BOFIT Policy Brief
2021 No. 7

Heli Simola and Laura Solanko

Russia's oil & gas sector in global energy transition

Bank of Finland, BOFIT
Bank of Finland Institute for Emerging Economies

BOFIT Policy Brief
Editor-in-Chief Mikko Mäkinen

BOFIT Policy Brief 7/2021
25 May 2021

Heli Simola and Laura Solanko
Russia's oil & gas sector in global energy transition

ISSN 2342-205X (online)

Bank of Finland
BOFIT – Institute for Emerging Economies

PO Box 160
FIN-00101 Helsinki

Phone: +358 9 1831

Email: bofit@bof.fi
Website: www.bofit.fi/en

Contents

Heli Simola and Laura Solanko

Russia's oil & gas sector in global energy transition

Abstract

The past two decades have witnessed a major transformation of global energy markets. While growth in energy demand now comes from emerging economies, and technologies critical to oil and natural gas production have seen dramatic advances, the biggest changes in global energy markets lie ahead. For countries to meet their ambitious climate goals, demand for conventional energy sources must fall significantly and be accompanied by a massive shift in investment to renewable energy sources. Such changes can have major implications for the Russian economy, which depends heavily on oil and gas. This brief provides an overview of the latest trends in Russia's oil & gas sector in the context of evolving global energy markets.

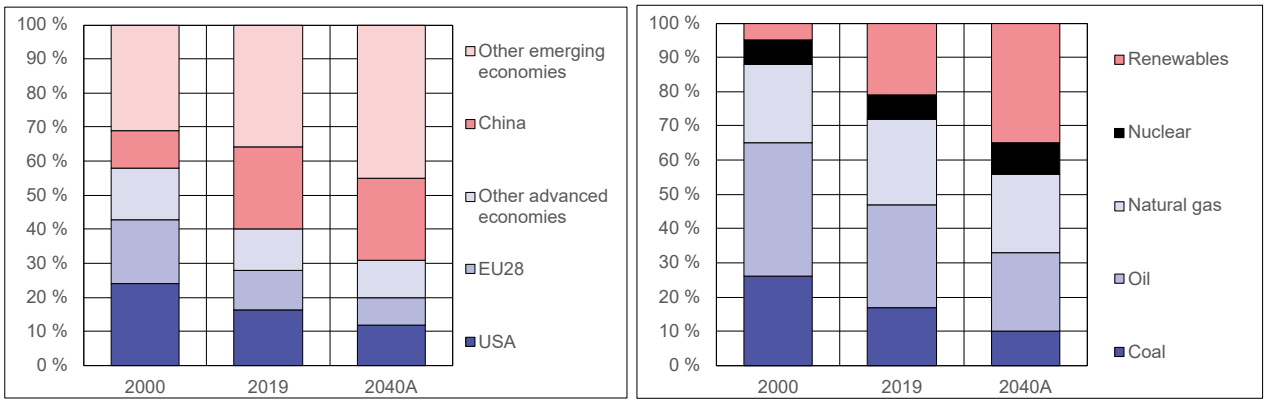
Keywords: Russia, oil, natural gas, energy transition

1. Introduction

Over the past two decades, global energy markets have struggled with the shift in energy demand growth to emerging economies and technological advances in energy production.[1] China became the world's largest energy consumer over a decade ago, and energy consumption has grown rapidly in several other emerging economies – especially in Asia (Figure 1). At the same time, energy consumption in developed economies has been declining. The breakthrough technologies that have given new entrants a foothold in the market mainly involve production of shale oil and gas or liquefied natural gas (LNG). These newcomers have raised the level of competition and put pressure on traditional hydrocarbon-producing nations. The Covid Recession dealt a heavy blow to energy consumption, adding to the woes of economies reliant on energy production.

Even bigger changes in global energy markets may lie ahead. An ever-increasing number of countries have adopted policies aimed at mitigating climate change with commitments to reduce their greenhouse emissions significantly over the coming decades. Reaching these climate goals will require improvements in energy efficiency and less-polluting forms of power generation. For the time being, however, most of the world's primary energy is produced with oil, gas and coal.

Figure 1. Breakdown of global primary energy consumption by region (BP Net Zero scenario) and fuel type (IEA Sustainable Development scenario) in 2000, 2019, and 2040.



Note: The 2040 geographic breakdown is taken from the "Net Zero" scenario in BP's *Energy Outlook 2020*. The fuel-type breakdown is taken from the "Sustainable Development" scenario presented in the IEA's *World Energy Outlook 2020*. Both scenarios assume the targets set out in the Paris Agreement are met.
Sources: BP and IEA.

Such changes can have huge implications for the Russian economy, where oil and natural gas still play commanding roles. While Russia has been slow to react to changes in the energy market, it has signed on to the OPEC+ production-ceiling agreements, developed its LNG production and infrastructure, and placed strong emphasis on the Chinese energy market. Climate change and efforts to deal with it have only recently entered the public discussion. The effects of climate policy, which is fraught with uncertainty for many countries, will probably not be substantial yet on this decade. Nevertheless, the long-term impacts for the Russian economy could be profound.

This policy brief discusses recent developments and possible futures of Russia's oil & gas from multiple perspectives against the backdrop of the ongoing transformation of global energy markets.

1 See e.g. Solanko and Vilmi (2013).

The discussion comprises 13 sections, each dealing with a specific topic. Together they provide a general overview of Russia's energy sector. It opens with an overview of the importance of the oil & gas sector to the Russian economy. Sections 2 and 3 look at recent trends in oil production, exports and future prospects. Sections 4 and 5 focus on the outlook for natural gas production, consumption and exports. Section 6 takes up Russia's rapid expansion into LNG production, while Section 7 considers Russia's coal industry. Section 8 looks at the Arctic territory's role in the development of Russia's energy sector. Section 9 investigates the specific impacts of Western sanctions on Russia's oil & gas sector. Section 10 takes up global efforts to deal with climate change, and how this might affect Russia. Section 11 delves in the relative contribution of Russia's oil & gas sector to GDP and how Russia might adjust to changes in global energy markets. Section 12 looks at Russia-China energy relations, while Section 13 provides insights into the role of hydrocarbons in Russia's state finances. Section 14 discusses potential new energy sources. Section 15 summarizes the discussion.

2. Cornerstone of the Russian economy

2.1 Oil & gas account for large shares of industrial output, exports and government revenues

The importance of the oil & gas sector, long a central element of the Russian economy, has remained steady over the past two decades. Calculating directly from the national accounts, oil & gas production, including petroleum refining, accounts for about 40 % of industrial output and 10 % of GDP. The oil & gas sector also makes a sizeable services contribution, particularly in the wholesale trade and transportation branches. While it is difficult to drill deeper into these figures due to such practices as transfer pricing,[2] researchers have approached determining the GDP contribution of the oil & gas sector from several angles, and generally agree it is around 20 %.[3] The oil & gas sector's high capital intensity means it makes only a small labor contribution, directly employing only about 2 % of Russia's labor force or about 1.5 million people. While the indirect employment effects are larger, they are hard to quantify due e.g. to statistical reporting issues.

Oil & gas also form a lion's share of Russian exports. In the 2000s (2001–2010) and 2010s (2011–2019), they accounted for about 54 % of combined exports of goods and services and 61 % of goods exports (Table 1). Oil, however, is far more important to Russia as an export commodity than natural gas. During 2011–2019, crude oil and petroleum products represented 49 % of goods exports on average, while natural gas was just 12 %. The share of oil and natural gas in exports varies annually largely due to fluctuations in oil prices. In 2011, for example, crude oil, petroleum products and natural gas accounted for 67 % of goods exports. In 2020, that share was just 43 %. However, if the export prices of these products were equal to the level of 2011 in 2020, their relative share of goods exports would also rise to 67 %.

[2] Transfer pricing is a practice involving firms within a corporate conglomerate or group. Firms that produce oil and gas often sell their products through the group's commercial outlets. Transfer pricing allows the producer company to sell its oil and gas at below-market prices to their group's transportation and retail chains, which then sell the products at significantly higher prices. The value-added is booked in the national accounts under wholesale trade rather than as oil & gas production. Transfer pricing is often an element of corporate tax planning, but it has been also used for tax avoidance in Russia. (Simola et al. (2013)).

[3] IEA (2014); Kuboniwa (2015); Simola et al. (2013).

Table 1. Russian oil & gas exports

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Crude oil, USD billion	182	181	174	154	90	74	93	129	122	72
Petroleum products, USD billion	96	104	109	116	67	46	58	78	67	45
Natural gas, USD billion	68	67	71	60	46	34	42	55	50	32
Total, USD billion	346	351	355	330	203	154	193	262	239	149
Share of goods exports, %	67	67	68	66	60	55	55	59	57	43
Oil price, USD/barrel*	102	103	100	94	50	40	51	68	62	41
Share of goods exports in 2011 prices, %	67	66	68	68	73	75	70	68	68	67

* Average USD price per barrel of exported Russian crude oil.

Sources: Central Bank of Russia, BOFIT.

Oil and gas are important for the public sector as they generate a substantial share of Russia's budget revenues. In 2011–2019, oil & gas revenues averaged 24 % of revenues to the consolidated budget (federal, regional, municipal, and social fund budgets) (Table 2). In recent years, their share of the consolidated budget has been slightly smaller than at the start of the 2010s. This was due in part to price trends. Taxation of oil & gas is partly based on their market price (oil & gas taxation is dealt with in Section 13). Notably, a contraction in tax revenues calculated in rubles is buffered by ruble depreciation. The government has also managed to increase other budget revenue streams in recent years. The 2019 consolidated government deficit without oil & gas revenues was smaller than in previous years, but still 5 % of GDP. In the crisis year of 2020 it widened again to 9 % of GDP. The government also collects more revenue from oil than gas because it taxes oil more heavily and because oil accounts for a larger share of export revenues. The share of export taxes in the total tax revenues from oil & gas, however, has contracted sharply in recent years as the emphasis of oil taxation has shifted towards production.

Table 2. Contribution of oil & gas revenues to Russia's consolidated budget.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Oil & gas revenues, RUB billion	5 640	6 450	6 530	7 430	5 860	4 840	5 970	9 020	7 920	5 240
Share of total revenues, %	27	28	27	28	22	17	19	24	20	14
Oil & gas revenues, USD billion	192	208	205	193	96	72	102	144	122	73
Export tax revenues	124	130	126	119	45	30	33	48	35	31
Oil	79	80	73	68	23	15	17	25	17	15
Petroleum products	32	36	38	39	12	7	7	10	7	6
Natural gas	13	14	15	13	9	8	10	13	11	10
Deficit calculated without oil & gas revenues, % of GDP	-8.0	-9.1	-10.1	-10.5	-10.4	-9.3	-8.0	-5.7	-5.3	-8.9

Sources: Russian Ministry of Finance, CEIC and BOFIT.

2.2 Economy reacts quickly to oil price changes

Because the Russian oil & gas sector's economic contribution is quite large, movements in oil prices have a significant impact on economic performance. Oil prices often show unpredictable and sharp swings even in the short term. Such swings are quickly reflected in an economy's export earnings,

foreign capital flows and exchange rate. Over the longer term, they affect government revenue streams. In Russia's case, the price of oil has a direct impact on export earnings. Moreover, price changes are generally reflected in foreign capital flows to and from Russia as the oil & gas industry constitutes a large part of Russia's corporate sector. Indeed, the capitalization weights of oil & gas companies in Russia's main stock index (RTS/MICEX) is over 50 %. A change in the oil price rapidly translates via export revenues and capital flows to the ruble's exchange rate.[4]

The impacts of the oil price on the economy can be partly lightened with the help of monetary and fiscal policy measures. Due to the shift in Russian economic policy in recent years, the impact of the oil price on the ruble's exchange rate and the public finance sustainability has decreased slightly, even if it is still important. Russia's monetary policy emphasis has shifted to inflation targeting, and the ruble's exchange rate has been allowed to float freely since late-2014. A floating exchange rate absorbs some of the shock to the economy from changes in the oil price. For example, if the oil price falls, the ruble's exchange rate declines. As oil is usually priced in US dollars, a depreciating ruble means that the price of oil in rubles does not decline as much as the dollar price. Violent fluctuations in the exchange rate, however, can harm the economy. For this reason, the Bank of Russia intervenes to quell large exchange rate swings from changes in the oil price using pre-announced forex operations. These interventions are done on behalf of the finance ministry within the framework of the government's fiscal rule. The government also seeks to offset impacts from changes in the oil price with a fiscal policy toolkit that include the fiscal rule and the National Welfare Fund (see Section 13).

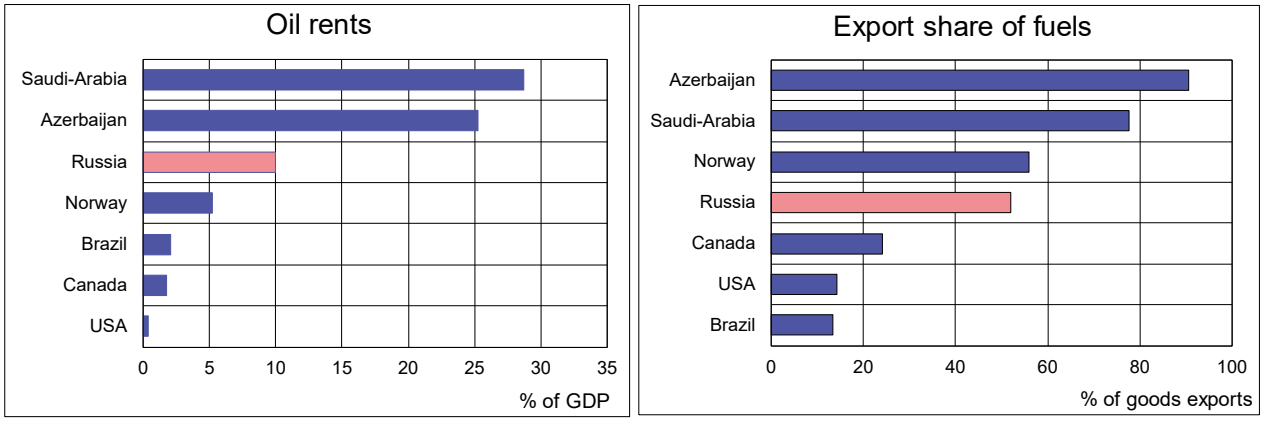
Empirical studies have shown that the price of oil has a significant impact on Russian economic development in both the short and long term.[5] Researcher estimates of this effect vary considerably, however. Depending on the model, a 10 % increase in the oil price raises Russian GDP from 0.6 % to 2 % over the long term. By the same token, a decline in the oil price reduces Russian GDP growth by a similar proportion.

2.3 An average level of oil dependence by international standards

Compared to other major oil producing nations, the dependence of the Russian economy on oil is quite average (Figure 2). Measured by oil rents[6] or exports of energy commodities, the economic significance of oil for Russia is considerably smaller than for e.g. Azerbaijan or Saudi Arabia. On the other hand, oil is a significantly more important income source for Russia than e.g. Brazil or Canada. The situation is also similar from the standpoint of government finances. For example, Saudi Arabia's government finances in recent years have balanced at an oil price around $80 a barrel. Russia's government finances balance at an oil price of about half that.[7]

[4] Ponomarenko and Yakovleva (2020).
[5] Simola (2019).
[6] "Oil rents" here refer to the concept used in the World Bank data. It is calculated as the difference between the value of produced oil at the world market price and the total cost of production relative to national GDP.
[7] IMF (2021).

Figure 2. Ratio of oil rents to GDP in 2018 and share of fuels in goods exports in 2019 for select oil-producing countries.



Source: World Bank.

Looking at the statistical data, we see that the dependence of the Russian economy on oil is roughly the same as that of Norway, which has one of the highest GDP per capita figures in the world. Still, oil dependence is more problematic for Russia that Norway, which is less of a petrostate (see Section 11 for more on oil dependence and economic diversification). The oil & gas sector can employ only a tiny fraction of the Russian population. The oil earnings set aside by Russia in its sovereign wealth fund measured on a per capita basis is only a tiny fraction of that tucked away by Norway for its future generations. Finally, Norway has actively sought to modernize and diversify its economy by reducing its oil dependence. Unfortunately, even globally there are only few countries that have succeeded in diversifying their economies and shifting from commodity production to higher value-added production. In this respect, often cited role models for Russia are e.g. Canada and Australia.[8]

3. Modest outlook for production and export of oil

3.1 A top oil producer and exporter

Russia has been one of the top global producers of crude oil throughout the 2000s. Over the past decade, Russia's share of global crude output has hovered steadily in the range of 13–14 %.[9] While Russian oil production roughly kept pace with the global growth average of about 1 % a year, US production escalated rapidly on shale oil production. Production of shale oil, sometimes referred to as unconventional oil production, helped the US surpass Russia and Saudi Arabia to become the world's largest oil producer.

The US nearly tripled its share of global oil exports over the past decade to about 11 % in 2019. Russia's share of global oil exports has remained fairly stable at around 13 %. As Saudi Arabia's share has declined, Russia has risen in recent years to become the world's largest crude oil exporter. Saudi Arabia accounted for 12 % of global oil exports in 2019. The US and Russia are heavyweight exporters of refined petroleum products. Their global shares in 2019 were 20 % and 13 %, respectively.

[8] World Bank (2020).

[9] The term "oil output" refers to crude oil production including gas condensates. Oil production statistics use varying definitions that give slightly divergent pictures of oil market conditions (see e.g. Simola and Solanko, 2017). Here, the figures for the global oil market have been taken from BP (2020a).

3.2 OPEC+ production ceiling agreement has restricted oil production

Global oil production grew briskly in 2014 and 2015 as elevated US shale oil production hit the market. Quite expectedly, world oil prices plummeted. As a rule, Russian oil production barely reacts to changes in world oil prices as its average production costs are low. Indeed, the average production cost to Russia is only about $10–15 dollars a barrel. If investment and infrastructure costs are included the breakeven point still only rises to around $30–40 dollars a barrel.[10] Russian oil companies are additionally insulated to some extent from oil price shocks as Russian oil taxation is based on prevailing world oil prices and the ruble's exchange rate floats freely.

To support global oil prices, Russia joined forces with the Organization of Petroleum Exporting Countries (OPEC) and ten other oil producer countries in a voluntary production-ceiling agreement in December 2016.[11] The long-negotiated arrangement was the first of its kind. Production ceilings in the initial OPEC+ agreement remained in force until the end of summer 2018, when oil prices had recovered. New production ceilings were needed again in January 2019. The new agreement was in force until the end of March 2020, although some details were occasionally revised according to the market situation.

In spring 2020, the agreement was allowed to expire briefly amidst the first wave of the covid pandemic. Global oil prices sank to historically unprecedented lows (Figure 3). For this reason, a new agreement was signed relatively soon thereafter, even if it required parties to make historically deep cuts in their output. The OPEC+ agreement has helped oil prices recover to pre-crisis levels in recent months. The production ceilings first agreed to were lowered slightly after the agreement was signed. Some countries, including Saudi Arabia, have cut their production to levels well below their ceiling commitments at their own initiative. The current OPEC+ agreement expires at the end of April 2022.

Figure 3. Urals oil monthly average price, 2007–2021.

Source: Reuters.

Even with the production ceiling agreement, Russian oil output increased in the years preceding the covid crisis, hitting an all-time high in 2019. Russia reduced its production by 9 % last year under its OPEC+ commitments. While the OPEC+ agreement still limits Russian oil production this year, it

[10] IMF (2021); Yermakov and Henderson (2020).
[11] Equatorial Guinea became an OPEC member in 2017.

will be less than in 2020 (Table 3), and production is expected to rise slightly this year. After the ceilings imposed under the OPEC+ agreement expire, Russian oil production should quickly ramp up to pre-crisis levels or even slightly exceed them.

Table 3. Production ceilings under the 2020 OPEC+ agreement, million barrels per day (mbd).

	Reference level	5-7/20	8-12/20	1/21	2/21	3/21	4/21	5/21	6/21	7/21	8/21-4/22
OPEC+	43.9	34.2	36.2	36.7	36.7	36.8	37	37.3	37.7	38.1	38.1
Russia	11	8.5	9	9.1	9.2	9.2	9.4	9.4	9.5	9.5	9.5

Note: The production figures in the agreement presumably do not include gas condensates.
Sources: OPEC, media reports and authors' calculations.

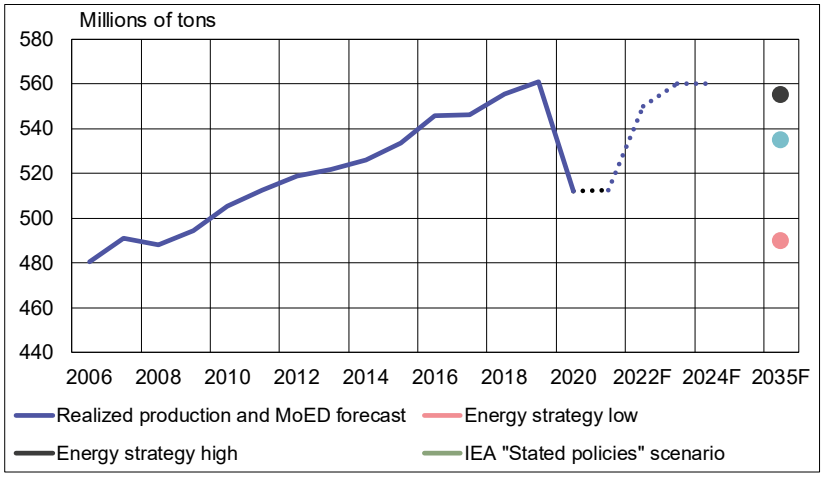
3.3 Oil output expected to decrease over the long term

Russian oil production will eventually decline. Indeed, without massive investments to bring new fields on stream, oil production could enter a steep downturn in just a few years. Depending on the scenario, Russian oil output will decline by 1–13 % of the 2019 production level by 2035 (Figure 4). Production in Russia's traditional elephant oil fields in Western Siberia is gradually waning. New technologies have been introduced in recent years to exploit deposits more efficiently, but these possibilities, too, are destined to fade.

While Russia is launching new production in Eastern Siberia and Russia's Far East, that output is insufficient over the long term to make up for the lost production at Russia's traditional oil fields. Of course, Russia still has vast unexploited reserves, but due to their remoteness and harsh conditions, production costs are higher than for traditional oil fields. It is estimated, for example, that an oil price of $80 a barrel is needed to justify development of oil deposits in the Arctic territory.[12]

[12] Henderson and Grushevenko (2019).

Figure 4. Oil production outlook based on the Ministry of Economic Development (MoED) forecast for 2021–2024, Russia's Energy Strategy 2035 and IEA scenarios (millions of tons per year).



Note: Estimate calculated by averaging the 2030 and 2040 figures given in the "Stated Policies" scenario in the IEA's World Energy Outlook 2020. The figures are then converted from millions of barrels a day to millions of tons a year using a multiplier of 8.49.

Sources: Rosstat, Ministry of Economic Development, Russian government, IEA and BOFIT.

The Covid Recession has affected oil company plans to invest in new production capacity. Western economic sanctions have also restricted the access of Russian oil companies to the financing and production technologies needed to develop new oil fields (for more on the impacts of Western sanctions on Russia's oil & gas sector, see Section 9). The investment appetite of oil companies could be further reduced by tepid growth in oil demand. The baseline scenario in the IEA's latest World Energy Outlook (2020) anticipates a very slow rise in global oil demand over coming decades – and possibly a major contraction if countries succeed in implementing their ambitious climate policies (see Section 10).

3.4 Lower growth in oil exports

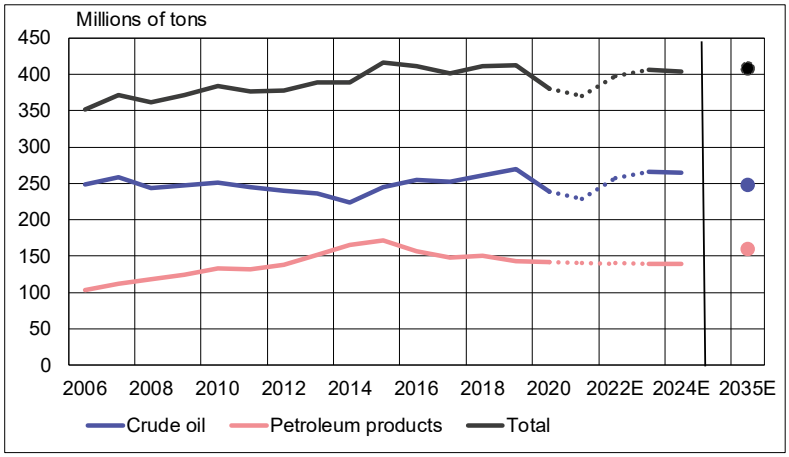
About 45–50 % of Russian oil output is exported as crude oil and some more as refined petroleum products. The total volume of crude oil and petroleum product exports grew on average by less than 1 % a year during 2010–2019 (Figure 5). The volume of crude oil exports shrank in the early 2010s, only to start rising again midway through the decade. The trend for petroleum product exports is largely the reverse. Much of the shift is due to a change in Russia's taxation of oil and petroleum products aimed at increasing the value-added in oil exports (detailed discussion in Section 13). The volume of crude oil exports last year contracted sharply as the covid pandemic shocked global demand. Exports of refined petroleum products also declined, but much more modestly. Although gasoline exports to CIS and EU countries grew briskly,[13] gasoline still only represents a small fraction of total petroleum product exports.

In its April 2021 forecast, Russia's Ministry of Economic Development assumes that the volume of crude oil exports will recover to pre-crisis levels by 2023, and that exports of petroleum products will decline slightly in coming years. Such practices as tax "guidance" are used to reduce exports of petroleum products with low value-added. According to *Energy Strategy 2035*, Russia's latest energy strategy document, the government expects the volume of crude oil exports to reduce

[13] Russian gasoline exports to a few EU countries, including Latvia and Malta, soared last year. The gasoline was apparently distributed on to buyers in third countries.

slightly by 2035. The government foresees a significant reduction in exports of oil products with a low degree of refining in line with the government objectives, while it hopes to see exports of higher-value products such as gasoline and diesel fuel increase by an order of magnitude.

Figure 5. Realized volumes of Russian crude oil and refined petroleum product exports in 2007–2020, Ministry of Economic Development (MoED) forecast for 2021–2024 and medium scenario in the policy document *Energy Strategy 2035* (millions of tons per year)

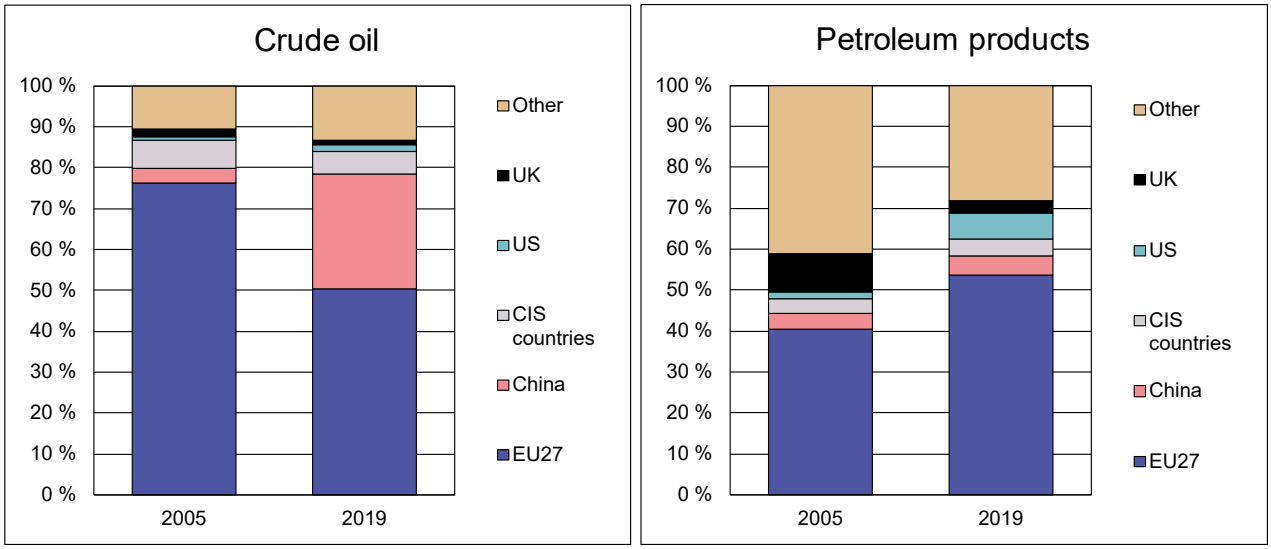


Note: The medium scenario is based on the average of the forecasted upper and lower growth bounds used in the government document *Energy Strategy 2035*.

Sources: Central Bank of Russia and Russian Ministry of Economic Development.

Most of Russian oil exports go to EU countries (Figure 6). The share of crude oil exports to the EU contracted sharply in the 2000s as China's share began to grow. With its import volumes quadrupling between 2005 and 2019, China has become the driver of growth in global oil demand. Russia's newest oil production areas are located relatively close to China. Export growth has been further boosted by increases in transmission capacity of the East Siberia–Pacific Ocean (ESPO) oil pipeline. The first stage of the ESPO pipeline (Taishet-Skovorodino) was commissioned in 2009 and its second stage (Skovorodino-Kozmino) in 2012 (Russia-China energy relations are discussed in Section 11). During 2005–2019, the share of EU in Russian exports of petroleum products rose slightly. China's share of Russian petroleum product exports has remained small as China has its own refining capacity and prefers to import crude oil rather than refined products. Compared to crude oil exports, Russia's petroleum products exports are geographically less concentrated than crude oil.

Figure 6. Geographic breakdowns of crude oil and petroleum product exports in 2005 and 2019, % (measured by value).



Sources: Russian Customs and CEIC.

4. Low demand growth keeps natural gas production in check

The phenomenal growth of shale gas production in the United States allowed it to surpass Russia as the world's largest natural gas producer about ten years ago. Russia, in turn, retained its position as the world's second largest natural gas producer throughout the past decade. As natural gas producers, the US and Russia are in a league of their own. The combined production of the next three largest gas producers (Iran, Qatar and Canada) does not even match Russian gas production. Unlike crude oil, natural gas production in Russia is largely constrained by demand, not the lack of capacity.

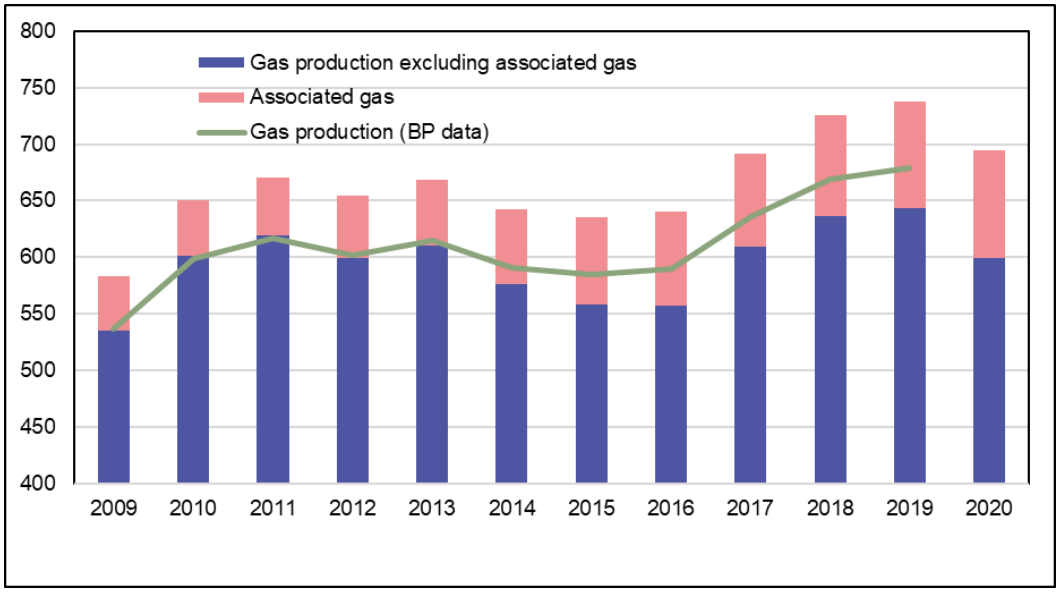
4.1 Natural gas production fluctuates with demand changes

Using Russia's measurement method, natural gas production averaged 650–700 billion m^3 a year over the past decade.[14] Most of Russia's current gas production comes from the massive gas fields in Yamalo-Nenets autonomous okrug in Western Siberia. During 2017–2019, strong growth in domestic demand and rising exports led to a powerful expansion of production. Gazprom's newest "supergiant," the Bovanenkovo gas field, reached around 100 billion m^3 of output in 2019. In that year, Russian gas production reached a historic peak of nearly 740 billion m^3, thanks mainly to growth in production of associated gas. Associated gas, mainly a side-product of oil wells, has a different chemical composition than natural gas. It contains valuable chemicals that can be separated out before its methane component is combined with the natural gas stream. Despite growing efforts to capture associated gas and make beneficial use of it, Russian oil fields still flare off a large share of their associated gas. Russia continues to be the main source of large flares globally.

[14] Russian practice measures natural gas volume at 20°C. Gas expands when heated, so gas volumes reported by Russia are larger than when using the IEA's standard of measuring gas volume at 15°C.

Russia's reported production figures are not directly comparable with international figures, as seen in Figure 7 below.[15] In 2020, Russian gas production was clearly lower than in previous years due to decline in demand.

Figure 7. Russian natural gas production (billion m^3) peaked in 2019.

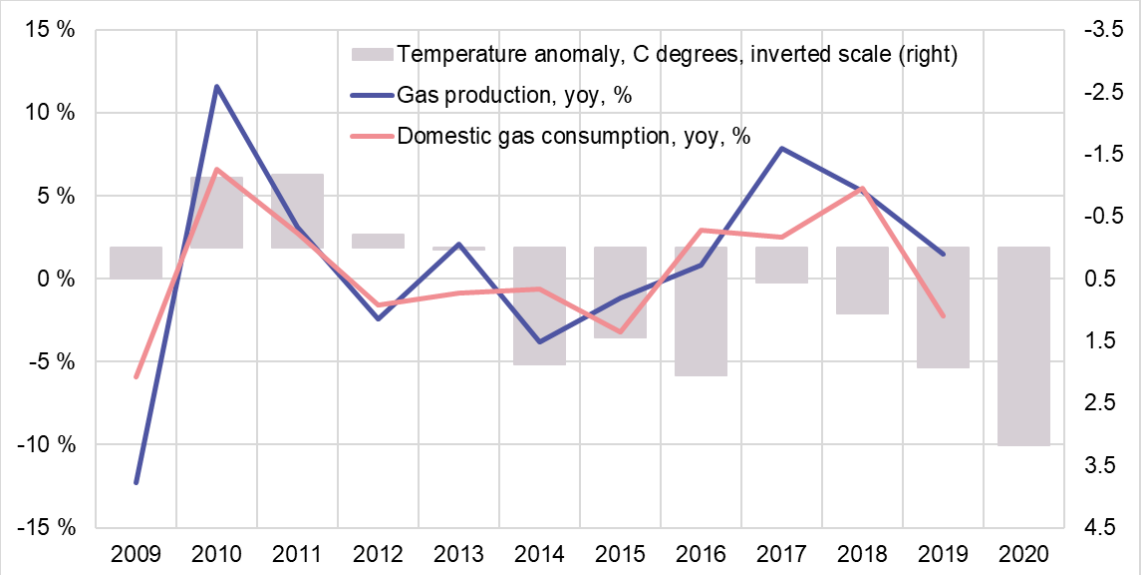


Sources: Ministry of Energy, CEIC, BP and BOFIT.

Because storage of natural gas is difficult and storage capacity limited, most of the variance in Russian gas production directly reflects changes in demand. Annual fluctuations in demand are largely due to general economic trends and the severity of the winter heating season in the northern hemisphere. During warmer winters, the need to burn natural gas for district heating and electricity is lower both in Russia's domestic market and its main export markets. The winter of 2019–2020 was the warmest on record, over three degrees Celsius higher than the 1981–2010 average. Gas production would have declined in 2020 even without the covid recession.

[15] Besides multiple standards for measuring gas volume, energy content is described in several ways. Some statistical agencies (including BP in its annual statistical overview) use "standard cubic metres," where the energy content is a constant. Eurostat reports gas consumption and imports purely in terms of energy content: British thermal units (BTU) or terajoules (TJ). Each has its own conversion factors.

Figure 8. Annual fluctuations in Russian gas output and divergence from average temperature during the winter heating season.



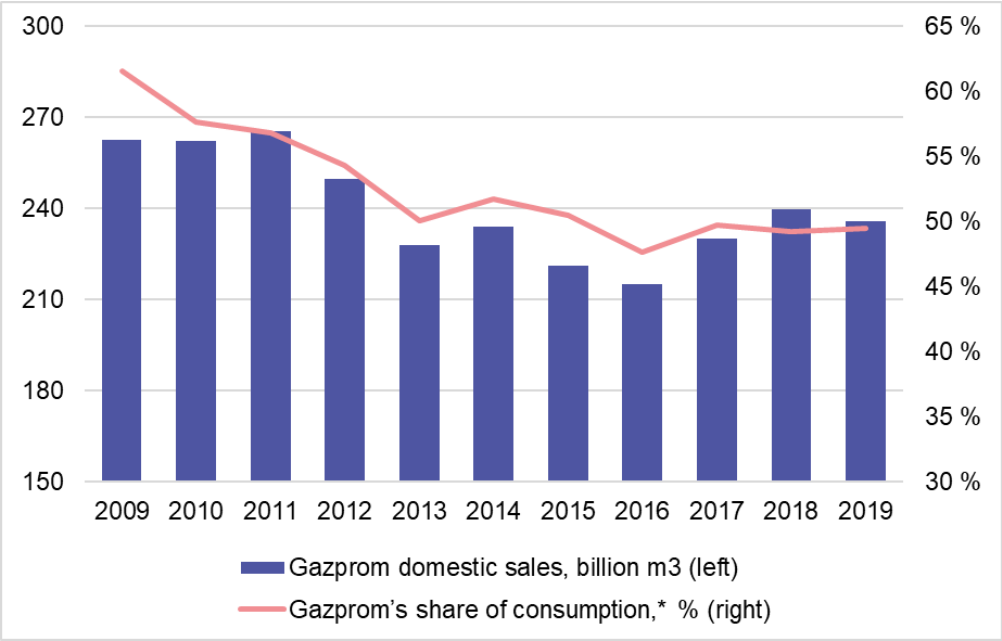
Sources: BP, Copernicus, BOFIT. Temperature anomalies are based on the Copernicus data for December-February in terms of divergence from the European average temperature during 1981–2010. A positive value means a warmer-than-average December-February period. Copernicus data available at: https://climate.copernicus.eu/sites/default/files/2020-02/ts_1month_anomaly_Global_ea_2t_202001_v01.csv.

4.2 Gradual decline in Gazprom's dominance

Most of Russia's gas production is still overseen by Gazprom, a huge gas company built on the remains of the Soviet Union's gas industry ministry. Private shareholders own about half of the company's shares (49.8 %), but the Russian state remains the dominant stakeholder with an absolute voting majority in company matters. With the output and sales of other gas producers rising, Gazprom's market share has contracted substantially. Gazprom still accounted for about 85 % of Russian gas production in 2008, but by 2016–2017, its share had fallen to around 65 %.

Russian law grants Gazprom a monopoly on natural gas exports. Over 40 % of Gazprom's production goes to export markets. As a consequence, Gazprom's domestic market share of slightly below 50 % is considerably smaller than its share in Russia's gas production. Gazprom is required to supply gas at regulated rates on the domestic market, while other gas producers have greater freedom in setting their prices.

Figure 9. Gazprom's shrinking domestic market share.



Sources: Gazprom annual reports, BP and BOFIT. Russia's domestic consumption converted to the Russian measurement unit multiplying the BP figures by a factor of 1.072.

4.3 Natural gas is Russia's domestic fuel of choice

Over two-thirds of all Russia's gas output is consumed within the country's borders. Natural gas is the primary fuel source for power generation and district heating. About half of all Russian electricity is generated at gas-burning power plants. In addition, Russian manufacturing industries rely on gas in many of its production processes. On the domestic market serving industry and corporate customers, only Gazprom is mandated to supply gas at regulated rates. Because regulated corporate tariffs are rather high sometimes, other producers (especially Rosneft) have managed to gobble up market share by undercutting the competition. About a third of all gas consumed in Russia is sold at free-market rates. The remaining two-thirds is sold at regulated rates.

From time to time, discussion arises about deregulation of gas rates for corporate customers and raising gas prices to levels that would bring them into line with export prices. Despite many plans, virtually no progress has been made on the matter. Complete deregulation of natural gas prices would require e.g. separation of trunk and distribution pipelines from production and sales. For the moment, all pipelines belong to Gazprom, which controls the entire national gas grid.

While households account for less than 15 % of total gas consumption, expansion of the natural gas distribution grid is considered politically expedient. In many smaller villages and towns, household stoves and water heaters already use gas. Thanks to an investment program (*Развития газоснабжения и газификации субъектов РФ*) Gazprom launched in 2005, over 70 % of Russian households are now hooked up to the gas grid. Just 15 years ago, about half of households had access to the gas grid.[16] Under the current five-year plan (2021–2025), the goal is to raise that share of households to 75 %.[17]

[16] Gazprom website: Газификация (gazprom.ru).
[17] Gazprom press release, December 2020: https://www.gazprom.ru/press/news/2020/december/article521403/.

Household gas is often considered a type of necessity that the government is expected to provide to every resident. Thus, households get their gas a rates far below that of what firms pay. Increasing household gas tariffs is a political third rail. Deregulation of household gas supplies to support investments in distribution infrastructure is off the table.

4.4 An end to natural gas imports

Prior to the global financial crisis, Russia imported roughly 60 billion m^3 of gas annually from Central Asia. Most of the imported volumes was re-exported to customers in Western CIS countries. Since 2009, the volumes of such imports have diminished significantly as Russian domestic production has increased. Between 2009 and 2013, Russia imported about 30 billion m^3 of gas annually. Gas imports have dropped to around 20 billion m^3 a year in recent years.

Several factors underlie this contraction. Russian domestic production capacity has increased, with higher production in Western Siberia allowing Russia to phase out imports. At the same time, gas demand in other CIS countries, particularly in Ukraine, has declined. The single largest destination for re-exported natural gas was Ukraine. Moreover, new export markets have opened up for Central Asian producers. The Central Asia-China gas pipeline, which runs from Turkmenistan via Uzbekistan and Kazakhstan to China, was commissioned in 2010. The pipeline's capacity was raised to 55 billion m^3 in 2015. As a result, Russia is no longer the sole, or even largest, export option for Central Asian producers.

5. Pipeline gas exports

5.1 Bleak prospects for demand growth in Russia's main markets

In the early 2000s, when European gas demand was still expected to increase significantly, some analysts expressed concern about whether Russia could actually meet its gas exports commitments over the long term. The prospect of rapid export growth emboldened Gazprom to expand production in the Yamal region and invest in new gas export pipelines.[18] Since 2008, however, the export outlook has turned grim.

Russia's reputation as a reliable gas supplier was tarnished in a January 2009 gas dispute that suspended gas deliveries to Central Europe in the midst of an unusually cold winter. Around the same time the availability of liquefied natural gas (LNG) also began to improve, causing many European customers to see LNG as an attractive alternative to Russian pipeline gas. The flexibility of the LNG markets made Gazprom's long-term take-it-or-pay-it supply contracts look increasingly antiquated.

Moreover, some EU member countries viewed that Gazprom's supply contracts and pricing policies violate EU competition law. In 2012, the European Commission launched a six-year investigation into Gazprom's contracting arrangements. The Commission's 2018 decision, among other things, required that Gazprom commit to market pricing and allow gas sales to third parties. During the Commission's investigation a number of interconnecting pipelines were commissioned within the EU, making the European gas market more flexible and further eroding Gazprom's market power.

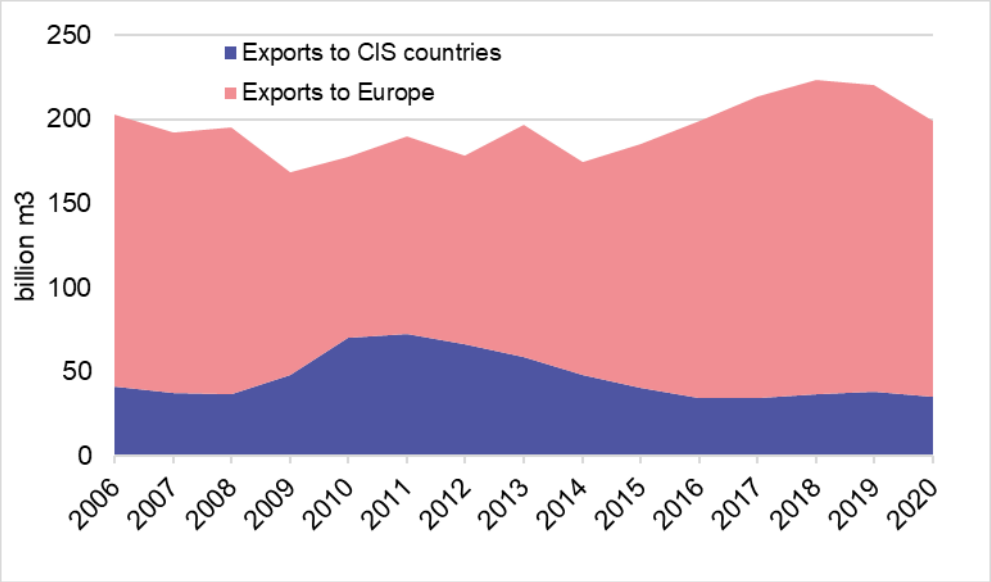
[18] Sutela and Solanko (2009).

During the last decade also the forecasts of natural gas demand in Europe have changed markedly. Competition from renewables is expected to intensify as the EU strives for a low-carbon future and net-zero greenhouse gas emissions by 2050. In the long run, fuel use of natural gas will necessarily decline unless new technologies (e.g. carbon capture and storage) emerge. Russia, the main gas exporter globally, has shown little interest in developing the new solutions that would boost its gas exports in the future.

For the past decade and a half, Russia's annual gas exports have mostly fluctuated between 175 billion m^3 and 200 billion m^3. In 2017–2019, Russian pipeline gas exports climbed to over 200 billion m^3, due largely to increased demand from Western Europe. With the decline of economic activity in 2020 and an exceptionally warm winter, export demand fell and total pipeline gas exports amounted to just under 200 billion m^3. At the same time, gas exports to CIS countries have steadily declined (Figure 10).

Ukraine was traditionally Russia's largest CIS customer, but since the illegal annexation of Crimea and Russia's actions in Eastern Ukraine in 2014, Ukraine's gas imports from Russia have virtually ceased. Gas consumption in Ukraine has declined since 2014, and Ukraine has switched to buying natural gas from Western European markets instead of direct imports from Russia. Most CIS exports are currently destined to Belarus, which continues to purchase natural gas at domestic Russian prices, which are well below international market prices.

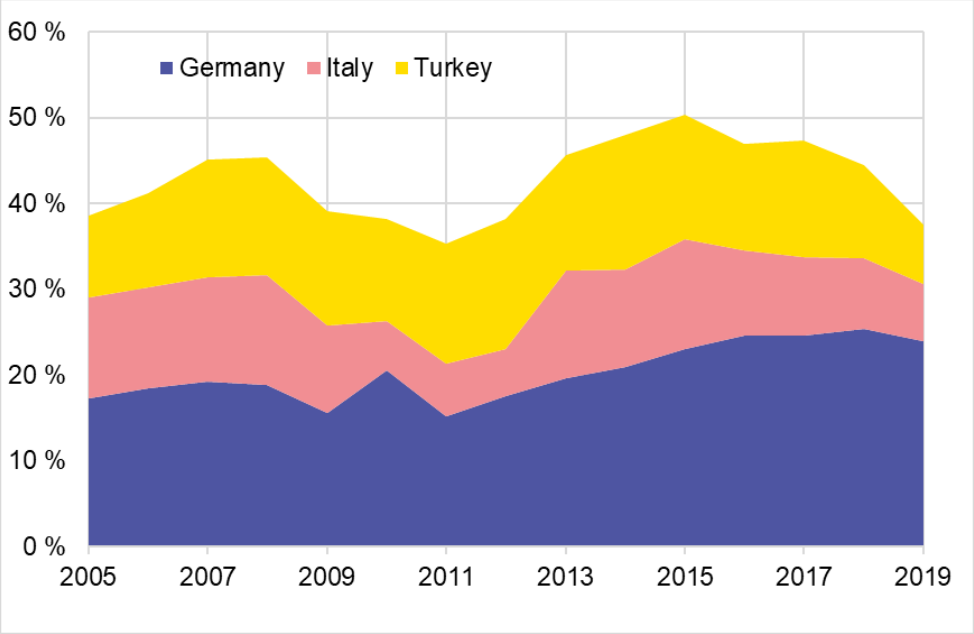
Figure 10. Pipeline gas exports to CIS countries and Europe.



Sources: Central Bank of Russia, Russian Federal Customs Service and BOFIT. Exports to CIS countries include exports to Ukraine. Exports to Europe include exports to Turkey.

The top destinations for Russian natural gas exports are Germany, Turkey and Italy. These three countries together have accounted for over 40 % of Russian pipeline gas exports in recent years. Exports to Germany, in particular, have grown significantly. Germany today accounts for about a quarter of all Russia's pipeline gas exports (Figure 11). The increased role of Germany as an export destination also reflects its role as a transit country for distribution of pipeline gas to users elsewhere in Europe.

Figure 11. Germany, Italy and Turkey together account for almost 40 % of Russian pipeline gas exports.



Sources: Russian Customs, CEIC and BOFIT.

5.2 Politicization of new pipeline projects

One of Russia's key trade policy goals throughout the early 2000s was to direct foreign trade to Russia's own harbours and to cut out third-country transit problems. This objective applied also to gas trade, in particular, as Russia's pipeline gas export was extremely dependent on a single transit country – Ukraine. As the years passed, pipeline transmission via Ukraine came to be seen as increasingly unreliable due to opaque pricing agreements and rampant corruption. Circumventing Ukrainian transit pipelines, however, required massive investment in new pipeline routes. The Nord Stream pipeline, commissioned in 2011, demonstrated Russia's willingness to make such investments.

Construction of a gas pipeline binds both seller and buyer to a multi-decade venture. For this reason, international pipeline projects are almost necessarily viewed through the lens of foreign policy. Over the past decade, Russia-EU energy relations have grown increasingly conflicted and confrontational. Following the war in Georgia in 2008 and the 2009 gas crisis, EU-Russia relations soured. While existing contracts and Russian gas exports remain unaffected, rising tensions have made new pipeline projects highly questionable. Since the 2014 annexation of Crimea and Russian interference in the 2016 US elections, advancing planned pipelines running from Russia to the EU has become increasingly problematic. The construction of Nord Stream 2, the second 55 billion m^3 pipeline running through the Baltic Sea, started in 2018 but the pipelaying work were suspended in 2019 due to the threat of US sanctions. At the time of writing, the fate of the pipeline was still unclear.

In 2017–2019, still about a half of Gazprom's exports to Europe (90 billion m^3 a year) transited Ukraine. When the transit agreement between Gazprom and Ukraine's gas pipeline operator Naftogaz expired in 2019, the parties only agreed to continuing transit until the end of 2024. Gazprom committed to transmit at least 60 billion m^3 via Ukraine in 2020 and 40 billion m^3 of gas a year during

2021–2024.[19] Due to the decline in gas demand in 2020, the realized transit volume in 2020 was only 56 billion m^3.[20]

Estimates vary on levels of capacity utilization, but the general consensus is that there is at least some unused capacity in all of Russia's export gas pipelines (Table 4). Notably, only part of the designed capacity of the Nord Stream pipeline and the Turk Stream pipeline, which is buried under the Black Sea, can be utilized. Nord Stream's use has been limited by the EU requirement that third parties be granted access to the OPAL pipeline running through Germany, a decision that effectively restricts the volumes that can be pumped from Nord Stream. Gas supplied via Turk Stream is intended to be transmitted not just to users in Turkey, but also in Bulgaria, Serbia and elsewhere in Southeastern Europe. Construction of an essential trunk line has run into problems, putting the project well behind schedule.

Table 4. Gazprom gas export pipeline capacities.

	Estimated capacity, billion m^3	Year of commissioning
Blue Stream (Turkey)	15	2003
Turk Stream (Turkey)	30	2020
Nord Stream (Germany)	55	2011
Ukraine-Slovakia*	120	1973
Ukraine/Romania	25	1979
Yamal-Europe (Belarus/Poland)	33	1997
Power of Siberia (China)**	10	2019
Vyborg-Imatra (Finland)	6	1974
Total	294	

Sources: Simola & Solanko (2017), Gazprom. *Estimates of the total capacity of the Ukraine route are in the range of 100–160 billion m^3 a year. **The Power of Siberia pipeline was commissioned in December 2019, but export volumes remained quite small during 2020 due to the covid pandemic.

If the Nord Stream 2 gas pipeline were finalized and if all three pipelines built in the 2000s (Nord Stream, Turk Stream and Nord Stream 2) could be used in full capacity to supply European markets, less than 40 billion m^3 a year of pipeline gas will transit via Ukraine in the future. The future of gas demand in the EU has, however, become increasingly insecure. While natural gas is a significantly cleaner fuel than coal or oil, it is not an emission-free nor a renewable energy source. The latest IEA *World Economic Outlook* estimates European gas consumption peaked already in 2019 and that demand is now expected to fall by about 5 % a year until 2030.[21] However, as gas production within the EU countries will decline sharply in coming years, EU gas imports should not contract much, leaving Russian gas exports largely unaffected for a while. It is clear, however, that Russia's traditional top gas export market is unlikely to offer significant future growth opportunities.

5.3 New markets in Asia

China's growing market is a top priority for Russia both economically and politically. With virtually no growth expected to come from the EU market, new markets elsewhere must be cultivated. For

[19] Naftogaz press release, February 2020: Gas Transit Through Ukraine in 2019 (naftogaz-europe.com).
[20] Naftogas facts and figures, March 2021: Natural Gas Transit via Ukraine 1991-2020 (naftogaz-europe.com)
[21] IEA (2020); WEO 2020; "Stated Policies" scenario.

years, Russia has regularly presented its concept of a new Altai pipeline that would supply gas from fields in Western Siberia to Western China. For Russia, this particular pipeline proposal is critical as it would provide the giant gas fields of Western Siberia with new export opportunities and even fuel a bidding competition between European and Asian buyers. The Chinese, in contrast, have expressed low enthusiasm for the project.

After years of intense negotiations, the parties agreed in 2014 on building a new gas pipeline from yet-to-be-developed gas fields in Eastern Siberia to China. The official commissioning of the Power of Siberia pipeline was announced in December 2019, but actual figures on the amount of gas flowing through the pipeline in 2020 have yet to be released. Gazprom reports it pumped 3.8 billion m^3 of gas to China between December 2019 and December 2020.[22] Some Russian plans for 2021 call for a doubling of the export volume from 2020, implying that the export target for this year could be as high as 10 billion m^3. The earliest that the Power of Siberia pipeline could reach its designed capacity of 38 billion m^3 a year is 2025. When the pipeline running at full capacity, gas exports to China would constitute about 15 % of Russia's total gas exports.

Additional pipelines are constantly discussed. Russia has proposed an alternative routing of the Altai pipeline so that it would transit Mongolia to Northeastern China, where gas demand is high. China's interest in this new route has been lukewarm at best, but Gazprom has initiated planning of this new route currently designated "Power of Siberia 2." While it is unclear if the project will ever be implemented, it appears to have the backing at the highest government level in Russia.[23]

In addition to the Power of Siberia pipeline, an "Eastern" pipeline has been proposed to further boost Russian gas exports. The pipeline would pump gas produced on Sakhalin island via Khabarovsk to Vladivostok. The gas pipeline would mainly serve the sparsely populated Khabarovsk region, but a huge increase in the pipeline's capacity and its extension to the Chinese side of the border is routinely mentioned.

6. Yamal success fuels Russia's quest to enter LNG top tier

6.1 Export deregulation leads to output growth

One of the biggest changes in energy markets has been the gradual ascension of natural gas, traditionally a regionally distributed product, to the status of global commodity. The biggest factor in this change is the rapidly advancing technology for natural gas liquefaction and liquefied natural gas (LNG) transportation, storage and reception. LNG has allowed a number of new players to enter the natural gas space (notably Qatar and Australia), and intensified competition in traditional pipeline gas markets.

Russia has been slow to make the transition from traditional pipeline gas to LNG production and exports. Part of the reason is that state-owned Gazprom had a complete monopoly on exports – a fact not lost on other players. In 1994, a Shell, Mitsui and Mitsubishi consortium signed an agreement to construct Russia's first LNG facility on Sakhalin island. Soon after the facility was commissioned in 2009, the majority stake in the consortium was transferred to Gazprom. Gazprom has, despite numerous plans and initiatives, never managed to push its own LNG project through to the viable operational stage.

[22] Gazprom press release, December 2020: https://www.gazprom.com/press/news/2020/december/article519895/.
[23] Gazprom press release, March 2020, https://www.gazprom.ru/press/news/2020/march/article502469/.

The outlook for LNG in Russia saw a distinct change at the end of 2013, when the Russian government announced its was opening up LNG exports to other operators. In particular, the decision allowed Novatek and Rosneft to move forward with their envisioned LNG projects.[24] Novatek's project on the Yamal peninsula was already underway, so after the government's decision the project began to move ahead quite rapidly. Yamal LNG commenced production in late 2017. By early 2019, production capacity had risen to 16.5 million tons a year.[25] The project was completed ahead of schedule and came in on budget – an exceptional achievement given the project's scale. The biggest difference between Yamal LNG and the proposed projects of Gazprom and Rosneft, however, is the ownership structure. Novatek holds a 50.1% stake in the project, with the remainder held by foreign investors. These foreign investors include both companies that have LNG expertise and buyers of the final product: Total (20 %), China National Petroleum Corporation (20 %), and China's Silk Road Fund (9.9 %).

Encouraged by the success in its first Yamal project, the Novatek-led consortium made the investment decision in 2019 to go forward with the Arctic LNG 2 project. The Arctic LNG 2 facility is being built near the Yamal LNG facility on the opposite side of the Ob Bay. The facility is expected to reach its roughly 20 million tons a year design capacity in 2025.

Rosneft has plans to launch LNG production on Sakhalin island. Gazprom has continued its plans for both the expansion of the LNG facility on Sakhalin and as well as construction of a new LNG facility as part of the Ust-Luga port development project by the Baltic Sea. It will still be several years, however, before any of these projects might be completed. Uncertainty about domestic tax treatment of pipeline gas used in LNG liquefaction has created additional challenges for planning of Ust-Luga's LNG plant.

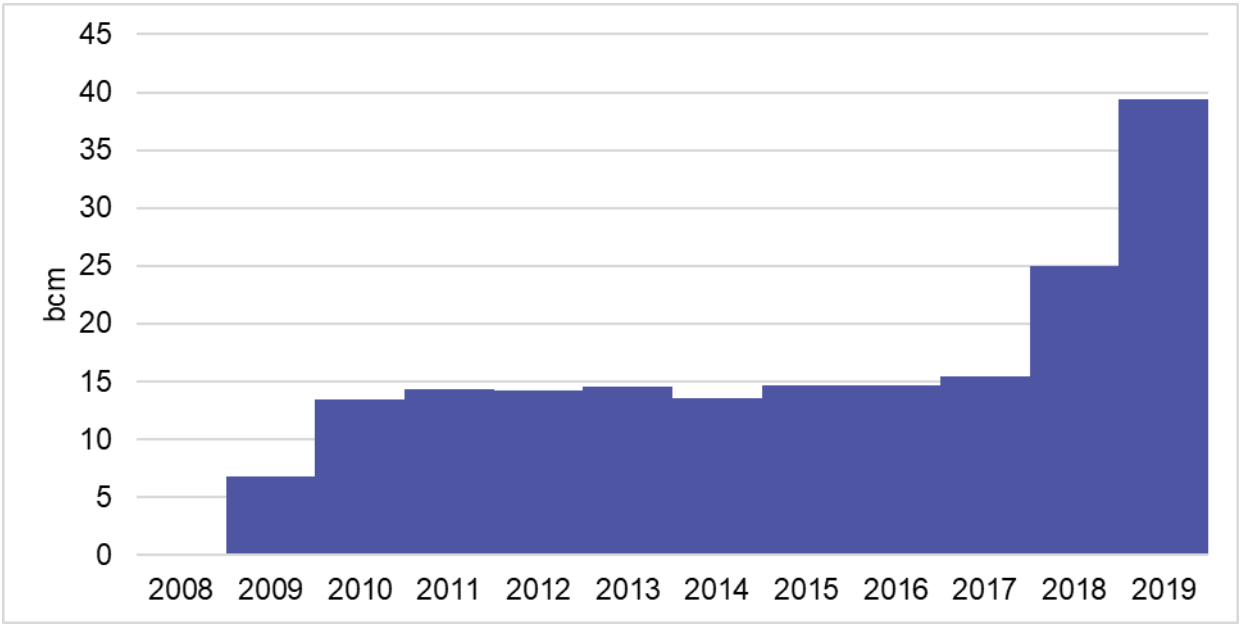
All LNG production from both Sakhalin and Yamal is exported, mainly to Asian markets. British Petroleum (BP) reports that Russian's LNG exports in 2019 amounted to nearly 40 billion m^3. Russia's Ministry of Energy says around 30 million tons. Using the most commonly applied conversion factor (1.36), these figures seem roughly consistent. Both figures are hard to square with the 65 million m^3 in LNG exports reported by Russian Customs.[26] No matter the yardstick used, LNG volume more than doubled in 2018–2019 when production began at the Yamal LNG facility (Figure 12). LNG's share of Russia's total gas exports has risen to 15 %. In 2020, reduced pipeline gas exports raised its share to 20 %.

[24] Henderson and Yermakov (2019).

[25] Liquefied natural gas production is measured in tons. One million tons of LNG corresponds to about 1.36 billion cubic metres of natural gas.

[26] The figure of Russia's Federal Customs Service has also been used by the Central Bank of Russia and Rosstat in their own publications.

Figure 12. LNG exports have more than doubled since 2009.



Source: BP.

6.2 Ambitious growth plans

Spurred on by its Yamal success, Russia has become the world's fourth largest LNG producer after Qatar, Australia and the United States. LNG has become a significant share of Russia's energy export plan. Ambitious growth targets for LNG are stated in the government's *Energy Strategy 2035* document approved in 2020. The current plans call for increasing production from the current 30 million tons a year to 46–65 million tons in 2024 and 80–140 million tons by 2035.[27] Before 2025, all production increases require the on-schedule completion of Novatek's 20-million-ton Arctic LNG 2 facility. For production to double between 2025 and 2035, not only would Novatek have to complete the expansion of its projects, but both the Rosneft and Gazprom LNG projects would have to succeed.

The energy strategy document signals Russia's intentions to join the ranks of the world's top LNG producers, making increased production both a political and economic aspiration for Russia. While LNG production has so far had an insignificant impact on government finances, it has been supported to a certain degree through investments in infrastructure and tax breaks. This could change with time, of course. LNG projects previously have been treated as part of efforts at import substitution and development of new expertise in the domestic gas branch. Yamal LNG's fourth liquefaction plant, still under construction, was planned to rely on a new Russian technology (arctic cascade). Its commissioning is hoped to showcase Russian technological capabilities at the international level. For a gas sector struggling under Western sanctions, the innovation would be major news.[28] The launch of the fourth plant has, however, been postponed repeatedly due to recurring technical problems.

The emphasis on LNG production suggests that Russian decision-makers realize that the gas market is changing. The growth outlook for pipeline gas is modest at best, and customers in both Europe and Asia appreciate the flexibility and diversity of import routes offered by LNG –. LNG also

[27] Energy Strategy 2035 (2020). The ES 2035 paper is somewhat inconsistent. Its scenarios mention LNG export volumes of 69–75 million tons in 2024 and 124–217 million tons in 2035. Where the production and export figures are consistent is in their unwavering belief in high growth for the sector.
[28] Sun (2020).

creates the possibility for Russia to establish energy relationships in new markets such as India. Russia, however, still has a way to go before it becomes an LNG superpower like Qatar, Australia or the United States.

7. Coal production and exports still rising

7.1 Coal makes a comeback

Russian coal production declined sharply in the 1990s, when many economically unviable mining operations were shut down. Production reached its nadir during the financial crisis in 1998, with annual production falling to just 230 million tons. Coal production began to rise in 1999, reaching 360 million tons in 2015, a level exceeding 1991 output (Figure 13). In 2018 and 2019, annual production exceeded 430 million tons, but the Covid Recession caused production to decline by about 8 % last year.

Coal has a much smaller importance than oil & gas for the government budget or export revenues, but it is by no means insignificant. Coal mines and the coal industry generally hold great importance in certain regions and localities. Russia's coal industry is concentrated in Southwestern Siberia, home to Russia's largest coal mining area, the Kuznetsk Basin (Kuzbass). Coal production is controlled by a small number of privately owned energy and coal companies, of which the most significant is the Siberia Coal Energy Company (SUEK). SUEK accounts for about a quarter of Russia's coal production.

Even with heavy investment in production in Eastern Siberia and the Russian Far East in recent years, about 60 % of Russian coal production still takes place in Southwestern Siberia. The coal industry is a significant business for 15 Russian regions in total, and the industry supports 30 company towns (*monogorods)*.[29]

7.2 China's rising demand supports coal exports

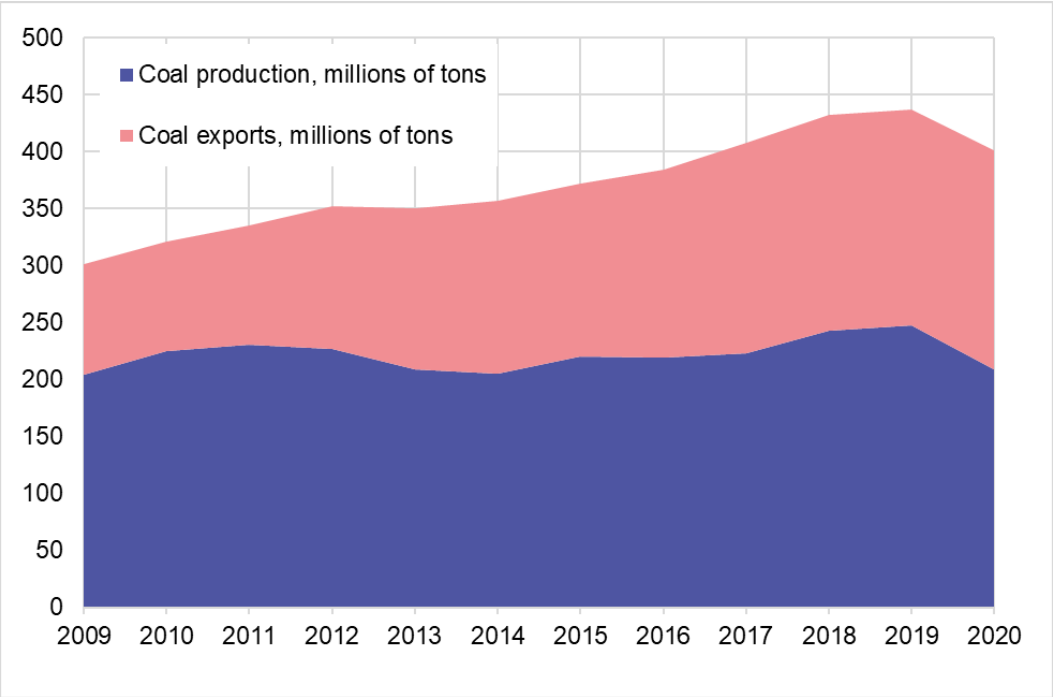
A significant share of Russia's increased coal production has gone to exports. After Indonesia and Australia, Russia is the world's third largest coal exporter. Coal exports to China began in 2009, when China's own production was no longer sufficient to meet rising domestic demand. China's share of Russian coal exports has grown steadily over the past ten years. In 2019, about 40 % of exports went to Europe (excluding CIS countries) and 50 % to the Asia-Pacific region (particularly China, South Korea, and Japan).

Heavy public investment in transportation, especially railroads, has been key to increasing coal exports to Asia. In March 2021, president Putin reportedly approved investment in a rail line running from Yakutia to China. The 700-billion-ruble investment includes over 1,000 km of new rail lines, as well a bridge over the Amur River.[30] The project is specifically intended to support growth of coal exports. Overall, coal already accounts for a significant share of rail freight in Russia. By tonnage, coal has constituted about a quarter of rail freight in recent years.

[29] Rosbalt.ru, 27 Feb 2020: Стало известно, сколько потратят на угольную промышленность в РФ.

[30] Finanz.ru, 2 Mar 2021: Россия построит железную дорогу за $10 млрд, чтобы вывозить уголь в Китай.

Figure 13. Growth of coal production and coal exports.



Sources: Russian Ministry of Energy, CEIC and BOFIT.

7.3 Impressive growth plans

While Russia's *Energy Strategy 2035* document anticipates domestic coal consumption remaining roughly at current levels, the government has set an ambitious target for export growth. Russia's goal is to increase its share of the global coal export market from 14 % at present to 23–25 % by 2035.[31] The growth target set forth in the strategy document was echoed in the coal sector development plan approved in summer 2020.[32] The development plan is highly ambitious, setting a production target of 485–668 million tons per year by 2035. High growth requires significant investment in infrastructure, particularly the rail system.[33]

Notably, none of the approved plans see coal consumption decreasing in the years ahead. Indeed, the energy policy brushes off any challenges to coal, noting simply that "an international campaign against coal" as one of the future challenges of the coal sector. [34] In reality, opinion is divided even within the government on the future outlook for coal.[35] It is more likely that Russia, like the other two major coal exporters Australia and Indonesia, only hopes to maximize output as long as demand for coal still exists.

[31] Russian government (2020), Energy Strategy 2035.
[32] Новости - Правительство России (government.ru).
[33] Sukhankin (2020).
[34] Russian government (2020), Energy Strategy 2035, page 1.
[35] Finmarket.ru, 29 Jan 2020: Минэнерго и Минэкономразвития по-разному оценивают перспективы развития угольной отрасли РФ.

8. Oil & gas crucial to development of Russia's Arctic territory

8.1 Gas megawarehouse

Under the Russian government's official definition, Russia's Arctic territory encompasses four entire and parts of five other federal subjects.[36] About 2.4 million Russians, or 2 % of the population, inhabit the Russian Arctic territory. The Arctic territory generated 6 % of Russia's GDP in 2018. From an economic perspective, the Arctic territory's largest contribution comes from extraction of various raw materials. Production is heavily focused on mineral extraction (and hydrocarbons, in particular). For the government, the territory is very important from a geopolitical standpoint.

The Arctic territory has long been central to Russia's traditional natural gas production (Figure 14). The massive gas fields of the Yamal-Nenets region have produced gas for many decades. Indeed, the Arctic territory accounts for over 80 % of Russia's total as well as traditional natural gas production (LNG not included). The share has declined slightly in recent years and will likely continue a gradual decline in the years ahead, as the production in the traditional giant fields is fading.

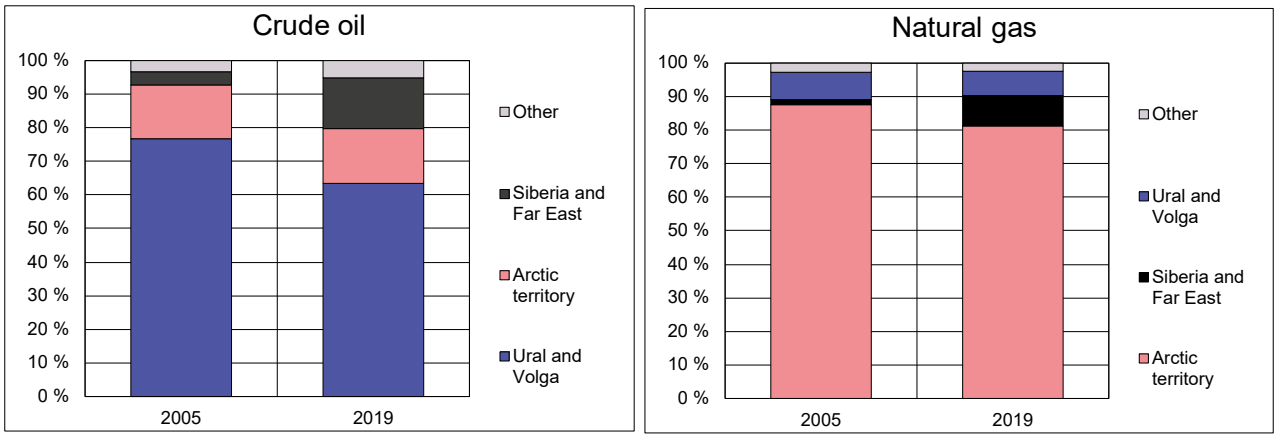
Nevertheless, the central role of the Yamal-Nenets region in Russian gas production will continue as it has become a center for Russian LNG production, surpassing the Sakhalin island. About 60 % of Russia's total LNG production last year took place within the Yamal LNG project. Another LNG project underway in the Arctic territory is expected to double current LNG production from about 40 million tons (54 billion m^3) at present. One goal spelled out in Russia's Arctic development strategy approved in autumn 2020 is increasing LNG production to 90 million tons a year by 2035. The strategy is not explicit, however, as to where this growth will come from.

Russia already produces large quantities of oil in its Arctic fields, even if they are not the most important. The Arctic territory's contribution to Russian oil production, which has long been roughly unchanged, stood at 17 % in 2019. Brisk growth is required to meet the development strategy target of increasing the share in total production to 26 % by 2035. Production growth possibilities, however, are considered quite limited, especially over the short term, because it takes so long to achieve production the Arctic territory's demanding conditions.[37]

[36] The Arctic territory encompasses four federal subjects in their entirety: Murmansk Oblast, Nenets Autonomous Okrug, Yamal-Nenets Autonomous Okrug and Chukotka Autonomous Okrug. The Arctic territory also spans in part the Arkhangelsk Oblast (which has administrative jurisdiction over the Nenets Autonomous Okrug), the Karelian Republic, Komi Republic, Krasnoyarsk Krai and Sakha Republic (Yakutia).

[37] Henderson and Grushevenko (2019).

Figure 14. Crude oil and natural gas production in Russia by region in 2005 and 2019, % contribution.



Sources: CEIC, Rosstat and BOFIT.

8.2 The Arctic territory's vast, hard-to-reach resources

Theoretically, Russia has considerable potential for increasing oil & gas production in the Arctic territory. Russia's Arctic territory and especially its offshore continental shelf areas, are estimated to contain vast reserves of oil and natural gas. Extreme and remote production conditions, however, limit possibilities for developing these deposits. Cost are high and sophisticated technology is needed. For example, development of one of the world's largest gas deposits, the Shtokman field in the Barents Sea north of the Kola peninsula, was abandoned in 2013. In fact, Russia has only managed to bring a single Arctic shelf hydrocarbon project on stream – an oil production platform at the Prirazlomnoye field north of Varandey in the Nenets region. Gazpromneft commissioned its Arctic shelf production in 2013.[38]

The estimated oil price needed to justify development of new oil fields in the Arctic territory is about $80 a barrel (the average annual Urals price last exceeded $80 a barrel in 2014). Because oil demand is expected to rise slowly at best, there is currently little prospect of an oil price rise over the longer term that might change the arithmetic.

Exploitation of natural resources in the Arctic territory is complicated by Western economic sanctions imposed on Russia (sanctions are discussed in Section 9). Sanctions limit access to Western technology and services exports, particularly implementation of offshore oil production projects in the Arctic Sea. Russia still lacks sufficiently advanced domestic technology to implement these projects. In addition, sanctions limit the access of Russian energy companies to international financing.

8.3 Northeast Passage navigability advances exploitation of Arctic resources

Exploitation of Arctic territory resources has been supported by the improved transport possibilities provided by the Northeast Passage. As the average annual temperature in Russia's Arctic territory has increased markedly in recent decades, perennial and annual ice cover in the Northeast Passage has dwindled, providing navigable open water lasting longer and allowing larger vessels to make the journey. The Northeast Passage has been open to international shipping since the early 1990s, but the

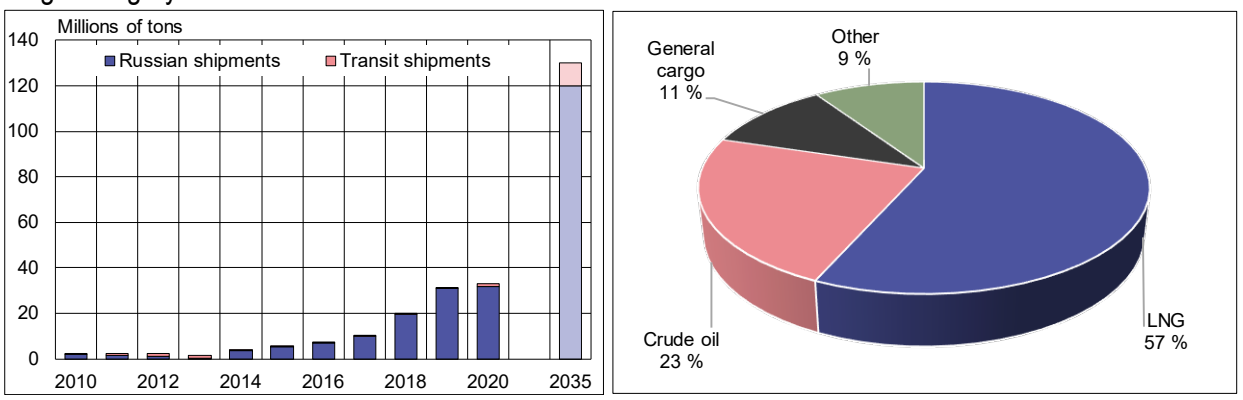
[38] Markov (2020).

tonnage actually shipped has been quite modest. The peak Soviet-era shipping records were only broken in 2016.[39]

In recent years, the net tonnage transiting the Northeast Passage has been rising rapidly (Figure 15). New deposits have been launched in the Yamal-Nenets region with the only viable transport routes by sea. In 2020, roughly 30 million tons of cargo was shipped via the Northeast Passage. Russian sea ports in total handled about 820 million tons of cargo the same year. Tonnage traversing the Northeast Passage is expected to climb rapidly in coming years if the Arctic LNG 2 project moves ahead as planned. Crude oil and coal shipping is expected to increase, but there is uncertainty about how much tonnage is at issue. The development strategy for Russia's Arctic territory sets a goal of boosting Northeast Passage freight tonnage to 130 million tons a year by 2035. Most cargo is expected to be commodities produced in the Arctic territory and not transit shipping.

The Northeast Passage has been envisioned as an transit shipping route between Asia and Europe as it would significantly shorten the length of the journey compared to travel via e.g. the Suez canal. About 1.2 billion tons of cargo passed through the Suez canal last year. Russia's development strategy for the Arctic territory sees transit shipping rising from about 1 million tons a year at present to 10 million tons by 2035. Even this target has been considered difficult to reach.[40] Even with global warming, melting of the polar ice cap and reduction in perennial ice, the weather conditions in the Northeast Passage will remain dangerous and unpredictable. For most of the year, freighters must be accompanied by icebreakers, which slows transit times and raises costs. Certain types of cargo such as electronics may not be amenable to the cold weather conditions that the ships encounter. At the moment, transit shipping has focused mainly on certain raw materials, particularly iron ore. Several international logistics firms have also committed to not using the Northeast Passage due to the significant environmental risks involved.

Figure 15. Realized tonnage shipped via the Northeast Passage (2010–2020), 2035 target and breakdown by cargo category in 2020.



Sources: Klimentyev (2020), Rosatom and BOFIT.

8.4 Climate change poses significant challenges to Arctic territory production

Climate change poses a substantial risk to the Russian Arctic territory as a whole, even if navigation of the Northeast Passage becomes easier. While the Arctic territory is threatened by multiple facets of climate change, their potential impacts are hard to predict with any accuracy.[41] During the past decade, accidents related to oil & gas production have increased dramatically, particularly along the

[39] Klimentyev (2020).
[40] PwC (2020).
[41] In this sub-section, the main source is Rosgidromet (2017).

Arctic shoreline, where extreme weather events such as violent storms have increased. The general increase in turbulent weather has caused a shore erosion that has affected operations at Arctic ports.

Further warming of the climate is clearly faster in the Arctic territory than in Russia generally due to the polar amplification phenomenon. Russia's average annual temperature has risen by about 0.5 degrees Celsius over the past ten years, while the average temperature in the Arctic territory has risen by about 0.8 degrees Celsius. Warmer weather could shorten the time when frozen winter roads are navigable, further complicating access to extremely remote and challenging oil & gas production sites. Higher average temperatures could even diminish the efficiency of natural gas compressor stations.

Higher average temperatures may accelerate melting of the permafrost layer. The permafrost layer covers most of the Russian Arctic territory, so its melting can pose major problems. Melting of the permafrost layer could reduce productivity of oil deposits and wreak havoc on pipeline infrastructure, roads, and buildings. Even if some of these problems can be mitigated with technical solutions, the additional costs could be substantial.

9. Western sanctions hit the energy sector

The EU, US and their allies introduced sweeping economic and political sanctions against Russia in 2014 in response to Russia's actions in Ukraine. Initially, the restrictive measures were mild, mostly consisting of travel restrictions and asset freezes of individuals directly linked to the illegal referendum that led to the annexation of Crimea. After Russia-supported rebels in Eastern Ukraine downed Malaysian Airlines Flight 17 on July 17, 2014, however, sanctions were tightened considerably. The new measures included embargos on arms exports and exports of dual-use goods for military use. Western countries also banned exports of goods and services related to deep-sea, Arctic and shale oil exploration and production. Finally, and most significantly, specified Russian banks and energy companies were effectively curtailed from USD- and euro-based funding. The EU countries agreed to review their sanctions every six months and decide whether to continue them. As the lifting of sanctions is contingent on Russia meeting its commitments under the Minsk protocol (and later Minsk 2), the EU has yet to find any basis for removing sanctions.[42]

9.1 Limited access to financing

The most significant economic aspect of sanctions has to do with limiting Russia's access to international capital markets. Investors in the EU and the US were initially barred from providing funding with maturities longer than 90 days to Russia's largest state-owned banks, i.e. Sberbank, VTB, Gazprombank, Rosselkhozbank (Russian Agricultural Bank), and VEB (the state-owned development bank). Several smaller privately-owned financial institutions were also sanctioned. The restrictions covered oil giant Rosneft, oil pipeline company Transneft, oil exploration and refiner Gazpromneft, as well as a number of companies operating in the military sector. The US has sanctioned Novatek, Russia's largest producer of liquified natural gas. The maturity limit was later

[42] For an updated general overview of the EU sanctions against Russia, see the European Council's website at: https://www.consilium.europa.eu/fi/policies/sanctions/ukraine-crisis/. The sanctions measures taken by the US government are posted on the US State Department website at: https://www.state.gov/ukraine-and-russia-sanctions/.

cut to allow for funding for only 30 days. Gas export monopoly Gazprom and the largest privately-held oil companies Lukoil and Surgutneftegas are not subject to direct sanctions. [43]

Targeted Western sanctions have not prevented growth of the banking sector or energy company investment in Russia. They do, however, narrow the opportunities of Russian companies seeking competitive offers for financing. The sanctioned corporates and banks have extremely limited opportunities to borrow internationally, which translates into increased borrowing costs. Investment needs of large energy companies like Rosneft and Novatek are huge in comparison to the size of the domestic banking sector. Before 2014, these companies used syndicated loans and global bond markets extensively to raise money and international funding continues to be crucial. Even if the share of foreign funding has decreased, only 45 % of external funding of Russia's main listed oil and gas companies was domestic in year 2019[44]. In seeking new funding, corporates either rely on either government or pay a higher price for credit. Since 2014 Rosneft, has largely relied on domestic credit and up-front payments from its Chinese customers. Chinese lenders also helped secure Novatek's Yamal LNG project, which had relied on lending from European banks, assets from Russia's National Welfare Fund, as well as capital investments from China's Silk Road Fund and China's state-owned oil company CNPC.[45]

The impacts of financial market sanctions are difficult to quantify as details about credit deals are not public. On firm level, one is therefore limited to assuming that financial sanctions have increased both direct and indirect costs of funding. Taken together, the magnitude of these costs can be sizable. Projecting out over a period from 2015 to 2017, Gurvich and Prilepskiy (2015) estimated that sanctions depressed GDP growth by about 2.4 percentage points compared to a hypothetical sanctions-free scenario.

9.2 Increasing challenges to oil projects

The initial sanctions regime, which entered into force in July 2014, included direct bans on exports of products and services essential to certain types of oil production. The sanctions list includes goods and services that support deep-sea oil drilling, shale oil production and oil production in the Arctic Sea area. These fields are ones in which the US and EU enjoy distinct technological advantages. While the EU sanctions only restrict technology exports to Rosneft, Transneft and Gazpromneft, US sanctions also apply to oil projects involving Gazprom and Novatek.[46] The US list of sanctioned entities also specifies the Gazprom-controlled offshore Sakhalin Yuzhno-Kirinskoye oil & gas field. Projects with a sole focus on gas production have yet to make the entities list, but the threat of additional sanctions has made technical cooperation difficult also within the gas sector.

Western sanctions have clearly postponed development of oil fields and shale oil deposits in the Arctic territory. Sanctions have hit hardest on Rosneft's plans for exploiting oil & gas deposits in the Kara Sea. Work in the Kara Sea has essentially been at a standstill since ExxonMobil abandoned the project over sanctions. Many major shale oil projects have also been put on hold since Western partners have departed.[47] Sanctions have considerably limited the opportunities for specialized Western oil & gas services companies to operate in Russia. The exit of Western technical expertise from the market has slowed projects and created opportunities for domestic and Chinese competitors.

[43] Korhonen et al. (2018).
[44] CSR (2021). Information based on 2019 annual reports financial data for nine largest oil and gas companies listed in Moscow Exchange.
[45] Sun (2020).
[46] Mitrova et al. (2018).
[47] Mitrova et al. (2018).

While sanctions have yet to decrease oil output, they have postponed and raised costs of new oil field development.

Western export bans have given traction to Russia's import substitution policies. The import substitution plan for the oil & gas sector approved in spring 2015 imposed highly specific goals in lowering import content.[48] The targets were revisited in 2019, when the target year was changed to 2024. Despite several exceptions, particularly those related to LNG production, the goal is to increase the share of domestic production by well over 50 % by 2024.[49] Even with many successful import-substitution solutions, Russia lacks the sophisticated technical expertise and equipment needed to achieve its goals in exploitation of Arctic territory resources.[50] Only time will tell if going it alone on projects without Western partners will result in R&D that pays back in the form of innovation or exportable products. In the short run, import substitution only pushes up production costs and slows down Arctic oil and gas projects.

Prior to 2014, many Russian oil companies had ambitious plans about diversifying internationally. Lack of access to financing and Western export bans effectively shut Russian energy companies out from international projects and forced sanctioned companies to focus on increasing the efficiency of their domestic operations.

9.3 Pipeline projects in the balance

The measures imposed by the EU do not directly target gas production. The US financial market measures directed at Novatek, which is primarily a gas company, have forced it to broaden its ownership base of its Yamal LNG project to include China's Silk Road Fund and China's state oil company CPNC in order to secure sufficient financing. Yamal LNG was completed despite sanctions.

Although Gazprom has not been directly targeted by sanctions, the US Congress in December 2019 approved rules that grant wide powers to limit construction of gas export pipelines. In practice, the measures target the Nord Stream 2 gas pipeline that runs along the Baltic sea floor from Russia to Lubmin in northern Germany. Since the Swiss-Dutch Allseas suspended its pipe-laying activities, however, Nord Stream 2 has been in limbo. At the time of writing, a section of underwater pipeline slightly over 100 km in length, initially delayed by Danish permitting, has yet to be laid.

Even if the pipeline is completed and commissioned, it will not increase EU gas consumption in the slightest. Instead, Nord Stream 2 operating at full capacity obviates a large share of gas imports transiting Ukraine and Slovakia to the EU market. While Ukraine suffers most from the loss of gas transit fees, Slovakia will also lose substantial fee income. By crossing under the Baltic, the gas pipeline route of Nord Stream 2 largely avoids transit fees.

In the American view, new gas pipelines increase Russian influence in energy and foreign policy of the EU. The US also fears that the new import route could weaken the market position of US LNG in EU countries. On the other hand, an alternative import route increases gas supply security, particularly in Germany's case.

[48] MinPromTorg (2015). Prikaz 31.3.2015: 6451.pdf (minpromtorg.gov.ru).

[49] MinPromTorg (2019). Prikaz 16.4.2019: Приказ Минпромторга России от 16.04.2019 N 1329 "Об утверждении Плана мероприятий по импортозамещению в отрасли нефтегазового машиностроения Российской Федерации" (legalacts.ru).

[50] CDU TEK (2020). 11.12.2020: ТЭК России | Возрождение рынка нефтегазового оборудования (cdu.ru).

10. Global efforts to mitigate climate change could hurt Russian exports

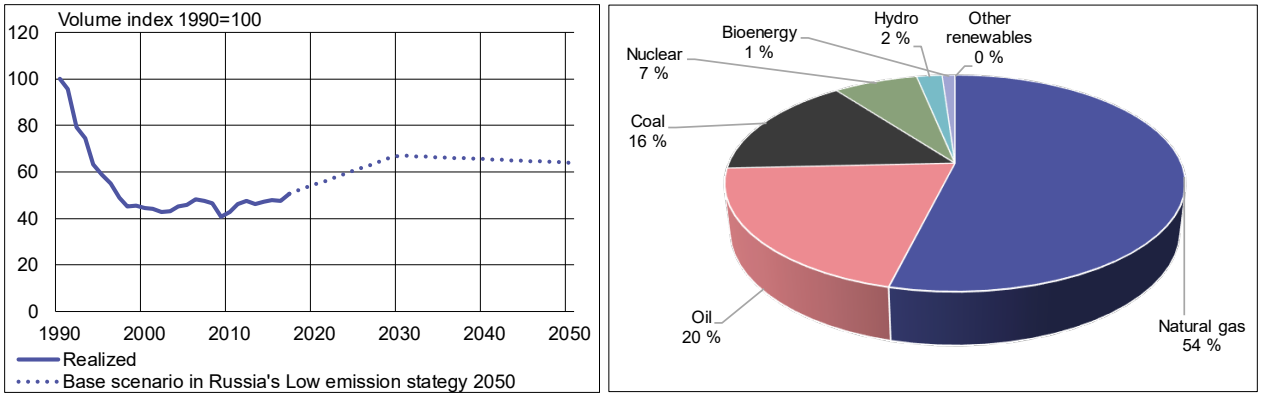
10.1 Climate change still not a priority in Russia

Russia is one of the world's largest greenhouse gas emitters, yet climate change is far from the top in the government's list of concerns. Under the Paris Agreement, Russia has committed to modest emission-reduction targets.[51]

By 2030, Russia wants to reduce its greenhouse gas emissions by 30 % from 1990 levels. Russia's greenhouse gas emissions fell sharply after the collapse of the Soviet Union in 1991. Despite an increase in recent years, Russia's greenhouse gas emissions in 2019 were still 45 % below their 1990 level (Figure 16). Indeed, Russia has considerable room to increase its carbon emissions under the Paris climate agreement. In the base scenario in the long-term development plan drafted by the Ministry of Economic Development, emissions only begin to trend slightly downward in 2030. Even in 2050, they would still be considerably higher than at present.[52] Russia, however, possesses huge potential to reduce its emissions by e.g. increasing its currently low reliance on renewable energy (Figure 16), improving energy efficiency or diversifying the economy's production structure to lower-emission branches.

Although Russia's own emission cuts are not considered a priority, the plans of other countries have recently received considerable attention because they can cloud the outlook for Russian energy exports. All other large greenhouse-gas-generating economies have declared ambitious emission-reduction targets. The EU and the United States, for example, want to be climate-neutral by 2050. China declared its intention last autumn to reach net zero carbon emissions by 2060. Most global greenhouse gas emissions stem from energy production, so reduction of energy consumption and reduction of emissions from energy production are central themes in most national efforts to reduce greenhouse emissions.

Figure 16. Russian greenhouse gas emissions and sources of primary energy consumption in 2018.



Sources: UNFCCC, Russian Ministry of Economic Development and IEA.

[51] Kokorin and Korppoo (2017); Tynkkynen (2020).

[52] Includes the Land Use, Land-Use Change and Forestry (LULUCF) sector. Russian Ministry of Economic Development (2020).

10.2 The EU's ambitious climate policy

As noted in Sections 3 and 5, the EU is Russia's largest market for oil & gas exports. The EU's ambitious climate policy seeks to reduce energy consumption substantially in coming years and shift to lower-emission energy sources. Realization of these plans could involve EU oil imports contracting by about a quarter from their current levels by 2030. Natural gas imports could fall by about 15 % in the same period.[53] Assuming that EU imports from Russia would decline at the same pace suggests that EU success in meeting its climate targets eliminates about a tenth of Russian oil & gas exports (which in terms of 2019 exports would be worth about $25 billion). The impacts in coming decades could be even more dramatic. Meeting its climate targets could require that the EU decrease by 2050 its oil imports by as much as 80 % from current levels and 60 % of its gas imports. This would reduce Russian oil & gas export volumes by about 40 %, or by about $100 billion in 2019 level. A large contraction in EU demand would also place huge pressures on the global market prices for oil & gas. Despite their roughness, such calculations illustrate the magnitude of possible longer-term risks facing Russian energy exports.

From Russia's standpoint, there is a second risk stemming from the EU's climate policy, a risk that is receiving considerable attention in Russia. The EU's latest climate policy program suggests implementation of a possible border-adjustment mechanism for carbon ("carbon tax") in coming years. The mechanism would support EU climate targets by taxing the embedded carbon emissions in imported goods. The details have yet to be determined, as the EU is investigating various implementation possibilities. The mechanism could raise the price of Russian export products, thereby lowering their demand in the EU. For the most part, Russia exports products to the EU that cause large amounts of CO_2 emissions. In addition, production in all branches in Russia generates more emissions on average that in other countries.[54] For example, Russian oil production is far more emission-intensive than Saudi Arabian production. By some estimates, a carbon tax could cost Russian export firms an additional $2 billion to $6 billion a year.[55]

10.3 Can other markets make up for lost EU demand?

Russia's energy strategy foresees a near doubling to 50 % in the share of the Asia-Pacific region in Russian energy exports by 2035. The particular importance of China to Russia's energy sector grew substantially in the 2000s (China-Russia energy relations are discussed in Section 12), and the development of the Chinese energy market is an important factor for the future of Russian energy exports. Last autumn, China announced its own highly ambitious emissions target – carbon neutrality by 2060.

Meeting that target likely requires China to reduce massively its dependence on coal, as well as oil to a lesser extent.[56] As the cuts in oil consumption are expected to come in later, China's oil consumption is likely to keep rising in coming years. In the transition phase, China's natural gas consumption could spike for a few years as highly polluting coal plants could be replaced with cleaner natural gas. China's role as a market for Russian natural gas exports is, however, at least presently limited by transmission capacity. China is Russia's largest coal customer, so a reduction in coal demand hurts Russian exports.

[53] Leonard et al. (2021).
[54] Makarov and Sokolova (2014); Simola (2020b).
[55] BCG (2020); RBK (2020).
[56] ICCSD (2020); Meidan (2020).

Over the long term, the trend in global demand of oil & gas will be determined largely by the climate policies practiced by each country. If current policies are maintained, overall global demand for both oil & gas would rise modestly in coming decades, supported by consumption growth in emerging economies.[57] It is more difficult for emerging economies to reduce emissions by shifting to lower-emission energy production, because, at least for the moment, it is expensive for them. In stricter emissions policy scenarios, global demand for oil & gas is expected to rise for the next few years and then drop precipitously in the next decade. Reduced demand could cause again a collapse in global oil prices as well.

This is a significant risk to the Russian economy. In an environment of falling demand for oil and sinking oil prices, Russia would have to implement massive structural reforms to maintain economic growth. It would have to decarbonize and diversify its economy. As demonstrated by Russia's economic development in the 2000s, implementation of such changes would be slow and difficult. Without reform, however, Russia stands to be the big loser in the global energy transformation when its key source of economic growth and political influence loses relevance.[58]

11. Modest progress in economic diversification efforts

11.1 Why is oil dependence a problem?

Section 2 dealt with the Russian economy's heavy dependence on the oil & gas sector. The over-reliance on a single of the economy can exacerbate the economy's sensitivity to external shocks, amplifying economic ups and downs. Households and businesses are unable to plan for the future as they face increased uncertainty about economic trends. Even if this over-dependence is problematic irrespective of the industry, these negative effects are typically more pronounced in relation to dependence on raw material branches. Commodity prices can fluctuate wildly and unpredictably even in short-term. Moreover, prices of different commodities tend to vary in the same direction.

This dependence on a few commodities can become a "resource curse" and lead to structural distortions that impede economic growth over the long term.[59] Excessive focus on commodity production can stunt growth of the manufacturing sector and limit opportunities to develop export-oriented service branches. The conversion of raw materials into intermediate or finished products also tends to enhance the value-added of products, creating the possibility for higher paying jobs. Productivity and innovation opportunities are typically higher in manufacturing and certain service fields than in commodity production. This explains the focus of advanced economies on high-tech manufacturing and, increasingly, knowledge-intense services.[60] Economic research even suggests a connection between commodity dependence and weak institutions. Weak institutions such as inadequate protection of property rights and poor judicial system are substantial barriers to long-term economic growth.

[57] IEA (2020); BP (2020b).

[58] OIES (2021).

[59] Arezki and van der Ploegh (2011); Frankel (2012).

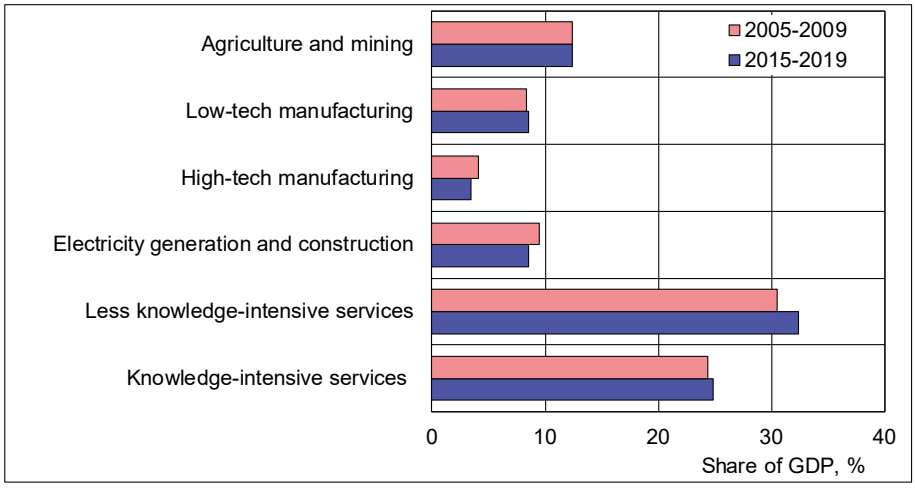
[60] In Eurostat's branch classifications, low-tech manufacturing includes e.g. the food industry and the textile industry. High-tech manufacturing includes e.g. pharmaceutical manufacture and the electronics industry. Low-tech knowledge-intense services include e.g. trade and transportation, while high-tech knowledge-intense services include e.g. IT services and product R&D. For more, see https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pd f
We have used the classification at a relatively aggregate level and thus the results should be considered only indicative.

To reduce the risks to economic development and uncertainty, as well as avoid the negative impacts from the resource curse, Russia must diversify its economic structure. While diversification of production and exports has long been an official priority of Russian economic policy, the large structural changes involved are difficult and take time to implement. Moreover, Russia's commitment to reform has largely been superficial with only modest progress in that direction. In recent years there have been glimmers of progress in some emerging fields, but it would be premature to conclude that Russia can sustain this trend.

11.2 Production structure has remained nearly unchanged

The problem of determining the actual contribution of the oil & gas sector to Russian GDP was described in Section 2. Here, we focus on the overall development of the production structure. Between 2005 and 2019, the breakdown of Russian GDP by branch barely changed when adjusted to 2016 prices (Figure 17). The service sector continued to generate well over half of GDP, while primary production and manufacturing each contributed about 12 %. The share of services has continued to rise in recent years, largely driven by "less knowledge intense" services. Manufacturing's share has remained nearly unchanged, while low technology branches have grown slightly and high technology branches declined slightly. In any case, these changes are marginal. No branch has shown a clear development direction at the aggregate level, and relative shares bounce around slightly from year to year. Longer-term comparisons are further complicated by changing statistical methodologies.

Figure 17. The production structure of the Russian economy (in 2016 prices).



Sources: Rosstat and BOFIT.

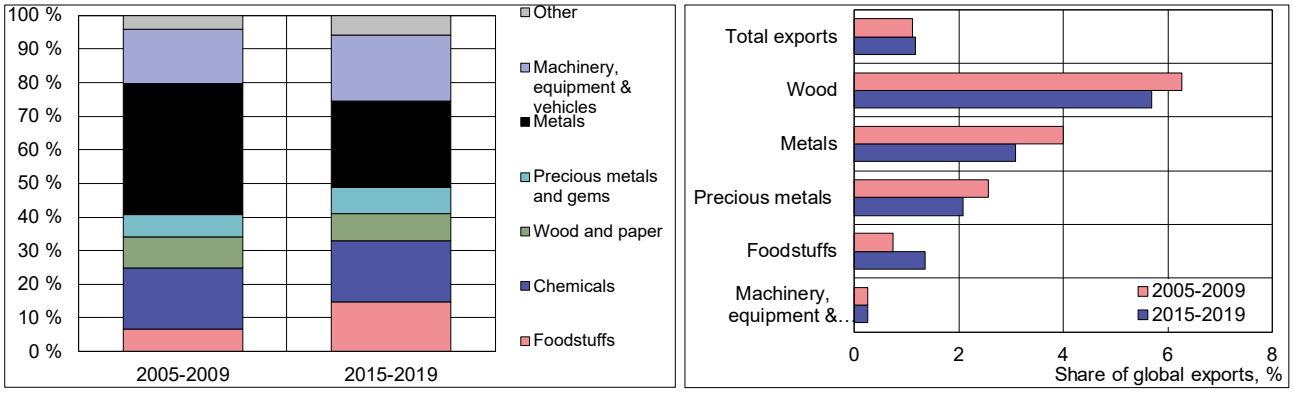
A more detailed assessment of production trends over the past decade indicates more varied trends among branches. The rise of computer technology and programming services in recent years provides a positive sign, but their total contribution to GDP was still only 1.8 % in 2019. On the other hand, negative trends have appeared in recent years in product R&D services, as well as manufacture of machinery, electrical equipment & vehicles. Even at this relatively granular level, however, the changes are quite small, so again it is premature to draw conclusions.

11.3 Minor progress in diversifying exports

We noted in Section 2 that oil & gas make up the bulk of Russian exports. Variations in export share largely reflect changes in oil prices. No large structural changes have occurred in Russian exports for years, but small changes are visible. Services account for a slightly larger share of Russian exports. Services averaged 11 % during 2005–2009, but more recently that share has risen to nearly 14 %. After oil & gas, Russia's top goods exports have traditionally been other commodities, particularly metals and low value-added basic chemical products such as fertilizers. On the index of sophistication of export products, Russia scores significantly lower than other countries with comparable per capita income levels, ranking on par with e.g. India.[61] Russia has long had a few high-technology export products such as military weapons systems and nuclear technology.[62] Russia also has significant market shares globally in these narrow sectors.

The biggest changes for other goods exports (oil & gas excluded) in recent years has been the substantial decrease in the relative share of metals and growth in food exports, particularly grains (Figure 18). The export share of machinery, equipment & vehicles has also increased slightly. New export products are rare in Russia, and most have to do with mineral or agricultural commodities.[63] A similar development pattern can be seen in Russia's shifting global market shares. Russia's share of global exports has contracted in metals and risen in foodstuffs. In contrast, Russia's global market share of exports in the machinery, equipment & vehicle category has hardly changed. More detailed inspection reveals that Russia's market share has recently increased in certain farm and forestry equipment, but again, it is yet difficult to conclude whether this constitutes a trend. Generally speaking, Russian exports appear to have diversified slightly away from energy commodities towards agricultural commodities.

Figure 18. Production structures and averaged share of global exports of Russian non-oil & gas exports 2005–2009 and 2015–2019.



Sources: CEIC, ITC, BOFIT.

[61] World Bank (2020).

[62] While detailed figures on Russian arms exports are not available, their value based on official statements has remained around $15 billion a year in recent years, which would thus represent about 3–5 % of goods exports depending on the year.

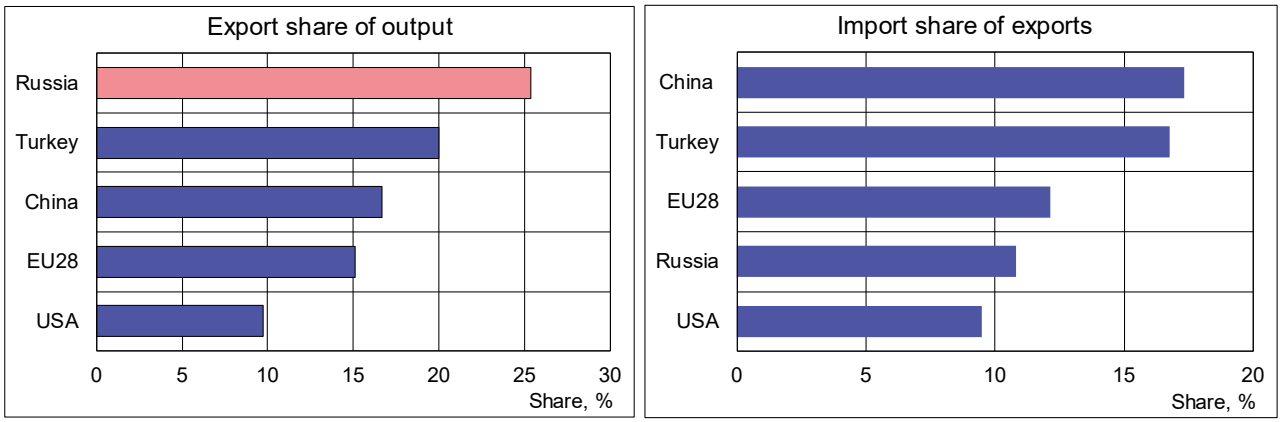
[63] World Bank (2020).

11.4 Tighter integration with international production chains could support economic diversification

International production chains have expanded tremendously over recent decades. Participation in them has supported economic growth in many countries, with China perhaps the clearest example. In the quest of emerging economies to participate in global export markets, it is often easier to enter production chains at select production phases rather than attempt to master a vast range of production processes simultaneously. Economic studies suggest taking advantage of sophisticated imports has increased firm productivity in many countries. By leveraging the embedded knowledge in imports to increase the value-added in their exports (backward participation), firms can use the most appropriate components from the world's most efficient suppliers at each production phase, while focusing on their core competence. This enhances the competitiveness of their products in global markets.[64] Russian corporations with active importing operations have been shown to be significantly more productive on average than firms that rely solely on domestic inputs.[65]

Russian participation in international production chains is narrow, and there have been no significant changes in that participation in past decades. Small positive signs have appeared in recent years, but their meaning is still difficult to interpret.[66] Generally speaking, Russia relies more on foreign demand than most large economies (Figure 19). At the same time, the share of imported inputs in Russian exports is distinctly lower compared to most peers. This partly reflects Russia's specialization in commodity exports. Efforts to enhance backward participation could bolster Russia's efforts to diversify its export and production structure. In economic policy, the government in recent years has focused its efforts in the diametrically opposite direction on import substitution. Rather than benefit from international know-how, Russia has tried to make everything itself, that can restrict firm productivity and erode the competitiveness of their final products.

Figure 19. Share of exports to total output and import share of exports for select countries in 2015, %.



Note: In the above figure, exports refer to the share of value-added from total domestically produced value-added going to satisfy foreign demand. Import share of exports refers to the share of foreign value-added in the total value-added of exports (the so called backward-participation).

Source: OECD TiVA.

[64] On development and changes in global value chains, see e.g. Simola (2021).

[65] Volchkova (2020).

[66] World Bank (2020).

12. Looking to Asia

12.1 China's growing importance as an economic partner

Russian energy exports took their first major move to market diversification towards Asian markets with the construction of the East Siberia–Pacific Ocean (ESPO) oil pipeline. The first stage of the ESPO pipeline was commissioned in 2009. Branch lines connecting to China were opened in 2011 and 2018. The branch line from Skovorodino to Daqing allows Russia to provide China with about 30 million tons of crude oil a year. Oil is also shipped to Chinese ports via tanker from the Kozmino oil port, where the ESPO pipeline terminates. As noted in Section 3, China already accounts for over a quarter of Russian crude oil exports. In contrast, petroleum product exports to China have not increased. China has clearly opted for investing in domestic refinery capacity and importing only the raw material. Moreover, most of Russia's refining capacity remains west of the Urals, making exports to Asia logistically demanding.

Progress on pipeline gas exports to China has progressed more slowly oil exports, but construction of the new gas pipeline was finally agreed upon in 2014. The Power of Siberia gas pipeline to supply Chinese customers was completed in 2019, and transmission of gas on limited scale began in 2020. Currently gas exports to the East are minimal, but once the pipeline reaches full capacity, China may account for about 15 % of Russian pipeline gas exports. With regard to LNG exports, Japan has long been a core market for Sakhalin LNG exports. With the Yamal LNG project, China's role has increased both as a customer and an owner. For the moment, however, the lion's share of Yamal's LNG shipments still go to customers in Western Europe.

The "Pivot to the East" (*Поворот на Восток*) has been a centerpiece of Russian foreign policy over the past decade. Russia's eastward policy shift to Asia, and China in particular, makes sound economic sense. China is the world's biggest buyer of crude oil, Russia's top export commodity. China has also become a significant customer for Russian coal, pipeline gas and LNG.[67] Even as demand in Europe for Russia's traditional hydrocarbon exports has already peaked, Asian countries with rising demand have stepped in to take up the slack. Indeed, it would be a bit odd if the world's largest supplier of hydrocarbons and the biggest buyer of them do not trade directly. In this sense, Russia's pivot to the East is above all an acknowledgement of the economic might of China and other countries in Southeast Asia.

Moreover, diversification of export markets in itself is a prudent economic policy move. China has become a major trading partner for Russia over the past ten years in both exports and imports.[68] Growth in exports to China has, however, been driven by energy raw materials. Thus, the pivot to the East has helped to diversify export destinations,but has done nothing to change the structure of Russian exports. On the contrary, increased exports to China have made Russia more, not less, dependent on exports of unrefined natural resources.

12.2 Trading on Chinese terms

The "Pivot to the East" became increasingly important after 2014, when relations with the West went into freefall due to the annexation of Crimea and the war in Eastern Ukraine. In terms of foreign policy, Russia has sought China's support in reducing US dominance and erection of a "multipolar"

[67] Kaaresvirta et al. (2020).
[68] Nuutilainen and Rautava (2020).

world order. The two countries have intensified cooperation not just in the energy sphere, but in the defense industry and branches that support it such as satellite navigation and microelectronics.[69] China's increasing technological capabilities, however, only make starker the weaknesses of the Russian economy. From the Chinese perspective, Russia is a difficult country that lags behind average pace of global economic growth. In many fields the competitiveness of Chinese products is superior, most likely precluding need for genuine cooperation in R&D.

The countries also share a common mistrust of the US dollar as the global reserve currency. Both China and Russia have encouraged their companies to increase use of their national currencies in foreign payments, with the euro and renminbi emerging as dollar's leading substitutes in bilateral trade. The Russian ruble's share as transaction currency in either imports or exports has remained small.

The 2014 economic sanctions imposed by the West significantly limited the access of companies in the Russian energy sector to dollar- or euro-denominated loans. Chinese state banks and funds have apparently stepped in to fill the gaps to assure a steady flow of raw materials to China. While information about the price of Chinese loans is hard to come by, sanctions have likely increased financing costs for Russia. In addition, Chinese financing has naturally directed investments to energy projects in which China has a specific interest.

China's energy policy consciously aspires to diversification of exports to avoid excessive dependence on any supplier. For this reason, Russia is unlikely to achieve dominance as the top hydrocarbon supplier in the Chinese market similar to its position in Europe. Although China is Russia's largest single crude oil export destination, it only accounts for about 15 % of China's crude oil imports. Power of Siberia gas pipeline at full capacity only puts Russia on par with Turkmenistan in China's pipeline gas market. Moreover, the total volume of Russian gas in all forms is unlikely to every exceed a fifth of China's import gas supply. For these reasons, China continues to hold most of the cards in its energy negotiations with Russia.

For the foreseeable future, the EU remains Russia's most important trade partner. In 2020, the EU-27 accounted for about a third of Russian exports and imports, while China's share of Russian exports was 15 % of imports 24 %. EU countries still accounted for well over half of Russia's exports of oil, petroleum products, pipeline gas and LNG.

13. Russia's struggles to reduce dependency of its public economy on oil & gas revenues

13.1 Managing oil & gas revenue is challenging

The purpose of taxing extracted natural resources is to distribute a portion of the monetized wealth from common resources more widely to society, including unborn generations, rather than allowing individual firms to retain the profits for themselves. There are several ways to approach natural resource taxation, each with distinct advantages and disadvantages. From the economic viewpoint, the optimal form of taxation on natural resource extraction is focused on rents to avoid market distortions. Unfortunately, such tax systems can be difficult to implement and administer, and easy

[69] Juola (2018).

to circumvent. For this reason, Russia's finance ministry has been unwilling to tax rents, preferring instead taxes directed at production and exports. Such taxes, while relatively easy to collect, can readily disrupt markets. First, they can disincentivize investment in developing new deposits by failing to take into account production costs. Second, export taxes can be used as an indirect way to subsidize domestic refiners. They can make it more profitable to sell e.g. crude oil for domestic refining at a lower price than selling to international customers at the global market price. When the export tax is high, selling to the domestic market at lower prices is more profitable than exporting.

During times of economic expansion and high commodity prices, vast amounts of oil & gas revenues flood into the government coffers, putting strong pressure on the government to boost public sector spending. This is risky to the government finances as revenues lost from a decline in oil prices may not be possible to recover in every instance. Russia, in accordance with internationally recommended practices, has long set aside money in sovereign funds to prevent excessive spending growth and conduct prudent countercyclical policy to smooth oil & gas booms and busts. During financial crises, the funds are used to finance government spending obligations. The spending of oil revenues in normal times has been capped through the use of a fiscal rule.

13.2 Frequent changes in oil taxation

Oil taxation in Russia has long served government purposes as a budget revenue generator and a tool to motivate the oil industry to increase the value-added of extracted oil. Design of the tax system has to account specifically for domestic gasoline prices. While the price of gasoline is not regulated per se, temporary price caps have been imposed from time to time when the government seeks to avoid price spikes that may arouse popular dissatisfaction.

Initially, Russia tried to keep the oil taxation system relatively simple to assure easy tax collection. Over time, the oil tax system became increasingly complicated, especially with respect to tax breaks. For example, due to high production costs, the government granted tax breaks to producers developing remote oil fields in challenging conditions. The government has experienced difficulties in foreseeing the market impacts of an increasingly convoluted tax system and thus additional measures such as the above-mentioned caps on gasoline prices have been occasionally taken to use for fine adjustments.

Russia's main oil tax revenue streams are its mineral extraction tax, export tax, and excise taxes. The *mineral extraction tax*, which focuses on crude oil production, has two components. The first component is a fixed rate applied to the amount of oil extracted. The second component is a sliding rate that tracks the global market price of oil. The *export tax*, which focuses on exports of crude oil and petroleum products, only considers the oil price. By tying taxation to the global market price of oil, the state captures a fairly large share of oil earnings when oil prices are high and eases the pain to oil companies when oil prices are low. Special characteristics of a production site or process are usually sufficient ground for tax breaks. In 2019, about half of all Russian oil production operations enjoyed tax breaks in some form. Russia's finance ministry estimates that tax breaks to the oil industry cost the state budget 1.4 trillion rubles in lost tax revenue in 2019 (i.e. 3.5 % of 2019 consolidated budget revenue). *Excise taxes*, which are applied to the sale of petroleum products, are applied at flat rates. Finally, oil companies are required to pay a *profit tax* like all firms. Russia is now implementing an alternative taxation framework of *oil rent tax* on some production. It is based on profits (rent) from those oil sales that take place after the company has cleared its production and investment costs.

The tax burden on oil producers began to climb in the 2000s. At the turn of the millennium, taxation on mineral extraction and exports represented about 40 % of the oil sales. In recent years, it

has been around 60 %.[70] Export taxes have played a central role in Russian government finances since the start of the 2000s. The mineral extraction tax, which has always been important, has seen its significance increase in recent years. The role of excise taxes has remained modest and the oil rent tax system was only introduced on a trial basis at the beginning of 2019.

The taxation emphasis of Russian exports in the early 2000s was on crude oil. To move production towards higher-value petroleum products and modernize petroleum refining, crude oil exports were taxed much more heavily than exports of petroleum products. The taxation gap difference has typically been narrower in the case of gasoline as the government has tried to restrain gasoline exports to levels that assure stability in the domestic market. The tax system generally encouraged exports of refined petroleum products, but subsidies largely went to low-value products such as heavy fuel oil that require little refining. The prices paid for these products were often even lower than the price of Russian crude oil exports. The key to making such low-value exports profitable was their lower taxation. Such tax design meant lost tax revenue for the state and perpetuation of a system that rewards obsolete refineries and low value-added products.

An effort to fix the tax system came in 2014 with the "Great Tax Overhaul" (*bolshoi nalogovoy manevr*). The thrust of the new legislation was to shift the oil taxation emphasis gradually away from export taxes to mineral extraction and excise taxes, and thereby reduce subsidies to inefficient, outdated refining operations. To support this effort, the export tax rate on low value-added petroleum products was set to rise with a transition period to a level on par with the export tax on crude oil. Part of this tax overhaul had to do with the launch of the Eurasian Economic Union (EAEU) at the start of 2015. As oil export taxes were not to be collected within the EAEU, it would have meant a loss of budget income for Russia. The Great Tax Overhaul was postponed with the collapse of oil prices and subsequent 2014–2015 recession in Russia. The tax plans were further amended slightly in 2018, when domestic gasoline prices soared. Planned hikes in excise taxes were delayed and a temporary ceiling imposed on gasoline prices.

Following the current schedule, the Great Tax Overhaul should gradually be implemented by 2024, when export taxes on all oil and petroleum products will be eliminated. The lost tax revenue to the state will be offset with hikes in the mineral extraction tax and excise taxes. For some oil refiners, their unfavorable tax treatment will be compensated for with a reverse excise tax. In addition, the impact of fluctuations in global oil prices on domestic market prices is restrained through a separate "damper mechanism" (*dempfer*).[71] A temporary ban on gasoline imports was also introduced in 2020 to support Russia's domestic oil-refining industry.

At the beginning of 2019, Russia introduced an oil rent tax system on a trial basis. The new arrangement is intended to support investment in new production. Under the system, the starting rate on oil rents is 50 %, but the rate can be adjusted according to the type of oil deposit. Companies within the oil rent tax system also enjoy breaks on other oil taxes. As of 2019, about 9 % of Russian oil production was subject to the system. Oil companies have generally given thumbs up to the oil rent tax arrangement. The finance ministry sees, however, that the trials so far have resulted in lower government revenues and have not increased investment in production as expected.

With the covid crisis and collapse of oil prices, Russia's budget revenues last year contracted precipitously. To make up for lost revenues, oil taxation was again adjusted last autumn. Details of the oil rent tax were modified and various tax breaks eliminated, particularly those for more mature oil fields. The finance ministry expects that a larger part of oil production will be conducted within the oil rent tax system and that government tax revenues will increase by about 200 billion rubles (2.8 billion USD) a year after modifications to the system. Oil sector analysts note that elimination of

[70] Vygon (2020). The calculation assumes an oil price of $60 a barrel and no tax breaks.

[71] See e.g. Kaukin and Miller (2020).

these tax breaks will create significant additional costs to firms that could make it difficult to maintain production at current levels.[72]

13.3 Greater stability for natural gas taxation

Russia's tax system for natural gas has traditionally been more straightforward that oil taxation, but this has also gradually changed. Like taxation of oil, the basic purpose of taxing natural gas is to raise money for the state. There have also been efforts in recent years to use the tax system as a way to encourage investment in new production that assures future availability of natural gas supplies. Tax system design, however, is influenced by special characteristics of Russia's natural gas market. Consumer prices for natural gas have traditionally been administratively set rates. Deregulated pricing only applies to a third of gas consumption. All gas sold to households is still provided at lower administratively set rates (see Section 3). Russia's gas market also features a two-tier tax system to accommodate state-majority-owned Gazprom, the only company allowed to engage in pipeline gas exports.

The biggest tax revenue streams generated from natural gas taxes are the mineral extraction tax and export tax. In the early 2000s, the extraction tax for natural gas was a flat tax based on production volumes. Under the two-tier taxation model introduced in 2012, a higher tax rate was applied to Gazprom and a lower rate to "independent" producers. Since the 2014 overhaul of the taxation scheme for mineral extraction, several factors are used to determine the magnitude of the mineral extraction tax. These include the location of the production site and how long it has been in active production. The reform shifts the tax emphasis to mature production operations in order to encourage development of new production. As part of the reform, the extraction taxes were raised substantially to follow the hikes in the administratively regulated rate. The 2014 tax reform generated large variation in extraction tax rates from gas field to gas field.[73] The export tariff on pipeline gas is 30 % of its export value. According to Russia's WTO commitments this tariff cannot be increased. In contrast, there are no tariffs on LNG exports.

13.4 Fiscal rule and oil fund are used for management of oil & gas revenue

A share of Russia's oil and gas earnings have been set aside since 2004, when the government established the Stabilization Fund. As its name indicates, the purpose of the Fund was to provide stability in economic downturns. At the start of 2008, the Stabilization Fund was split into two parts: a Reserve Fund to be used for countercyclical government spending to smooth fluctuations in the economy, and a National Welfare Fund to help with Russia's pension obligations. The government dipped into the Reserve Fund during the 2009 financial crisis to cover budget expenditures and again in 2014 at the start of another financial crisis. The Reserve Fund was completely drained by 2017. The remaining and still extant National Welfare Fund's primary purpose was then changed to funding countercyclical spending by the government.

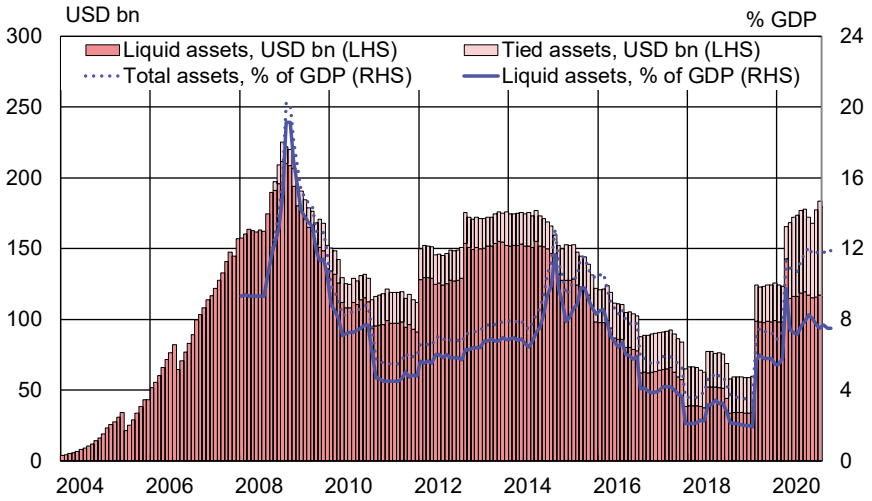
The government's current fiscal rule was adopted in 2017. It restricts the possibilities for the government to use oil & gas revenues to finance budget spending. Somewhat simplified, the original rule required federal budget to be in balance when oil revenues were calculated at a "base" price and spending was calculated without the government's debt-servicing costs. The rule defines the "base" price for oil at $40 a barrel in 2017 prices. In practice, this means that the base oil price rises by 2 %

[72] IEA (2021); Vygon (2020).
[73] Yermakov and Kirova (2017).

a year after 2017. Following president Putin's announcement of "national projects" in 2018,[74] the balanced-budget requirement of the fiscal rule was relaxed to facilitate the funding of national projects between 2019 and 2024. The change allowed for a federal budget deficit of up to 0.5 % of GDP. With the covid crisis, the government decided to ignore the fiscal rule altogether in the 2020 and 2021 budgets, with an intention to reinstate the rule when global economic conditions stabilize.

Under the fiscal rule, when the average price of oil exceeds the base price, any excess tax revenues are deposited in the National Welfare Fund. Conversely, if the realized average oil price is below the base price, the deficit in tax revenues from the energy sector can be made up with money from the Fund. Under current law, countercyclical smoothing is the primary role of the National Welfare Fund. However, Fund assets can be used to support the economy in other ways when its liquid assets exceed 7 % of GDP. The National Welfare Fund ended 2020 with assets worth roughly $180 billion, of which about $120 billion, the equivalent of nearly 8 % of GDP, was in highly liquid forms (Figure 20). Most of the Fund's committed assets are invested in shares of Sberbank, Russia's largest bank, as well as shares and bonds of other Russian corporations.

Figure 20. Liquid and tied assets of Russia's National Welfare Fund (oil fund), 2004–2020.



Sources: Russian Ministry of Finance and CEIC.

The fiscal rule requires Russia's finance ministry to moderate swings in the ruble's exchange rate when they are caused by shifting oil prices. To accomplish this, the CBR engages in forex operations at the finance ministry's behest. The finance ministry announces in advance the average daily volume of forex operations for the following month based on the ex-post difference of expected and realized oil price in the previous month. If the realized price of oil has exceeded the finance ministry's estimate, the CBR is tasked with purchasing forex, or conversely selling forex when the oil price falls below the finance ministry's estimate. Typically, the scale of these forex operations has been quite moderate compared to daily forex trading volumes in Russia. For example, the average daily volume of forex purchases in 2019 was about $200 million dollars. Due to the Covid Recession, the finance ministry deviated from the fiscal rule also in this aspect to some extent in 2020 and the CBR

[74] See e.g. Simola (2020a).

performed additional preannounced forex operations to dampen fluctuations in the ruble's exchange rate.

14. New and renewable energy sources

14.1 Russia and hydrocarbons

Burning hydrocarbons accounts for nearly all Russian energy consumption. Coal, gas, and oil together satisfy about 90 % of energy consumption, a level that has remained fairly constant in recent decades. Oil is predominantly a transportation fuel also in Russia, with about half of domestic oil consumption going to transportation purposes. Non-energy use of oil products and natural gas has increased slightly during the last decade. Close to 30 % of oil consumption and 25 % of gas consumption in recent years has gone to purposes other than fuel use. In terms of final consumption by sector, coal is clearly an industrial fuel.

The share of renewables in Russian electricity production is nearing 20 %, most of which reflects the country's huge hydropower generation capacity. Other renewables still only account for about 1 % of total electricity production, but their contribution is growing. About half of Russian electricity and two-thirds of district heating are produced by natural gas. As discussed in section 10, reduction of CO_2 emissions is not a priority in Russian energy policy and Russian firms hardly view zero emissions as a competitive advantage. The attitudes in corporate management are, however, slowly changing as green financing has gained attraction also in Russia.

Table 5. Main sources for production of primary energy, electricity and heating in Russia

	Primary energy supply 2018	Electricity production 2019	Heating production 2019
Coal	16 %	16 %	21 %
Oil	20 %	1 %	4 %
Natural gas	54 %	46 %	65 %
Nuclear	7 %	19 %	0 %
Hydro	2 %	18 %	-
Wind	0 %	0.0 %	-
Solar	0 %	0.1 %	-
Other	1 %	0 %	10 %
Total	760,411 ktoe	1,118 TWh	5,239 PJ

Sources: IEA World Energy Balances 2020 and IEA Electricity Information 2020. Ktoe = kiloton of oil equivalent, TWh = terawatt hour, PJ = petajoule.

14.2 Subsidies for wind and solar…with domestic content requirements

Current Russian legislation allows for long-term capacity supply agreements on very favorable terms for eligible renewable electricity projects. Since 2014, generous support schemes have existed to

assist the push for wind and solar. In 2019, for example, wind power production was up by 47 % y-o-y and solar power production by 70 %. Renewable electricity generation is still, however, miniscule. Despite the strong growth, wind and solar together accounted for less than 0.1 % of electricity production in 2019. Most of the investment in this early phase has gone to southern regions on Russia's European side.

Construction of wind farms and solar fields is held back to some extent by the lack of demand and the peculiarities of the support schemes. To qualify for the capacity supply agreements, a project has to meet extremely high domestic-content requirements. During 2020–2024, access to subsidized agreements comes with a domestic-content requirement for machinery and equipment of over 65 %.[75] Another restriction for developing renewable electricity generation is that support is not available to small-scale projects nor for projects located in isolated regions. The regions isolated from the national electricity markets would, however, be natural candidates for replacing coal and heavy oil by local renewables in electricity generation. Thus, it seems that the purpose of Russia's renewable subsidy program is to support domestic manufacturers rather than low-emission electricity production.

14.3 Is blue hydrogen the answer?

Even if Russia has been spectacularly late in developing, commercializing and implementing zero-emission and renewable technologies, there are glimmers of hope on the wind and solar horizon. Gradually tightening emission standards globally, and the carbon tax envisioned by the EU in particular, are forcing Russia to seek alternative revenue sources to replace or complement its traditional hydrocarbon offerings. In summer 2020, the European Commission approved a hydrogen strategy that envisions green hydrogen as a cornerstone of Europe's energy transformation and transition to a climate neutral economy by 2050. Green hydrogen refers to hydrogen produced with renewable energy.

In this context, Russian corporate actors have gradually realized the existence of a new potential market opening. There are discussions about producing green hydrogen and ammonia using electricity generated in the future wind farms in the Russian Arctic. While large scale production of green hydrogen could be a daunting challenge for Russia, also discussion on potential production and exports of blue hydrogen has emerged. Blue hydrogen refers to hydrogen produced with zero-emissions electricity, generated by nuclear power or by traditional combustion in which all carbon dioxide emissions are sequestered (carbon capture and storage). Indeed, Russia's pipeline grid could be repurposed to exports of hydrogen in the event demand for natural gas contracts declines significantly.

The Russian government approved a hydrogen sector development program in October 2020.[76] The program, which runs for 2021–2024, is largely a scoping exercise requiring almost no concrete action. Nevertheless, the program description is the first document to lay out clear milestones for the relevant administrative bodies on the path to hydrogen production. Indeed, incorporating hydrogen into the political discussion may well be an important first step for Russia in coming to terms with the 21st century energy transition.

[75] CMS (2020).

[76] Russian government, Razporyazenie 12 Oct 2020: 7b9bstNfV640nCkkAzCRJ9N8k7uhW8mY.pdf (government.ru).

15. Conclusion

Current trends in global energy markets can have profound implications for the Russian economy due to the sizeable contribution of its oil & gas sector. The global outlook for oil & gas demand is modest, and demand could decline substantially over the longer term if larger economies meet their ambitious decarbonization goals. The biggest drop in demand is expected in Europe, that is still Russia's main export market although the share of China and other Asian countries has increased.

Competition in oil & gas markets has intensified, particularly from the rise of shale oil & gas and global LNG infrastructure. In recent years, Russia has joined with other major oil-producing nations in curtailing its oil production to sustain higher global oil prices. Over the longer term, however, massive additional investment in developing deposits in remote and challenging locations will be needed to maintain Russian oil production at current levels. Responding to shifts in the gas market will also require an ample increase in investment in development of production and transport infrastructure. Costs will be increased further by Western sanctions imposed on Russia that restrict access of Russian energy companies to key technologies and financing. Moreover, these investments could at least partially be in vain if the hoped-for demand never materializes.

Diversification of the economy and reduction of oil dependence has long been included among Russia's economic policy goals. Despite a few baby steps, progress has been quite modest. The government in recent years has managed to mitigate some of the economic impact of changes in oil prices through monetary and fiscal policy reforms. There have been some preliminary signals of diversification of production and exports as well as development of new energy products in recent years, but this trend is still in its infancy.

Reducing dependence on raw materials is admittedly difficult and slow, but not impossible. Until now, Russia has not seen it necessary to wean itself from its commodity dependence as oil & gas revenues have secured an acceptable pace of economic growth. Moreover, Russia's economic policy planning horizons have been quite short. Some of the largest international energy companies have begun to make significant investments in renewable energy and zero-emission electricity production. Russia has been slow to accept evolving energy policies at the global level, which makes getting on with needed economic structural reforms more timely than ever.

References

Arezki, R. and van der Ploeg, F. (2011). Do natural resources depress income per capita? Review of Development Economics, 15(3), 504-521.

BCG (2020). How an EU border tax could jolt world trade. Boston Consulting Group, June 2020.

BP (2020a). Statistical Review of World Energy 2020. https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy.html.

BP (2020b). Energy Outlook 2020. https://www.bp.com/en/global/corporate/energy-economics/energy-outlook.html.

CDU TEK 11.12.2020. ТЭК России | Возрождение рынка нефтегазового оборудования (cdu.ru).

CMS (2020). CMS Expert Guide to Renewable energy law: Renewable energy law and regulation in Russia, December 2020. Renewable energy law and regulation in Russia | CMS Expert Guides.

CSR (2021). Климатическая повестка России: реагируя на международные вызовы. Center for Strategic Studies, Moscow. Климатическая повестка России: реагируя на международные вызовы (csr.ru)

IEA (2014). Russia 2014. International Energy Agency.

IEA (2020). World Energy Outlook 2020. International Energy Agency.

IEA (2021). Oil. Analysis and forecast to 2026. International Energy Agency.

IMF (2021). Russian Federation, IMF Country report 21/36, February 2021.

Frankel, J. (2012). The natural resource curse: A survey of diagnoses and some prescriptions. HKS Faculty Research Working Paper Series RWP12-014, John F. Kennedy School of Government, Harvard University.

Gurvich, E. and Prilepskiy, I. (2015). The impact of financial sanctions on the Russian economy. Russian Journal of Economics, 1(4), 359-385.

Henderson, J. and Grushevenko, E. (2019). The future of Russian oil production in the short, medium and long term. Oxford Institute for Energy Studies Energy Insight 57, September 2019.

Henderson, J. and Yermakov, V. 2019. Russian LNG: Becoming a global force. Oxford Institute for Energy Studies, OIES Paper NG 154, November 2019.

ICSSD (2020). Launch of the Outcome of the Research on China's Long-term Low-carbon Development Strategy and Pathway. 应对气候变化科学方法研究及数据库建设 (efchina.org).

Juola, C. (2018). Kiinan and Venajän puolustusteollinen yhteistyö 2010-luvulla. Pro gradu, Maailmankulttuurien laitos, Helsingin yliopisto.

Kaaresvirta, J., Kerola, E., Nuutilainen, R., Parviainen, S. and Solanko, L. (2020). Miten kaukana ilmastotavoitteista ollaan? Katsaus Chinan energiasectorin. BOFIT Policy Brief 14/2020.

Kaukin, A. and Miller, E. (2020). Nalogovyi manevr v neftyanoi otrasli: promezhutochnye itogi i riski dalneyshei realizatsii. Voprosy Ekonomiki (10), 28-43.

Klimentyev, A., (ed.) (2020). Severnyi morskoi put: istoriya, region, proekty, flot i toplivoobespechenie. Tsentr Energetiki Moskovskoi shkoly upravleniya Skolkovo, Moscow, July 2020.

Kokorin, A. and Korppoo, A. (2017). Russia's ostrich approach to climate change and the Paris agreement. CEPS Policy Insight 2017/40, November 2017.

Kuboniwa (2015). The impact of oil prices, total factor productivity and institutional weakness on Russia's declining growth. In: Oxenstierna, S. (ed.). The challenges for Russia's politicized economic system. Routledge Publishing, London, 2015.

Korhonen, I., Simola, H. and Solanko, L. (2018). Sanctions, counter-sanctions and Russia − Effects on economy, trade and finance. BOFIT Policy Brief 4/2018.

Leonard, M., Pisani-Ferry, J., Shapiro, J., Tagliapetra, S. and Wolff, G. (2021). The geopolitics of the European Green Deal. European Council on Foreign Relations Policy Brief, February 2021.

Makarov, I. and Sokolova, A. (2014). Otsenka uglerodoemkosti vneshnej torgovli Rossii. Ekonomicheskii Zhurnal VSE, 3(2014), 477-507.

Markov, B., ed. (2020). Deyatelnost krupnyh neftegazovyh kompanii v Arcticheskoy zone Rossii. Tsentr Energetiki Moskovskoy shkoly upravleniya Skolkovo, Moscow, July 2020.

Meidan, M. (2020). Unpacking China's 2060 carbon neutrality pledge. Oxford Energy Comment, The Oxford Institute for Energy Studies, December 2020.

Mitrova, T. Grushevenko, E. and Malov, A. 2018. The future of oil production in Russia: Life under the sanctions. Skolkovo Energy Centre. March 2018.

Nuutilainen, R. and Rautava, J. 2020. Russia and the slowdown of the Chinese economy. BOFIT Policy Brief 2/2020.

OIES (2021). The geopolitics of energy: Out with the old, in with the new? Oxford Energy Forum 126, The Oxford Institute for Energy Studies, February 2021.

Ponomarenko, A. and Yakovleva, K. (2020). Transformatsiya platezhnogo balansa v periody snizheniya eksportnoi vyruchki. Analiticheskaa zapiska, Bank Rossii, June 2020.

PWC (2020). Northern Sea Route: Development perspectives and uncertainties. PwC Russia, January 2020. https://www.pwc.dk/da/publikationer/2020/pwc-severnyy-morskoy-put-perspektCIS -i-neopredelennosti-razvitiya-en.pdf

RBK (2020). KPMG otsenila ushserb dlya Rossii ot vvedeniya uglerodnogo naloga v ES. July 7, 2020 KPMG оценила ущерб для России от введения углеродного налога в ЕС :: Бизнес :: РБК (rbc.ru)

Rosgidromet (2017). Doklad o klimaticheskih riskah v territorii Rossiiskoi Federatsii. Federalnaya sluzhba po gidrometeorologii i monitoringu okruzhayushshei sredy, Sankt Peterburg, 2017.

Simola, H. (2019). Effects of external shocks on Russian economy. BOFIT Policy Brief 4/2019.

Simola, H. (2020a). Venäjän talous koronan kourissa. BOFIT Policy Brief 7/2020.

Simola, H. (2020b). Climate change and the Russian economy. BOFIT Policy Brief 11/2020.

Simola, H. (2021). The impact of Covid-19 on global value chains. BOFIT Policy Brief 2/2021.

Simola, H. and Solanko, L. (2017). Overview of Russia's oil and gas sector. BOFIT Policy Brief 5/2017.

Simola, H., Solanko, L. and Korhonen, V. (2013). Perspectives on Russia's energy sector. BOFIT Online 3/2013.

Solanko, L. and Vilmi, L. (2013). The transformation of global energy markets. BOFIT Online 6/2013.

Sukhankin, Sergey (2020). Coal Strategy 2035: Is Russia Preparing for the Last War? Eurasia Daily Monitor, 17(109).

Sun, J. 2020. Implications of sectoral sanctions on Russia's gas sector. BOFIT Policy Brief 12/2020.

Sutela, P. and Solanko, L. 2009. Too much or too little Russian gas to Europe? Eurasian Geography and Economics, 50(1), 58-74.

Tynkkynen, V-P. (2020). Could Russia embrace an energy transition? Current History, 119(819), 270-274.

Russian government (2020). Energetitsheskaya strategiya Rossiiskoi Federatsii na period do 2035 goda.

Russian Ministry of Economy (2021). Prognoz sotsialno-ekonomitsheskogo razvitiya Rossiiskoi Federatsii na 2022 god i na planovyi period 2023 i 2024 godov, April 2021.

Russian Ministry of Economy (2020a). Strategiya dolgosrotshnogo razvitiya Rossiiskoi Federatsii s nizhkim urovnem vybrosov parnikovyh gazov do 2050 goda.

Volchkova, N. (2020). The export trap of Russian import substitution policies. Baltic Rim Economies 1/2020. University of Turku, February 2020.

World Bank (2020). Russia integrates: Deepening the country's integration in the global economy. World Bank, Washington DC, December 2020.

Vygon (2020). Nalogi v neftedobytshe: Reforma 2020. Vygon Consulting, November 2020.

Yermakov, V. and Henderson, J. (2020). The new deal for oil markets: implications for Russia's short-term tactics and long-term strategy. Oxford Institute for Energy Studies Energy Insight 67, April 2020.

Yermakov, V. and Kirova, D. (2017). Gas and taxes: The impact of Russia's tinkering with upstream gas taxes on state revenues and decline rates of legacy gas fields. Oxford Institute for Energy Studies Energy Insight 20, October 2020.

BOFIT Policy Brief

https://www.bofit.fi/fi/julkaisut/policy-brief/

2017

No 1 Jouko Rautava: Kiinassa talouspolitiikka ei pysy maan muutosten vauhdissa
No 2 Heli Simola: China's growing role in global production boosted by strong competitiveness – evidence from international input-output tables
No 3 Heli Simola ja Laura Solanko: Katsaus Venäjän öljy- ja kaasusektoriin
No 4 Heli Simola: Chinese production chains rely increasingly on domestic services
No 5 Heli Simola and Laura Solanko: Overview of Russia's oil and gas sector
No 6 K.C. Fung, Nathalie Aminian, Iikka Korhonen and Keith Wong: The Chinese yuan: Influence of interest groups examined
No 7 Päivi Määttä: Meeting the challenges of impact measurement
No 8 Caroline Stern, Mikko Mäkinen and Zongxin Qian: FinTechs in China – with a special focus on peer to peer lending
No 9 Iikka Korhonen and Riikka Nuutilainen: Breaking monetary policy rules in Russia
No 10 Andrei Yakovlev, Lev Freinkman, Sergey Makarov and Victor Pogodaev: In response to external shocks: How advanced Russian regions react to changes in federal policies – Experience of Tatarstan

2018

No 1 Ivan Lyubimov and Maria Lysyuk: Schooling ain't learning in Russia either: High level of student employment as an indicator for slow human capital accumulation
No 2 Jouko Rautava: Intian nopea kasvu ei vähennä reformien tarvetta
No 3 Eeva Kerola: Hongkongin talous on vahvasti kytkeytynyt Manner-Kiinaan
No 4 Iikka Korhonen, Heli Simola and Laura Solanko: Sanctions, counter-sanctions and Russia − Effects on economy, trade and finance
No 5 Andrei Yakovlev, Lev Freinkman and Nina Ershova: Channels of dialogue between international businesses and national governments: The implications for domestic reforms and international relations in the case of Russia
No 6 Helmut Wagner: Structural change, rebalancing, and the danger of a middle-income trap in China
No 7 Wing Thye Woo: A U.S. perspective on China's external economic disputes in the past 40 years and in the coming 40 years
No 8 Nigel Gould-Davies: Economic effects and political impacts: Assessing Western sanctions on Russia
No 9 Jouko Rautava: Kiina ja Venäjä – eripariset talouskumppanukset
No 10 Sergey Vlasov and Mariam Mamedli: Russia's pension system in the context of world experience and expected trends
No 11 Riikka Nuutilainen: Juanin kansainvälistyminen ei etene suoraviivaisesti

2019

No 1 Mariya Hake and Alice Radzyner: Western Balkans: Growing economic ties with Turkey, Russia and China
No 2 Iikka Korhonen: Sanctions and counter-sanctions – What are their economic effects in Russia and elsewhere?
No 3 Carsten Sprenger and Srdjan Todorović: Corporate Governance of the Largest Russian Banks
No 4 Heli Simola: Effects of external shocks on Russian economy

2020

No 1 Laura Solanko: From reforms to stagnation – 20 years of economic policies in Putin's Russia
No 2 Riikka Nuutilainen and Jouko Rautava: Russia and the slowdown of the Chinese economy
No 3 Le Xia: Lessons from China's past banking bailouts
No 4 Heli Simola: CO2 emissions embodied in EU-China trade and carbon border tax
No 5 Jouko Rautava: Protektionismi ja uudistusvastaisuus estävät Intian nousun keskeiseksi globaaliksi taloustoimijaksi
No 6 Heli Simola and Laura Solanko: Domestic and global economic effects of corona containment measures - Russia in international comparison
No 7 Heli Simola: Venäjän talous koronan kourissa
No 8 Christian Alexander Belabed and Thomas Theobald: Why the Chinese recovery will slow – some lessons from sectoral data
No 9 Risto Herrala: Capital controls in an integrated world: A review of recent developments, policies and the academic debate
No 10 Vesa Korhonen: Chasing developments in Russia's government budget
No 11 Heli Simola: Climate change and the Russian economy
No 12 Jinsok Sung: Implications of sectoral sanctions on Russia's gas sector
No 13 Yin-Wong Cheung: A Decade of RMB Internationalization
No 14 Juuso Kaaresvirta, Eeva Kerola, Riikka Nuutilainen, Seija Parviainen ja Laura Solanko: Miten kaukana ilmastotavoitteista ollaan? – katsaus Kiinan energiasektoriin

2021

No 1 Julia Lintunen: An overview of China's regional trade agreements
No 2 Heli Simola: The impact of Covid-19 on global value chains
No 3 Seija Parviainen: Jiefang-kuorma-autosta Nio-sähköautoon: Kiinan autoteollisuuden pitkä marssi
No 4 Juuso Kaaresvirta, Eeva Kerola, Riikka Nuutilainen, Seija Parviainen ja Laura Solanko: How far is China from hitting its climate targets? – An overview of China's energy sector
No 5 Juuso Kaaresvirta and Helinä Laakkonen: China as an international creditor
No 6 Heli Simola ja Laura Solanko: Venäjän öljy- ja kaasusektori globaalien energiamarkkinoiden murroksessa
No 7 Heli Simola and Laura Solanko: Russia's oil & gas sector in global energy transition

http://www.bofit.fi • email: bofit@bof.fi
ISSN 2342-205X