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RUSSIAN AGRICULTURE AND CLIMATE CHANGE

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ANALYSIS

Russian Climate Change Policy: Increasing Ambitions

By Marianna Poberezhskaya (Nottingham Trent University)

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Abstract

For decades, Russia has been criticized for its modest climate change reduction commitments and ambiguous national and international climate policy. Over the last few years, the situation has started to change, with Russia establishing a legal framework for its climate policy and initiating a number of 'pilot' climate projects throughout the country. While the motivation behind those initiatives is debatable, more important is whether they will translate into intentional Greenhouse Gas (GHG) emissions reductions.

Introduction

Russian climatologists are adamant about Russia's geographical vulnerability to climate change and the fact that the temperature rise is greater here than the global average (http://www.meteorf.ru/upload/pdf_download/doklad_klimat2020.pdf). In June 2021, during the 'direct line' (a Q&A session with the president), Vladimir Putin echoed these concerns by adding that, while there are some positives in climatic change for Russia, there are also 'significant' negative consequences, including the desertification of agricultural lands and the melting of permafrost, which would lead to 'very serious social, economic consequences' (http://kremlin.ru/events/president/news/65973). Later that month, Putin stated in a speech at the international economic forum that due to Russia's place and role in the world, regardless of which climate projects are implemented, the initiatives adopted in the country over the next decades will be of utmost importance to the world's efforts to mitigate climate change. He then highlighted the importance of Russia's natural gas reserves ('the cleanest hydrocarbon', which cannot be ignored during the transition), its established nuclear energy sector and the evolving renewable energy sources (RES) industry (https://regnum.ru/news/economy/3288882.html). Finally, in October 2021 Putin's statement that Russia will become carbon neutral by 2060 made national and international headlines (https://www.reuters.com/business/environment/russia-striving-be-carbon-neutral-no-later-than-2060-says-putin-2021-10-13/). Due to its importance in the global fossil fuel market and its questionable historical record of climate change decisions (or, indeed, the lack of them), Russia has been persistently scrutinized and criticized (e.g., Henry & McIntosh Sundstrom 2012), and as recently as 2020, Russia's climate targets were proclaimed 'critically insufficient' (https://climateactiontracker.org/countries/russian-federation/). However, over the last year, a number of changes have been observed at the national level, which, although perhaps not critical enough, nevertheless represent an important development.

National Policy Progress

Despite Russia's regular participation in global climate politics, its national climate policy has been consistently criticized for being mere 'window dressing' (e.g., Kokorin & Korppoo 2013) and for lacking political will. Indeed, Russia's first climate-related document was accepted only in 2009 (the Climate Doctrine), which (while it was an important discursive step) did not have any restrictive powers. The next notable move was taken in 2013, when the president signed decree N752 'on the reduction of GHG emissions; however, it did not lead to any practical economic changes. For example, Russia's GHG emissions dropped by 32.9% in the 1990–2019 period (without LULUCF) (https://unfccc.int/sites/default/files/resource/sbi2021_11_adv_0.pdf); this impressive reduction is traditionally attributed not only to the collapse of the USSR but also to intentional and unintentional economic restructuring and an introduction of energy efficiency technologies (Makarov et al. 2021). Hence, the 2013 decree did not require any actual reductions for the emissions to stay within 75% of 1990 levels.

Several years later, Russia's national climate policy saw a substantial increase in the official documentation. In 2019, resolution N1228 'on the adoption of the Paris agreement' was published. That same year, Russia's climate vulnerability was acknowledged at the state level in Governmental Executive Order N3183-r 'on adopting a national plan of events of the first stage of climate change adaptation to 2022'. In addition to the abovementioned increased risk of natural disasters and the melting of permafrost, the plan highlights the threat to public health, the agricultural sector, the increased possibility of forest fires, the loss of biodiversity and the surge in expenditures on air conditioners during warm seasons. Noting significant variability in climate change impacts across the country, the plan suggests the involve-

ment of a wide range of official institutions starting with the Ministry of Natural Resources and Environment, Rosgidromet, and finishing with the Security Council and the Ministry of Transport. The plan also mentions 'possible positive consequences', including a decrease in energy use during the hot season, improved access via the Northern Sea Route, expansion of agricultural lands, an increase in efficiency of animal husbandry (if 'a number of additional conditions are met, and certain measures are taken'), and the increased productivity of boreal forests. While not completely unexpected (the notion of the potential positive consequences of climate change for Russia has been a long-debated concept), this passage does make the adaptation plan somewhat weaker and detracts attention from its political significance. In 2021, the plan was followed by the Ministry of Economic Development of the Russian Federation's Order N267, containing 'methodological recommendations and indicators on adaptation to climate change'.

In November 2020, a new Presidential Decree N666 'on reduction of greenhouse emissions' was published, which suggested a 30% cut of emissions over the 1990 level and ordered the creation of a 'strategy for the socio-economic development of the Russian Federation with a low level of greenhouse gas emissions until 2050'. Another notable Decree (N76) was signed in February 2021 on 'measures to implement the state scientific and technical policy in the field of environmental development of the Russian Federation and climate change', including the federal program aimed at creating advanced scientific solutions to assure the country's sustainable socioeconomic development with low levels of GHG emissions. The decree also expressed support for climate change-related research and academic studies. However, it was in the summer of 2021 that the most significant piece of climate legislation in the country was adopted—Federal Law N296 on 'restricting GHG emissions'. The law introduces the mandatory disclosure of information on GHG emissions by companies that emit the equivalent of 150,000 tons of CO_2 a year, with reporting required starting from January 1, 2023; those that emit 50,000 or more tons need to disclose starting January 1, 2025. The law also introduces the legal framework for carbon trading and climate projects.

While climate change is still taking a backstage (if it appears at all) in Russia's international relations and the legal measures presented are not without their limitations, it is still important to look at the evolution of the national discourse and whether it will eventually start translating into real GHG emissions reductions.

Economic Changes

As in many countries throughout the world, economic prosperity in modern Russia still takes priority over environmental concerns. Thus, Russia's climate policy has been criticized not only for its lack of international and national commitments but also for the overall incompatibility of its economic system with a sound climate change mitigation policy. Russia is still struggling with the carbon intensity of its economy, and its GDP relies heavily on the export of fossil fuels. Hence, it would require a strong political will to turn toward a more sustainable economic model with low levels of GHG emissions. There are, however, some initiatives emerging from the energy sector, especially from the larger corporations that trade internationally and understand the importance of engaging with the climate discourse.

It is also speculated that a major external 'push' is heading Russia's way in the form of the EU Carbon Border Adjustment Mechanism (CBAM), which aims to 'put a carbon price on imports of a targeted selection of products […] This will ensure that European emission reductions contribute to a global emissions decline, instead of pushing carbon-intensive production outside'. The initial phase of the CBAM includes five sectors: cement, electricity production, aluminum, iron and steel, and fertilizer. From 2023 until 2025, importers will be asked only to declare their emissions, and from 2026 onwards, they will need to pay 'financial adjustments' where required. It is stated that the mechanism will expand in the future by adding more sectors to the list and/or considering the whole production process (e.g., the carbon intensity of electricity used during the manufacturing stage) of the imported products, which might further affect Russia's exports and imports. If Russian companies do not take the mechanism seriously, they may end up with substantial economic losses. Furthermore, it is likely that individual corporate efforts might not be enough; as Mel'nikov and Daneeva (2021) point out, to maintain strong connections with the European market, Russia needs a solid national decarbonization strategy.

Overall, it is apparent that in the long run, Russia would benefit both economically and politically from assuming a more comprehensive 'green' approach to its economic development. As Makarov et al. (2021) note in their report on Russia's 'green turn': if Russia ignores the advancement of green technology, it will repeat the history of the USSR's falling behind in its technological innovations back in the 1970s–80s. Furthermore, the authors argue that environmental protection in general, and a wide-ranging climate policy in particular, should be important components of Russia's national approach and even its global mission, bringing not only important economic but also political benefits to the country. In contrast, dismissing the problem of climate change would put Russia on the periphery of global governance.

Regional Developments

In 2020, Sakhalin Oblast (a region in the Russian Far East) set an ambitious goal to reach carbon neutrality by 2025. The decision was based on data from the inventory of GHG emissions conducted in 2015–2018. The methods to achieve this neutrality include an already existing program on improving energy efficiency, the gasification of the housing and communal sector (moving away from coal-fired boilers), the electrification of transport, the development of 'green' energy sources (which, according to Sakhalin's official website, includes not only RES but also hydrogen), and the encouragement of the use of green technologies and the production of goods with a low carbon footprint. Carbon neutrality plans also rely on the absorbing capacity of the region's forests, which cover 68% of the region. More importantly, the region will become a testing ground for carbon trade, and if successful, the 'experiment' can be extrapolated to other regions and eventually to the whole country. Hence, regional companies will host or invest in various climate projects to lower their GHG emissions or to receive credits. Sakhalin's 'climate experiment' overall, and its carbon trading attempts in particular, will help Russia test the water with the EU and its CBAM. For example, Russian companies can see if their GHG emissions reduction efforts will be considered by the EU.

In 2021, similar ideas were discussed in the Altai region, which is located in southwestern Siberia. Climatologists, local officials and environmentalists suggest that Altai can also be an important 'pilot' climate project with a high potential to test various ideas about how to lower and/or absorb GHG emissions. Unlike Sakhalin, the Altai region is not host to any gas or oil industries, but it is an agricultural region. Agriculture is another sector in Russia that requires drastic improvements in more sustainable/low-emissions approaches. Last, the Altai region is home to the first climate afforestation project in Russia, which was carried out under the Kyoto Protocol requirements and has been officially acknowledged by the UNFCCC.

Another region that is worth closer examination in the near future is the Murmansk Oblast located in Northwest Russia, almost completely above the Arctic Circle. In June 2021, RUSNANO (Russian innovation development institute) signed an agreement with the region's government to initiate another 'pilot' climate project—a 'Carbon Free Zone'. In addition to the usual set of promises to invest in RES and green technologies, this project has a particular emphasis on 'green' hydrogen fuel (generated with wind farms), which will not only be used domestically but will also be an export commodity to trade with the EU.

Finally, in 2021, the Ministry of Science and Higher Education proposed creating a 'network of carbon monitoring sites', or 'carbon polygons'. The official definition of the polygons suggests that they are 'territories with a unique ecosystem, created to implement measures to control GHG emissions with the participation of universities and scientific organizations' (https://minobrnauki.gov.ru/action/poligony/). At the time of writing, it has been proposed that polygons should be located in the Chechen Republic, Kaliningrad Oblast, Krasnodar Krai, Sakhalin Oblast, Novosibirsk Oblast, Sverdlovsk Oblast and Tyumen Oblast. In August 2021, the latter became home to the first opened carbon polygon.

Similarly, it is too early to state whether any of these initiatives will have a substantial impact on Russia's carbon footprint. However, it is important that they now exist and cover a diverse range of federal subjects throughout Russia; therefore, intentionally or unintentionally, they are prone to involve an increasing number of actors and institutions in the national climate change agenda. Thus, at the very least, they will be advancing climate change awareness.

Conclusion

For years, Russia has shown relatively low levels of climate change awareness and concern (Poberezhskaya 2016). Even when people's livelihoods have been directly endangered by the negative consequences of climate change, there has been skepticism about the anthropogenic link (Graybill 2013). An opinion poll published by the UNDP and the University of Oxford in 2021 showed some positive dynamics, with 65% of respondents in Russia stating their belief in the climate change crisis (this is slightly above the average among the 50 countries surveyed). However, only 49% of those surveyed agreed that 'we should do everything necessary' to combat the climate problem, which once again puts Russia at the bottom of the list (https://www.undp.org/publications/peoples-climate-vote). A year earlier, an opinion poll conducted by IPSOS (https://www.ipsos.com/sites/default/files/ct/news/documents/2020-04/earth-day-2020-ipsos.pdf) showed that Russians are the least likely among the surveyed countries to make a link between climate change and the state's responsibility. This is not just a problem of climate change knowledge but a product of a range of other social, economic and political issues. Of course, it does not help that some degree of climate skepticism keeps reappearing in the official discourse. For example, in May 2021, a document from the Ministry of Foreign Affairs offered support for climate mitigation steps but also advocated for assisting research studies that look into 'alternative' viewpoints on climate change origins. One can hope that, as we see more advancements in the climate policy legal framework in Russia and as climate projects drop the word 'pilot' from their titles and become more rou-

tine, we will start witnessing the purposeful reduction of GHG emissions and greater climate change awareness and concern, which, hopefully, may become more prominent across Russia.

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ANALYSIS

Challenges of Forest Fires in Russia

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Abstract
Forest fires in Russia have increased in scale in recent years. While climatic conditions do influence the incidence of fires, their increase also reflects socioeconomic changes and policy failures associated with the forest management system in Russia, such as the overemphasis on privatized forestry and the misallocation of forest protection budgets disfavoring the sparsely populated and forest-rich eastern regions.

Introduction
Large-scale events of wildfires in Siberia in recent years have promoted worldwide interest in the situations of wildfires in Russia. They have broad implications not only for Russia domestically but also for global air quality and climate. Some scientific studies have indicated that climate change could increase the occurrence of Siberian wildfires in the future through the effects of warmer and drier climate conditions, northward shifts in vegetation patterns, and permafrost thawing (reviewed by Leskinen et al., 2020). The threat of enhanced wildfires as a climate-related long-term risk also seems to be gradually recognized at the level of the national government. As the latest development, in August 2021, President Vladimir Putin stated that there was a connection between climate change and large-scale wildfires in Siberia in the summer of that year (Tass 2021).

Wildfires themselves may occur and spread outside of tree-covered forest areas, but the national patterns and trends of fires mirror the status of forests in Russia and their public management system. Natural drivers, including climatic conditions, do influence the inci-

dence of fires, but socioeconomic and policy-related factors are also important determinants of the trends of forest fires in Russia. The intensification of fire events in recent years could be in part a reflection of policy failures as well as socioeconomic changes that took place over the decades in Russia.

Trends of Forest Fires in Russia Documented in the National Statistics

Satellite-based data on fire occurrence in Russian forests are openly available and have been discussed extensively in the natural scientific literature, and the data indicate an increasing trend of fire-affected areas in Siberia in recent years (e.g., Ponomarev et al., 2021). The official data published by the Russian government also broadly confirm this trend—the annual average fire-affected area increased from 0.6 million hectares in 1991–1995 to 4.9 million hectares in 2015–2019 according to the National Russian Statistical Agency Rosstat, which is also the source of the statistical data referred to in the following text. However, the annual average of fire cases actually decreased substantially during the same period, from approximately 22,000 cases in 1991–1995 to 12,000 cases in 2015–2019 nationally. Meanwhile, the total area of forests in Russia remained mostly unchanged during that period (approximately 1,180 million hectares).

Russian governmental statistics also record the causes of fires. In the 1995–2011 period in which data were available, a dominant proportion of fire incidences (75% of all documented fire cases) was caused by human factors, whereas the economic activities of organizations and natural factors such as dry storms were responsible for 10% and 9% of events, respectively. At least over that period, no systematic trend was apparent for the share of natural factors, while the percentage of "human factors" showed a decline (from 84% in 1995–1999 to 61% in 2007–2011).

The above-shown counteracting dynamics of increasing fire-affected areas on the one hand and decreasing numbers of fires on the other hand are apparently perplexing, but some general trends of socioeconomic situations and policies in Russia that have existed over the last decades may explain this pattern. In discussing socioeconomic developments in the Republic of Sakha (Yakutia), which hosts a vast share of forests of the Russian Federation, Narita et al. (2021) noted that the collectivization policy in the Soviet era and progressive urbanization over previous decades reduced the number of settlements and population in the remote forest areas in Yakutia, resulting in decreased interfaces between forests and people.

On the one hand, this shift reduced the frequency of fires, but on the other hand, this transition led to the neglect of forests and consequently might have served as a factor that increased the size of events once a fire occurred. Enhanced remoteness of forest areas from human settlements also means increased difficulties in terms of accessing the fire sites by public fire management operations. Under the Russian system, the government is not obliged to extinguish forest fires if they do not affect human activities and settlements[1] (i.e., in the areas designated as "forest fire control zones," which represents the system introduced in October 2015 by the order of the Ministry of Natural Resources).

The links between the trends of socioeconomic conditions and fires are not limited in Yakutia and might also exist at the federal level. Table 1 on p. 8 shows that Russia's two easternmost federal districts (Siberian and Far Eastern Federal Districts) both exhibited a decline in the population density and an increase in the fire-affected areas in the last two decades, while the fire-affected areas have in fact decreased substantially in the same period in the relatively urban two federal districts where Moscow and St. Petersburg are located (Central and Northwestern Federal Districts), possibly as a result of targeted resource allocation by the federal government for fire operations to areas with high population densities. The fire-affected areas of these latter federal districts, however, are negligible in size compared to those of the former districts.

The Russian System of Management of Forest Fires

The Russian Federation has a comprehensive system of forest management, in which both the federal government and the regions (regional administrative units) have functions, and the management of forest fires is incorporated in this framework. Its institutional features reflect the history of the system, which once went through major disruptions around the perestroika era.

The current primary law determining the Russian system of forest management is the Forest Code, which was established in 1997 and amended in 2006. The Code makes it explicit that the government is responsible for extinguishing forest fires and for other fire safety measures. Under the law, regional governments carry out most forest safety management operations within the framework of the powers delegated to them by the federal government, while the federal government provides funding to the regional governments for these measures. In some areas of activities, however, the federal government still directly engages in managerial operations.

1 More precisely, "in the absence of a threat to settlements or economic facilities in cases where the projected costs of extinguishing a forest fire exceed the projected harm that may be caused by them."

In the context of fire safety, these interventions include aircraft-based fire extinguishing activities conducted by the Federal Budgetary Institution "Aviale-sookhrana." As mentioned in Narita et al. (2021), aviation is a major means for forest fire management in Russia and contributes to the elimination of approximately 40% of them nationally. Today, this federal institution consists of 30 teams with 560 service workers (Kozlov 2021). Additionally, in the event of large-scale fires when the forces of the federal institution and of local forest workers and firefighting services are insufficient, different resources may be mobilized. For example, in 2021, organized volunteers made a great contribution to extinguishing forest fires and helping the affected residents in Yakutia. Furthermore, in some cases, the army may be involved in extinguishing forest fires.

A factor that adds complexity to the Russian system of forest management is that the actual jurisdiction over forestland is separately established from the responsibilities for safety-related operations. By maintaining the system established in the Soviet era, the entire forestland ("forest fund") of the country still lies under the jurisdiction of the federal government, which regulates commercial forestry activities in the fund.

Failure of Forest Management as a Driver of the Intensification of Forest Fires in Russia

The separation between the responsibilities for forest safety and protection on the one hand and those of utilization of forest resources on the other hand is a problem for forest management in Russia. For example, the emphasis on the privatization of forestry activities under the Forest Code has reduced the size of the staff engaged in forestry operations, leading to the neglect of fire prevention measures. Additionally, the current system of commercial-based forestry assumes a high productivity of forests applicable only to European Russia and cannot be sustained in the low-productivity forests of Siberia, where large-scale incidents of forest fires have occurred in recent years.

The abovementioned system of forest fire control zones, in which fires are practically left abandoned by the public system of fire protection, is another form of failure. Today, the area of the control zones is approximately 45% of the total forest fund. In 2019, 90% of catastrophic fires in Siberia and the Far East occurred precisely in the control zones, mainly in the Krasnoyarsk Territory, the Republic of Sakha (Yakutia) and the Irkutsk Region. In total (including fires in "unofficial" forests, for example, not on the lands of the forest fund), the fire covered an area of almost 15 million hectares. Greenpeace made an appeal to the State Council last year, with the support of over 400,000 Russians, about the reduction of the share of control zones. Accordingly, the government is expected to review and revise the designation of zones. (Greenpeace 2020)

The need to adjust the forest management system to the increased risks of fires is beginning to be considered in the policy domain. On 13 September 2021, President Putin instructed the federal government to increase the amount of funding for forest protection from wildfires to 14 billion rubles a year (equal to approximately 192 million USD at the current exchange rate). These costs will be included in the federal budget in the next year and will be distributed to the Avialesookhrana and Russian regions in the form of subsidies. The distribution method of subsidies, which is currently based on the population density and disfavors the forest-rich eastern regions, could also be changed. In 2021, the amount of federal money for forest protection from wildfires was 6 billion rubles (82 million USD).

Russian forests and their fire safety measures have significance for the health and life of both domestic and global populations. The Russian government should recognize such multifaceted meanings of its forests and increase public funding for forest protection corresponding to the social benefits of its forests and forest safety.

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Table 1: Population Density and Incidents of Forest Fires in Four Federal Districts (Annual Averages for 2000–2004 and 2015–2019)

	Population density (persons/sq km)			Number of forest fires			Fire-affected areas (hectares)		
	2000–2004	2015–2019	Trend	2000–2004	2015–2019	Trend	2000–2004	2015–2019	Trend
Siberian Federal District	4.1	3.9		9,191	3,797		554,422	1,810,811	
Far Eastern Federal District	1.3	1.2		6,119	4,031		927,244	3,015,795	
Central Federal District	58.3	60.4		4,396	457		11,285	1,885	
Northwestern Federal District	8.3	8.3		4,134	903		65,836	7,336	

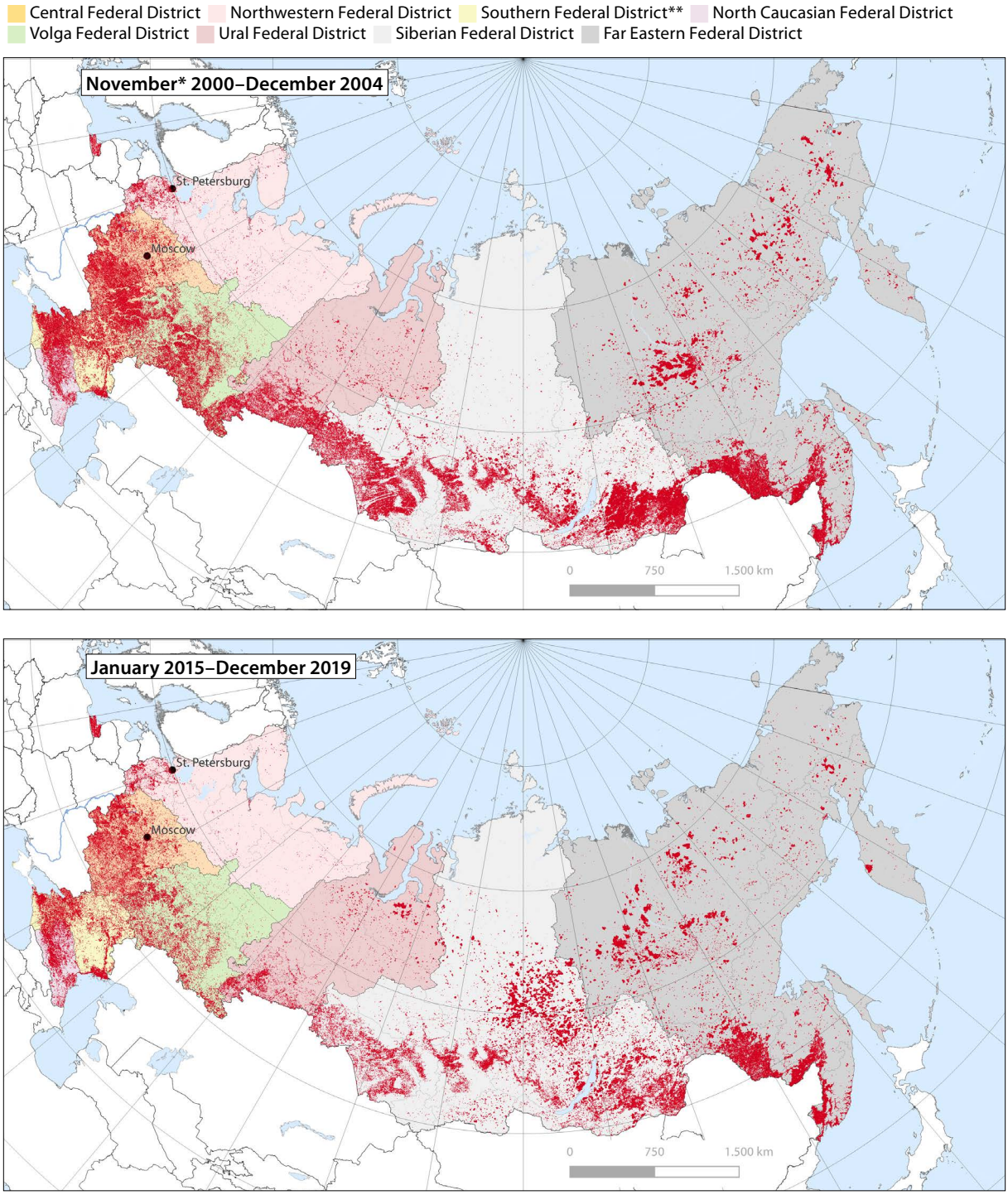
Source: compiled by the authors

See also satellite data on fires and burned areas on pp. 9–10.

MAPS

NASA Satellite Data for Active Fire/Hotspot Information and Burned Areas

Figure 1: Active Fire/Hotspot Data for the Russian Federation Captured by the Moderate Resolution Imaging Spectroradiometer (MODIS) on the Aqua and Terra Satellites November* 2000–December 2004 and January 2015–December 2019

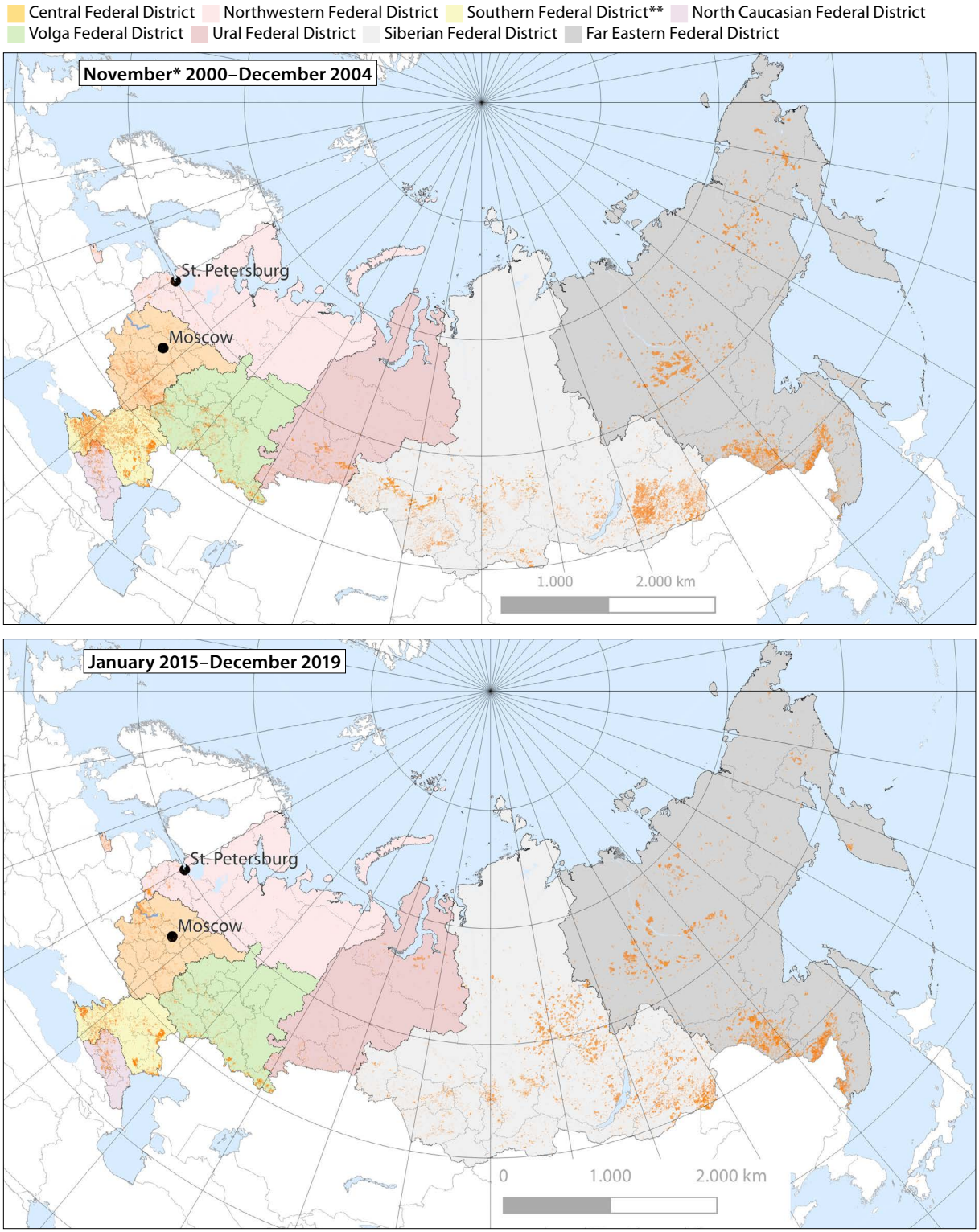


** No data available for January – October 2000*

*** Excludes Crimea and Sevastopol for the years 2015–2019 (both regions were annexed in 2014 by the Russian Federation, this annexation has not been recognized by most of the world's countries).*

Source: Maps created in QGIS by the Research Centre for East European Studies at the University of Bremen, using GIS data from GADM, Openstreetmap, and the MODIS Collection 6 Hotspot / Active Fire Detections MCD14ML distributed from NASA FIRMS. Available on-line https://earthdata.nasa.gov/firms. *doi: 10.5067/FIRMS/MODIS/MCD14ML (from NASA's Fire Information for Resource Management System (FIRMS), part of NASA's Earth Observing System Data and Information System (EOSDIS); please see also the disclaimer at:* https://earthdata.nasa.gov/earth-observation-data/near-real-time/citation#ed-lance-disclaimer.

Figure 2: Burnt Areas Data for the Russian Federation Captured by the Moderate Resolution Imaging Spectroradiometer (MODIS) on the Aqua and Terra Satellites November 2000–December 2004 and January 2015–December 2019



** No data available for January – October 2000*
*** Excludes Crimea and Sevastopol for the years 2015–2019 (both regions were annexed in 2014 by the Russian Federation, this annexation has not been recognized by most of the world's countries.*
Source: University of Maryland, sftp://fuoco.geog.umd.edu

ANALYSIS

Will Russian Agriculture Benefit from Climate Change?

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Abstract
Climate change threatens large swaths of global agriculture. However, the global North could benefit agriculturally and economically from warming. Russia is therefore increasingly portrayed internationally as a major beneficiary of climate change. Is climate change driving today's agricultural heavyweight player to become an internationally dominant agricultural giant? In this article, I reflect on recent and important scientific studies to investigate this question.

Russia's Path to Becoming an Agricultural Giant
Systemic change and profound social transformation in the early 1990s led Russian agriculture into a tremendous crisis. Agricultural yields and cultivated land declined, and livestock production collapsed. Around the turn of the millennium, political and farm structures stabilized, and the Russian agricultural sector entered a boom phase that continues to this day. The upswing is due less to an increase in cultivated land and more to rising productivity. While average wheat yields in the 1990s were 1.6 tons per hectare (t/ha), this metric increased to 2.0 t/ha in the 2000s and 2.4 t/ha in the 2010s (FAOSTAT, 2021). Although yields to date remain far below those of the leading grain producers, for example, in the European Union, Russia is now an agricultural heavyweight. The world's largest country supplied 23% of global wheat exports in the 2017/18 season. The Russian agricultural sector is thus not only a driving force of domestic economic growth, but also a crucial pillar for global food security. Against this background, climatic developments in Russia are being followed with great international attention (for example, Lustgarten, 2020).

Is the Recent Agricultural Boom due to Climate Change?
Warming in the southern Black Earth region, where the main agricultural areas are located, has been well above the global increase in recent decades, with 0.4–0.5 °C warming per decade (Agafonova et al., 2017). Several scientific studies show that the large yield increases there in recent years are not due to improved climatic conditions. In contrast, a groundbreaking study indicated that Russian wheat yields would have been 15% higher between 1980 and 2008 if the climate had not changed during that period (Lobell et al., 2011). In addition, annual weather-related yield fluctuations have been high for many years and continue to rise. The number of hot summers doubled between 1980 and 2012 compared to the previous three decades. The extreme drought of 2010 resulted in yield declines (Hunt et al., 2021), prompting the Russian government to block grain exports in August 2010 to counteract domestic food inflation (Svanidze et al., 2019). Russia's export restrictions have contributed to rapid price increases and social unrest worldwide (which is particularly severe in Egypt).

How Will Climate Change Affect Crop Production in Russia?
Russian land area is projected to warm by 2.6 to 3.4 °C by 2050, depending on trends in global greenhouse gas emissions. Warming is expected to be slightly greater in the north than in the south. It has been calculated that today's subarctic climate in northern Russia may change from a summer warm to hot continental climate by 2071–2100. Russia will then have a climate similar to the wheat belt of the United States (Beck et al., 2018). Permafrost soils will retreat far into northern Russia. Precipitation forecasts are more uncertain than temperature forecasts, but there is clear evidence of a positive trend (10–20% increase) across the largest part of Russia. Extreme weather is very likely to increase. If global warming exceeds 1.5 °C, drought events as intense and widespread as those in 2010 will be much more likely in a few decades than they are today (Templ and Calanca, 2020). Another study modeled that a weather constellation similar to 2010, in combination with lower soil moisture, would result in much more intense droughts in the future than in this extreme year (Rasmijn et al., 2018).

What do these climate prospects mean for Russian agriculture? Almost all studies suggest that climate change will negatively affect yields in the southern Black Earth region, especially in the absence of adaptation. In particular, greater heat and water stress during key developmental stages in early summer are likely to affect crops in the Black Earth region even more than today. Yield reductions are expected to be higher for spring crops than for winter crops. The highest yield declines are expected in the Volga region, where spring crops are predominantly grown. It is very likely that more frequent and intensifying extreme weather events will increase annual yield variability in the Black Earth region.

There is also widespread scientific agreement that higher temperatures and, in particular, an extended growing season will allow for higher yields north of the Black Earth region (roughly between 54° and 60° north latitude) in the future. Even further north (roughly north of 60° latitude, i.e., north of St. Petersburg), where little grain or small amounts of forage have been produced to date, warming could produce even more dramatic changes. Numerous recent studies, some of which have received much attention, imply that the future climate in northern Canada, Scandinavia, and especially Russia will be favorable for crop production within a few decades (Hannah et al., 2020, Xu et al., 2020). According to these studies, a broad swath of northern Russia will cultivate wheat and potatoes in a few decades. The future shift of agricultural suitability toward the north is very well illustrated in Figure 3 in Di Paola et al. (2018).

Can Future Climate Advantages Be Exploited in the North?

In the medium term (until 2050), development opportunities are most favorable for the strip north of the Black Earth region (54°–60°N). This region is well developed in terms of infrastructure and agricultural structure, and approximately half of Russia's total population lives here (although massive rural depopulation since the collapse of the Soviet Union has hit this region). Our research has shown that very large yield increases are possible in this region, especially if nutrient fertilization and crop protection are optimized (Schierhorn et al., 2014). Improved varieties, modern agricultural management, and more favorable climatic conditions could also lead to increases in terms of yield. Our research also indicates that the largest areas of abandoned agricultural land are located north of the Black Earth region (Lesiv et al., 2018). Abandoned land that has not yet stored large amounts of carbon in the soil and vegetation (some areas are already forested) could be transformed into high-yielding fields in the next few decades. In the long term (by 2100), increasing extreme weather events could, however, put a lot of pressure on cropland in this region, according to most climate predictions.

For regions north of the 60th parallel, agricultural potential, in my view, should be evaluated realistically and in a differentiated way. Only 4.5% of the Russian population lives in this region, and there are good reasons for this: short days in the winter months (which, of course, will not shift along with climate change), extreme weather conditions, and poor infrastructure; these features characterize northern Russia. The thawing and accompanying subsidence of permafrost poses huge challenges and investments for settlements in northern Russia (Shemetov, 2021). The Russian government is offering immigrants free land in northern Russia, but this initiative has been quite unsuccessful thus far, according to several recent newspaper articles. All in all, these are rather unfavorable conditions for positive demographic growth in this region in the medium term.

There are also arguments against exaggerated expectations with regard to agricultural suitability: Although the growing season will be longer on average, the number of warm days per year will be subject to strong annual fluctuations. Frequent late frosts and unstable summer precipitation will also affect agriculture in northern Russia for a long time. There is preliminary scientific evidence that thawing permafrost soils could flood crop fields or, due to soil erosion, have unfavorable properties for crop production (Desyatkin et al., 2021). Last but not least, ecological factors limit the agricultural potential of northern Russia. Most of the area north of 60 degrees latitude is forested, and large amounts of carbon and methane are stored in the vegetation and soil. The conversion of forests and permafrost soils to cropland is very likely to result in high greenhouse gas emissions. The draining of peatlands, which are widespread in northern Russia, is also associated with large emissions. There is also evidence that cropping leads to faster permafrost thawing than other land uses, driving climate change.

Conclusion

To date, the Russian grain sector has been on a growth trajectory. However, the bulk of grain is produced in the fertile southern Black Earth region. There, it has already become too hot and/or too dry for primary crops, but almost all climate models predict less favorable climatic conditions for crop production. Regions north of the Black Earth region are expected to benefit from warming, and large jumps in yield are realistic there. Given the widespread abandoned croplands in this part of the country, land under cultivation could be increased. Climate change will also open up areas further north to crop production. However, many agroclimatic and socioeconomic factors will still severely limit agricultural development in northern Russia in the coming decades. Climate change poses major challenges for Russian agriculture and Russian policy. A narrative in which climate change will have only positive effects on agriculture in Russia is undifferentiated and misleading.

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ANALYSIS

Why Do Farms in Russia Engage in Corporate Social Responsibility? An Assessment of Survey Results

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Abstract
This article presents the results of an analysis of the institutional, organizational and individual (personal) drivers of socially responsible activities of Russian agricultural enterprises. Assessment of the results of a farm survey in Russia reveals notable positive effects of farm size (in terms of land area), access to local labor, and insecure land use conditions on enterprises' engagement in corporate social responsibility (CSR) activities. Moreover, individually owned farms tend to have more CSR affinity than corporate farms. Additionally, livestock-specialized farms are more likely to engage in CSR than pure crop-producing farms.

Multilevel Nature of CSR Motivations
CSR is generally considered to be a firm's action that appears to further some social good beyond the interests of the firm and beyond that which is required by law. Recent empirical evidence suggests that farming enterprises in the former Soviet Republics increasingly conduct various CSR activities. For instance, commercial farms in Russia have been found to sponsor social infrastructure and services, such as clearing roads from snow and supporting schools and culture clubs. In addition, farms invest in improvements of rural technical infrastructure: roads, electricity lines, and water and gas pipelines. Based on these findings, CSR in the agriculture of Russia can be generally defined as the social and technical infrastructure provided by farms in rural areas. This is in line with a broad consensus among CSR researchers that context-specific definitions of CSR have become increasingly relevant. However, it is rather unclear why agricultural enterprises in Russia engage in these seemingly economically unrewarding activities.

Existing research suggests that, in general, the likelihood of enterprises' engagement in CSR activities is shaped by the factors arising at different levels, namely, institutional, organizational, and individual levels. At the institutional level, CSR is a way to respond to the pressures of legitimacy and power that society grants to businesses. At the organizational level, it represents public responsibility for problems and social issues that derive from business operations and interests. At the individual level, CSR is characterized by managerial discretion or the morality of managers. Thus, understanding the reasons for CSR engagement requires a multilevel analysis, a task that has rarely been undertaken or accomplished before. The present article presents the results of a unique research effort that employed a multilevel approach to study the drivers of farms' social engagement at different CSR levels in Russia[1]. Prior to proceeding to the research results, we provide background information on the institutional preconditions for farms' interactions with rural society in Russia.

Farms' Social Engagement in Russia: Historical and Contemporary Developments
Historically, a symbiosis between large-scale collective farms and small-scale rural households existed in all Soviet Republics. In addition to being a major source of food and agricultural products for the urban population, the Soviet Republics' large-scale farms were nearly exclusive employers for the rural population. While being a cornerstone of the Soviet rural economy, collective farms also maintained a tight 'informal contract' between large-scale producers and the rural population. Economically, such symbiosis implied (and often forced) a flow of labor from rural households to farms. However, in exchange, workers gained wage top-ups and subsistence farming support that was informally encouraged by the collectives. Due to this symbiosis, the rural population received secure employment and gained access to production inputs such as seeds, fertilizer, and machinery. In the long term, such symbiosis provided rural communities with secure employment, social services (education, medicine, legal services, cultural life, etc.) and infrastructure (roads, post office, electricity, water, sanitation, energy resources, etc.).

The end of the Soviet era and ensuing farm restructuring dismantled this social contract. No central planning office forced the agricultural enterprises to continue their social obligations anymore. Legislation entrusted local authorities with the task of providing social, cultural, entertainment, and servicing facilities, tasks that had previously been done by collective farms, while some facil-

1 The original study is based on the analysis of survey results conducted for farms in Russia and Kazakhstan. This article presents the results only for Russia although our findings did not differ much between Russia and Kazakhstan.

ities were privatized. However, central governments did not provide sufficient financial resources to allow local authorities to meet their new duties. As a result, many social facilities were closed, whereas privately owned facilities adopted a commercial orientation with higher service charges that took them out of reach for average rural people. With decollectivization and privatization, a substantial share of the rural population became unemployed. Increasing migration of the economically active population to urban regions and an increasing mortality rate among elderly individuals within the rural population have emerged as a consequence. At the same time, land market reforms enabled millions of rural inhabitants to become private landowners of small farmland plots, which they could either use for their own agricultural production or lease out to (now privatized) farms, thus improving their own income.

As a result of these transformations, farming enterprises, i.e., now privately owned individual/family and corporate farms, face a number of economic and moral challenges. From an economic perspective, farms are particularly threatened by a deficit of farm labor caused by growing outmigration and ageing of the rural population. In addition, access to farmland as a production factor is associated with high transaction costs induced by the need to manage numerous lease contracts with smallholder landowners. From a moral perspective, farms are confronted with high societal expectations. Empirical evidence shows that rural communities, farm employees and local authorities demand various forms of social support from farming enterprises in Russia. In part, the reminiscences of the abovementioned symbiosis between collective farms and rural households that existed during Soviet times drive these expectations. However, new expectations of the farming sector have also arisen in the transition period as a result of worsening living conditions in rural areas. Overall, these developments provide the baseline for farms' motivations to engage in a broad range of CSR activities in Russia. However, the exact institutional, organizational and managerial determinants of farms' CSR aspirations, as well as the magnitude of their effects on actual CSR implementation, remain largely undisclosed and, therefore, require more in-depth scrutiny.

How Farms' CSR Engagement in Russia was Analyzed

The subsequent analysis draws on survey data collected from a sample of 600 agricultural producers in Russia. Questionnaires were administered among randomly selected farms in five regions (Belgorod, Ryazan, Stavropol, Altai Krai and Novosibirsk). These regions were purposively selected for data collection to capture the diversity of the main agricultural regions in Russia, inside and outside of the Black Earth Region, as well as in the European and Siberian regions.

To determine whether a farm participates in CSR activities, we asked the respondents four questions to inquire whether their farm conducts CSR activities targeting the development of (1) the local community, (2) rural inhabitants, (3) physical infrastructure, or (4) social infrastructure. Each question allowed for Yes/No/Don't know answers. Based on the four questions, we constructed a dependent variable 'conducts any CSR activity', which takes the value of 'Yes' if any of the four CSR variables states 'Yes'.

The remaining part of the questionnaire included questions that aimed to identify the institutional, organizational and managerial (personal) determinants of farms' CSR engagement. The institutional-level questions concerned farms' actual figures and farmers' perceptions of access to land, labor and capital as well as farmers' assessment of the strength of existing institutions. At the organizational level, the survey inquired about farm size, ownership (legal form) and specialization (crop vs. livestock production). Finally, at the managerial level, the survey collected data on the sociodemographic characteristics of farm managers: age, gender, and education. To test the effects of all these indicators on farms' likelihood of CSR engagement, we assessed the survey data using a logistic regression model.

Determinants of Farms' CSR Engagement

The results of the analysis at the institutional level show that primarily the risk of losing farmland, dependence on sourcing of local labor and, to a lesser extent, farm credit constraints make farms decide to engage in CSR activities. These findings point to turbulence within the local institutional environment in which farms operate. At the same time, farmers' perceptions of the strength of general institutions are not an important driver of CSR. For instance, farmers' trust in the courts' conflict resolution capacity has no statistically significant effect on farms' CSR engagement.

Our results at the organizational level show that the likelihood of CSR engagement increases with growing farm size. Farms that both lease and own larger land areas are more likely to engage in CSR. Previous research has underlined land lease as a factor that makes farms conduct CSR to address the uncertain lessee-landowner relationships in transition countries. Our novel finding is that a farm's ownership of land increases the likelihood of the farm's CSR. On the one hand, this result points to a potentially positive effect of farms' embeddedness within local communities through land ownership. On the other hand, the effect of land ownership has to be juxtaposed with a strong effect of land use insecurity at the institutional level, which implies that landowners may fear losing land just as land lessees do.

One possible reason for this finding is the presence of individual farms in our sample. In contrast to corpo-

rate farms, individual farms operate mainly on their own land. They are considerably smaller and have less power in the land market than large corporate farms, and thus, they may be concerned about the resilience of their own operations. To this end, our results demonstrate that individual farm ownership makes farms' engagement in CSR more likely than corporate farm ownership. Our analysis also shows a lower likelihood of CSR engagement by farms with a greater value of assets. We relate this result to the need of farms with large asset endowments to commit vast farm resources to maintain and operate those endowments, which reduces the possibility of using resources for other purposes, e.g., CSR. In addition, investments in those assets are mostly credit-financed, which makes farms spend additional resources to service debts.

Another farm-level characteristic—the share of livestock production on a farm—is positively associated with CSR engagement. More CSR in livestock-producing farms can be attributed to their role as an 'infrastructure improver' in a region. Associated with high capital intensity, livestock farms attract a large volume of state subsidized investments to build new production facilities. These construction works involve not only farm buildings but also access roads, electricity lines, wastewater disposal and sanitation facilities. Another reason why livestock farms would engage in CSR is their closer consumer proximity than that of pure crop farms. Livestock farms, especially in Russia, are often vertically integrated with processing facilities and produce foodstuffs, such as processed milk and meat products, under their own brands. Along with infrastructural improvements, these enterprises may engage in explicit CSR activities to gain a positive public image for their brands.

Surprisingly, the study has not found any significant effects of managerial-level indicators on farms' CSR engagement. This result suggests that farms engage in CSR regardless of their managers' age, gender and educational characteristics. Using a different set of managerial-level indicators in studying farms' CSR in the future may produce more insightful results.

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Further Readings

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ABOUT THE RUSSIAN ANALYTICAL DIGEST

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