ORIGINAL PAPER

DOI: 10.26794/2220-6469-2022-16-2-76-88
UDC 330.15(045)
JEL Q53

Air Quality as a Priority Issue for the New Economy

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ABSTRACT

The article talks about the problem of air pollution. In the world, its economic, social, and environmental aspects are receiving increased attention. This trend is clearly visible in the example of the UN Sustainable Development Goals (SDGs), adopted by all countries of the world in 2015 with a horizon of implementation up to 2030. A significant part of the SDGs is directly or indirectly related to combating air pollution, which will improve the health of the population and life cities, mitigate climate problems, create a new energy sector, implement new technologies, etc. Here we can mention SDG 3 (health), SDG 7 (energy), SDG 8 (economic growth), SDG 9 (industrialization and innovation), SDG 11 (sustainable cities), SDG 13 (climate), SDG 15 (terrestrial ecosystems). In fact, we can talk about the formed "air" priorities in the transition to new economic models, primarily green and low-carbon ones.

Keywords: air quality; public health; pollution damage; low-carbon economy; climate; greenhouse gases; monitoring

For citation: **Bobylev S.N., Solovyeva S.V., Astapkovich M. Air quality as a priority issue for the new economy. *The World of the New Economy.* 2022;16(2):76-88. DOI: 10.26794/2220-6469-2022-16-2-76-88**

INTRODUCTION

In the global context, there is an increasing trend towards prioritizing human health in addressing air pollution issues. It has much to do with awareness of the significance of socio-economic harm and damage from environmental degradation for quality of life and human development. In addition to health, may be noted a variety of environmental and economic damage, negative externalities, higher economic costs associated with natural resource degradation and pollution. To the thesis "cannot be healthy in a polluted environment" can be applied economic interpretation: "be healthy in a polluted environment is very expensive", because the cost of preventing or treating diseases caused by environmental degradation is high.

Economic valuation of pollution damage is a complex problem, depending, in particular, on the correct monitoring and determination of the environmentally dependent proportion of the population's health. Global and national researches show that the majority of damage is caused by air pollution, and less damage from water and waste.

According to UN agencies, air pollution is the most important environmental contributor to the global disease burden, every year leading to the premature death of millions of people and large economic losses. Monetary valuation of global welfare losses due to this pollution is estimated at 5.1 trillion dollars (or 6.6% global product). Nine out of ten city residents breathe polluted air, i.e. air does not conform with requirements of the World Health Organization. Air quality has deteriorated since 2010, with more than 50% of the world's population breathing (shorturl.at/ovBO6, shorturl.at/irvyD) [1].

The World Bank estimates air pollution losses in Europe and Central Asia account for 5.1% of GDP, with a maximum of 7.5% in East and South Asia (http://hdl.handle.net/10986/25013).

The country's unsustainable export-commodity model of the economy is causing enormous social, environmental and economic losses, occurring, in particular, of high environmental pollution and detrimental harmful to public health. According to WHO estimates, in Russia can prematurely die due to air pollution up to 100 thous. people. (https://ourworldindata.org/grapher/number-of-deaths-by-risk-factor?country=~RUS). The President of the Russian Federation cited a dramatic figure of losses from environmental degradation: "In a number of directions, the pressure on nature has reached critical values. As a result, the annual economic damage reaches up to 6% of GDP, and, given the health effects — up to 15%" (http://kremlin.ru/events/president/news/53602). Taking into account that in 2010 the economic development of the country and its regions was about 1–2% of GDP/GRP, the need to radically change the socio-economic model of development, the identification of new priorities is obvious. A transition to a green economy and its different types is needed: low carbon, circular (closed cycle economy), blue, bioeconomy. This economic transformation is increasingly evident in the world, especially in relation to climate policy.

In Russia, air quality improvement can contribute to solving important socio-economic problems facing the country, in particular in the field of national projects in the fields of environment, health, demography, housing and urban environment. Addressing these challenges is also consistent with the growing role of the ESG priorities of organizations in the environmental and social fields of economic activity.

In the economic context, air pollution is closely linked to arising social damage, health damage and increased costs of protection, reduced productivity, external costs, necessity for significant investment in emissions monitoring and even more significant — emission reductions.

Reports by UN international organizations, World Bank, OECD, researches by foreign scientists give much attention to air emissions and air pollution.

According to OECD estimates, global economic losses due to premature mortality due to air pollution of fine-dispersed suspended particulate matter (PM) and ground-level ozone (O_3), exceed 1.7 trillion USD per year, which corresponds to about 3.5% of global GDP. Russian losses are estimated at 12.5% of GDP — the highest rate among OECD and BRICS countries [2].

World Bank estimates are even higher: PM air pollution causes losses in 2019, equivalent to 6.1% of global GDP for 93 billion days of living with disease and 6.4 million premature deaths (http://hdl.handle.net/10986/36501). For comparison, by December 2021, the COVID-19 pandemic claimed 5.2 million lives (https://coronavirus.jhu.edu/map.html).

Country analyses of economic losses from air pollution show high economic losses for both developed and developing countries. Damage to health due to air pollution from fossil fuel combustion alone for Russia is estimated at 4.1% of GDP [3].

Panel data research of 195 countries found that Russia (together with China, India, USA, Germany and Japan) — among the countries with the highest rates of economic loss due to premature mortality, effects-related PM2.5 and ozone. Russia's total losses by 2017 are estimated at 237 billion USD (in 2010 prices) [4].

Many works by foreign authors focused on address the problem with air pollution. Analysis of the results of regional air pollution abatement programmes shows positive economic effects. Implementation of the Air Pollution Prevention and Control Action Plan in Beijing 2014–2017 resulted in a significant improvement in the quality of life in the region, mainly due to lower health costs for residents. The positive economic impact of the five-year programme is estimated at 4% of GRP [5]. The focus of the program was on PM, which, according to another research, makes the most significant contribution to air quality in major Chinese cities [6].

Conclusions on the causal relationship between the content of fine-dispersed airborne particles and the productivity of labour on these EU countries data. Increase of PM2.5 concentration per 1 micrograms/m^3 in air leads to decrease of real GDP by 0.8% due to reduced labor efficiency [7]. The results are the basis for the conclusions that strict air quality management is justified at least to increase productivity.

Combating atmospheric pollution contributes to reducing emissions of CO_2, methane and other greenhouse gases, helping to cope with climate change. 29 October 2021 The Government of the Russian Federation was accepted "Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050", and President of the Russian Federation declared his intention to achieve carbon neutrality to 2060.

In 2020–2021, almost all countries with developed economies declared a transition to carbon neutrality by 2050–2060, which means radical structural and technological transformation to construction a new low-carbon economy.

Special attention is given to the economic effects of air pollution in the context of countries' climate policies. Reduced greenhouse gas emissions correlate with reduced concentrations of other pollutants in the air (PM, SO_2, NO_x, volatile organic matter, etc.). The net positive effect of reducing the concentration of harmful substances in the air as a result of limiting greenhouse gas emissions is estimated at +0.5% of GDP for India and +1.5% GDP for China to 2050 year. For developed economies, this collateral effect is somewhat lower [8, 9].

In domestic scientific literature has experience in economic valuation of environmental and air pollution losses. The works of S. N. Bobylev, O. E. Medvedeva, G. E. Mekush, E. A. Ryumina, S. V. Solovyeva, A. S. Tulupov, G. A. Fomenko are devoted to these issues [10–14]. According to E. A. Ryumina estimates, the damage caused by emissions from industrial sources ranges from 4% of GRP in low-development regions to 17% of GRP in high-development regions [15].

AIR QUALITY TRENDS

After the 1998–1999 crisis, in country was a significant rise in total emissions of pollutants into the air, however, in 2005–2014 there was a rapid fall. This is a positive trend, indicating a decrease in many indicators of pollution intensity and decoupling effects. The changes were the result of structural and technological changes and timely environmental and economic decisions in the economy. However, in a context of stagnating of the economy after 2014, this indicator is increasing due to mobile sources, mainly by road transport, while emissions from stationary sources have stabilized somewhat.

Pollution is strongly influenced by the lag in the technological base of the economy — depreciation of a significant part of physical capital and fixed assets, their high age.

Pollutant emissions are unevenly distributed throughout the Russian Federation. Most of them are concentrated in cities and near industrial centres. Therefore, it is very important for the country to take into account the regional factor in pollution issues. In 2020, air pollution was high and very high in 34 cities in the Russian Federation (15% of all cities of the country). These cities have 9.6 million peoples (9% of the urban population). For a year in 133 cities (53% of cities with observations) had average concentrations of substances exceeding 1 MPL. They have a population of 102.9 million people (*fig. 1*).

Every year in the country is compiled a list of cities which includes urban areas with very high levels of air pollution, for which the integrated Atmospheric Pollution Index (API) is equal to or higher than 14. Among them: Norilsk, Novokuznetsk, Irkutsk, Krasnoyarsk, Nizhny Tagil, Chita, etc.

Transport, mainly by road, contributes significantly to total emissions. This problem

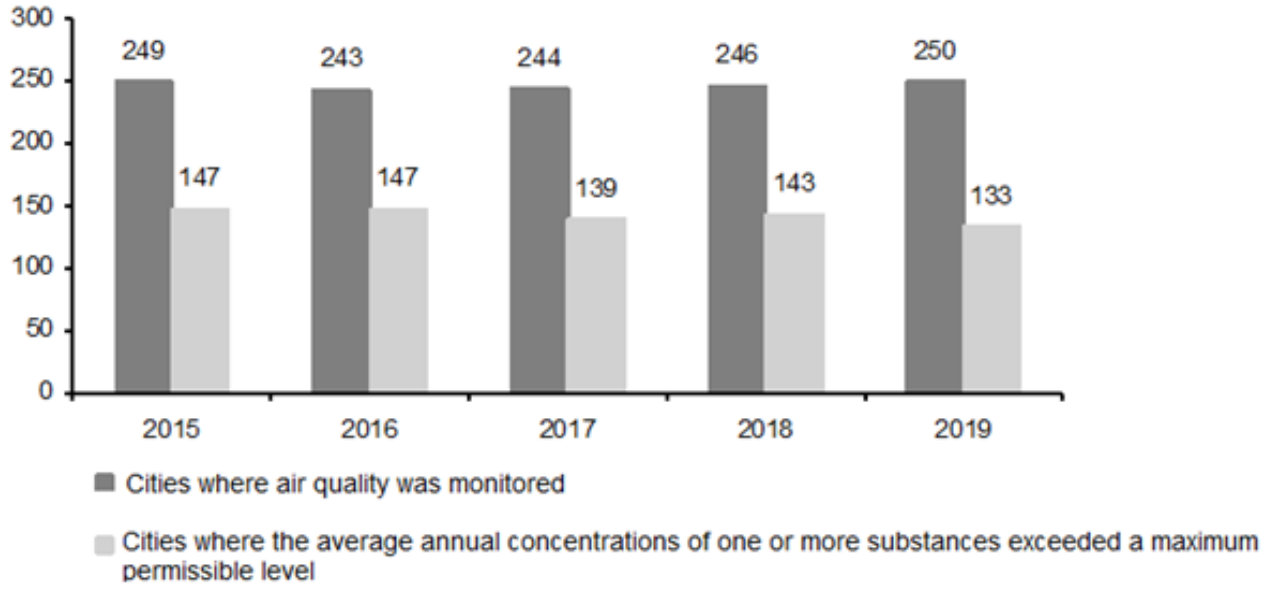

Fig. 1. **Cities suffering excess of the annual maximum permissible level of pollutants in the atmosphere, number of cities**

Source: Environmental Protection in Russia. Moscow: Rosstat; 2020.

particularly affects large cities where vehicle emissions may exceed 90% of total pollution (https://ac.gov.ru/files/publication/a/23713.pdf).

There is a significant regional variation in the distribution of air pollution by city. Currently, the urban population of the Siberian (55% of the population) and the Far East (25% of the population) of the federal districts suffers most from poor air quality. This situation contributes to the outflow of residents of these regions. The best environmental situation in the cities of the North-West and Volga federal districts.

There are many gaps and contradictions in air pollution statistics. In 2014, there was a significant relaxation of air quality standards, which led to a one-time reduction in the number of cities with high levels of pollution — from 123 in 2013 year to 51 in 2014 year. This softening has caused a mixed reaction of medical and epidemiologists. Since 2019, data on emissions from road and rail transport have been submitted by Rosstat taking into account the requirements of the Customs Union and OECD for environmental classes, quality and fuel types. As a result, emissions from mobile sources decreased almost on three times. However, correction of statistics is needed for comparability of data from different years and emissions.

AIR POLLUTION ECONOMICS

Macroeconomic and regional estimates of health damage relative to GDP and GRP were obtained in Russia in the early 2000s in the framework of the project of the Ministry of Nature, the World Bank and the Faculty of Economics of Lomonosov Moscow State University [16]. Based on health risk assessment methods, widely used in the world, health costs were calculated, resulting from air and water pollution in Russia, including morbidity and mortality factors. The model "EcoSense" developed at Stuttgart University was used in Russia for the regional assessment of damage to health from environmental pollution. It was used to assess damage (harm) from air pollution. Calculations based on this model showed that harm to health for environmental reasons can reach 8–10% of

GRP, in particular for the Ural regions and the Kemerovo Oblast.

More detailed calculations based on health damage data from selected air pollutants have recently become possible. Thus, the authors' calculations are based on researches by the British Department for Environment, Food and Rural Affairs (DEFRA) on pollutants NO_x, SO_2, NH_3, PM2.5 and PM10 show that valuation of air pollution damage in 2019 in Russia is in the range of 1.9–4.9% of GDP (2123–5415 billion rubles) (*table 1*). Indicators of statistical life cost (CLC) and purchasing power parities (PPP) for rubles were used for calculations.

Large-scale expansion of the monitoring network in the country is important to identify air pollution indicators and volumes. This will improve the identification of possible directions of pollution control and prevention of damage to public health [17]. Currently there are 619 posts in the Russian Hydrometeorology network, which is about 30% of the required level according to GOST 17.2.3.01–86 (Nature conservation. Atmosphere). It is estimated that the number of monitoring points in cities should be increased to 2 089, plus 7 947 to be installed in enterprises. Thus, the total number of points should reach 10 026, which will require 19.3 billion rubles taking into account the use of modern small-scale and economical monitoring posts, the trend of which is widely used in the world. This amount is summarized of monitoring costs in cities (3.2 billion rubles) and enterprises (16.1 billion rubles). It is obvious that even at the lower limit of the annual damage to the health of the population from air pollution (2,123 billion rubles), the cost estimate of 19.3 billion rubles for monitoring throughout the country is not significant (less than 1% of annual damage). The same conclusion can be made when comparing the planned costs of the federal project "Clean Air", which is implementation of measures to improve air quality in 2018–2024–500 billion rubles in only 12 cities.

It is very important to include estimates of air pollution damage in macroeconomic indicators. Modern traditional macroeconomic indicators (GDP, GNP, production, consumption, etc.) do not adequately address social and environmental realities and need to be adjusted or replaced to accommodate the transition to sustainable development. Aphoristic this problem was reflected in the title of the book by two Nobel Prize winners, D. Stiglitz and A. Sen in "Mismeasuring our lives: why GDP doesn't add up" [18]. One of the main conclusions of the book is the need to shift the focus of the system of indicators from the measurement of production to the measurement of well-being; while the measurement of well-being must be seen in the context of sustainable development.

Currently, in the field of economic assessment of health damage, there are private indicators related to individual pollutants, various economic standards, specific damage. For example, the World Bank estimates health damage for selected countries from dangerous emissions of fine-dispersed suspended particulate matter PM2.5, which, according to medical opinion, is an extremely dangerous air pollutant (https://data.world/worldbank/world-development-indicators). For the European and Central Asian group (as classified by the Bank), the rate is 19 micrograms/m^3. Russia has less PM2.5 in air — 17 micrograms/m^3, in general, the economic valuation of this value is very significant — 0.4% gross national income. In 2021 WHO had strengthened and reduced the average annual impact rate to PM2.5 from 10 to 5 micrograms/m^3.

The World Bank estimate is likely to be optimistic, since in Russia PM2.5 is monitored in only a few cities. In the country as a whole, the additional mortality due to this type of pollution is estimated by physicians in 68–88 thousand cases a year. Particularly high morbidity due to PM2.5 pollution is observed in Siberia and the Far East, where the fuel balance structure is dominated by thermal

Table 1

Cost estimates of damage from air emissions in Russia (2019)

Pollutant	Damage assessment with CLC, billion rubles	Damage assessment with PPP, billion rubles
Nitrogen oxides NO_x	178.3	454.8
Sulphur dioxide SO_2	232.9	594.1
Ammonia NH_3	7.1	18.0
PM2.5 and PM10	1705	4348
Total, billion rubles (% of GDP)	2123 (1.9% GDP)	5415 (4.9% GDP)

Source: authors' calculations based on Air quality damage cost guidance. DEFRA; 2019. URL: https://www.gov.uk/guidance/air-quality-economic-analysis#damage-costs-approach.

Note: the share of Russia's GDP is calculated based on the 2019 GDP 109,242 RUB bln. URL: https://rosstat.gov.ru/accounts

coal. In Chita, for example, the share of this fuel reaches 95% in the fuel balance. The World Health Organization estimates that in China, people in the metropolis live 5–6 years less than those living in clean areas; coal combustion is primarily responsible for this difference. It can be assumed that Russia's "coal" losses for health account for tens of thousands of years of healthy life.

AIR QUALITY REGULATORY INSTRUMENTS FOR RUSSIAN CITIES

For quality monitoring it is necessary to provide appropriate control equipment about 8 thous. enterprises (at least one monitoring post per significant production platform), as referred above. This is largely due to the implementation of the concept of the best available technologies (BAT) in Russia from 1January 2019, world-wide for the past 20–30 years. This concept has two important criteria: Such technologies minimize environmental impact and are economically accessible. Already identified 300 of the most polluting enterprises, which by 2022 should complete the transition to BAT and obtain comprehensive environmental permits, and by 2024 all industry should adopt these technologies. Such trend sharply increases the requirements for pollution monitoring at enterprises and will require more than 16 billion rubles.

Radical improvements in air monitoring, including satellite monitoring, are required for ecosystems and their services. Russia has huge areas of forests, swamps, steppes, etc., which, because of their assimilative capacity, play a crucial role in ensuring clean air at all levels: local, regional, national, global. Only the regular fires in the forests on the territory of our country, primarily in Siberia and the Far East, cause huge air pollution and increase in the morbidity of the population. Here, first of all, it is necessary to note the huge volumes of fine-dispersed particulate matter PM2.5 and PM10. We can recall the burning swamps in the Moscow region in 2010, that resulted in additional mortality of 11 thous. people (https://www.the-village.ru/city/situation/105137-zhara-i-smog-ubili-11-tysyach-moskvichey-sverh-normy). In 2020, a huge forest area of 9 million hectares was affected by fire (according to some estimates, this figure is low halved) (https://greenpeace.ru/news/ 2021/08/16/2021-god-stal-rekordnym-po-ploshhadi-pozharov/); mega-fires were also observed in 2012, 2016, 2018 and 2019 years (shorturl.at/duAE 6).

The need for adequate air monitoring has been heightened by the pandemic COVID-19.

Air pollution of fine-dispersed particulate matter PM2.5 may be related to the rate of spread of the virus COVID-19 [19]. Results of pilot research by the Harvard School of Public Health on estimating deaths from the disease in human settlements published in 2020, where 90% of the population lives, showed the relationship between mortality from COVID-19 and the concentration of PM2.5 in the air. If the concentration of these particles increases by 1 micrograms/m^3 mortality increases by 15%.

In terms of funding directions is rather problematic the federal project "Clean Air", included in the national project "Ecology", with the selection of priority 12 polluted cities, for which it is expected to spend 500 billion rubles. The selection was based on total emissions but did not take into account ambient air pollution levels and the level of pollution hazards. An important economic principle of "polluter pays" was also violated. Probably only for Chita, where there are no major industrial and energy facilities, federal funding is really needed, and the remaining 11 cities have the largest Russian companies, which are well placed to co-finance environmental projects and monitoring within the framework of public-private partnerships.

Payments for adverse environmental impacts remain an important economic tool for air quality management. The current basic rates for emission ingredients are set by the Government in 2016, followed by the calculation procedure: resolution of the Government of the Russian Federation from 13 September 2016 No. 913 (ed. from 24 January 2020) "On rates of charging for negative impact on the environment and additional rates"; resolution of the Government of the Russian Federation from 03 March 2017 No. 255 (ed. from 17 August 2020) "On calculation and charging for negative impact on the environment" (together with "Rules of calculation and charging for negative impact on the environment"). Adjustment coefficients introduced to stimulate the introduction of BAT: coefficient 0 when switching to BAT, coefficients 25 and 100 — depending on the object category and emission limits achieved: resolution of the Government of the Russian Federation from 31 December 2020 No. 2398 (ed. from 07 October 2021) "On the approval of criteria for the classification of objects with adverse environmental impact to objects I, II, III and IV categories".

The system of payments for negative impact on the environment was established in the Russian Federation in the 1990s to encourage nature conservation and compensation for damage caused by environmental pollution. However, low payments are not sufficient to compensate for losses and stimulate environmental protection. The current payment system performs mainly fiscal functions as a revenue item to the regional budgets.

In 2020, payments for negative environmental impact amounted to 14.5 billion rubles, or 2% of payments for the use of natural resources. Since the significance of the payment for the federal budget is low, it has been transferred to the budgets of the constituent entities of the Russian Federation. The payment for air emissions in 2020 was 2.5 billion rubles (*table 2*).

Payments for a negative impact on the environment reached maximum value in 2015 — about 27 billion rubles and in subsequent years decreased. Receipt of funds as reparation to the environment, stopped in 2020, apparently due to a pandemic (*table 3*).

In general, it should be recognized that the current system of payment for emissions does not serve as a stimulus or fiscal function for the federal budget of the country.

AIR QUALITY MANAGEMENT AND CLIMATE POLICY

Strategy for socio-economic development of the Russian Federation with low greenhouse gas emissions up to 2050, adopted by the Government in October 2021, is an important stage in the implementation of Russia's

Table 2

Payments for negative impact on the environment in the state budget of the Russian Federation, million rubles, 2020

Payments	Consolidated budget of the Russian Federation	from it	
		Federal budget	Consolidated budgets of constituent entities of the Russian Federation
Payments on the use of natural resources	630520	593463	37056
Payment for a negative impact on the environment of which:	14484	0	14484
Payment of air emission	2445	0	2445
Payment of water discharge	2704	0	2704
Payment for accommodation waste	8902	0	8902
Emission payments for associated gas combustion	431	0	431

Source: Consolidated budget of the Russian Federation and budgets of state extra-budgetary funds. 2020. URL: https://roskazna.gov.ru.

Table 3

Payments to the consolidated budget of the Russian Federation for negative impact on the environment, billion rubles

Payment category	2007	2010	2015	2016	2017	2018	2019	2020
Payment for a negative impact on the environment	16.9	20.5	26.8	22.2	14.2	13.1	13.1	14.5
Compensation for damage to the environment	0.09	0.05	1.02	1.86	2.07	1.73	2.30	0.01

Source: On the state and protection of the environment of the Russian Federation in 2020. State report. Mscow: Ministry of Natural Resources of Russia; 2021. (In Russ.). State report "On the state and protection of the environment of the Russian Federation in 2010". Moscow: Ministry of Natural Resources of Russia; 2011.

climate policy and transition to a new, green, low-carbon model of economy ("Strategy of socio-economic development of the Russian Federation with a low level of greenhouse gas emissions until 2050". Approved by the Order of the Government of the Russian Federation from 29 October 2021 No. 3052). Thirty-year planning horizon provides a framework for projection of atmospheric emissions. Two main options for the development of the country's economy are assumed: inertial and intensive. Estimates of

Table 4

Greenhouse gas emissions scenarios in Russia (in million tons of carbon dioxide equivalent, CO_2eg) for the period 2019–2050

Emission changes actor	Inertia scenario	Intensive scenario
Change in emissions, excluding ecosystems including factors of:	+ 464	–356
Growth of GDP	+ 924	+ 924
Electricity	–217	–455
Capture technology CO_2	0	–150
Transport	0	–108
Other sectors	–243	–567
Carbon sequestration of ecosystems	–320	–965
Change in ecosystem emissions	+ 144	–1321

Source: Compiled by the authors based on the data of the project «Strategy of socio-economic development of the Russian Federation with a low level of greenhouse gas emissions until 2050».

Note: Plus sign denotes an increase in emissions; minus sign denotes a decrease in emissions.

greenhouse gas emissions change depending on the contribution of various factors. Most significant factor remains GDP growth — more than 900 million tons CO_2-eq. Compensating factors are the energy efficiency of electricity, transport and other industries, as well as technologies for capturing greenhouse gases. Carbon sequestration by ecosystems is becoming the most important factor.

In inertial scenario, emission reduction CO_2 does not occur, in contrast, emissions are projected to increase by 21.8% from 2050 compared to 2019, excluding ecosystems, including a 43.6% increase in emissions due to GDP growth and a 21.7% decrease in emissions due to energy efficiency measures.

Intensive scenario assumes emission reduction CO_2 by 16.8% from 2050 compared to 2019 excluding ecosystems. GDP growth will offset energy efficiency measures on emissions. The main reduction in emissions — 62.3% by 2050 compared to 2019 — is achieved at the expense of ecosystems (*table 4*).

Dynamics of greenhouse gas emissions in retrospect also demonstrating, that the main factor is the change in production volumes. Analysis of greenhouse gas emissions over the period 1990–2020, especially excluding land use and forestry, the falling trend in 1990–2000 is clearly visible, rising trend in 2000–2008, decline during the global financial crisis 2008–2009, growth in the recovery period 2010–2014 and subsequent stabilization. Accounting for greenhouse gas sequestration in agriculture and forestry reduces emissions but does not change major trends (*fig. 2*).

Extrapolation of the greenhouse gas emission projection from the total input of pollutants into the atmosphere demonstrates the relevance of air quality management measures. Especially the inertial scenario of The Strategy (*table 4*), which shows that technological change alone is not sufficient to offset emissions growth, by increasing GDP and production.

International climate policy includes carbon market management mechanisms:

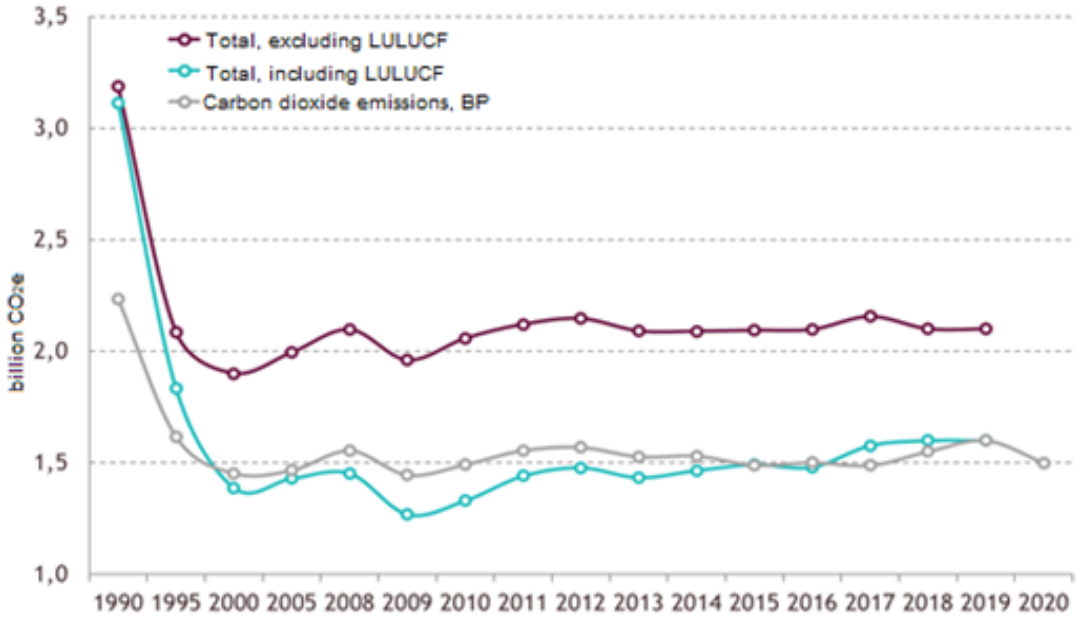

Fig 2. **Emissions of greenhouse gases in Russia for the period 1990–2020. (LULUCF — greenhouse gas emissions and removals associated with land use and forestry)**

Source: compiled by the authors from the online database of Rosstat, BP.

greenhouse gas emission payments, emissions trading system. At the international and national levels are established carbon trading exchanges ETS (Emission trading scheme — greenhouse gas emissions trading scheme).

Climate policy implementation created a market for carbon emissions: первоначально — quasi-market, and now — the real market. The theoretical basis became the work of the Nobel laureate Nordhaus, in which establish social cost of carbon (SCC) as the ultimate social damage from emissions of additional tones CO_2 into the atmosphere. The indicator is determined as a result of modelling the influence of greenhouse gas emissions on economic and geophysical systems. Conservative estimate was 40 dollars/tones CO_2 [20]. Updated calculations using the same model estimated 100 dollars/tones CO_2 and higher taking into account refined damage from climate change [21]. Climate economics is also at its core on research led by N. Stern (2006 r.), in which the economic cost of climate change is estimated at 5% of world GDP [22].

In 2020, 44 countries and 31 regions and cities applied non-zero prices for greenhouse gas emissions ("carbon prices") in the form of a carbon tax or various emissions trading schemes. Carbon prices ranged from 1 to 123 dollars (114 euro) per 1 ton CO_2. More than 75% of price-controlled emissions had a price below 10 dollars (8–9 euro) (http://hdl.handle.net/10986/32419) [23]. In the report of the High-Level Commission on Carbon Pricing (2017) N. Stern and J. Stiglitz recommended an estimate of 40–80 dollars/tones CO_2 in 2020 and 50–100 dollars/tones CO_2 in 2030 in order not to exceed the increase in global temperature by 2 °C [24].

In the new environment, coordination of environmental and climate policies, in particular measures to control atmospheric emissions, is desirable.

Adopted Federal Act of June 2021 "On limiting greenhouse gas emissions", which established the accounting, reporting and inventory of greenhouse gas emissions, a carbon unit as a property right provides the basis for the development of instruments to regulate greenhouse gas emissions into the atmosphere (Federal Act of 02 July 2021 No. 296 "On limiting greenhouse gas emissions").

Because reducing emissions to the atmosphere also reduces greenhouse gas emissions, and environmental protection contributes to the fight against climate change, may introduce a payment for greenhouse gas emissions, supplement or change the current composition of emission payments, optimize the list of controlled substances, enhance the incentive of payments. With 2.1 billion tons of greenhouse gas emissions (2019) establishment of a rate of 1 euro /tones CO_2 (85 rubles/tones CO_2) will generate revenues that are 100% higher than the current air emission fee in the consolidated budget of the Russian Federation.

Improving environmental and climate regulation stimulates the growth of the low-carbon economy. Calibration of economic instruments will contribute to the modernization and restructuring of emission payments, which will reduce administration costs.

CONCLUSION

Russia's commodity export economy is causing high levels of environmental pollution and significant damage to public health. The authors' calculations showed that the cost of air pollution damage could be as high as 5% of GDP.

Russia's stated orientation to transition to a low-carbon economy in 2021, achieving carbon neutrality and reducing greenhouse gas emissions requires a radical transformation of the unsustainable pattern, which has shown itself in stabilizing greenhouse emissions for 2000–2020. The world has essentially two carbon management mechanisms: greenhouse gas emission payments and emissions trading system. Russia will also have to incorporate the "price of carbon" directly or indirectly into economic decision-making.

The analysis showed that the existing air quality management presented by the system of payments for adverse environmental effects, does not create incentives to reduce emissions of pollutants into the atmosphere. In order to achieve a comprehensive and balanced management of air quality, it is necessary to carry out technological modernization, improve statistical support and significantly expand the monitoring network.

ACKNOWLEDGEMENTS

The article was prepared with the financial support of the Russian Foundation for Basic Research within the framework of the scientific project No. 20–010–00981.

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S.N. Bobylev — development of the general concept of the article.
S.V. Solovyov — analysis of Russian research.
M. Astapkovich — nalysis of foreign studies.

Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

The article was received on 08.12.2021; revised on 20.12.2021 and accepted for publication on 12.01.2022. The authors read and approved the final version of the manuscript.