*)	"Corporate Governance" (*G*)	
PJSC Novolipetsk Steel	4	14	9	4
PJSC Severstal	9	5	32	9
EVRAZ	24	17	25	21
PJSC Magnitogorsk Iron and Steel Works	31	19	14	22
MECHEL	158	132	93	122

nies. The positions of steelmaking leaders in the ESG ranking are presented in Table 4.

As per Clause 1 of Article 31.1 of Federal Law No. 7-FZ dated 10.01.2002 (as amended on 30.12.2021) "On Environmental Protection," entities and individuals engaged in economic or other activities at Category *I* facilities are mandated to apply for an Integrated Environmental Permit. Concurrently, in accordance with Clause 12 of Article 31.1 of the aforementioned law, entities and individuals engaged in economic or other activities at Category *II* facilities are eligible to obtain an Integrated Environmental Permit, provided they possess Best Available Techniques (BAT) Reference Documents.

In April 2018, the Ministry of Natural Resources and Ecology of the Russian Federation sanctioned a list of 300 deemed detrimental to the environment falling under Category *I*, contributing no less than 60 % to the total pollutant emissions in the Russian Federation (commonly known as the "List 300") [15]. This list encompasses major ferrous metallurgy industrial sites, including Cherepovets Industrial Site, EVRAZ United West Siberian Metallurgical Plant, Magnitogorsk Industrial Site-1 and Magnitogorsk Industrial Site-2, Chelyabinsk Metallurgical Plant, and JSC Karelskiy Okatysh Industrial Site. In compliance with Clause 6 of Article 11 of Federal Law No. 219-FZ dated 21.07.2014, "On Amendments to the Federal Law 'On Environmental Protection' and certain legislative acts of the Russian Federation," Category *I* facilities included in the "List 300" were obligated to apply to Rosprirodnadzor for an Integrated Environmental Permit between 01.01.2019 and 31.12.2022. Regrettably, during the period from 2019 to 2021, none of Russia's metallurgical companies obtained Integrated Environmental Permits (ESG-IEPs)[23].

We are currently witnessing global transformations as countries worldwide transition towards a low-carbon economy. Experts from the Task Force on Climate-related Financial Disclosures (TCFD) emphasize that addressing the challenges of climate change may necessitate significant innovations in the political, legal, technological, and market domains. While acknowledging the humane concept of sustainable development, focused on reducing carbon footprint and preserving Earth's biodiversity, it is crucial to recognize that, in the context of the 2022 global geopolitical crisis and considering economic sanctions imposed against Russia by most countries, the promotion of ESG-principles, particularly their environmental aspect, is perceived as a tool of political and economic pressure. Notably, the content of the Glasgow Climate Pact is significant. This document advocates for the reduction of coal power and the discontinuation of "inefficient subsidies" for fossil fuels.

Russia stands as one of the major exporters of ferrous metallurgy products, with key destinations including Turkey, Taiwan, the USA, Italy, Mexico, Belgium, the Netherlands, Germany, Spain, South Korea, among others [16]. In light of the global commitment to ESG-principles and climate policies by most nations, compliance with these principles is essential. Simultaneously, the world has not yet identified a suitable substitute for metallurgical industry products, which find extensive applications in construction, engineering, shipbuilding, medicine, IT, and various other fields.

Conclusions

The analysis of average monthly SI values for atmospheric air pollution in Cherepovets, Novokuznetsk, and Lipetsk from 2020 to 2021, along with the average daily SI values in Chelyabinsk for 2021, reveals persistent high, very high, and higher-then-normal levels of atmos-

[22] ESG-Рэнкинг российских компаний (от 15.03.2022). https://raex-rr.com/ESG/ESG_companies/ESG_rating_companies/2022.3/ (Accessed: 18.03.2022).

[23] Перечень объектов негативного воздействия на окружающую среду, на которые выданы комплексные экологические разрешения. Официальный сайт Росприроднадзора. URL: https://rpn.gov.ru/opendata/7703381225-objectker (Accessed: 10.03.2022).

pheric air pollution despite the implementation of quotas for harmful emissions and compensatory measures. Our examination of the official websites of major metallurgical companies in Russia, including PJSC Severstal, EVRAZ, PJSC Novolipetsk Steel, PJSC Magnitogorsk Iron and Steel Works, and MECHEL, focused on determining their adherence ESG-principles. It is evident that PJSC Severstal and EVRAZ are actively engaging with ESG-principles. Both companies publish sustainability and climate reports on their official websites, addressing climate policy scenarios and monitoring the carbon and energy intensity of their products. Furthermore, the climate reports of PJSC Severstal and EVRAZ outline short-, medium-, and, in the case of PJSC Severstal, long-term targets for reducing greenhouse gas emissions intensity into the atmosphere. PJSC Novolipetsk Steel has made available its Environmental Protection Report and Corporate Social Responsibility Reports on its official website. Similarly, PJSC Magnitogorsk Iron and Steel Works has published the Sustainability Report and the Integrated Annual Report. There are no climate reports available, and the goals for reducing greenhouse gas intensity are exclusively formulated for the medium term. MECHEL's website lacks environmental protection, ecological, climate, or integrated reports, and the mid-term objective for reducing greenhouse gas emissions lacks a specific baseline period reference. In 2020, major ferrous metallurgy enterprises exceeded the specific emissions of CO_2-equivalent per ton of products by 5 to 8 times the values stipulated by the sustainable development project criteria outlined in the Decree of the Government of the Russian Federation No. 1587 dated 21.09.2021. None of the aforementioned metallurgical companies obtained Integrated Environmental Permits (ESG-IEPs) from 2019 to 2021. Considering the emerging global trend towards decarbonizing economies, reducing carbon and energy intensity in products becomes imperative for enhancing the competitiveness of domestic ferrous metallurgy enterprises in the global market and ensuring sustainable development for the Russian economy. To promote ESG-principles in Russia, it is essential for the government to implement measures supporting research on low-carbon technologies, especially in ferrous metallurgy. Institutional investors should also actively participate in the implementation of ESG-principles to contribute to the overall sustainability of industries.

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