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Border Carbon Adjustment: Implications for Russian Companies and Regions in the Context of the Russia Sanctions (the case of Magnitogorsk Iron and Steel Works and Chelyabinsk region)

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ABSTRACT
Relevance. There are at least two serious challenges that Russian exporting companies are now facing: first, in 2021, the EU introduced the carbon border adjustment mechanism (CBAM), which will come into force in 2026, and, second, since February 2022, many exporters have been subject to the EU sanctions as part of the Russia sanctions regime. There is much uncertainty surrounding the duration of the current sanctions episode as well as the introduction of the carbon tax in the Middle Eastern and Asian countries.
Research objective. The study aims to assess potential economic losses resulting from the CBAM introduction and the pressure of sanctions on the Russian exporters of metallurgical products and their home regions. The study focuses on the case of Magnitogorsk Iron and Steel Works (MMK) and Chelyabinsk region.
Data and methods. Methodologically, the study relies on scenario analysis. Two scenarios are considered: the EU sanctions against Russian steel companies will be lifted after 2024–2025 and the sanctions will not be lifted in the near future. For each scenario, two variations are analyzed and the annual economic losses are calculated both for MMK and for Chelyabinsk region. The data for the study was taken from MMK official reports.
Results. If the EU sanctions are lifted in the nearest future, at the initial stages of the carbon tax introduction, the economic consequences for Russian exporters will be insignificant. In the future, however, carbon regulation can create serious threats to the financial condition of such enterprises even if exports account for a small share of their revenue. If the EU sanctions stay in place, Russian enterprises are likely to search for trade partners in the Middle East and Asia. If the latter introduce a carbon tax, Russian companies can enjoy a competitive edge due to the comparatively low carbon intensity.
Conclusions. To ensure Russian steel companies' competitive edge, it is necessary to stimulate them to reduce their carbon footprint and create a national carbon regulation system. Not only will this measure help to reduce the loss of export income and regional governments' tax revenues but it will also enable companies to stay competitive and deal more effectively with the sanctions pressure.

KEYWORDS
carbon border adjustment mechanism, carbon regulation, regional tax revenue, sanctions, scenario analysis, iron and steel industry, carbon intensity

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Пограничная углеродная корректировка: последствия для российских компаний и регионов в контексте санкций против России (на примере Магнитогорского металлургического комбината и Челябинской области)

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АННОТАЦИЯ
Актуальность. Есть как минимум две серьезные проблемы, с которыми сейчас сталкиваются российские компании-экспортеры: во-первых, в 2021 г. Европейский Союз (ЕС) принял резолюцию о введении трансграничного углеродного регулирования (ТУР), которая начнет действовать

КЛЮЧЕВЫЕ СЛОВА
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с 2026 г., и, во-вторых, с февраля 2022 г. многие российские экспортеры попали под санкции, запрещающие ввоз продукции на территорию ЕС. Существует большая неопределенность в отношении продолжительности текущего эпизода санкций, а также введения налога на выбросы углерода в странах Ближнего Востока и Азии.

Цель исследования. Целью исследования является оценка возможных экономических потерь в результате введения трансграничного углеродного регулирования и санкционного давления на российских экспортеров металлургической продукции и регионы их базирования. Исследование сосредоточено на примере Магнитогорского металлургического комбината (ММК) и Челябинской области.

Данные и методы. Методологически исследование опирается на сценарный анализ. Рассматриваются два сценария: санкции ЕС в отношении российских металлургических компаний будут сняты после 2024–2025 гг. и санкции не будут сняты в ближайшее время. Для каждого сценария анализируются два варианта и рассчитываются годовые экономические потери как для ММК, так и для Челябинской области. Данные для исследования были взяты из официальных отчетов ММК.

Результаты. Если санкции ЕС будут сняты в ближайшее время, то на начальных этапах введения налога на выбросы углерода экономические последствия для российских экспортеров будут незначительными. Однако в будущем углеродное регулирование может создать серьезные угрозы для финансового положения таких предприятий, даже если экспорт составляет небольшую долю их доходов. Если санкции ЕС останутся в силе, российские предприятия, скорее всего, будут искать торговых партнеров на Ближнем Востоке и в Азии. Если последние введут налог на выбросы углерода, российские компании смогут получить конкурентное преимущество за счет сравнительно низкой углеродоемкости.

Выводы. Для обеспечения конкурентоспособности российских металлургических компаний необходимо стимулировать их к сокращению углеродного следа и созданию национальной системы углеродного регулирования. Эта мера не только поможет сократить потери доходов от экспорта и налоговых поступлений региональных правительств, но также позволит компаниям оставаться конкурентоспособными и более эффективно справляться с санкционным давлением.

экономические потери регионального бюджета, санкционное давление, сценарии, сценарный анализ, металлургия, углеродоемкость

БЛАГОДАРНОСТИ
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制裁背景下的跨境碳调整对俄罗斯公司和地区的影响（马格尼托哥尔斯克钢铁联合企业和车里雅宾斯克州为例）

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摘要
现实性：现在俄罗斯出口商至少面临两个严重的问题：首先，2021年欧盟（EU）通过了跨境碳监管(TUR)决议，该法规将从2026年开始生效；其次，许多俄罗斯出口商自2022年2月以来一直受到制裁，他们被禁止向欧盟输送货品。当前制裁的持续时间以及中东和亚洲国家是否引入碳税存在很大的不确定性。

研究目的：评估跨境碳监管和制裁压力对俄罗斯冶金产品出口商及其家乡造成的潜在经济损失。研究的重点是马格尼托哥尔斯克钢铁联合企业（MMK）和车里雅宾斯克州。

数据与方法：该研究基于情景分析，其中考虑了两种可能：欧盟对俄罗斯钢铁公司的制裁将在2024-2025年后解除，以及制裁在近期内不会解除。文章对于每种可能，都列举了两种情况，并计算了钢铁联合企业和车里雅宾斯克州的年度经济损失。研究数据来自马格尼托哥尔斯克钢铁联合企业的官方报告。

关键词
跨境碳监管、碳监管经济损失、区域预算经济损失、制裁压力、情景、情景分析、冶金、碳强度

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研究结果：如果欧盟的制裁很快被解除，那么碳税在初始阶段对俄罗斯出口商的经济影响将很小。然而，在未来，即使出口占其收入的一小部分，碳监管也可能对这些企业的财务状况构成严重威胁。如果欧盟制裁将持续存在，俄罗斯企业可能会在中东和亚洲寻找贸易伙伴。如果后者引入碳税，俄罗斯公司可以通过其相对较低的碳强度获得竞争优势。
结论：为确保俄罗斯冶金公司的竞争力，有必要鼓励它们减少碳足迹并建立国家碳监管体系。这一措施不仅有助于提高出口收入、减少地区政府税收损失，而且还能使公司保持竞争力，更好地应对制裁压力。

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Introduction

Most of the Paris Agreement countries, which account for more than a half of global greenhouse gas (GHG) emissions, are planning to introduce a carbon management system in the nearest future or, alternatively, are considering the possibility of participating in other countries' carbon management systems.

Russia is no exception: even under the pressure of sanctions, the government is planning to introduce carbon regulation. There is a national system to account for GHG emissions by sector, described in the Methodology of the Intergovernmental Panel on Climate Change (IPCC). Large companies also have their own corporate accounting systems for GHG emissions. In 2021, the Low-Carbon Development Strategy until 2050 was adopted by the Russian government[1]. The Ministry of Economic Development has set forth a set of criteria for climate projects[2], which can be used as a guidance by companies and citizens implementing such projects. To obtain state funding, they need to record their GHG emission reductions in a carbon registry system. It should be noted, however, that such important elements of carbon regulation as CO_2 pricing and emissions trading have not yet been developed in Russia and will not begin to function soon.

Meanwhile, after years of discussions, in July 2021, the EU introduced the Carbon Border Adjustment Mechanism (CBAM) as part of the comprehensive "Fit for 55" climate package. The CBAM is essentially aimed to ensure that EU importers should pay a price for their carbon emissions that would be comparable to the price paid by European domestic producers[3]. The tax is calculated by using the volume of direct GHG emissions that occurred during the production process and the price of CO_2 emissions equal to the market price of mandatory carbon certificates of the EU GHG emissions trading system (EU ETS). This fee is paid by the importer, who must register with a special regulatory body, provide information on the volume of GHG emissions and purchase certificates to offset them. The tax applies to five commodity groups: cement, fertilizers, iron and steel, aluminum, and electricity. Moreover, for electricity, there are rules for calculating emissions that differ from other goods.

The CBAM is planned to be introduced in several stages, starting from 2023, and then in full, including the purchase of CBAM certificates, from 2026. Initially, the CBAM will cover direct emissions of selected sectors (Scope 1). For complex products, tax calculations will also take into account GHG emissions from natural resources extraction and materials production (Scope 1 + Scope 3).

The system of carbon regulation traditionally relies on efficient administrative management methods such as technical regulation, consumption rates for fossil fuels and electricity used, building energy efficiency standards, compiling lists of the best available technologies, quantitative limitation of emissions, etc.

We believe, however, that by relying on administrative methods alone, the government will be unable to create a comprehensive carbon regulation system. It is clear that if the system of carbon regulation does not include economic incentives (e.g. setting a market price per ton of GHG; introducing a carbon tax), its effectiveness will be

[1] Decree of the Government of the Russian Federation dd. October 29, 2021 No. 3052-r

[2] Decree of the Government of the Russian Federation. March 24, 2022 No. 455 "On approval of the Rules for verifying the results of the implementation of climate projects" https://www.garant.ru/hotlaw/federal/1535164/ (Accessed: 19.06.2022).

[3] Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021PC0564 (Accessed: 22.06.2022) .

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low. In addition, economic methods such as cap-and-trade systems with baselines and emissions reduction subsidies (including subsidizing the use of renewable energy) allow the governments to set a more "objective" price for carbon because the cost of production should, among other things, depend on the external costs of overcoming the consequences of emissions (the so-called monetization of environmental damage). Thus, economic instruments for GHG emissions reduction, including carbon taxes and CBAM systems similar to the one implemented in the EU, can be applied in other countries, including the countries of the Middle East and Southeast Asia (Tagliapietra, & Wolff (2021); Morgan, & Patomäki (2021)).

Since February 2022, Russian iron and steel enterprises have been under sanctions from various countries, including the EU. The fourth package of the EU restrictive measures bans iron and steel imports from Russia to the EU[4]. If these sanctions are not lifted by 2024–2025, domestic metallurgical enterprises are likely to search for trade partners in Asian and Middle Eastern countries and reorient their production toward these markets[5]. This circumstance will increase the transportation costs of exporting enterprises. It is also conceivable that in the designated countries carbon payments will be introduced, similar to those included in the European CBAM system, which will mean extra costs for exporters.

At present, the actual price of carbon for more than half of all the emissions in the world remains at a very low level and does not exceed $10 per ton of CO2-eq., which does not stimulate the decarbonization of the economy. However, according to the International Energy Agency, the price of CO2-eq. can be set at around 75–100 US dollars per ton of CO_2. To date, this price level has been set for only 5% of the emissions covered by the carbon adjustment, the source of these emissions being mainly the EU countries. Russia is not included in this group. Therefore, in the absence of the national carbon adjustment system, when the carbon tax is introduced in the EU, Russian exporters to the EU and other countries may lose their competitive edge and/or incur significant losses.

[4] Council regulation (EU) 2022/428 of 15 March 2022. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2022:087I:FULL&from=EN (Accessed: 05.06.2022).

[5] Ferrous metallurgy is predicted to stagnate under sanctions until 2030. https://www.vedomosti.ru/business/articles/2022/08/07/934909-chernoi-metallurgii-stagnatsiyu-sanktsiyami (Accessed: 08.06.2022).

The purpose of this article is to estimate Russian exporters' potential economic losses caused by the introduction of the CBAM, taking into account the sanctions pressure on the Russian exporters of metallurgical products and their home regions. To this end, we are going to use the case of one of the largest facilities in Russia's metallurgical sector – PJSC "Magnitogorsk Iron and Steel Works" (MMK) situated in Chelyabinsk region. MKK is a group of companies, which includes both manufacturing facilities and trade companies operating in Russia and abroad.

To achieve this goal, the following tasks have been set, which, in their turn, determined the structure of the article: first, we are going to build an organizational chart for the CBAM and calculate the amount of the carbon tax; second, since there is much uncertainty surrounding the duration of the current sanctions episode, we are going to consider two possible scenarios – the first scenario proceeds from the assumption that the EU sanctions will be lifted after 2024–2024 and the second, that it won't happen in the near future; third, we are going to apply both of these scenarios to the case of Magnitogorsk Iron and Steel Works (MMK) and its home region; finally, for each scenario, we intend to estimate the losses incurred by the facility and Chelyabinsk region and give our recommendations as to how these losses can be handled.

Theoretical framework

A border adjustment instrument is introduced to encourage exporters to reduce the carbon intensity of their products as well as enhance the competitiveness of European producers, who bear higher environmental costs due to the EU legislation. European companies adhere to the carbon neutral policy, and it is believed that in this respect they are less competitive than manufacturers from countries such as the United States, China and Russia, which use carbon fuels and carbon-intensive technologies, since these countries do not have any serious restrictions on CO_2 emissions (Krivorotov, Belik et al., 2019). According to Ailor et al. (2020), China, Russia and the United States rank high among the main countries in terms of carbon dioxide emissions in Europe (Fig. 1).

Russia is the second largest exporter to the EU after China in terms of CO_2 volumes (approximately 150-200 million tons annually for all goods and services). The EU countries account for 42% of Russian exports, including metals.

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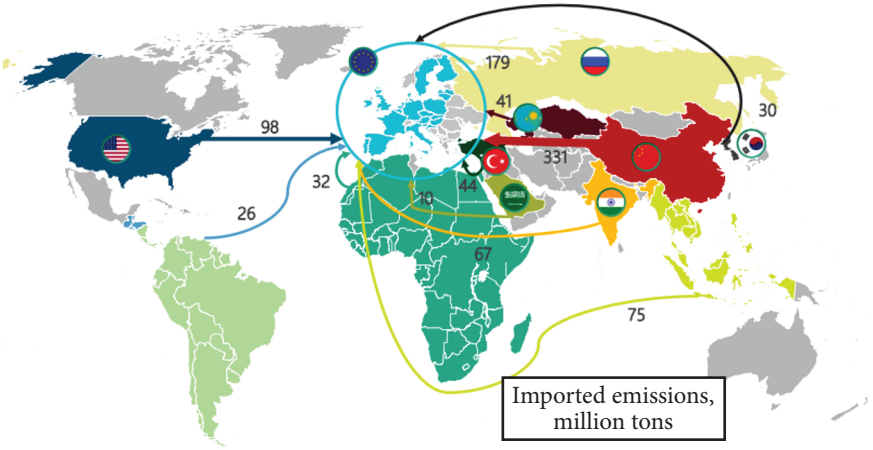

Figure 1. *Sources of CO_2 emissions for the European Union*
Source: Ailor et al., 2020

China has already joined the carbon trading system, and in July 2022 held the first online trading of GHG quotas, while the cost of quotas did not exceed $10 (in the European market, the price exceeds 60 euros per ton). Thus, we can assume that the market for trading carbon units in China has already been created.

It would make sense, therefore, to consider the group of studies dealing with the problem of China's transition to carbon neutrality. Ren et al. (2021) explored the ways for China's transition to a low-carbon model in the sphere of iron and steel manufacturing to achieve carbon neutrality by 2050. Iron and steel production in China accounts for 14% of total energy-related CO_2 emissions, which means that the decarbonization of this industry plays an important role in achieving carbon neutrality. Ren et al. (2021) apply an integrated approach combining a general equilibrium model and a bottom-up technology choice module to show that in the long term it is necessary to focus on the introduction of advanced technologies, for example, carbon capture and storage and hydrogen-based direct reduction. The latter could be an effective option to reduce CO_2 emissions in scenarios where carbon capture and storage is not available, increasing its share to 23–25% by 2050.

Xiao et al. (2021) proposed a decarbonization model that takes into account the technological progress in China and inter-regional power transmission for China's energy sector.

Demetriou & Hadjistassou (2021) note that China's electricity sector can only achieve net zero emissions by phasing out coal. Thus, it should be expected that the development of a low-carbon economy will not only minimize the costs associated with more stringent regulation but the products with a low carbon footprint will become more competitive, which will create extra benefits (favorable borrowing conditions, reduced trade barriers, etc.) for exporting companies and will ensure their sustainable presence in international markets.

Belik et al. (2016, 2017) explore the concept of low-carbon economic development and propose a mechanism for its implementation for Russia. Chernenko et al. (2022) identified regional determinants of the low-carbon transition in Russian companies and found that this transition is becoming an essential component of the national development strategy, and that there are two types of factors that influence the implementation of management practices for the low-carbon transition: human capital and the digitalization of regions.

Schiffer (2021) explains that an international agreement on the floor price for CO_2 within the G20, which is superior to the CBAM advocated by the EU Commission, should be the "cornerstone" for the CBAM introduction.

Hájek et al. (2018) investigated the effectiveness of the carbon tax in the energy sectors of individual EU countries and concluded that an increase in the carbon tax rate can help reduce GHG emissions.

Frischmuth & Härtel (2022) examined the structure of low-carbon energy markets and energy markets and demonstrated that achieving climate neutrality in Europe will require transformations in all sectors of the economy, including energy, construction, industry and transport.

Andersson et al. (2021) discuss industrial decarbonization processes and argue that energy

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management is the most important means of improving energy efficiency. Since production processes in the manufacturing industries differ significantly, Andersson et al. (2021) conclude that it is essential to develop sector-specific models for devising the necessary indicator systems.

Lopez et al. (2021) modified carbon analysis approaches to determine the minimum renewable energy target for a group of countries with an electricity trade agreement. The efficiency of this carbon-contained energy planning approach is illustrated by three case studies, including those involving the countries of the Association of Southeast Asian Nations.

Sotiriou and Zachariadis (2021) have developed a multi-objective approach to optimize decarbonization pathways in a dynamic policy context. Although the modeling framework was developed and adapted to the specific political conditions of the EU, the proposed methodology is fully applicable to other regions of the world and includes the development of a decarbonization roadmap.

There is a growing consensus in research literature that decarbonization is a major economic trend and that it is achieved through the development of clean technologies, governmental support of the projects for the creation of an appropriate infrastructure and policy-makers' efforts to eliminate the barriers to investment in such projects. There is substantial research evidence pointing to the potential of the carbon tax as a source of funding for the upcoming modernization of European industry and the fuel and energy complex (Parry, 2019).

A number of studies discuss the implications of the CBAM introduction, including the consequences for Russia (see, for example, Sulin et al. (2021), Kolpakov (2021), and Sokolov (2021)). Stepanov (2021)[6] developed a methodology for calculating the implied price of carbon, the aggregate price of a ton of emissions, which includes both the direct price of emissions, set through carbon taxes and the EU ETS, and the indirect price, presented in taxes on the use of fossil fuels (including motor fuel taxes).

A separate group of studies deal with the problems of decarbonization in Russia in the context of specific industries (see, for example, Grushevenko et al. (2021), Usov et al. (2017), Vetrova et al. (2021), Iktisanov & Shkrudnev (2021), Lukin (2021) on the oil and gas industry[7]; Gaida et al. (2021), Golyashev et al. (2021) on the energy industry; Plakitkina et al. (2021) on the coal industry; Klepcha (2021) on the iron and steel industry)[8]. Lebedev (2022), Kaisina & Kustikova (2022), Balashov (2020) and Mitrofanova (2021) provide a more comprehensive perspective on the decarbonization processes in Russian industry

The CBAM may provide a stimulus for Russia to introduce its own carbon regulation system: in order to be granted an exemption from paying the carbon tax, an exporter has to have a similar carbon payment mechanism in its home country (Gaida et al, 2021; Golyashev et al, 2021; Sokolov, 2021).

To date, the Strategy for the Socio-Economic Development of Russia with Low GHG Emissions until 2050 (dated October 29, 2021) considers two scenarios: the inertial ("no change") scenario and target scenario, with different sets of measures to decarbonize the economy (Table 1).

Table 1

Mass indicators for GHG emissions and uptake

Name	Actual – 2019	Plan – 2030	Plan – 2050
"No change" scenario			
GHG emissions	2119	2253	2521
Absorption	–535	–535	–535
Net emissions	1584	1718	1986
Target scenario			
GHG emissions	2119	2212	1830
Absorption	–535	–539	–1200
Net emissions	1584	1673	630

Source: Strategy for Socio-Economic Development of the Russian Federation with Low GHG Emissions until 2050. http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf (Accessed: 27.05.2022).

Another big step for Russia in the development of carbon regulation is the so-called Sakhalin experiment (No. 34-FZ "On conducting an experiment to limit GHG emissions in certain regions of the Russian Federation"), which will run from September 1, 2022 to December 31, 2028. The goal of the experiment is to achieve carbon neutrality in Sakhalin Region by December 31, 2025.

[6] Stepanov, I.A. (2021). Economic instruments for regulating greenhouse gas emissions in European countries. Summary of thesis. … cand. of economic sciences. Moscow, 27 p. (In Russ.)

[7] Lukin, V. (2021). Decarbonization: industry risks and opportunities. Neftegaz.ru, 7(115), 54–59. Retrieved from https://magazine.neftegaz.ru/articles/ekologiya/689023-dekarbonizatsiya-otraslevye-riski-i-vozmozhnosti-/ (In Russ.). (Accessed: 15.06.2022).

[8] Klepcha, K. (2021). Pioneers of the low carbon footprint. Expert, 23. https://expert.ru/expert/2021/23/pionery-nizkouglerodnogo-sleda/ (In Russ.) (Accessed: 17.06.2022).

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Data and Methods

The carbon tax and emissions trading systems are the most applicable economic tools in the world. As of 2021, the World Bank counted 64 active or launch date carbon pricing initiatives[9] covering 46 national and 35 subnational jurisdictions, covering approximately 22.3% of global GHG emissions (22Gt CO2-eq.).

Regarding Russia, according to experts' preliminary estimates (Gaida, 2021), the introduction of a carbon tax could affect about 42% of all the exports, since the carbon intensity of domestic products is very high. The following diagram (see Fig. 2 below) gives a visual representation of the dynamics of emissions by sector.

The structure of the country's emissions is dominated by the energy sector, whose share in total emissions volume is 78.9%. Analysis of the intra-industry structure indicates that the largest contribution is made by the extraction, transportation, processing and use of various types of fossil fuels (with the exception of their use as raw materials). The associated emissions are classified as emissions from the energy sector since they are produced by the combustion and processing of extracted natural fuel (oil, natural and associated gas, coal, peat and oil shale).

The most important source of the country's emissions in the industrial sector is the iron and steel industry. Its contribution to the total GHG emissions in this sector in 2017 amounted to 46.3%. Another significant source of emissions is the chemical industry – 29.6%; emissions from the production of mineral materials account for 15.9% (see Table 2).

As noted, an important export market for Russia is the European Union. The key Russian exports are the products of the oil and gas industry and metallurgical sector. The share of the Russian exports to the EU in 2021, according to the Federal Customs Service, was approximately 36%; metallurgy ranks second in this structure[10].

Experts from Boston Consulting Group (Ailor, Gilbert, & Kosach, et al. (2020) and KPMG, one of the Big Four accounting firms[11], in their study on the impact of a carbon border tax on global trade found that regulation will mainly affect exporters of carbon fuels of oil and gas and coal industries as well as the iron and steel industry. For example, if the tax is charged at $30 per ton of CO_2 emissions for producers of flat steel products, the losses from the fall in exports to the EU could be up to 40%. A positive side of the situation for Russian companies is that in terms of global competitive advantages they look much more attractive than manufacturers from China, whose steel carbon intensity is much higher.

[9] The World Bank. State and Trends of Carbon Pricing. https://openknowledge.worldbank.org/handle/10986/35620 (Accessed: 16.06.2022).

[10] Rosstat. https://rosstat.gov.ru/storage/mediabank/26_23-02-2022.html (Accessed: 20.06.2022).

[11] KPMG. Summary of the CBAM Regulation. https://home.kpmg/xx/en/home/insights/2021/07/summary-of-the-cbam-regulation.html (Accessed: 25.06.2022).

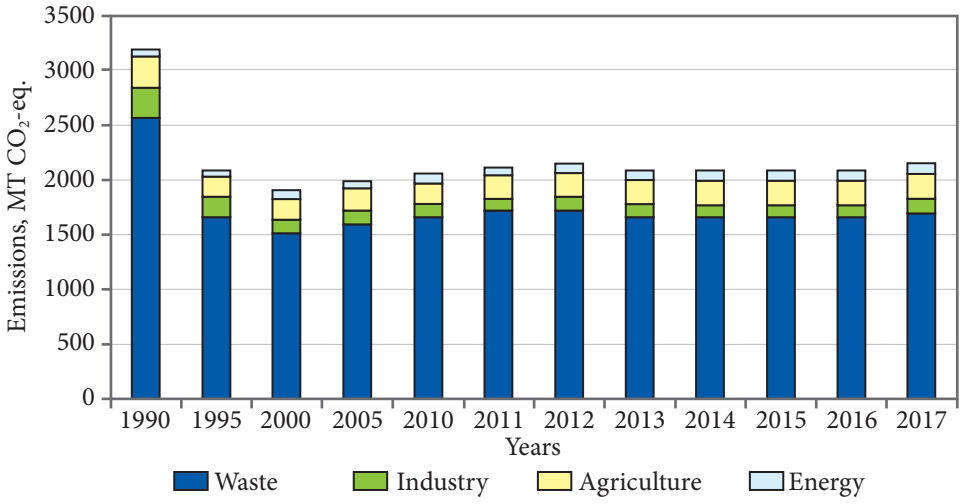

Figure 2. *Amount of GHG emissions in Russia, excluding land use changes in land use and forestry*
Source: 4th Biennial Report of the Russian Federation submitted in accordance with decision 1/CP.16, the Conference of the Parties to the United Nations Framework Convention on Climate Change. https://unfccc.int/sites/default/files/resource/10469275_Russian%20Federation-BR4-1-4BR_RUS.pdf (Accessed: 27.05.2022)

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Table 2

GHG emissions associated with industrial processes and product use, mln tons of CO_2-eq.

Source categories	Gas	2010	2011	2012	2013	2014	2015	2016	2017
Mineral materials mining	CO_2	37.14	40.11	42.10	43.52	43.07	40.01	36.51	37.12
Chemical industry	CO_2	35.09	36.64	36.08	37.62	37.61	39.24	41.31	43.37
	CH_4	0.39	0.41	0.41	0.45	0.43	0.45	0.45	0.48
	N_2O	5.40	5.65	5.50	5.76	5.56	6.01	6.32	6.57
	F-gases	8.21	4.42	9.08	11.50	13.13	9.46	9.16	17.99
Iron and steel industry	CO_2	99.21	100.34	103.82	101.22	103.17	104.13	103.75	104.82
	CH_4	0.13	0.13	0.13	0.13	0.13	0.14	0.13	0.13
	F-gases	3.49	3.15	3.18	3.28	2.90	3.36	3.49	3.01
Use of solvents and non-energy fuel products	CO_2	1.12	1.18	1.30	1.20	1.50	1.59	1.69	1.39
Use of fluorinated substitutes (ODS)	F-gases	5.39	7.07	8.92	10.47	11.85	13.05	14.63	16.43

Source: 4th Biennial Report of the Russian Federation submitted in accordance with decision 1/CP.16, the Conference of the Parties to the United Nations Framework Convention on Climate Change. https://unfccc.int/sites/default/files/resource/10469275_Russian%20Federation-BR4-1-4BR_RUS.pdf (Accessed: 27.05.2022).

According to the management of the Association of Russian Metallurgists "Russian Steel"[12], the business may suffer significant losses due to the loss of its position in a highly competitive market, and over time, the cross-border tax factor will put more pressure on the business, since the cost of CO_2 linked to the EU ETS prices, will keep growing every year[12]: KPMG predicts the EU ETS price for the period of 2023–2030 within the range from 56 to 89 euros/t CO2-eq.

The CBAM Resolution proposes to calculate the cross-border carbon tax by using the following formula:

$$\text{Carbon tax} = (CF - CF \cdot SS) \times \times (CCO_{2EU} - CCO_{2\ \text{country of origin}}), \quad (1)$$

where CF is the carbon footprint of the imported product in tons of $CO_{2\text{-eq.}}$ per unit of production; SS is the sectoral share of free emission quotas in the EU ETS, units; CCO_{2EU} is the cost of CBAM-certificate in the EU, EUR/t $CO_{2\text{-eq.}}$; $CCO_{2\ \text{country of origin of the product}}$ is the payment for the 1 ton of $CO_{2\text{-eq.}}$ in the product's country of origin, EUR/t$CO_{2\text{-eq.}}$

The methodology for calculating the components of the carbon tax raises many questions as it relies on approaches that are not verified by practice, including some issues that have not been worked out procedurally, containing data that are not reflected in current reporting. Thus, our calculations are based on certain assumptions and extrapolation methods.

In 2021, the price in the EU ETS has almost doubled compared to the level before the pandemic and reached 50 euros per 1 tonne of greenhouse gases[13]. In this regard, the authors rely on the weighted average price, which is 55 euros per ton of $CO_{2\text{-eq.}}$.

The payment for GHG emissions in the country of origin of the goods is assumed to be zero, since the national regulatory mechanism in Russia has not yet been formed.

At the moment, there is also uncertainty related to the procedure for calculating the non-taxable part of the carbon footprint of products imported by the EU. The existing ETS benchmark system in the European Union, which establishes the number of free quotas for GHG emissions issued to enterprises in various sectors of the economy, is not directly applicable to the CBAM. This discrepancy is explained by the fact that in the EU ETS, emission benchmarks are introduced for production processes, while in the CBAM the carbon footprint is estimated for individual products, not processes. It is likely that in the future, emission benchmarks for individual products will be introduced specifically for the CBAM, and these two benchmark systems will be harmonized. For this reason, when determining the

[12] Metallurgists urge authorities to protect them from EU carbon tax. https://www.rbc.ru/business/15/07/2021/60f01ab49a79479e896d2e64 (Accessed: 20.06.2022).

[13] Trading economics. https://tradingeconomics.com/commodity/carbon (Accessed: 20.06.2022).

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share of free quotas for emissions, the assumption is made that in 2019 in all sectors that produce products subject to the CBAM, the sectoral shares of free quotas were 80–90% and that they will remain so until 2026. Subsequently, with the start of the second stage of the CBAM, all these shares will be reset to zero by 2035. Therefore, the data obtained through the extrapolation over a ten-year period were taken into account. The shares of free sectoral emission quotas issued by the EU ETS, as stipulated by the amendments to the law on the EU ETS, should be reduced by 10% annually, starting from 2026.

Table 3 presents the values of the free quotas by sector.

We estimated the potential losses from the carbon tax introduction for domestic exporting enterprises and for regional budgets by using the case of one of the largest facilities in the metallurgical sector – Magnitogorsk Iron and Steel Works (MMK) and Chelyabinsk region. The company occupies the first place in the ESG-transparency ranking of companies and banks of the "Expert RA" Rating Agency and is included in the top four ratings of openness of mining and metallurgical companies in Russia in the field of environmental responsibility compiled by the Wildlife Fund (WWF) of Russia.

The data on gross and specific GHG emissions at MMK (Scope 1, 2 and 3) are taken at the 2020 level and are presented in Fig. 3 and 4.

As follows from Fig. 4, in 2020, MKK released 2.18 tons of $CO_{2\text{-eq.}}$ per ton of steel.

To date, there is no exact understanding of how the situation with the sanctions against Russia will develop. Therefore, in the face of the uncertainty about the duration of these sanctions, we propose to consider two scenarios: the EU sanctions against Russian iron and steel companies will be lifted after 2024–2025 and the EU sanctions against Russian iron and steel companies will not be lifted in the near future, which will require companies to reorient themselves to new markets.

Table 3

Shares of free quotas for GHG emissions in the sectors that manufacture CBAM-targeted products, in 2019, 2026–2035, %

Sector	Actual						Forecast				
	2019	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Aluminum production	85	77	68	60	51	43	34	26	17	9	0
Pig iron and steel production	74	66	59	51	44	37	29	22	15	7	0
Ammonia production	82	74	66	57	49	41	33	25	16	8	0
Production of nitric and sulfonitric acids	87	78	70	61	52	43	35	26	17	9	0
Cement production	99	89	79	69	60	50	40	30	20	10	0
Power generation	0	0	0	0	0	0	0	0	0	0	0

Source: Khomutov et al., 2021; Cross-border carbon regulation in the EU: how to turn it in favor of Russia? http://www.petromarket.ru/upload/iblock/306/CBAM_Petromarket_08_2021.pdf (Accessed: 27.06.2022).

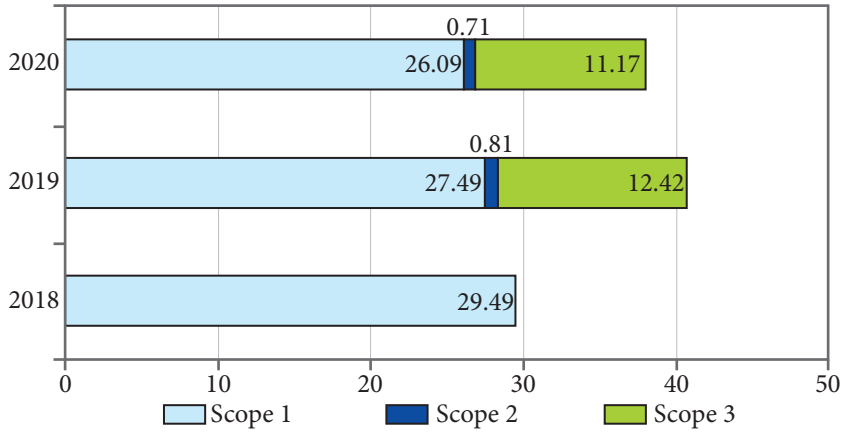

Figure 3. *Gross GHG emissions of MMK, in mln tons of* $CO_{2\text{-eq.}}$

Source: MMK Integrated Report 2020. https://mmk.ru/upload/iblock/c5f/t80bjab1uofvi6fjvfr1i26w23xtape8/Integrated%20annual%20report_RUS.pdf (Accessed: 27.05.2022)

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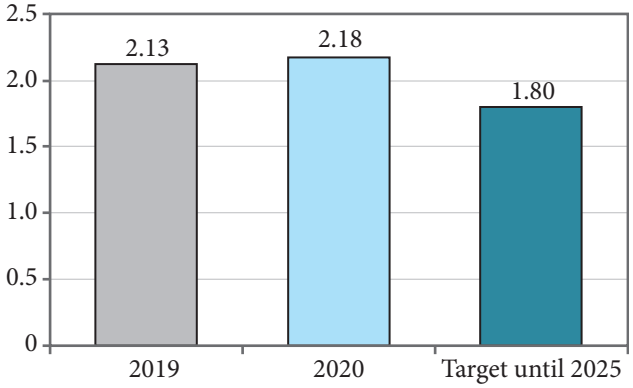

Figure 4. *GHG emissions of MMK, t $CO_{2\text{-}eq.}$/t of steel*
Source: compiled by the authors

The paper considers the following scenarios for the development of the situation for MMK and Chelyabinsk region.

Scenario 1

The first variation of this scenario considers two options:

a) there is a company affiliated with MMK that buys products from Russia while being a resident of the EU.

In this case, when metal products are exported to the EU, this company will bear the burden of the carbon tax, which means losses for the whole MKK group.

b) an importer of the CBAM-targeted products will pay the full carbon tax.

In this case, when concluding a contract with a counterparty from Russia for the supply of products, it may set a condition for including a discount in the contract, the amount of which will be determined by the amount of the paid carbon fee.

The second variation of this scenario is the loss of a part of export revenues because of the decrease in the export volume of metal products due to the reduction in the size of preferential quotas for the EU producers and, as a result, an increase in the amount of carbon tax paid for imports of those products that fall under the CBAM.

Calculations based on the case of MMK will assume that the decline in sales will be gradual and will amount to 10% of the total sales to Europe (proportionate to the volume of the reduction in preferential quotas in the European Union).

Scenario 2

The first variation of this scenario is related to Russian companies' reorientation to the Middle East and Asian markets. In this case, there are additional costs associated with an increase in the transportation leg. According to the estimates of the Association "Russian Steel", about 4 million tons of steel products per year can be redirected by Russian metallurgical companies to the east, while the distance of cargo delivery will increase by more than three times – from 2300 to 7900 km, which will lead to additional companies' expenses of 17 billion rubles a year, or, in terms of a ton of products, additional costs will amount to 4.25 thousand rubles per ton[14].

The second variation repeats the conditions of the previous one, an additional assumption being that the countries of the Middle East and Asia will also introduce a carbon tax on the import of carbon-intensive products, while, since the conditions for its calculation in the given countries are not known today, it is proposed to calculate it by using the EU parameters (formula (1)).

The introduction of carbon payments for exporting companies, a decrease in revenue from the export of goods falling under the CBAM, and an increase in transport costs will also have an impact on regional tax revenues. MMK is the largest taxpayer in Chelyabinsk region, and in the following section we are going to consider the potential losses of the regional budget arising from the shortfall in income tax. According to the Tax Code of the Russian Federation, today 17% of the corporate income tax goes to the regional budget.

Results

According to our calculations, the amount of the carbon tax for importers of metal products to the EU will be 40.766 euros/per ton of steel $(2.18 - 2.18 \cdot 0.66) \cdot (55 - 0)$.

Now we are going to calculate the potential losses of MKK and Chelybinsk region for the two scenarios and their variations described above:

1st scenario variation (*1a*). The assessment of MKK's potential losses will take into account the annual volume of exports to the EU (an average of 2.9% or 280,000 tons in 2021, according to the financial statements of MMK). The losses in this case will amount to 11,414.48 thousand euros $(280{,}000 \cdot 40.766)$ or 993,972.9 thousand rubles (for the exchange rate we used the average annual rate of the Central Bank of the Russian Federation

[14] Metallurgists estimated the costs of redirecting Russian steel from Europe to the East. https://www.forbes.ru/biznes/461239-metallurgi-ocenili-zatraty-na-perenapravlenie-stali-iz-evropy-na-vostok (Accessed: 25.06.2022).

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in 2021 – 87.08 rubles). These losses will be borne by the entire MMK holding.

Losses of the regional budget in this case will amount to 168,975 thousand rubles per year (993,972.9 thou. rubles · 0.17).

1st scenario variation (*1b*). In this case, MMK will face a decrease in its export revenue by the amount of carbon tax paid in the amount of 993,972.9 thousand rubles.

Losses of the regional budget in this case will also amount to 168,975 thousand rubles per year.

1st scenario variation (*2*). According to MMK's annual report, in 2021, the company's revenue from exports to the EU amounted to 18,952,542 thousand rubles.

In this case, the sales volume will be 252 thousand tons, and the carbon tax will be equal to 10,273 thousand euros (252,000 · 40.766) or 894,575.6 thousand rubles.

Export proceeds from sales to the EU will decrease by 18,952,542 thousand rubles · 0.1 = 1,895,254 thousand rubles or by 21,764.5 thousand euros (MKK's revenue from exports to the EU for 2021 are taken as the basis for calculations).

Thus, the total losses of MMK in this scenario will amount to 894,575.6 thousand rubles + 1,895,254.0 thousand rubles = = 2,789,829.6 thousand rubles or 32,038.3 thousand euros.

Losses of the regional budget will amount to 474,271 thousand rubles per year.

2nd scenario variation (*1*). Due to the reorientation to the Middle Eastern and Asian markets, additional transportation costs for MMK will amount to 4.25 thousand rubles · 280,000 tons = = 1,190,000 thousand rubles per year. Losses of the regional budget in the form of the lost income tax in this case will amount to 202,300 thousand rubles per year.

2nd scenario variation (*2*). If the Middle Eastern and Asian countries introduce a carbon tax similar to the EU, MMK will incur costs equal to 11,414.48 thousand euros (280,000 · 40.766) or 993,972.9 thousand rubles. Thus, the total losses of MMK, together with additional transportation costs, in this case will amount to 1,190,000 thousand rubles + 993,972.9 thousand rubles = = 2,183,972.9 thousand rubles

Tax losses of the regional budget in this scenario variation will amount to 371,275 thousand rubles per year.

In both variations of Scenario 2, there are risks associated with the loss of a part of export earnings due to a likely decrease in the price of export metal products. It should be noted, however, that the carbon intensity of domestic metal products is at the global average and is significantly lower than in the countries of the Asian and Middle Eastern segments (Fig. 5). The latter is very important to determine the amount of the carbon tax and it can also be used as a leverage in price negotiations.

If we consider the situation in relation to the MMK Group, whose position is the most vulnerable (Fig. 6) in terms of the carbon intensity of products compared to the top Russian companies, an important observation should be made: since 2016 the company has been accounting for its GHG emissions. And now, MMK's top goal is to reduce specific GHG emissions ($CO_{2\text{-eq.}}$/t of steel) by more than 20% by 2025 (compared to 2018).

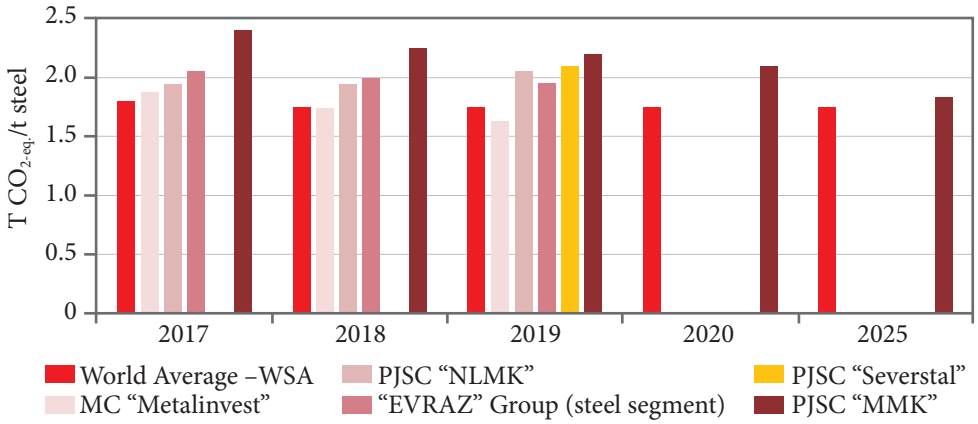

Figure 5. *Russian companies' CO_2 emissions per ton of steel*

Source: Bashmakov I. Benchmarking of specific GHG emissions in industrial production. CENEf-XXI. https://cenef-xxi.ru/uploads/Session_2_I_Bashmakov_Benchmarking_of_greenhouse_gas_emissions_in_industrial_production_dfe5178e68.ppt (Accessed: 27.05.2022)

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To achieve this goal, MMK is actively implementing projects to increase its energy efficiency and improve its technological processes, which means cutting the amount of GHG emissions. Moreover, in the future, the company plans to implement even more such projects, including a converter gas utilization project, starting in 2025, which will significantly reduce the carbon intensity of its products and strengthen its competitive position worldwide.

A summary of the four scenarios is presented in Table 4.

If the sanctions are lifted in 2024–2025, the annual losses of both MMK and the regional budget will be the highest in the second variation of the first scenario, 2.8 times higher than in the first variation. In this case MMK will incur losses both due to the profits lost as a result of a drop in EU exports revenue due to the company's high carbon intensity and falling competitiveness and due to payments under the CBAM. Proportionately, the government of Chelyabinsk region will also lose a part of its tax revenue. We believe that the events described in the second variation of the first scenario are more likely since a gradual decrease in the value of free quotas in the EU by 2035, as the CBAM is introduced, appears unavoidable (see Sato, Rafaty, Calel, & Grubb, (2022); Ellerman, Marcantonini, Zaklan (2016)).

If the EU sanctions against metallurgical enterprises are not lifted, then the second variation of the second scenario will mean the maximum losses for MKK and its home region – here the carbon tax is added to the additional transport costs. We believe, however, that it is less likely to happen in the near future, since so far there have been no official statements from the Asian and Middle Eastern countries about the extension of intra-country carbon payments to third countries. In any case, Russian steel manufacturers' low carbon intensity compared to their counterparts in these regions as well as MKK's planned decarbonization activities give us hope that carbon tax payments will be lower.

In this regard, the implementation of projects aimed at reducing the carbon footprint is of particular importance. Such targets should also be reflected in regional investment programs. The planned reduction in the specific carbon intensity of MMK's products to 1.8 tons of $CO_{2\text{-eq.}}$ per ton of steel (see Fig. 6) will bring this figure in line with the global average and allow the company to compete more confidently in the global market in terms of the carbon intensity of its products (see Fig. 5).

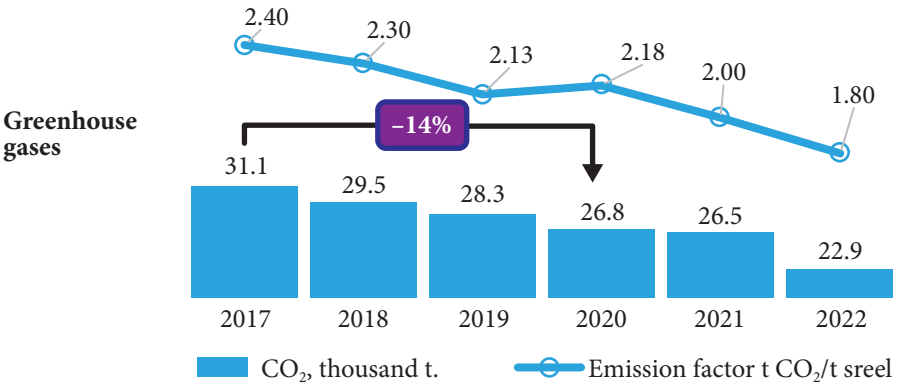

Figure.6. *Reducing MKK's impact on the environment*

Source: PJSC MMK's presentation for private investors BCS. https://mmk.ru/upload/iblock/234/vmanww0oq260mjt0nmvpnq63ca9igizz/MMK_BCS_retail_investors_conference_final.pdf (Accessed: 27.05.2022)

Table 4

The estimation of economic losses of MMK and Chelyabinsk region

Facility	Annual economic losses, thousand rubles				
	Scenario 1 (the EU sanctions are lifted in 2024–2025)			Scenario 2 (reorientation to new markets)	
	1a	1b	2	1	2
MMK	993,972.9	993,972.9	2,789,829.6	1,190,000.0	2,183,972.9
Chelyabinsk region	168,975.0	168,975.0	474,271.0	202,300.0	371,275.0
Total	1,162,948.0	1,162,948.0	3,264,101.0	1,392,300.0	2,555,247.9

Source: authors' estimations

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Conclusions

The scenarios considered for MMK and Chelyabinsk region related can be extrapolated to the whole Russian market. Of course, while the organizational structure of the mechanism remains unclear, there is also high uncertainty surrounding the national carbon regulation system. Whether it will be similar to the mechanisms of the EU ETS and the EU CBAM, and the Russian regulator will be guided by similar principles or whether it will develop more serious regulatory measures is still unclear. This situation indicates that if at the initial stages of the introduction of the CBAM the risks for export-oriented companies are small, then in the near future carbon regulation in the European Union and other countries may create serious threats to financial stability of enterprises, even those with a small share of exports in their sales. After the abolition of the free emission quotas in the EU and the global increase in GHG prices, enterprises will incur significant costs from the carbon tax.

Companies with an uncertain environmental policy and unclear plans for its implementation will lose out against their competitors, as evidenced by various indices, both Russian and international, which determine the level of environmental friendliness of a particular corporation and product.

An increase in the level of environmental friendliness is achieved through the implementation of so-called "green" projects. The Decree of the Government of the Russian Federation of September 21, 2021 No. 1587 establishes the criteria for sustainable (including green) development projects and the requirements for the verification system for sustainable (including green) development projects. Such environmental projects should meet the criteria of the national taxonomy of adaptation (or transition) projects. In the world such projects are not recognized as "green" in the full sense of this word, but they are very important for the Russian economy, as their goals are related to GHG reduction.

Green financing provides such financial instruments as debt securities or loans. These funds, however, can be used exclusively for capital expenditures and operating expenses necessary for the implementation of the project and financing the portfolio of sustainable development projects. Funds raised through financial instruments can be used both for future projects of an enterprise, and for refinancing and reimbursement of the costs of ongoing projects.

Active stimulation of metallurgical companies to reduce their emissions, for example, through regional programs, will help regional governments avoid losses in export earnings and regional budget revenues in the future, while complete inaction is fraught with losses, both in the share of export profits and in the domestic market. The Russian system of target indicators for reducing GHG emissions by sector is rapidly evolving. The Russian legislation also provides for the gradual introduction of carbon reporting: the largest emitters of GHG emissions (more than 150 thousand tons of CO_2 at the first stage until 2024) will have to provide mandatory carbon reporting while for other enterprises carbon reporting will be optional. Russian regions should take an active part in the development of carbon policy tools.

While the regulatory framework for non-financial corporate reporting is still beginning to take shape in Russia, there is already a burgeoning need for harmonizing these reporting standards with the existing ESG standards and frameworks, especially in the light of the evolving carbon regulation system. By incorporating ESG principles into their business models, Russian companies may enhance their reputation and improve their image with investors.

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