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Yakhya G. Buchaev · Arsen S. Abdulkadyrov · Julia V. Ragulina · Arutyun A. Khachaturyan · Elena G. Popkova *Editors*

Challenges of the Modern Economy

Digital Technologies, Problems, and Focus Areas of the Sustainable Development of Country and Regions

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Introduction: Challenges to Global Sustainable Development and Response Mechanisms in Support of the SDGs at Different Levels of Economics and Governance

Today's economy faces several challenges to sustainability. One of the current global challenges is the COVID-19 pandemic. The unexplored viral threat that poses a high risk to humankind has significantly increased the level of social tension. The situation is complicated by the fact that the traditional mechanism of social cohesion in the face of an external threat is not available because strict quarantine measures involving social distancing have been imposed to contain the disease.

Another global challenge of our time is related to the global financial and economic crisis, which arose in the pandemic and is called the COVID-19 crisis. Social restrictions caused a decline in business activity and slowed the rate of economic growth. Business losses were superimposed on the negative balance of national budgets, which reduced the opportunities for government support to "revive" the economy. Significant increases in demand are also unaffordable against the backdrop of rising inflation and unemployment.

The third global challenge is world economic disintegration. International economic ties, which have been built and strengthened for decades, have shown unexpected fragility in the face of instability because they have not had a sufficiently solid foundation in the form of shared political interests and global cultural ties. The world is approaching a new Pareto-optimal balance of free trading and protectionism. This calls for an overhaul of international partnerships and a renewal of global value chains.

These challenges have created unfavorable conditions in the global economy. Despite the commonality of these conditions for all economic systems and economic entities, adaptation to them and their management is based on different mechanisms (economic, legal, and technological) at each level of the economy. At the national level, it is necessary to revise strategies for sustainable socio-economic development of economic systems (implementation of the 17 SDGs proclaimed by the UN) considering the new realities. There are two critical milestones in the foreseeable future:

- 2025—completion of the planned programs of digital modernization of the economies of the advanced countries of the world;
- 2030—completion of the "Decade of Action."

The legal field also needs to be updated—it must create institutional opportunities to trigger macroeconomic trends of adaptation to the changing global environment. At this level, it is critical to support scientific and technological progress, so that the economic system is not "left behind" the Fourth Industrial Revolution. This requires the development of a "knowledge economy": support for science and education, encouraging the mass development of digital competencies, the dissemination of advanced technologies, and support for the innovative development of entrepreneurship.

At the regional level, greater flexibility in the public administration of the economy is required to consider its territorial characteristics. In this case, we also face the task of updating the regulatory framework, taking into account the macroeconomic development course chosen at the national level and economic practices applied in the region. This book considers a region

as an economic subsystem within the country (territory). Cooperative mechanisms of adaptation to the changing global environment are of particular importance at the regional level of governance.

The priorities for developing the "knowledge economy" formulated at the national level are implemented by the regions with the support of universities as local centers of knowledge and technology and sources of creation and dissemination of innovation. At the regional level, it is especially important to mobilize domestic resources to unlock the potential for economic growth and sustainable development of territories. Digital technologies are used to stimulate business activity and ensure transparency and full coverage of public administration (in the e-government system).

Human resources play a leading role at the corporate level: attracting and retaining the best personnel, developing the corporate knowledge system, and generating know-how when using digital technology are all critical to achieving the efficiency and competitiveness of entrepreneurship. Business networking can also take place, but, in most cases, it is put in a narrow framework dictated by global challenges. At this level, digital technology takes on the most applied meaning and is used to optimize business processes.

Support for sustainability has long ceased to be a superficial market trend and is deeply rooted in corporate strategies. Despite external challenges, support for the SDGs must be continuous because only then will the planned sustainable development results be successfully achieved. It is also necessary to consider the peculiarities of each industry and, when considering them, to activate corporate mechanisms of change management.

Thus, each level of economic activity needs to be studied in detail in its own right and reconsidered from the perspective of the new conditions in the global economy. Although the mechanisms of adaptation and management to changes in the external environment are well known (outlined above), the specifics of their application in relation to the current set of contemporary global challenges of sustainable development and the prospects for improving these mechanisms need in-depth scientific study. In this regard, this book aims to systematically study the challenges of today's economy and the related problems and areas of sustainable development of countries, regions, and businesses, with particular attention to the new prospects offered by the spread of digital technology.

The originality of this book lies in the multi-level study of SDGs' support in the economy in unity, considering the specifics of country, regional, corporate, and sectoral practices. The novelty of the book is associated with the disclosure of a new view of digital technologies. This view, for the first time, shows digital technology as a tool to achieve strategic benchmarks in the field of sustainable development. The advantage of the new view of digital technology formed in the book is that it clearly prioritizes digitalization (secondary) and sustainable development (primary), demonstrates their interconnectedness, and integrates digital technology into SDGs practices, thereby accelerating their achievement.

The book is logically structured into six parts. Part One systematizes and explores the current challenges of the economy as barriers to sustainable development in perspective up to 2025 and 2030. Part Two identifies promising areas for sustainable development of countries and reviews international experience, in particular, the experience of New Zealand, Russia, and the EU (with special attention to Germany and France). The characteristics of developed and developing countries are also considered. Part Three is devoted to the problems and prospects of sustainable development of regions: both southern and northern (the Arctic region).

Part Four focuses on the best practices for sustainable development and support of SDGs in business (both commercial and non-profit, formal and informal), considering the characteristics of the sectors of the economy. Part Five reflects economic and legal foundations and cooperative mechanisms of sustainable development (international trade, customs unions, consumer cooperation, clustering, and integration of universities among themselves and with business). Part Six reveals advanced digital technologies and their contribution to sustainable

development: "green" technologies, Industry 4.0 technologies (Big Data, AI, and robots), and the digital competencies required for their absorption and highly efficient use.

The book is intended for scholars studying sustainable economic development. In the book, they will find a systemic view on the global challenges of sustainable development and scientific and methodological recommendations for providing an effective response to these challenges at every level of the economy: country, regional, and cooperative. The book is additionally of interest to practicing experts. For them, the book reveals in detail the best international practices and offers applied recommendations to support sustainable economic development and implementation of the SDGs in the practice of state (national regulation and public administration of the region) and corporate (in various sectors) management.

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Contents

Challenges of the Modern Economy as Barriers to Sustainable Development

Statistic Indicators for Assessing the Measuring Efficiency to Counter Economic Sanctions

Nina V. Shirkunova, Elena V. Roditelskaya, Svetlana N. Bludova, Gulpari O. Vafodorova, and Irina M. Turlanova

Abstract

This research presents the calculation of these indicators based on statistical information over the past few years. The authors developed statistical indicators to counteract economic sanctions and calculated these indicators for the past five years. The presented technique can be used by government institutions and persons concerned for scientific and practical purposes to conduct statistical analysis.

Keywords

External trade • Commodity composition • Statistic indicators • Economic sanctions • Import • Export • Import substitution

JEL Classification

F10 • O11

1 Introduction

Selective economic sanctions imposed by Western countries impacts the countries of the Eurasian Economic Union is studied by Bukavnyova et al. (2020), Belyaev (2020a, 2020b, 2020c), Shapor et al. (2016), Shkarpetina (2020).

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Sanctions have affected throughout the years: oil, gas, defense, aerospace, nuclear industries, and the banking sector. American companies have started to pull Russian organizations out of the European market. The Russian Federation has approved retaliatory countermeasures consisting of a ban and restriction on importing some categories of goods, services, and intellectual property into the country to protect economic security.

Trade relations that had been developing for decades were destroyed owing to restrictions imposed. Russia was forced to solve various economical issues from within existing resources and also to look for new trading partners. Issues of assessing the effectiveness of foreign trade are studied in the works of Abramchuk and Shimov (2013), Punko (2017), Shved (2020), Tamashevich and Leshkevich (2008). The issues of statistical assessment of the effectiveness of measures to counteract economic sanctions are not sufficiently developed, with many related publications available.

It is essential to assess how effective the government's response measures and internal economic and political decisions have been in increasing the country's economic security. A quantitative assessment of the effectiveness of the measures taken by the Russian Federation to counter economic sanctions imposed.

2 Methodology

The analysis of the generalized theoretical approaches used to calculate statistical indicators is related to the search for new trading partners for foreign policy. Economic sanctions had negative consequences on the country's external policy. This affected the sharp decrease in foreign trade turnover. The country's leadership opposes these sanctions and has developed countermeasures for the past seven years.

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In this regard, the authors proposed quantitative indicators for assessing the effectiveness of foreign policy in countering economic sanctions.

The counterpart country's relative replacement rate is calculated as follows:

$$R_r = \frac{G_{n-CIS_i}}{G_{CIS_i}}, \quad (1)$$

where:

R_r—counterpart country's relative replacement rate;

G_{n-CIS_i}—growth rate of imports of the ith structural part of products from non-CIS countries (or countries that have joined the economic sanctions);

G_{CIS_i}—growth rate of the ith structural part of products from the CIS countries (or non-CIS countries that do not participate in the sanctions).

It is convenient to present the indicator as a percentage. The values of this indicator allow comparing the growth rates of imports of products from the CIS countries with a similar group of products from non-CIS countries (Table 1). As a group of non-CIS countries, countries that have joined the economic sanctions can be selected.

The counterpart country's absolute replacement rate is calculated as follows:

$$A_r = \frac{V_{CIS_i}}{V_{n-CIS_i}}, \quad (2)$$

where:

A_r—counterpart country's absolute replacement rate;

V_{n-CIS_i}—import volume of the ith structural part of products from non-CIS countries (or countries that have joined the economic sanctions);

V_{CIS_i}—import volume of the ith structural part of products from the CIS countries (or non-CIS countries that do not participate in the sanctions).

It is convenient to present the indicator as a percentage. The values of this indicator allow comparing the import volume of products from the CIS countries (a group of non-CIS countries that do not participate in sanctions) with a similar group of products from non-CIS countries (Table 1). As a group of non-CIS countries, countries that have joined the economic sanctions can be selected.

Under the introduction of economic sanctions, the country's government was faced with the need to pursue an import substitution policy to produce certain categories of goods. In this regard, measures are being taken to stimulate the development of domestic producers and stabilize the national economy.

Statistical indicators for evaluating the effectiveness of internal policy to counter economic sanctions allow comparing the economic indicators of a country's production with the volume of foreign trade turnover.

The export elasticity coefficient is calculated as follows:

$$E = \frac{Gr_{ce_i}}{Gr_{GDP_i}}, \quad (3)$$

where:

E—export elasticity coefficient;

Gr_{ce_i}—growth (increase) rate of the country's exports for a certain ith period;

Gr_{GDP_i}—growth (increase) rate of gross domestic product (GDP) for the same ith period.

The export elasticity coefficient compares decreases faster than the other (Table 2). The industrial production index comparison ratio:

Table 1 Estimated annual values of the counterpart country's relative and absolute replacement rate

Period	2014	2015	2016	2017	2018	2019	2020
Growth rate of products with code 01–24 from non-CIS countries	92.3	65.0	92.0	114.3	102.0	99.5	99.0
Growth rate of products with code 01–24 from CIS countries	91.3	76.3	105.0	122.4	104.5	104.3	100.1
Counterpart country's relative replacement rate for the group of food products (expressed as a percentage)	101.1	85.2	87.6	93.4	97.5	95.4	98.9
The volume of import of products with code 01–24 from non-CIS countries ($ mln.)	34,106.0	22,174.6	20,406.7	23,318.4	23,783.3	23,665.5	23,422.5
The volume of import of products with code 01–24 from CIS countries ($ mln.)	5608.8	4282.2	4495.5	5500.4	5848.3	6181.5	6294.8
Counterpart country's absolute replacement rate for the group of food products (expressed as a percentage)	16.4	19.3	22.0	23.6	24.6	26.1	26.9

Source Authors based on Federal Customs Service of the Russian Federation (2014, 2015a)

Table 2 Statistical indicators for evaluating the effectiveness of internal policies

Indicator	Years					
	2015	2016	2017	2018	2019	2020
Export growth rate, % to the previous year	68.9	83.2	124.8	125.6	94.0	79.3
GDP growth rate, % to the previous year	105.1	103.0	107.3	113.1	105.2	97.9
Export elasticity coefficient, times	0.66	0.81	1.17	1.11	0.90	0.81
Manufacturing industry index, %	99.9	101.1	105.7	103.6	103.6	101.3
Product import index, %	63.3	100.6	124.5	105.1	102.7	94.3
Industrial production index comparison ratio, %	157.8	100.5	84.9	98.6	100.9	107.4
Agricultural production index, %	102.1	104.8	102.9	99.8	104.3	101.5
01–24-coded product import index, %	65.0	92.0	114.3	102.0	99.5	99.0
Agricultural production index comparison ratio, %	153.7	109.9	92.5	101.6	104.1	101.6

Source Authors based on Federal Customs Service of the Russian Federation (2014, 2015a, 2015b, 2016a, 2016b, 2017a, 2017b, 2018a, 2018b, 2019a, 2019b, 2020a, 2020b), Federal State Statistics Service of the Russian Federation (2008)

$$R_{i.p} = \frac{T_{m.i}}{T_i} * 100\%, \quad (4)$$

where:

$R_{i.p}$—industrial production index comparison ratio;

$T_{m.i}$–index of the manufacturing industry in Russia;

T_i—index of product imports.

The manufacturing industry indices are calculated and can be used to analyze quarterly and annual data (Table 2).

The comparison ratio allows one to estimate the relative change in the industrial production volume compared to the import volume (Table 2). The values of the indicator of 2018 can be used as a comparison base: the comparison ratio will be 99.0%.

The agricultural production index comparison ratio is as follows:

$$R_{a.p} = \frac{T_{a.p}}{T_{i.n-CIS}} * 100\%, \quad (5)$$

where:

$R_{a.p}$—agricultural production index comparison ratio;

$T_{a.p}$—agricultural production index in Russia;

$T_{i.n-CIS}$—import index of 01–24-coded products with non-CIS countries.

The indices are calculated according to the methodological guidelines for calculating the agricultural production index. The agricultural production indices are calculated (Table 2).

The indicator's value is less than 100 in the context of redistribution of food products since 2015. This indicates the effectiveness of redistribution for this category of goods in absolute and relative terms (Table 1).

We will calculate the export elasticity coefficient (data on the country's exports from 2015 to 2020) to assess internal policy measures to counter economic sanctions. The calculation of the elasticity coefficient is presented in Table 2.

The calculated values of the elasticity coefficient indicate that, with the growth of the country's GDP from 2015 to 2019, exports successfully developed only in 2017 and 2018: export growth rates of 1.17 and 1.11, respectively, exceeded the GDP growth rates (Table 2).

The policy aimed at import substitution allowed increasing the output of products manufactured in the country.

The indicators are rising, which may indicate the effectiveness of the measures taken by the government for 2019–2020 (Table 2).

The analysis of the indicators presented in Table 2 shows that the growth rate of agricultural production is higher than the volume of agricultural imports in the country. The indicator value is above 100%.

The agricultural production index comparison ratio (expressed as a percentage) indicates the successful implementation of the country's food security doctrine.

The indicator is increasing, suggesting the effectiveness of the government measures in 2019–2020.

3 Results

The results of the statistical evaluation of the effectiveness of the counterparty country's substitution are presented in Table 1.

4 Conclusion

Restrictive measures on imports of food and industrial goods allowed Russian producers to increase production volumes. The authors have developed and proposed measures

introduced by Russia to counter economic sanctions. Relative statistical indicators were divided into two groups: indicators for policies to counter economic sanctions.

The indicators for evaluating the effectiveness of external policy include the counterpart country's relative replacement rate and the counterpart country's absolute replacement rate. The calculations indicate that the prohibitive measures allowed reorienting of external trade flow. The indicators include elasticity coefficient, the industrial production index comparison ratio, and the agricultural production index comparison ratio. These calculations showed that the country's policy aimed at import substitution allowed increasing the output of products manufactured in the country.

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The Innovative and Sustainable Development of Energetics Under the Conditions of the Post-pandemic Recovery of the Economy

Arsen S. Abdulkadyrov, Irina Yu. Eremina, Alena V. Chuprova, Irina Yu. Chuprova, and Naida A. Amadzieva

Abstract

At present, the issues of decarbonisation, namely the programs on the reduction of hazardous substances emissions, are widely discussed and solved around the world. When the things causing the increased level of CO_2 and the means of fighting air pollution are to be named, the discussions focus on the electric energy industry. This paper aims to study the innovative development of energetics during the post-pandemic recovery of the economy. Energetics is one of the drivers of economic development and plays a significant role in preventing climate change. The pandemic allows us to strengthen the cooperation and develop a comprehensive solution to the energy and climate problems. The scientific novelty of this work consists in the consideration of the development of green energetics during the post-pandemic recovery of the economy. The conditions for the quick recovery of the economy, which would allow counting on a more sustainable and safer future, is the increase of solidarity and creative thinking in all countries in sectors of the economy.

Keywords

Green economy • COVID-19 • Sustainable development of energetics • Post-pandemic period

JEL Classification

Q01 • Q40 • O13

1 Introduction

The COVID-19 pandemic caused many deaths, and its destructive consequences exceed everything that was observed during the world financial crisis a decade ago. The market volatility also exceeded the previous crises, which characterizes the level of the economic recession. It should be noted that sources of energy that do not produce greenhouse gases, including large hydroelectric power stations and nuclear power plants, provide a large share of the world's consumption of crude energy.

As for the energy sector, estimates show that the losses caused by the pandemic equal $400 billion. A large part of these losses account for hydrocarbon markets, but the whole energy sphere suffered losses, and it will need time for recovery. Government support and advantages from reducing the costs when using solar and wind technologies could stimulate the growth of clean energy production. Energy production based on renewable sources will be growing, but the economic effect of their use might not meet the expectations that were presented in the earlier periods. The volume of investments in hydrocarbon and atomic energy decreased substantially even before the pandemic. Here the most difficult part of the work on creating the conditions for the provision of sustainable recovery of the economy should be performed.

2 Materials

While Europe continues to move in the "green" direction, certain countries in Latin America, South Asia, and Africa, which suffered the most from the pandemic, will have

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limited capabilities in the implementation of the energy transition.

However, this might bring new prospects for investments in low-carbon energy sources. In any case, energy companies from around the world will have to re-evaluate their positions in the markets in light of the consequences of the COVID-19 pandemic (Shah, 2020).

Governments of the US and EU member states aimed a large share of assets allocated for the stimulation of the economy at the renewable energy sources. The goal was also to create new jobs in the construction and production of the corresponding objects and technologies. In the USA, loans, grants, and tax subsidies helped start the growth of the capacities of solar energetics. Similarly, direct stimulating investments in the programs of development of sea wind power generation in Europe and subsidies to the corresponding energy suppliers ensured a large growth of capacities and helped Europe to become a world leader in using wind energy.

In countries of Asia, the policy of stimulating the development of renewable energy sources was built, on the contrary, around the increase in the global competitiveness of the countries' economies in production and export. For example, the priority of the "green production policy" in China, South Korea, and Japan allowed these countries to build more effective and less costly supply chains in photoelectrical and battery technologies (Wang et al., 2021). Subsidies to Chinese manufacturers of solar panels allowed for a 100% growth of their production, which led to a sharp decrease in cost and the growth of world sales (Zhang et al., 2021).

3 Literature Review

The literature review on the studied topic demonstrated the following points. A small part of $9 trillion of budget expenditures during the COVID-19 was aimed at low carbon energy and other green policy. According to Arantegui and Jäger-Waldau (2018), for a short time, the coronavirus dominated in almost all political and administrative spheres, and it had little time to solve other environmental priorities".

In the course of the deepening of the economic crisis, the attention shifted from overcoming the crisis itself to the issue of the best possible recovery (Murdock et al., 2020). There were also calls for more eco-friendly fiscal measures to guarantee that the goals in the sphere of climate will not be ignored. Some scholars emphasize the necessity for a more long-term transition to a sustainable economy with a low level of CO_2 emissions due to targeted government expenditures combined with the cancelling of subsidies for hydrocarbon fuels (Wan et al., 2021). The development of green strategies for the recovery of the economy becomes more important. Though the global CO_2 emissions decreased during the pandemic, they had been growing by 1% annually before the pandemic, since the growth of the use of energy from hydrocarbon fuels exceeded the growth of the use of low-carbon fuels (Guan et al., 2020; Levine, 2021).

4 Results

Hydrocarbon fuels—oil, coal, and natural gas, still dominate the current structure of energetics. Though the share of hydrocarbon fuels in the structure of the world energy supply reduced, the total volume of supplies is still above 80%. The energy system with a large share of carbon led to an increase in CO_2 emissions. Emissions of greenhouses gases aggravated global warming, damaging humanity and the environment (Meng et al., 2018; Shan et al., 2021).

The COVID-19 pandemic led to serious implications not only for public healthcare but also for the energy sphere. First off, the economic decline aggravated the volatility of the renewable energy sources' markets. Second, the reduction of prices for hydrocarbon fuels further reduced the pricing attractiveness of renewable energy sources. Third, restrictions in international trade hinder the work of the supply chains of renewable energy, threatening multiple projects. More importantly, the plans for the recovery of the economy after the pandemic are still based on investments in hydrocarbon fuels, which complicate the transition to renewable energy sources. Despite the problems that the energy transition faces, the pandemic also provides certain opportunities.

The main obstacles to the transition to renewable energy sources amid the pandemic are the absence of investments and the low market demand. First, due to the decrease in government subsidies, the projects on renewable energy sources face high initial costs and technology investments. Second, lower prices for hydrocarbon fuels further complicate the competitiveness. Third, the decrease in industrial activities leads to a reduction of the demand for equipment and objects of renewable energetics, which slows down the growth of capacities in renewable energy production. Fourth, the global supply chain of renewable energy was violated as a result of mandatory trade restrictions, which made the promotion of new projects difficult.

In particular, the blocking of business and large expenditures for medicine and healthcare led to substantial economic losses, which, in its turn, led to the risk of government debt and budget deficit. Governments of many countries had to redirect the assets from investments in renewable energy sources for the fight against the pandemic and healthcare. The pandemic revealed the drawbacks of the development of sources of renewable energy, which largely depended on government assets. The projects on renewable energy

sources often need subsidies from the state due to high initial costs, technical difficulties, and large expenditures for exploitation and service maintenance. The COVID-19 pandemic resulted in the reduction of the government's financial support for initiatives in the sphere of renewable energy sources. Thus, companies that work with renewable energy sources faced difficulties in receiving revenues that are sufficient for compensating large expenditures. Moreover, the capital flows are reduced all over the world, so more and more investors avoid high-risk investing, which would further influence the commercial investments in renewable energy sources. This might lead to a lack of stimuli in the sphere for the renewable energy sources' development, which will hinder the transition to green energetics.

China's investments in renewable energy sources are the largest in the world. However, the pandemic made the procurement of multiple projects on renewable energy sources difficult in the first half of 2020. From the point of view of corporate investments, industrial revenues decreased due to the pandemic, which stimulates investments in profitable enterprises. For example, in the post-pandemic period companies in heavy industry will pay initial attention to the increase in production level, to stabilise the corporate structure.

COVID-19 also led to an opportunity for the transition to renewable energy sources. First off, the risks of investments in hydrocarbon fuel increased, since the global demand for it reduced. Second, governments received unprecedented opportunities to implement the policy and legislature in the sphere of reformation of energetics during the recovery of the economy. Third, the pros of renewable energy sources, which allow for remote work and the use of AI, provide an excellent possibility to substitute hydrocarbon fuel for renewable energy during the post-pandemic recovery of the economy.

Let us consider the green economy, which main elements are low-carbon development, effectiveness in using resources, and social integration. This economic model treats nature capital as the key economic asset and is aimed at a quick reduction of waste and limitation of resources and energy that are spent for consumption and production.

The green economy might create 24 million jobs by 2030. For example, investments in renewable energy sources might create a lot of jobs in the short-term and long-term, which will lead to the acceleration of the post-pandemic recovery of the economy. National legislators should pass laws on recovery that would stimulate green investments.

Let us consider the dynamics of the energy market development in Europe in 2021.

The materials presented in Table 1 allow for the following conclusions regarding the innovative characteristics and sustainable development of energetics under the conditions of the post-pandemic recovery of the economy in Europe.

1. Achievement of the UN's SDG 7 is connected to the energy transition to clean energy sources (IAEF, 2022). Clean energy sources include natural gas, nuclear energy, bioenergy, wind, water, and solar energy.
2. 2021 saw a decrease in the energy transition to clean energy consumption due to a large growth of natural gas prices and the reduction of wind and solar energy production. Accordingly, European countries were not able to ensure a sufficient level of energy security in 2021.
3. Countries of Western Europe are leaders by implementing the energy transition to clean energy sources; they are followed by countries of Southern Europe and countries

Table 1 Dynamics of the energy market development in Europe in 2020–2021

Indicator/region	2020	2021
1. Volume of natural gas consumption, billion cubic meters:	394	510
Western Europe	228	298
Southern Europe	89	116
Eastern Europe	77	96
2. Volume of coal consumption, million tonnes	56.5	64.41
2.1. Causes of changes in coal consumption:		
2.1.1. Change in prices for natural gas that is used for electric energy production	Decrease in prices does not influence on the growth of coal consumption	+ 585%
2.1.2. Reduction of production of wind and solar energy	No significant natural influence on the decrease in the production of these types of energy	Low temperatures, the seasonal shutdown of solar and wind power plants
3. Share of ecologically clean energy (produced of natural gas and other sources of generation, except for coal) in total energy consumed in Europe	2/3	2/3

Source Compiled by the authors based on Moore (2021), Simon (2022), Statista.com (2022), The United Nations Statistics Division (2022)

of Eastern Europe. Accordingly, developed European countries follow the adopted milestone that is linked to the given energy concept. The economic crisis, which was further aggravated by the pandemic, did not allow for high results of the energy complex ecologization.

5 Conclusions

Before the 2020 pandemic and economic crisis, Europe had been demonstrating a stable energy transition, connected to the reduction in the use of coal for electric energy production. Even in 2020, countries of Europe pursued the goal of decreasing coal consumption in this sphere. As of year-end 2020, 2/3 of clean electric energy in the total volume of energy consumption in Europe was ensured. At the end of 2020, the volume of coal consumption for electric energy consumption in Europe equalled 56.5 million tonnes, and the volume of natural gas consumption for these purposes—394 billion cubic meters.

The global economy has shown resilience during the COVID-pandemic, and its recovery turned out to be faster than was predicted in 2020. Still, there are difficulties with supply chains, workforce availability, and inflation. The important issue of innovative and sustainable development of energetics amid the post-pandemic recovery of the economy should be further elaborated by scholars from different countries.

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Scenario Analysis of the Development of the Russian Digital Economy Until 2025

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Abstract

The goal is to identify the key specific features and forecast parameters of the Russian digital economy sector's formation for the period until 2025. This research is performed using a range of methods, which enable the assessment of the factual and forecast state of implementing the digital economy and the study of the experience of formulation of the goals of ICT development. The scientific novelty of this paper is connected with the characteristics and determination of the system of goals for the Russian digital economy's development in the long term. A set of goals for the development of ICT in Russia is studied, and their possible development amid the existing global and national challenges and barriers is identified. Preference is given to the approach used for the formation of the system of state federal financing of the development and implementation of ICT. It is noted that it might be changed under the impact of the market realities.

Keywords

Economic growth • Financing • Digitalization • Scenarios • Digital economy

JEL Classification

O32 • O33 • O47 • Q01

1 Introduction

In the course of the world economy's dealing with the crisis, the global competition as a whole and in the high-tech markets in particular grows. However, the requirements of security and an increase in the cost of production factors (e.g., workforce in China) will probably slow down global growth in the long term. Thus, it will be more difficult to ensure the annual stable growth of the Russian economy. It is particularly difficult to retain support and growth of the economy in countries that are oriented toward the predominant production and realisation (including export) of products with low value added and raw materials, the revenues from which realisation depend on market fluctuations. For the development of an economy of a larger scale under the conditions of constant challenges of globalisation and the influence of regional and national factors, there is a need to search for new approaches to fulfilment of the revenues of the state budget at all levels. Further development of the Russian economy could be oriented toward the development of a prospective sector of ICT, which demonstrates positive results against the background of the decrease in the indicators of the effectiveness of other sectors. According to analytical data, the development of Russia's digital economy has the following specific features: growth of the national technological companies' costs for innovations in the main spheres (in 2014–2015—6.5%, 2015–2017—1.3%, 2017–2018—7.3%, 2018–2019—39.8% and 2019–2021—91%); high positions in the world ranking of the number of patent applications for ICT innovations in various spheres (15th position as of early 2020); the largest share of patent applications in the context of ICT innovations accounts for the sphere of IT (software) (35.2%), telecommunications (17%); growth of export of products (services) in the sphere of ICT (from 10.1% in 2013 to 26.2% in 2020) (Issek.hse.ru, 2022; Rudenko et al., 2022).

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