Economic diversification in Russia’s Kuzbass coal region

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Colophon

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About
This policy brief was published as part of the project ‘The Russian Coal Sector. Challenges and Transition Opportunities’. Convened by Climate Strategies, the project builds and enables knowledge exchange on the current and future status of coal in Russia. Focusing on progress towards a low-carbon development in Russia, the project provides insights into the macroeconomic and social stability of coal regions, and delineates pathways forward given the global, ongoing low-carbon energy transition.

Acronyms
CCS  Carbon capture and storage
CO2  Carbon dioxide
CO2e  Carbon dioxide equivalent
EBRD  European Bank for Reconstruction and Development
G7  Group of Seven
GHG  Greenhouse Gas
RES  Renewable energy sources
R&D  Research and Development
TOE  Tons of oil equivalent
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Executive summary

- Kuzbass is the main coal producing region in Russia with large coal reserves.
- The coal sector in Kuzbass is an important source of revenue in the region, despite its significant negative environmental and health impacts.
- The Russian government is advocating for diversifying coal regions such as Kuzbass due to the risk of an increasing low-carbon trend and a declining coal demand globally.
- Diversification options for Kuzbass promoted by the government are all fossil fuel-based.
- Kuzbass has the potential to transition to a low-carbon economy, however coal producers are only likely to diversify their business models once the demand for coal drastically declines.
- Despite the potential for renewable energy and emission reductions in Kuzbass, there are no signs of exploiting this potential in the next few decades.
The role of coal in Kuzbass

Kuzbass is the main coal producing region in Russia located in Western Siberia. The proven reserves of coal are estimated at 693 billion tonnes, including large amounts of coking coal. The coal industry accounts for over 30% of the region’s industrial production, employing 133,000 people. Coal dominates Kuzbass’ energy mix, providing 96% of total fuel resources. Most coal produced is exported (70%). Domestic coal consumers include primarily thermal power plants, metallurgy and other industries, and private households, which currently have no alternative energy sources to coal due to the existing business models and lobbying power of coal sector. Coal plays a controversial role in regional development: it provides jobs and income to people, funds for building schools and other social infrastructure; at the same time, it dramatically affects the local environment, ecosystems, and human health. This has increasingly caused social unrest and protests aimed at stopping coal mining in the region. However, local environmental activism has not yet led to meaningful behaviour changes of local coal businesses.

Coal mining has significant adverse impacts on the environment, polluting Kuzbass with over 250 different hazardous substances. Novokunetsk, Kemerovo and some other regional towns are regularly included in the list of most polluted cities in Russia. Though the region does not have the highest levels of air pollution in the world, it still demonstrates high levels of PM10 and other substances. It is also a significant source of greenhouse gas (GHG) emissions, especially methane and carbon dioxide from the energy sector. The annual average emission of both carbon dioxide and methane in Kuzbass from combustion and extraction of coal is about 117 Million tonnes of carbon dioxide equivalent (MtCO₂e) or about 5 percent of annual GHG emissions in the country (excluding Land-Use Change and Forestry). The region has seen an increase in GHG emissions since 2015 and over 1.8 million tonnes of hazardous pollutants (sulphur oxide, nitrogen oxides, methane, and some others) are being released into the atmosphere annually. Other environmental challenges related to Kuzbass’ coal sector include:

- **Water pollution**: Over 550 million m³ of wastewater is discharged annually, containing hazardous pollutants, such as sulphates, chlorides, phosphates, phenols, and lead, which negatively affect local ecosystems, the environment and human health. The main sources of pollution are coal extraction and processing, power and heat generation, metallurgy, coke chemical, and chemical production. In 2020, the maximum allowable concentration of pollutants in surface waters was exceeded by 2 times in Novokuznetsk (for phenols and iron), by 2.8 times in Kuzbass (for iron), and by 1.7 times in Leninsk-Kuznetsky (for manganese).
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- **Hazardous waste**: A further significant pollution source is ash disposal from coal combustion which contains high concentrations of chrome, magnesium, nickel, cobalt, zinc, arsenic, copper, mercury, and other dangerous substances and is stored at waste deposit sites.

- **Air pollution**: Coal export also causes substantial environmental pollution in coal regions as well as the maritime ports of the Russian Far East and North West. From 2016 to 2020 air pollution in the regional capital city of Kuzbass exceeded the maximum allowable concentration of highly hazardous benz(a) pene by 2.1-3.4 times, in Novokuznetsk by 3.5-6.9 times, while the concentration of total suspended particulates in Prokofievsk exceeded the reference level by 1.2-2.0 times\(^1\). There are also transboundary impacts of air pollution, particularly sulphur and nitrogen oxides, heavy metals, and volatile organic compounds, which can be observed at very long distances. Another issue is the open loading of coal for export in the marine ports, which has resulted in coal dust becoming a major source of pollution in the port regions of Murmansk, Nakhodka and others. Efforts to protect the port communities have been inefficient. For instance, the Murmansk port operator has built a protective screen of 1.5 km length and 20 m height, however coal dust pollution still negatively affects the City of Murmansk\(^12\).

The coal sector in Kuzbass is and will long be an important source of revenue for the regional budget and, more importantly for local communities, as well as corporate spending on ‘social commitments’ such as building schools and infrastructure. Yet, decarbonisation of the world economy is increasingly becoming more evident, as a growing number of countries adopt their mid-century carbon-neutrality goals, financial institutions divest from fossil fuels, and industries gradually switch to zero-carbon alternatives. Global energy transitions to green power and stronger sustainability requirements of businesses are likely to affect coal mining in Kuzbass and its revenues.

**Russia’s diversification plans**

The Ministry of Economic Development foresees an increase in coal exports by 2035\(^{15}\). In contradiction to this, the Russian government’s considerations and discussions around diversifying the economies of coal regions have deepened. The government is confronted with increasing pressure on the Russian coal sector resulting from the global energy transition that will make the coal sector less competitive and more reliant on subsidies. The main driver of economic diversification is the need to address the potential risk of a decline in coal demand due to international climate policies and the carbon neutrality goals of leading economies. The Group of 7 (G7) countries agreed to stop using coal by 2030\(^{16}\), and many others are likely to follow suit. Divestments from coal are an increasing threat for Russian producers as the construction of many coal-fired power plants will no longer be realised due to the recent decisions of the World Bank, European Bank for Reconstruction and Development (EBRD), and other international financial institutions to end fossil fuel financing\(^{17}\). At a meeting of the Russian coal industry in

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**Box 1. Public health\(^{13}\)**

Some open coal mines are in the centre of local towns (e.g., the town of Kiselyovsk), directly affecting local communities. As a result of coal mining, the total mortality rate in Kuzbass was 16% higher in 2019 than the Russian average. The cancer mortality rate in the region exceeds the Russian average by 7.4%, and annual mortality from respiratory diseases is 30% above the national average. Furthermore, the life expectancy at birth is 3 years below the Russian average. These environmental and health problems are recognised on the federal level, and in October 2020 the government approved the first phase of the scientific-technical programme “Clean coal – green Kuzbass” aimed at reducing environmental impacts through the implementation of 29 innovative projects\(^{14}\).
March 2021\textsuperscript{18}, President Putin insisted that diversification of coal producing regions must be strengthened. Specifically, the wellbeing of local communities and the environment should be improved. President Putin has requested the regional government and companies to use coal export revenues for diversification, rapid development of non-coal sectors, and services to secure regional labour markets and stimulate economic growth. However, in reality regional diversification of coal regions is likely to be financed by an increase in coal exports.

In early July 2021, plans for the diversification of the Kuzbass economy were adopted by the federal government\textsuperscript{19}. They provide the foundation for 78 projects in various sectors with overall public and private investments of about $6 billion by 2026. Major projects include a new plant for ammonia and urea production, an iron and steel casting and rolling plant, modernisation of heating systems, completion of a large hydropower plant, renovation of Rusal’s aluminium plant, and construction of a logistical centre for a large retailer, Wildberries. The Federal Ministry of Economic Development expects these projects to generate over 13,000 new non-coal sector jobs for the Kuzbass economy\textsuperscript{20}. Renewable energy resources and other green projects have not been included in the current list.

However, the adopted diversification plan primarily addresses matured sectors and those with slow growth, but not the fast-growing industries, so the impact on sustainable growth of employment and productivity of labour will unlikely be strong. They may also not attract young generations and workers due to low salaries, and thus the migration of young professionals from Kuzbass, which has already been very high for decades, may continue. IT, education, new construction materials and other innovative sectors have so far not been considered under the regional development plans. The Ministry of Economic Development may include those sectors in the next diversification phase.

**Diversification options for Kuzbass**

There are numerous opportunities for Kuzbass to transition to a new environmentally and climate-friendly economic model. Notably, all regional measures outlined in the plan of diversification include continued fossil fuel consumption.

**Box 2. Renewable energy**

Although fossil free renewable energy is currently not part of the regional government’s diversification plans, the technical potential of renewable energy sources (RES) in Kuzbass is about 30 billion tonnes of oil equivalent (toe) per year\textsuperscript{21}. The locally available RES includes solar, wind, small hydro (small-scale hydropower), and biomass.

The economic and financial assessment of the different development options still requires further cost-benefit analyses, including technological and regulatory costs, environmental and climate impacts, monetary valuation of human health impacts and ecosystem damages. Official documents in open access often provide indicative information without comprehensive economic reviews and justifications.

Currently it is still inconceivable that after many decades of being the coal capital of Russia, Kuzbass could become a prosperous ‘green’ region. However, Kuzbass has great potential to diversify and transition to a greener economy utilising its advantages as a transport and energy system hub in the geographical centre of Russia, vast natural resources to produce renewable energy and sustainable products, and highly qualified technical specialists and innovators. In the future, the federal government’s increasing support of economic diversification plans for Kuzbass may further expand to RES and other green sectors.
The role of coal in Kuzbass

| Energy efficiency | The energy efficiency and energy saving potential in the region is significant (25 million toe/year, similar to Moscow City’s annual gas consumption\(^22\) or the annual electricity consumption in the UK\(^{23,24}\). Over 40% of the current energy consumption can be saved, primarily in power and heat generation. As all energy is coal-based, energy efficiency may generate economic savings, social and environmental benefits, provided coal consumption does not increase. |
| Coal-bed methane | The potential for replacing coal with natural gas or coal-bed methane can be considered a "bridging" solution for the region. It is an unconventional form of natural gas found in coal deposits or coal seams\(^{25}\). The total reserve of coal bed methane in Kuzbass is estimated at 13.5 trillion m\(^3\), but may be even more up to 20 trillion m\(^3\). The company Gazprom dobycha Kuznetsk has already launched methane extraction from coal fields, which can be expanded up to 4 billion m\(^3\) per year in the short term\(^{27}\). |
| Coal chemical industry | The coal chemical industry has a promising potential of production and revenue generation compatible with the current revenues from coal supplies in Kuzbass. Coal as a raw material can be utilised to produce 130 types of chemical semi-products and over 5,000 products (carbon fiber, molecular sieves, nanotubes, nanocomponents, carbon sorbents, etc.). There are several local producers of coal chemical products with a total turnover of $1 billion per year. Development of the coal chemistry cluster in Kuzbass could generate 75,000 new jobs, and over $10 billion in annual revenue\(^{28}\). |
| Carbon capture and storage (CCS) | CCS technology refers to the process of capturing carbon dioxide (CO\(_2\)) before it enters the atmosphere and permanently storing it underground or in underwater reservoirs. CCS could play a meaningful role in Kuzbass’ energy sector, but its potential has not been investigated yet. As such, further Research and Development (R&D) in this field could be undertaken. A pioneering feasibility study of CCS potential in Kuzbass was initiated in 2020 under the regional program “Clean coal – green Kuzbass”\(^{29}\). An analysis of injecting CO\(_2\) into coal mines has been launched, based on the international experience with dozens of CCS projects worldwide\(^{30}\). Implementation of CCS technologies may provide Kuzbass with an opportunity to produce coal-based energy without emitting CO\(_2\), though the cost effectiveness of such measures is still unclear\(^{31}\). |

**Further perspectives**

An energy transition in Kuzbass will be a long and gradual process. The coal industry transition needs to deliver on social justice, new green jobs for local miners and other specialists, better environment and health, the growth of new eco-friendly businesses, modern education and much more.

Turning a blind eye to changing world energy markets and technological transformation, global carbon and environmental regulation, expansion of carbon pricing schemes, political commitments for clean energy, and zero-carbon pathways would come at a high financial cost for Russia\(^{32}\). Whilst the regional diversification plans for Kuzbass exclude renewable energy, some emission reductions could still be achieved on a fossil fuel-based pathway. Yet, for a more sustainable future, diversification plans should extend the scope to RES and a wide range of sectors.

However, the seemingly short-sighted behaviour of Russian coal producers and the government may indicate a realistic future, as coal production and export will continue as long as market demands exist. It is likely that only once there is insufficient demand for coal exports, triggered by the EU Green Deal and stricter carbon regulation worldwide, coal producers will diversify their business models. Seemingly, the short-term profits from expanding the Russian coal sector, supported by significant government subsidies, will continue to finance social responsibilities but may hinder a diversification of Kuzbass’ economy. As such, a substantive diversification of the Kuzbass economy is unlikely to happen for the next one or two decades, possibly leading to adverse economic, social and environmental impacts in the medium term.
References


3. Source: Kemerovo Statistical Agency


5. The Voeikov Main Geophysical Observatory. Available at http://voiekovomo.ru/?id=681lang=ru (last accessed on 22 July 2021).


11. Ibid.


13. Source: Kemerovo Statistical Agency


21. Based on author’s own calculations.

22. РИА Новости (2017). Потребление газа в Москве снизилось в последние годы на 21%. Available at: https://reality.ru/ru/20171229/1511977084.html (last accessed on 1 September 2021).


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