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Economic Models of Innovation Activity Based on Digital Platforms

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ABSTRACT

The relevance of the topic of economic models of innovative activity based on digital platforms is due, firstly, to the importance of the transition of the modern economy to an innovative development path; secondly, the importance of analyzing international experience in the development of innovative systems in order to possibly use the approaches that have developed in the world to form a national model of innovative development. **The purpose of this study** is to determine the possibility of using the experience of implementing innovative activity models in individual countries of the world in shaping the directions for the development of the economy of the Russian Federation in order to improve the indicators of its socio-economic development. **The object of the study** is the development of innovative activities of economic entities in the context of digitalization; **the subject of research** is digital platforms. The authors analyzed the ranking of the most innovative countries in the world; the types of models of innovative activity of developed countries are identified (leadership in science, dissemination of innovations, stimulation of innovations); the authors also traced the relationship, for which model of innovation, what types of platforms are most characteristic. The article substantiates the fact that a significant number of effects from innovation activity is achieved through the use of certain technologies and the modernization (restructuring) of individual business processes in the implementation of inter-company interactions based on digital platforms. Based on the characteristics and features of each considered type, the authors propose the most appropriate types of digital platforms for use in the implementation of one or another model of innovative activity. **The practical significance** of the proposals lies in the fact that, depending on the chosen development strategy, the use of one or another type of digital platform will be effective for a particular economic entity.

Keywords: innovation activity; digital platforms; economic models; innovative development; global innovation index

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INTRODUCTION

As evidenced by world experience, the greatest socio-economic growth is achieved by countries that form a special attitude to innovation, research and development, and knowledge-intensive industries as the basis of their development strategy.

According to this, innovation is "a social-technical-economic process, which through the use of practical ideas and inventions leads to the creation of better products and technologies. If the innovation is oriented towards economic benefit, its appearance on the market can bring added income" [1].

Such foreign researchers as G. Dosi, C. Freeman, B. Lundvall, R. Nelson, G. Silverberg, and others, made a great contribution to the study of innovation systems. [2–4].

The experience of implementing models and stimulating innovation activity, as well as innovation policy strategies of Japan, the USA, EU countries are analysed in their works by T. V. Kolesnikova, D. L. Malyutin, A. P. Kokhno, R. Scott, G. S. Khromov and others. [5–9].

There are also many publications by domestic researchers summarising the experience of industrially developed countries [10–12].

Despite this, the issues of innovative development of the Russian Federation require further research.

Complexity theory, which is gaining increasing popularity, allows us to consider the problems of managing organisations in today's environment using a new scientific approach. One of the key concepts of this theory is to treat organisations as networks. From the perspective of various theoretical studies, organisations can be represented using different types of hierarchies, but in recent years researchers have tended to believe that in practice all organisations are networks in one way or another. The complexity theory of socio-economic systems shows that management should focus primarily on inter-firm interactions rather than on organisational structures and maximising the effects of managing them. Thus, at the present stage, organisations should adhere to management principles based on the scientific provisions of network structure research.

At the same time, the methodological basis of management is most often represented as systems thinking, the focus of which is on cyclical inter-firm interactions and non-linear intra-network relations. The effectiveness of systems thinking in organisational management lies in the fact that through it the interaction problem can be viewed from different angles [13].

And if systems thinking acts as a theoretical basis for management, then digital platforms become an adaptor, a practical tool in modern conditions, according to the authors. Since any digital platform is a unified information environment that enables a significant number of participants of relations to interact mutually beneficially through a system of algorithms, it allows to provide economic entities with benefits not only of economic, but also social nature. The high potential of using digital technologies in general and digital platforms in particular to improve the efficiency of economic entities' functioning generates interest in this topic not only among domestic but also foreign scientists [14–17].

Thus, the relevance of the topic of economic models of innovation activity on the basis of digital platforms is conditioned, firstly, by the need for effective and comprehensive modernisation of the economy, secondly, by the importance of the analysis of international experience in the development of innovation systems with the aim of its possible use for the formation of the national model of innovation development, thirdly,

Table 1

Global Innovation Index 2012–2022

Country	Place in the 2012 GII.	Place in the 2022 GII.	Change in ranking over 10 years
Australia	23	25	↓ –2
Austria	22	17	↑+5
Belgium	20	26	↓–6
Bulgaria	42–43	35	↑+7
Great Britain	5	4	↑+1
Hungary	31	34	↓–3
Vietnam	76	48	↑+28
Germany	15	8	↑+7
Greece	66	44	↑+22
Denmark	7	10	↓–3
Israel	17	16	↑+1
India	64	40	↑+24
Ireland	8–9	23	↓–15
Iceland	18	20	↓–2
Spain	29	29	0
Italy	36	28	↑+8
Canada	12	15	↓–3
Cyprus	28	27	↑+1
China	34	11	↑+23
China, Hong Kong	8–9	14	↓–6
Latvia	30	41	↓–11
Lithuania	38	39	↓–1
Luxembourg	10–11	19	↓–9
Mauritius	49	45	↑+4
Malaysia	32	36	↓–4
Malta	16	21	↓–5
Netherlands	6	5	↑+1
New Zealand	13	24	↓–11
Norway	14	22	↓–8
UAE	37	31	↑+6
Poland	44	38	↑+6
Portugal	35	32	↑+3

Table 1 (continued)

Country	Place in the 2012 GII.	Place in the 2022 GII.	Change in ranking over 10 years
Russia	51	47	↑+4
Romania	52	49	↑+3
Singapore	3	7	↓–4
Slovakia	40	46	↓–6
Slovenia	26	33	↓–7
USA	10–11	2	↑+8
Thailand	57	43	↑+14
Turkey	73	37	↑+36
Finland	4	9	↓–5
France	24	12	↑+12
Croatia	42–43	42	0
Czech Republic	27	30	↓–3
Chile	39	50	↓–11
Switzerland	1	1	0
Sweden	2	3	↓–1
Estonia	19	18	↑+1
South Korea	21	6 (Республика Корея)	↑+15
Japan	25	13	↑+12

Source: compiled by the authors on the basis of data from the Global Innovation Index. URL: https://www.wipo.int/global_innovation_index/ru/2022/

by the significance of the transition of modern economy to the innovation path of development.

THE GLOBAL INNOVATION INDEX

It should be noted that the waves of innovation activity characteristic of the digital age, if effectively harnessed in the activities of economic actors, can have a significant positive impact on the growth of innovative labour productivity and national welfare. Based on the essence of the term "labour productivity", we can state that the key effect will be expressed in the increase in the efficiency of people's activity in the process of creating innovations: the number of innovations will increase, while the time spent on their creation will decrease.

Table 1 shows the change in the ranking of individual countries in the Global Innovation Index (GII) over the last 10 years.

Analysing the experience of the developed and developing countries, we can conclude that a successful transition to innovative models of functioning requires a fundamental restructuring of economic mechanisms of the country's economy by reforming innovation processes and programmes.

Statistics show that only a small number of economies demonstrate consistently high innovation performance (*Fig. 1*).

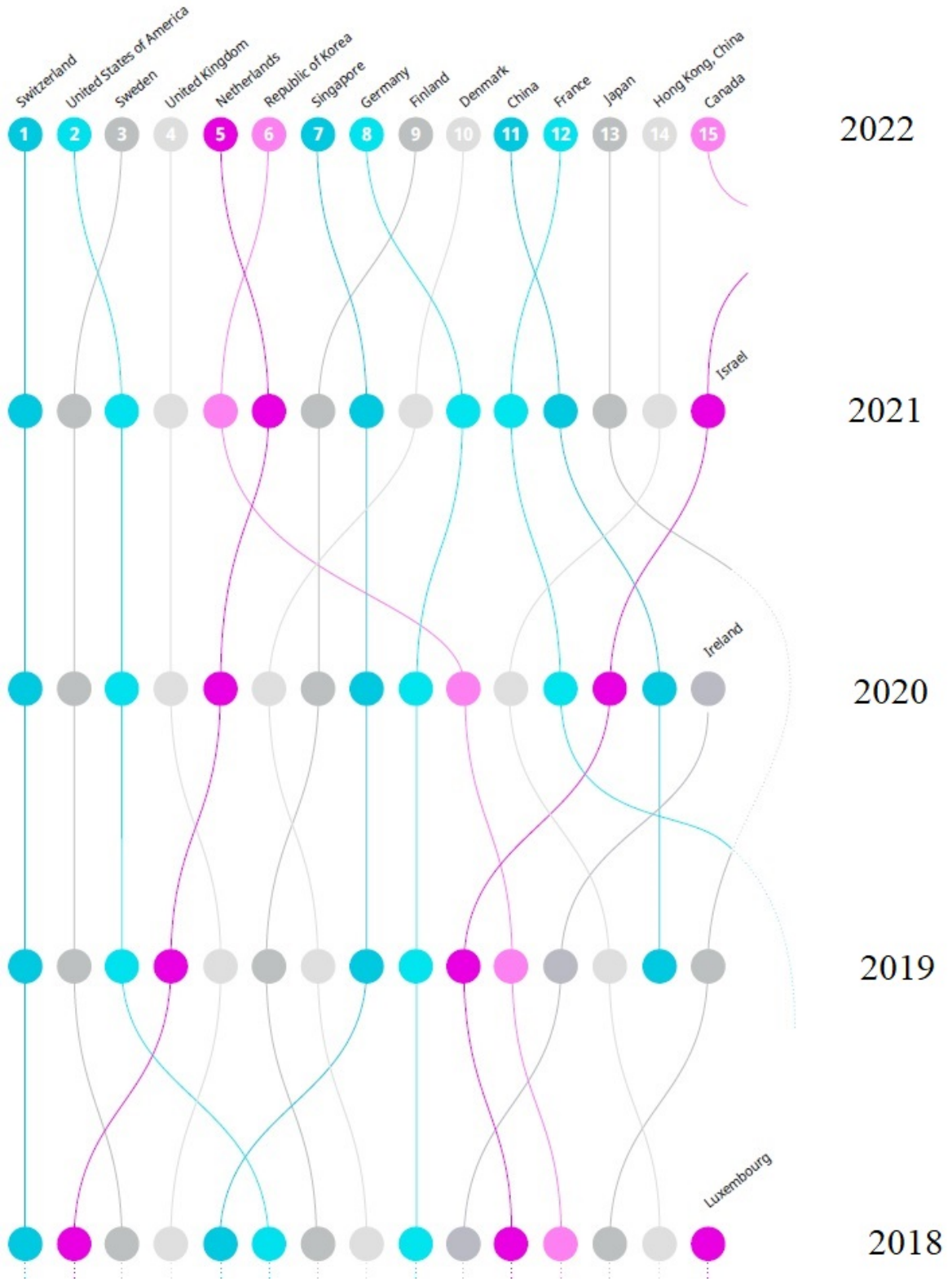

Fig. 1. **Change in the ranking of the top 10 GII economies, 2018–2022**

Source: compiled by the authors on the basis of data from the Global Innovation Index: URL: https://www.wipo.int/global_innovation_index/ru/2022/

Digital platforms by software product typology / Digital platforms by ownership of the asset and setting of terms and conditions	Instrumental DP - at the core is a hardware and software system	Infrastructure DP - based on an ecosystem of participants to automate their activities	Applied DP - at the core is the business model for running business operations
Centralised DP - owns the asset and sets the terms and conditions, ensures standardisation and scalability	A Examples: Google; Bing; Yahoo; Baidu; Mail; Java; Yandex: Rambler; MacOs; Sputnik: Windows: Linex; KasperskvOS: Bitrix	B Examples: WhatsApp; Telegram: WeChat Tamtam; Apple iOS; Skape; Aviton; Farechat; Android; SailfishOs: WindowsPhone	C Examples: Zipcar; Tripadvisor; Rent the runway; Aviasales; Tourvisor; Travelata; Skyscanner; Kayak: Gosuslugi
Decentralised DP - the owner sets the terms and conditions and offers the asset directly to the user	D Examples: Facebook; Twitter; Instagram; Linkedin; Chrome; Vk; Odnoklassniki: Firefox; Opera; Safari	E Examples: AirBnB; HomeAway; Cian; Hostel-world; Udacity; Domo-fond: Coursera; Stepik; Universarium: Edx	F Examples: Groupon; Kickstarter; Planeta; IndieGoGo; Starttrack; Boomstarter; Biglion; Crowdfunder
Hybrid DP - ownership and risk are decentralised while standardisation and service levels are centralised	G Examples: Youtube: Vimeo; MetaCafe; Rutube; Ozon: Ivi; Aliexpress; Amazon; Ticketland; Etsy	H Examples: WePay; PayPal; Amazon Pay; Apple Pay; Robokassa; QIWI; eBay	I Examples: Lyft; Uber; Blablacar; City-mobil; Indeed; Job; Upwork; Rentmania; CareerBuilder

Fig. 2. **Cross-classification of digital platforms**

Source: compiled by the authors.

Studying the peculiarities of innovation policies of countries showing significant changes in the GII ranking, we can distinguish active and passive behaviours.

Countries that use "active" policies (North American, East Asian, and Western European countries) ensure their development not only by acquiring more advanced foreign developments, but also through their technological and research base. The degree of dependence on innovative imports is influenced by the size and level of domestic development of countries. For example, the United States can dictate the innovation policy of less developed countries, as it has a large share of the world's R&D. In countries such as Denmark, Belgium, Canada, Greece, Portugal and Spain, a much larger share of innovation is consumed from abroad.

In Latin American, Central European, and post-Soviet countries, innovation policy is passive, while in Russia it is rather passive-active.

The development model currently being promoted in our country envisages a gradual build-up of innovation capacity together with a dosed use of innovation from outside. This allows Russia to pay more attention to improving its own innovation performance.

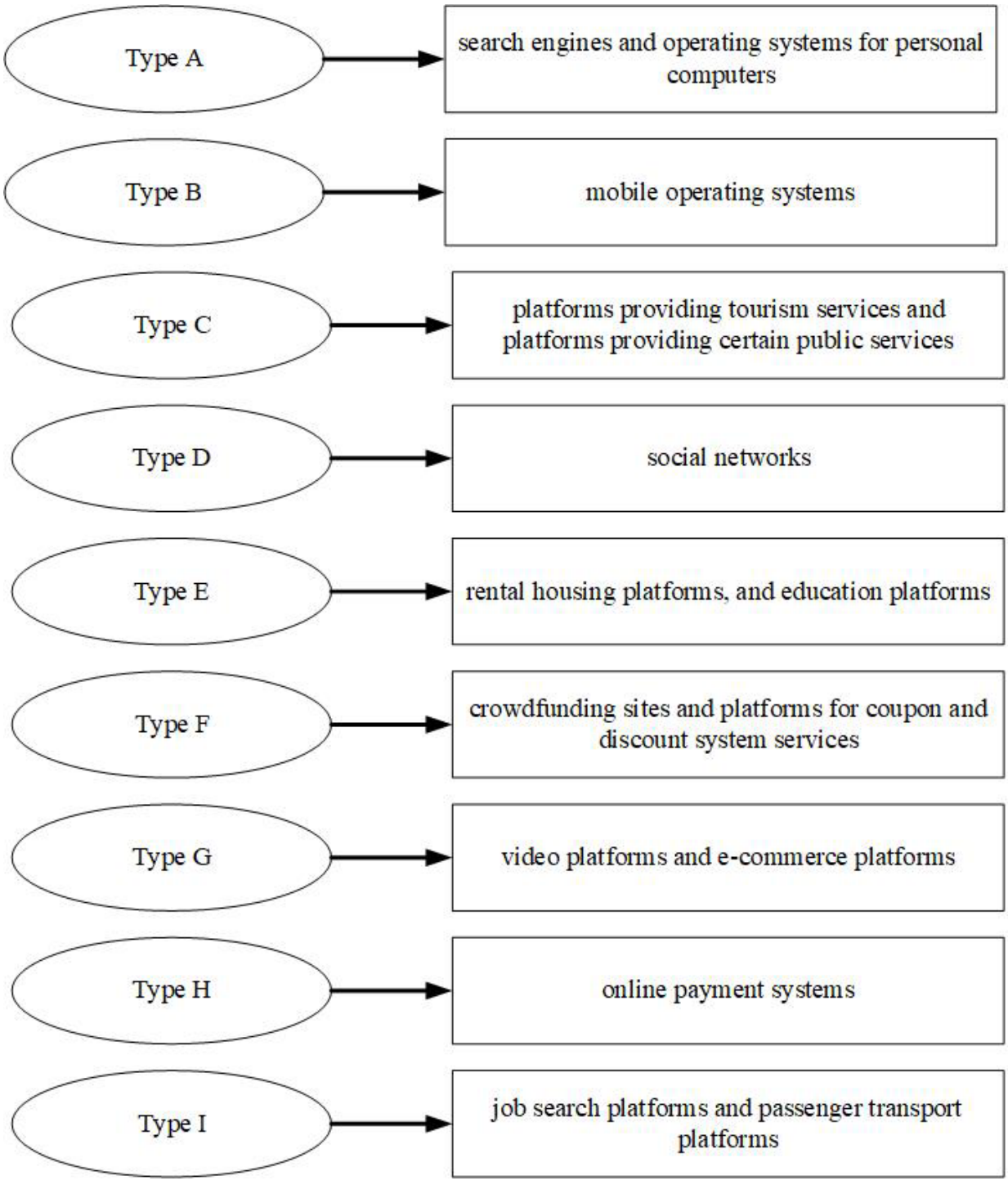

Fig. 3. **Examples of different types of digital platforms**

Source: compiled by the authors.

Researchers propose to distinguish three main types of innovation activity models [18]:

• Leadership in science (England, USA, France), when activities are aimed at the implementation of large, targeted projects (covering all stages of the scientific and production cycle) and innovation potential in the MIC (military-industrial complex).

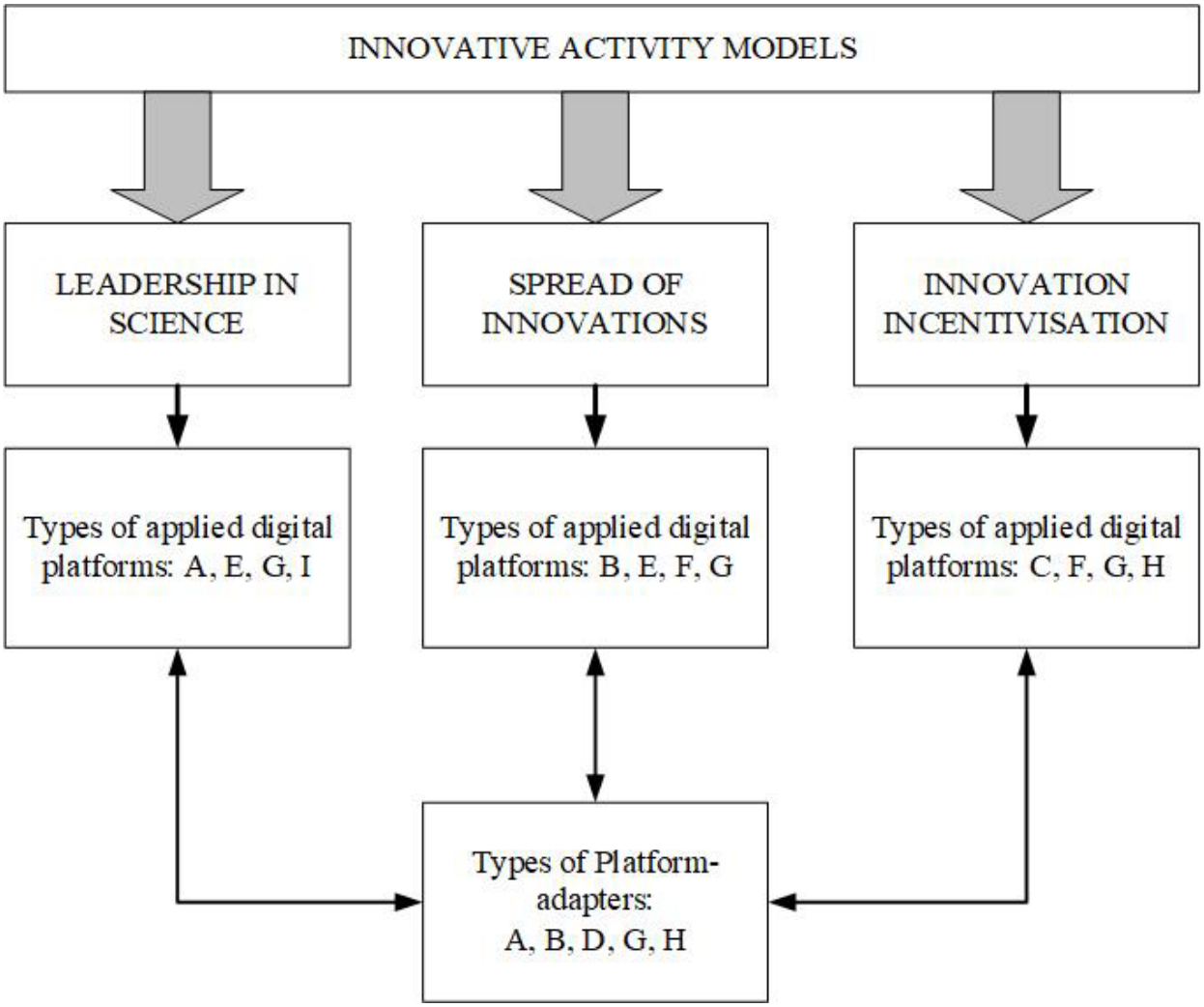

Fig. 4. **Economic models of innovation activity based on digital platforms**

Source: compiled by the authors.

• Diffusion and spread of innovation (Switzerland, Sweden, Germany), with activities aimed at creating a favourable innovation environment and rationalising the entire economic structure.

• Stimulation of innovations (Japan, South Korea). In this case, the activities are aimed at the development of innovation infrastructure. The policy helps to ensure the country's receptivity to the achievements of scientific and technological progress, and also helps to coordinate the actions of different regions and sectors of the economy in the field of science and technology.

Further research suggests identifying the types of digital platforms that are most appropriate for countries to use according to their innovation model.

DIGITAL PLATFORMS IN INNOVATION ACTIVITIES

Digital platforms in current research are classified and typologised depending on the goals of the analysis being conducted. Different schools of thought offer different classifications and their scientific justifications [19]. There are often schematic subdivisions of platforms according to the format of their use [20]: housing

rentals, video platforms, government services, Internet browsers, crowdfunding, messengers, operating systems, passenger transport, payment systems, job search, search engines, social networks, travel services, e-commerce, etc.

The approach of A. V. Polyanin and I. A. Dokukina, who consider cross-classification of digital platforms, is of the greatest interest [21]:

- according to ownership of the asset and setting of terms and conditions: centralised, decentralised, hybrid;
- according to software product typology: infrastructural, instrumental, applied (*Fig. 2*).

According to this categorisation, each type of digital platform has a number of features.

Type A. In this case, the entity that owns the asset sets the conditions in the areas of pricing, scaling, standardisation, quality control. The key advantage of this type of platform is access to data through a documented interface. The reusable data processing toolkit reduces the cost of production at the same time.

Type B. Is characterised by a high proportion of scaling costs.

Type C. The activity of the asset owner is to collect, process and store data on the conclusion/execution of a transaction between multiple economic actors.

Type D. The asset owner offers the asset directly to the user. The key advantage of this type of platforms is the facilitation of transactions through communication interactions between stakeholders. At the same time initial costs are significantly lower compared to other types of platforms, but there are difficulties in constantly involving economic actors in interactions to ensure normalised supply.

Type E. The asset is also offered directly to the user, however it is the platform operator that "brings together" the participants of interactions. A fee is charged for facilitating the transaction process. The advantage here is the aggregation of several automated processes in one transaction, which leads to significant business effects.

Type F. In this case, the maximum number of interested participants is involved, the number of transactions is maximised, and the exchange procedure is facilitated and simplified through algorithmic and highly transparent processes.

Type G. Provides low capital costs, with the stakeholder engagement process being a key influence on efficiency.

Type H. Platforms of this type are characterised by decentralised ownership of the asset, as well as less control. The operator sets and manages the service standard. The advantage is flexible pricing, where the initial terms are set by the asset owner, but the operator and the information provider have the ability to adjust them.

Type I. The service level is centralised, but the risks are decentralised. The advantage is a significant network effect due to the link between the growth of the consumer base and the supplier base.

Thus, the presented classification allows us to apply the different types of digital platforms to the different models of innovation identified earlier.

FINDINGS AND CONCLUSIONS

Based on the given characteristics of the different types of digital platforms, typical examples for each class can be given (*Fig. 3*).

Based on the characteristics and peculiarities of each type considered, the authors suggest the most appropriate types of digital platforms to be used when implementing a particular model of innovation activity (*Fig. 4*).

However, it should be emphasised that the type of platforms in any innovation

model should be as diverse as possible — it is impossible to limit oneself to one of the proposed types and standardise the types of platforms for a particular model. In complex systems there is no single right way of management, therefore, there can be no single optimal strategy for the development of innovation activity. The constant change in the external and internal innovation environment requires flexibility in the application of digital platforms, their constant modernisation and improvement of their quality characteristics [22].

The distribution of platforms by models of innovation activity proposed in the article reflects only the main guidelines for the introduction of digital platforms in the chosen development strategy, the use of a particular type of digital platform will be effective in a particular situation and may not coincide with the authors' vision. However, depending on the typical characteristics of innovation activity models, the authors propose the most appropriate types of digital platforms for application, taking into account the analysed world experience.

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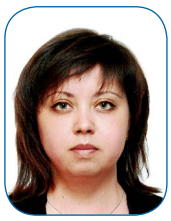

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Authors' contributions:
E. V. Popov — development of the general concept of the article.
V. L. Simonova — preparation of literature review, design of the article.
A. D. Tikhonova — development of author's typology of economic models of innovation activities based on digital platforms.

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ORIGINAL PAPER

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Current Trends in Russian Trade in Goods with the EU and China

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ABSTRACT

The article examines the current trends in Russia's foreign trade with the EU and China in the context of sanctions restrictions imposed by "unfriendly" countries.

Aim. The study aims to explore current trends in Russia's foreign trade in goods with the EU and China in 2022. ***Objectives.*** The author conducts an analysis of the dynamics of Russia's trade with the EU and China; identifies the main commodity groups that have contributed to the changes in trade with the EU and China; explores the impact of sanctions restrictions on Russia's trade with the EU; assesses the possibilities of reorienting Russia's foreign trade towards China. ***Methods.*** The main methods are the analysis of current statistics of foreign trade in goods between the EU and China; a comparative analysis of the dynamics of trade in commodity groups and individual goods with the EU and China; method of mirror statistics (due to the suspension of the publication of official data by the Federal Customs Service (FCS) of Russia). ***Results.*** The analysis shows a decrease in trade turnover between Russia and the EU and its growth with China. With the EU the decline in exports was mainly due to metal industry products, chemical products, precious stones and metals, and timber; in imports — at the expense of machinery and equipment. Trade with China in the main commodity groups has expanded, most significantly in terms of exports — in chemical products, in terms of imports — in machinery and equipment. ***Conclusions.*** The role of Russian exports of mineral fuels and energy as the basis for trade with the EU and China in 2022 has strengthened in the face of sanctions restrictions and rising prices. Russia's trade with the EU reduced mainly due to the sanctioned goods. The reorientation of Russia's foreign trade towards China is partially possible, with the restraining factors: in terms of imports — China's lack of strong positions in certain high-tech goods; in terms of exports — objective limitations on China's domestic market capacity, a slowdown in economic growth, a decrease in the energy intensity of the economy, competition with Russia.

Keywords: foreign trade; trade in goods; commodity export; sanctions; EU; China; unfriendly countries; trade reorientation

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The European Union (EU) as an integration association and China as a single country have traditionally been Russia's main foreign trade partners. In 2021, the EU accounted for 37.8% of Russia's merchandise exports, while China accounted for 13.9%. The share of these partners in Russia's imports was 31.9% and 24.7%, respectively.[1]

In 2022, most developed economies (except Israel) adopted unprecedented sanctions measures against Russia. At the same time, most developing countries did not join them (with the exception of Albania, Bahamas, Micronesia, Northern Macedonia, Montenegro, and Ukraine). The massive introduction of sanctions restrictions marked a new stage of development in Russia's international economic relations, primarily in foreign trade in goods. In the context of geopolitical tensions, which escalated after 24 February 2022, it is of particular interest to study the changes in the dynamics and structure of Russia's trade in goods with the EU — the largest trade counterparty that applied sanctions measures, as well as with China — the second most important partner that did not join these measures.

A number of scientific publications have been devoted to the study of trends in Russia's foreign trade in goods with the EU and/or China. The latest studies published since 2021 either consider long-term trends in Russia's trade relations with these economies [1–5], or focus on foreign trade in the context of the spread of a new coronavirus infection [6]. The relevant issues are also touched upon in monographs [7]. There are also works devoted to Russian exports in general, with preliminary estimates of the consequences of sanctions restrictions in 2022. [8, 9]. At the same time, a comprehensive study of Russia's foreign trade with the EU and China, based on the results of the "sanctions" year to date, is not presented in domestic scientific publications, including due to the inaccessibility of Russian data on foreign trade in goods for 2022.

The objective complexity of the study of the issues under consideration is due to the fact that the Federal Customs Service (FCS of Russia) suspended the publication of official foreign trade statistics in April 2022.[2] In this regard, the analysis for 2022 is based on "mirror" statistics using data from the relevant statistical services of the EU and China. In order to avoid systematic discrepancies between "direct" and "mirror" statistics, which are possible for a number of reasons [10], it seems methodologically sound to compare "mirror" data for 2022 and 2021, despite the availability of "direct" data for 2021.

If we consider the dynamics of Russia's foreign trade with the EU (*Table 1*), the mutual trade turnover decreased in 2022 against 2021 by 8.9%: from USD 299.0 billion to USD 272.5 billion. This was due to a decrease in imports, from USD 299.0 billion to USD 272.5 billion. This was due to a decrease in imports, while exports even increased slightly. As a result, the traditionally positive balance of Russia's foreign trade with the EU widened further (by 77.5%) and in 2022 will reach a record USD 156.3 billion.

The reduction in mutual trade turnover in 2022, despite the sanctions measures, is not intense by historical standards. For example, in 2020, when measures restricting economic activity were administratively imposed to curb the spread of the new COVID-19 coronavirus infection, Russia-EU trade turnover fell by 23.8%. The drop was even greater in 2015 — by 38.8%.

The reason for the relatively weaker than expected decline in 2022 is due to a

[1] Calculated by the author according to Customs Statistics of Foreign Trade of the Russian Federation. URL: http://stat.customs.gov.ru/

[2] The FCS will temporarily not publish import and export statistics. URL: https://www.interfax.ru/business/837264

Table 1

Russia-EU foreign trade in 2021–2022, USD billion

TN VED code (Customs commodity code)	Name of Goods	Exports			Imports		
		2021	2022	Growth rate, %	2021	2022	Growth rate, %
All goods		193.5	214.4	10.8	105.5	58.1	–44.9
01–24	Food products and agricultural raw materials	3.2	3.4	4.0	8.4	7.3	–13.0
25–27	Mineral products	125.7	156.9	24.8	1.3	0.6	–52.0
including 27	Fuel and energy products	123.0	156.0	26.8	0.9	0.5	–45.3
28–40	Chemical products, rubber	9.5	8.5	–10.5	26.7	20.7	–22.3
41–43	Raw leather, fur and products made of them	0.1	0.1	10.3	0.5	0.2	–56.2
44–49	Wood and pulp and paper products	4.6	2.2	–51.0	2.5	1.0	–57.6
50–67	Textiles, textile products and footwear	0.2	0.2	–9.4	4.5	2.7	–40.6
71	Pearls, gemstones, precious metals	5.5	3.7	–32.4	0.2	0.0	–80.8
72–83	Metals and metal products	17.8	16.0	–10.0	5.4	3.2	–40.0
84–90	Machinery, equipment and vehicles	2.6	1.5	–41.1	51.0	19.7	–61.3
68–70, 91–97, 99	Other goods	5.5	3.3	–40.4	4.1	2.1	–47.9

Source: compiled by the author based on Eurostat. URL: http://epp.eurostat.ec.europa.eu/newxtweb/

number of factors. Firstly, the dynamics of Russia's trade with the EU is traditionally determined by supplies of fuel and energy products. The 27.5% decrease in the physical volumes of exports of the relevant products was compensated by a sharp rise in world prices for fuel and energy products. Thus, in 2022, the World Bank price index for fuel and energy products increased by 60%.[3] As a result, the value of Russian exports of fuel and energy products to the EU in 2022 increased by 26.7%. Second, the sanctions measures on crude oil and oil products came into force partly in December 2022 (at the end of the year) and partly in February 2023, i.e., they did not affect most of 2022 (although even before these measures came into force, the EU sought to reduce imports of fuel and energy products from Russia). Third, the decline in trade may have been offset to a small extent by the ongoing post-Covid19 recovery, at least in January-February 2022.

Russia's commodity exports to the EU are traditionally dominated by fuel and energy products (63.6% in 2021). In 2022, the share of this group increased (to 72.8%), which further consolidated the raw material orientation of

[3] Calculated by the author according to World Bank. Commodity markets. URL: https://www.worldbank.org/en/research/commodity-markets.

Russian exports. Other relatively large (but significantly smaller in volume) commodity groups of Russia's exports to the EU include metallurgical products, chemical industry products, precious stones and metals, timber and pulp and paper products. All of these groups showed negative dynamics of Russia's exports. It is also noteworthy that shipments in the closed 99th group fell by almost one third.

The decrease in supplies of metallurgical products (by 10 per cent) was mainly due to a reduction in exports of ferrous metals (–32.4 per cent). Many products from this group were included in the EU sanctions lists.[4] In addition, the EU applies internal market protection measures to Russian ferrous metallurgy products, in particular ferrosilicon, transformer steel, certain types of cold-rolled and hot-rolled sheet steel, and corrosion-resistant steel. The fall in ferrous metal exports was partially offset by a 34.5% increase in nickel supplies.

Within the framework of chemical industry products, the decrease in supplies was due to the reduction in exports of certain types of organic chemical compounds (–33.0%), plastics (–37.4%) and rubber products (–32.6). In particular, supplies of cyclic hydrocarbons of ethylene and propylene polymers, new rubber tyres and tyres decreased. These goods are among those that bring Russia significant revenues and are not coincidentally included in the relevant EU prohibited list.[5]

The decrease in exports of precious stones and metals (–32.4%) was primarily due to diamonds. Despite their absence from the sanctions list, some European companies began to refuse to buy gems and minerals from Russia [11]. At the same time, the idea of banning the import of diamonds from Russia as a commodity that brings significant revenues to the country is being discussed in the EU.

The entire commodity group of wood and wood products was included in the sanctions list. Deliveries to the EU were more than halved. At the same time, even earlier some goods of this group were included in the Russian list of goods,[6] banned for export to unfriendly countries.

Thus, in the main commodity groups of Russia's exports to the EU (except for fuel and energy products and foodstuffs), supplies in 2022 have decreased. At the same time, the decrease in supplies is mainly due to the goods that have fallen under the sanctions restrictions. At the same time, even for goods that are not sanctioned, the EU seeks to diversify supplies (primarily natural gas).

Russia's imports from the EU in 2022 decreased in all aggregated commodity groups without exception (*Table 1*). The basis of Russian imports from the EU is machinery and equipment (in 2021 they accounted for 48.4% of supplies). This group of goods was mainly responsible for the reduction in imports. This is due to the entry of a wide range of machinery and equipment into the sanctions lists of products prohibited for delivery to Russia.[7]

These include goods used in oil refining; maritime navigation goods and technologies; luxury goods; goods and technologies used in the aviation or space industries; dual-use goods and technologies; and goods that can contribute to the strengthening of Russian industrial capacities. For Russia, this unfavourable dynamic is very sensitive, as the EU accounted for about a third of its imports of machinery and equipment until 2022, and

[4] Council Regulation (EU) 2022/428 of 15 March 2022. URL: https://eur-lex.europa.eu/eli/reg/2022/428

[5] Council Regulation (EU) 2022/1904 of 6 October 2022. URL: https://eur-lex.europa.eu/eli/reg/2022/1904/oj

[6] Resolution of the Government of the Russian Federation of 09.03.2022 No. 313. URL: https://base.garant.ru/403681900/

[7] Council Regulation (EU) 833/2014 of 31 July 2014 (consolidated version). URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02014R 0833–20230201

more than half of its imports in certain groups.

Given the imposed sanctions restrictions, growth in Russia's mutual trade with the EU seems unlikely. Russia's exports to the EU are likely to decline, primarily due to the entry into force of restrictions on the supply of fuel and energy products and the EU leadership's desire to reduce dependence on Russia (while the EU's dependence on US supplies is growing). In addition, we cannot rule out further expansion of the list of Russian goods subject to EU sanctions, the emergence of other barriers (e.g., new protective measures) and, in general, worsening conditions for access to the integration association's market. Russia's imports from the EU, which sharply decreased in 2022, may continue to decline with less intensity or stabilise.

The dynamics of Russia's foreign trade with China (*Table 2*) shows opposite trends compared to the EU, although similar features can be identified. Mutual trade turnover with this country increased in 2022 against 2021 by 29.3% — from USD 147.1 billion to USD 190.3 billion. The growth of both exports and imports was noted. At the same time, the growth of trade turnover with China by $ 43.2 billion is more than its reduction with the EU. The growth of trade turnover with China was USD 43.2bn more than its reduction with the EU (by USD 26.6 billion).

Among the common features that are characteristic of Russian exports to China (as well as to the EU), I would like to point out their predominantly raw material orientation with the predominance of fuel and energy products. The value volume of exports of these products to China in 2022 increased even more than to the EU — by 58.7%. As a result, the share of this group grew from 67.6% to 74.8%, and the surplus of Russia's foreign trade with China more than tripled, reaching USD 38.1 billion in 2022.

In other major groups, unlike in the EU, supplies to China were growing. In particular, supplies of metallurgical products increased slightly (by 6.6%). Apart from the absence of sanctions restrictions on Russian metals, China does not apply measures to protect the domestic market. By contrast, exports of ferrous metals, which contributed most to the decline in supplies to the EU, increased to China by 54.6%, demonstrating the largest absolute growth among metallurgical products. Such positive dynamics is due to the 2.8-fold expansion of supplies of steel semi-finished products, which are a sanctioned commodity on the European market.

Other tendencies are observed in another important group of Russia's exports — wood and pulp and paper products, where the increase in supplies was less than 1%. At the same time, exports to China in the largest commodity group — wood and wood products — decreased by 11.3%. This trend was mainly due to the reduction in supplies of unprocessed timber. A related factor may have been the introduction of increased export duties on these products by the Government of the Russian Federation.[8] Russia is trying to implement a policy to curb exports of unprocessed timber in order to stimulate domestic processing and value-added production.

Supplies of chemical industry products showed growth, primarily due to inorganic chemical products (by 3.5 times), rubber products (by 2.4 times) and fertilisers (by 34.8%). At the same time, the increase in exports of rubber products was provided by synthetic rubber. Supplies of new rubber tyres and covers, which showed the greatest decline within the group in the EU, also decreased to China.

Thus, in terms of the main commodity groups of Russia's exports to China, supplies in 2022 expanded. This happened at the

[8] Resolution of the Government of the Russian Federation of 27.11.2021 No. 2068. URL: http://publication.pravo.gov.ru/Document/View/0001202111300029

Table 2

Russia-China foreign trade in 2021–2022, USD billion

TN VED code (Customs commodity code)	Name of Goods	Exports			Imports		
		2021	2022	Growth rate, %	2021	2022	Growth rate, %
All goods		79.6	114.2	43.4	67.5	76.1	12.7
01–24	Food products and agricultural raw materials	4.3	6.1	42.5	1.6	2.2	38.8
25–27	Mineral products	58.2	89.2	53.3	0.2	0.4	75.0
Incl. 27	Fuel and energy products	53.8	85.5	58.7	0.1	0.3	93.6
28–40	Chemical products, rubber	2.1	3.3	55.9	7.4	12.0	62.4
41–43	Raw leather, fur and products made of them	0.0	0.0	–28.7	2.1	1.6	–21.7
44–49	Wood and pulp and paper products	5.7	5.7	0.7	0.5	1.1	120.1
50–67	Textiles, textile products and footwear	0.0	0.0	38.5	8.1	8.2	2.1
71	Pearls, gemstones, precious metals	1.5	1.6	4.9	0.0	0.0	–5.9
72–83	Metals and metal products	7.1	7.6	6.6	5.6	5.6	–1.5
84–90	Machinery, equipment and vehicles	0.6	0.6	4.4	35.7	39.5	10.7
68–70, 91–97, 99	Other goods	0.1	0.0	–82.3	6.3	5.4	–13.4

Source: compiled by the author based on General Administration of Customs of the People's Republic of China. URL: http://stats.customs.gov.cn/indexEn

expense of goods both affected and not affected by the EU sanctions restrictions.

Russia's imports from China in 2022, in contrast to the EU, grew by the main consolidated commodity groups (*Table 2*). Like in the case of the EU, the basis of Russian imports from China is machinery and equipment (in 2021 they accounted for 52.9% of supplies). Imports of this group of goods, as well as products of the chemical industry, were mainly responsible for the expansion of imports.

The dynamics and absolute volumes of imports of machinery and equipment from China increased not very significantly, especially in comparison with the fall in supplies from the EU. At the same time, in some groups, where there was the largest

decrease in supplies from the EU, there was also the largest increase from China. In particular, imports of equipment and mechanical devices from China increased by 14.7 per cent, or $ 2.2 billion. Imports of land transport equipment (excluding railways) increased by 47.1 per cent, or $ 2.0 billion. In comparison, from the EU, supplies of the above products decreased by USD 9.6 billion and USD 6.7 billion, respectively.

In general, Russia seeks to cover the reduction of machinery and equipment supplies from unfriendly countries, including the EU, at the expense of China. China, as the world's largest producer of machinery and equipment, which until 2022 accounted for about 30% (slightly less than the EU) of Russian imports of relevant products, is largely able to cover the emerging deficit. At the same time, there are a number of crucial high-tech goods regarding which China will not be able to help Russia. Among the most important are, firstly, products of the aviation industry, including components — one of the few sectors of China's economy where the country's position is weak. Unfriendly countries accounted for the vast majority of Russian imports of this type of products. Secondly, China will not be able to help Russia substitute certain types of semiconductors, especially the smallest ones. For example, in the world production of semiconductors <10 nm, 92 per cent is accounted for by Taiwan, and 8 per cent is accounted for by the Republic of Korea.[9]

The Russian leadership seems to be pinning its main hopes for import substitution in the aviation industry on Iran, with which it has signed memoranda of co-operation in the aviation sector.[10] Iran, which has been under sanctions for many years, can nevertheless supply parts and equipment for aircraft to Russia, as well as repair and maintain Russian aircraft. Iran has the relevant products primarily due to well-established parallel import channels.

In addition, in February 2021, the Civil Aviation Organisation of Iran announced plans to launch a production line of Iranian 100-seat passenger aircraft. According to the head of the organisation, Iran has become self-sufficient in repairing and supplying components and spare parts for aircraft through its own innovative companies.[11] At the same time, it is hardly possible to fully and qualitatively compensate for the falling volumes of imports of aviation industry products at the expense of Iran — it is likely to be a question of solving the problems of critical shortage of relevant goods in Russia with damage to flight safety.

Russia is trying to solve the problem of semiconductor imports by building new supply chains involving China and some other intermediary countries, such as Turkey.[12] However, it is difficult to draw a conclusion about the varieties of semiconductors obtained in this way, as well as the prospects of full-fledged substitution of imports from unfriendly countries, including the EU, given the US policy of restricting the supply of semiconductors and equipment for the production of microchips to China.

If we talk about the prospects for further reorientation of Russian exports to Chinese markets, including goods previously supplied to the EU, it is necessary to understand the objective limitations of such opportunities. The Chinese market

[9] Strengthening EU chip capabilities. July 8, 2022. URL: https://epthinktank.eu/2022/07/08/strengthening-eu-chip-capabilities/

[10] Iran and Russia sign memorandums of co-operation in the field of aviation. URL: https://tass.ru/ekonomika/17497805

[11] President Orders Production of Iranian Passenger Plane. URL: https://www.tasnimnews.com/en/news/2022/06/17/2729896/president-orders-production-of-iranian-passenger-plane

[12] Chip shipments to Russia fully recovered despite Western sanctions. URL: https://www.cnews.ru/news/top/2023–02–28_postavki_chipov_v_rossiyu_polnostyu

cannot fully accommodate the volumes that were previously sent to the EU and other unfriendly countries. For example, in 2021, crude oil shipments to the EU were 52.2 per cent higher in physical volume than shipments to China.[13] Although China is increasing its imports of Russian crude oil, it is clearly not feasible to buy twice as much as it does now.

It is also necessary to take into account the trend of China's economic growth slowdown, which emerged as early as the second decade of the XXI century, intensified with administrative restrictions during the coronavirus infection period. While China's average annual GDP growth rate was 10.5 per cent in the first decade of the 21st century, it has fallen to 7.3 per cent in the second decade (excluding 2020 data). In 2022–2027 this indicator, according to IMF forecasts, will be 4.3%.[14] This means a significant slowdown in the growth of domestic market capacity and, consequently, demand for imported products.

China is also experiencing a long-term trend towards increasing the energy efficiency of the economy (i.e., reducing the energy intensity of economic growth). The International Energy Agency estimates that energy intensity in the second decade of the 21st century (excluding data for 2020) decreased by 29.2 per cent. The decrease was faster than the world average (–16.1%).[15] In this regard, and taking into account China's greening course, it can be assumed that China's needs in fuel and energy goods will increase at an increasingly modest rate.

Finally, it should be taken into account that, with the exception of fuel and energy products, Russia is a competitor of China in many types of manufacturing products. A good example is ferrous metallurgy products, in the production of which China is the world leader. Thus, in 2021, China accounted for 52.9%[16] of global steel production.

In view of the above, it appears that partial reorientation of Russian exports and imports to/from China is possible, but it seems unrealistic to fully compensate for the loss of markets of unfriendly countries, primarily the EU, at least in the medium term. At the same time, the dynamics of Russia's foreign trade with China is likely to be more favourable (at least, positive) than with the EU.

[13] Calculated by the author according to International Trade Centre. URL: https://www.trademap.org/

[14] Calculated by the author according to World Economic Outlook Database. URL: https://www.imf.org/en/Publications/WEO/weo-database/2022/October

[15] Calculated by the author according to International Energy Agency. URL: https://www.iea.org/reports/sdg7-data-and-projections/energy-intensity

[16] Calculated by the author according to World Steel in Figures 2022. URL: https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2022/.

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Carbon Pricing as a Tool for Cross-Border Carbon Regulation and "Green" Transformation of the Global Economy

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ABSTRACT

The *relevance of the study* stems from the need to establish a mechanism for cross-border carbon regulation in the global economy. The *subject of the study* is different systems of carbon pricing in international practice in order to reduce greenhouse gas emissions. The *purpose of the work* is to analyse the current state of decarbonisation of the economy and energy transition as well as the challenges, taking into account current trends in the world economy; to identify the existing problems in the further development of transboundary carbon regulation. Using data from official Russian and foreign sources one can examine specific features and shortcomings of the major existing systems of carbon regulation in international practice, one can also analyse carbon charges in major countries and regions of the world from the perspective of sufficiency for meeting carbon neutrality targets by 2050. The study is based on a comprehensive approach to the consideration of possible options for the development of international carbon regulation and pricing. In the course of the research, the authors identify the existing problems in the decarbonisation of the world economy; study the objectives and possible consequences of the introduction of a carbon tax in the European region in 2026; and study the scenarios for the further development of the Russian economy as part of the global energy transition as set out in the Strategy for Socio-Economic Development of the Russian Federation. The main directions for the development of Russia's regional system of international carbon units trade were also outlined and the prospects for this system integration into the international emissions trading system were assessed.

Keywords: carbon regulation; energy transition; European Union; emissions trading system; green economy; carbon tax; greenhouse gases; climate change; border adjustment carbon mechanism

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INTRODUCTION

The world community is currently experiencing global shocks due to recovery from the COVID-19 pandemic, rising energy prices, inflation, economic recession, and global geopolitical instability.

Nevertheless, combating climate change remains high on the social, economic, and environmental agenda of this century and is one of the seventeen United Nations Sustainable Development Goals. To date, the Earth's average temperature has risen by 1.1 °C above pre-industrial levels, resulting in the melting of glaciers and rising sea levels, and causing a host of other environmental, social, and economic problems, such as floods and drought, forced migration, poverty, and lack of access to health care and education to meet basic human needs. All of these provoke further social inequalities and lower rates of economic development. According to some estimates, by 2030 some 700 million people in the world will be displaced by drought, while at the same time global sea levels could rise by up to 60 centimetres by 2100.[1]

Global warming is known to be caused by greenhouse gas emissions (*Fig. 1*) produced by major industries such as energy, transport, industrial production, and construction (*Fig. 2*).

In 1992, the United Nations Framework Convention on Climate Change was adopted to combat global warming and keep greenhouse gas emissions at an acceptable level, and is the main legal instrument for international co-operation in this regard.

The Kyoto Protocol, — a supplementary document to the United Nations Framework Convention on Climate Change, — was signed in 1997 and stipulated that between 2008 and 2012, total greenhouse gas emissions should be reduced by 5.2 per cent from 1990 levels.[2]

In 2015, the 21st Conference of the Parties to the UN Framework Convention on Climate Change resulted in the adoption of the Paris Climate Agreement,[3] which replaced the Kyoto Protocol. At that time, 195 countries (including Russia and the United States), which accounted for more than 94% of global greenhouse gas emissions, were in favour of joining the agreement, and it entered into force in 2020.

However, the US government then formally notified the UN of its decision to withdraw from the agreement — so it has now been ratified by 194 countries.

The Paris Agreement sets out three main long-term objectives:

1. The need to reduce greenhouse gas emissions to keep global climate warming to 2 °C this century, with efforts to keep warming to 1.5 °C if possible.

2. Regular review of country environmental targets and emission reduction commitments every five years.

3. Introduction and development of green finance.

According to the latest available data, 15 countries (including the EU) emitted more than 70 per cent of greenhouse gases globally in 2019 (*Fig. 3*).

The Paris Agreement stipulates that each participating country develops its own climate policy, makes commitments, and contributes to combating global climate change [1]. In addition to these three main goals, the agreement calls for achieving carbon neutrality (where the amount of greenhouse gases emitted equals their uptake) by 2050, and many countries have already made this commitment.

[1] Goal 13: Take urgent action plan to combat climate change and its impacts. 2017. URL: https://www.un.org/sustainabledevelopment/climate-change/ (accessed on 01.03.2023).

[2] Kyoto Protocol to the United National Framework Convention on Climate Change 11.12.1997. URL: https://unfccc.int/sites/default/files/resource/docs/cop3/l07a01.pdf (accessed on 01.03.2023).

[3] The Paris Agreement on climate change. 2015. URL: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf (accessed on 01.03.2023).

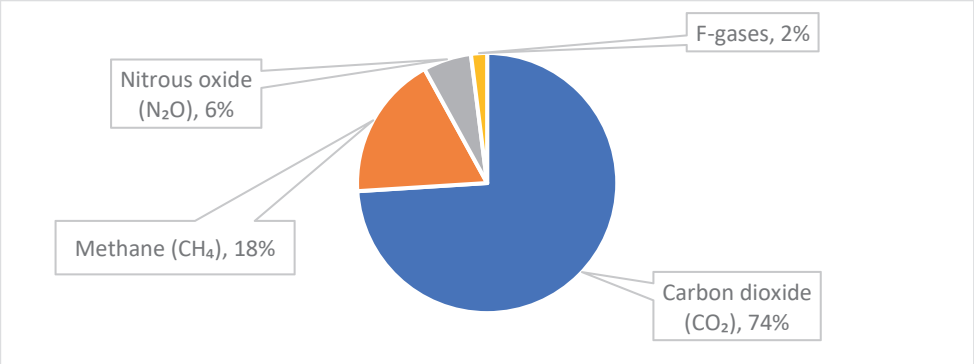

Fig. 1. **The composition of greenhouse gases and emissions, 2022**

Source: The Climate Action Monitor 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D2A24AED6B67BD26A26EE0587EB634E0

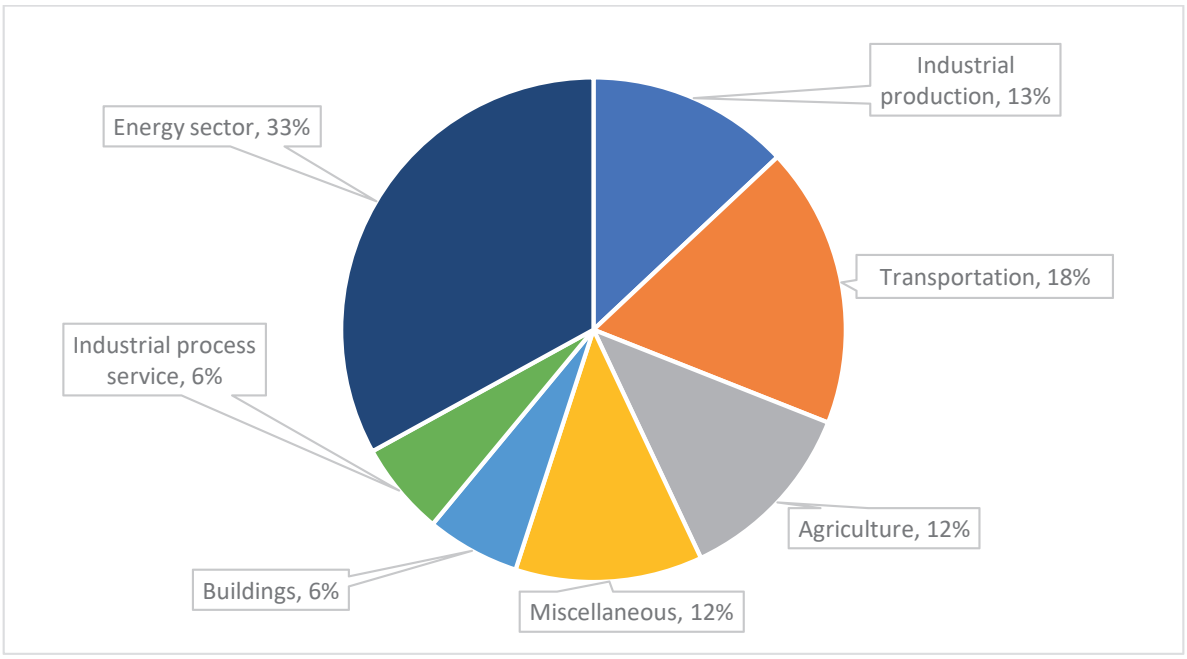

Fig. 2. **Shares of global greenhouse gas emissions by sector, 2022**

Source: The Climate Action Monitor 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D2A24AED6B67BD26A26EE0587EB634E0

For example, in September 2022, 136 countries, which account for 80 per cent of all greenhouse gas emissions, signed up to a commitment to carbon neutrality by 2050. However, for now, current estimates suggest that greenhouse gas emissions will increase by 10.6% by 2030 compared to the 2010 figure, with an international target to reduce emissions by 43% by 2019.[4]

GREENHOUSE GAS EMISSIONS TRADING AND CARBON TAX

So how to reduce greenhouse gas emissions and achieve carbon neutrality? There is an idea to use such a market instrument as emission trading [2] for pollution and emissions of greenhouse gases into the atmosphere, including at the international

[4] The Climate Action Monitor. 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D 2A24AED 6B 67BD 26A26EE 0587EB 634E 0 (accessed on 01.03.2023).

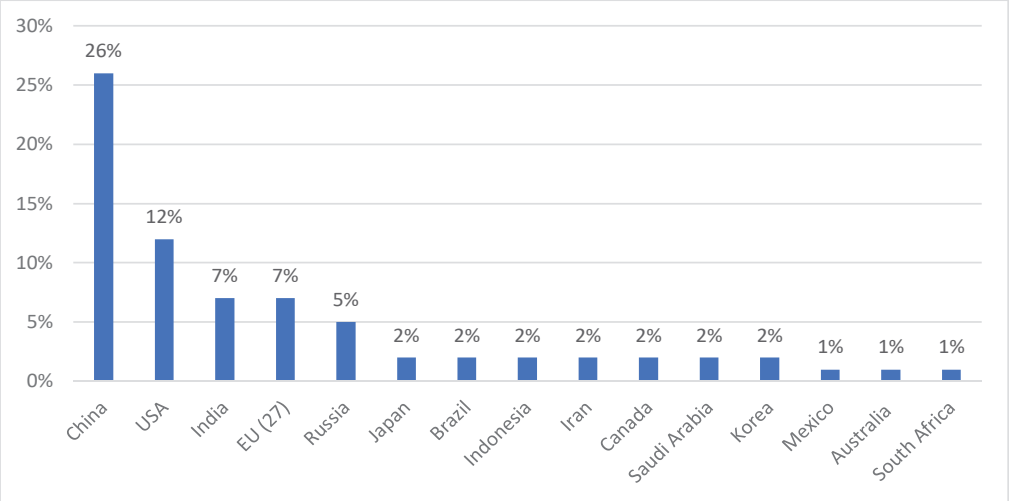

Fig. 3. **Global greenhouse gas emissions by country, 2019**

Source: The Climate Action Monitor 2022. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D2A24AED6B67BD26A26EE0587EB634E0

level. In essence, this represents a "price on carbon", which is further included in the costs of production and determines the fee that must be incurred to compensate for the consequences of environmental pollution by greenhouse gases.

As of the end of 2020, the World Bank counted 64 carbon pricing initiatives, including carbon taxes and Emissions Trading Systems (ETS), in operation or with a start date. At the same time, the actual carbon price remains very low, for more than half of all emissions it does not exceed USD 10 per tonne of CO-equivalent. For more than half of all emissions it does not exceed USD 10 per tonne of CO-equivalent (*Fig. 4*). In addition, carbon pricing now covers only 50% of greenhouse gas emissions among the member countries of the Organisation for Economic Co-operation and Development (OECD) and the G20, and the effective value of carbon "payment" is in the range of 20 euros per tonne of CO, which is much less than the amount of 50–160 euros per tonne required to meet the commitments of the Paris Agreement.[5]

Fig. 4 shows that the highest price for the disposal of 1 tonne of greenhouse gases is in North America; in the EU it is about 52 euros, while the International Energy Agency estimates that the price should be in the region of 75–100 USD per tonne of greenhouse gas emissions to meet the goals of the Paris Agreement.[6]

In the theory of carbon pricing, there are several ways to set a payment for greenhouse gas emissions:

1. The cap-and-trade system (from the English — cap-and-trade). The most famous one was developed and operates in the European Union.

The idea behind the use of emission quotas is that the state determines the limit of pollutant emissions on its territory for a certain period of time and distributes (sells) these quotas among industries. Over time, the amount of allowances (i.e., allowable pollution) decreases, contributing to the realisation of environmental goals. Greenhouse gas emissions without first

[5] Ibidem.

[6] International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704 (accessed on 01.03.2023).

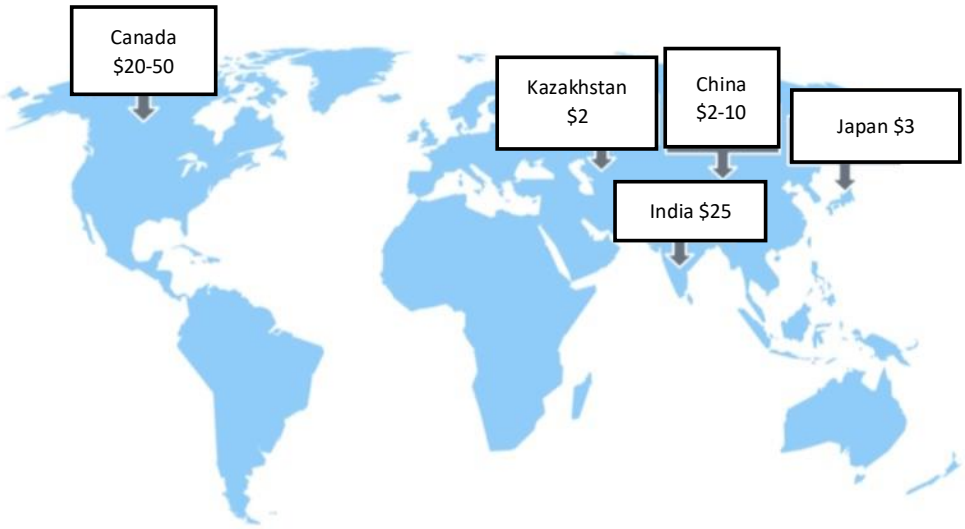

Fig. 4. **Price per tonne of CO_2 emissions in selected countries, 2021**

Source. International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704

purchasing a quota are subject to a penalty. If a company emits less than the allowances it has purchased, it accumulates carbon units. They are accounted for in a special registry of carbon units and can later be sold to states that need additional emission allowances [3].

Some of these quotas may be distributed free of charge by governments to greenhouse gas emitting companies or sold at special auctions. International trade of emission quotas between states is possible, which is stipulated by the UN Framework Convention on Climate Change, and is also verified within the European Union in the case of trading of EU emission quotas. Thus, states that consume large amounts of non-renewable energy can buy allowances from states with lower hydrocarbon energy consumption, which are traded, for example, on the London Stock Exchange and the European Climate Exchange.

The quota trading system is designed to incentivise companies to switch to renewable energy sources and to use and develop "green" technologies.

2. *The baseline-and-credit approach* (from the English — baseline-and-credit) to charging for hydrocarbon emissions also incentivises pollution reduction. It consists of providing "credits" to companies that reduce greenhouse gas emissions below a baseline level, which is usually defined as the maximum emission limit at some point in the past. The company can then use the earned "credits" to cover its emissions or sell them to other companies that exceed the baseline level of emissions.

3. *Carbon taxes,* which may include excise taxes on petroleum products; taxes on greenhouse gas emissions into the environment, on mining, on consumption of energy products (expressed in a fixed fee per 1 tonne of CO_2 emissions and applied to major carbon-intensive industries) [4].

Fig. 5 shows the coverage of pollutant gas emissions by existing carbon pricing systems in major countries.

Thus, carbon pricing is designed to oblige emitters of greenhouse gases to pay for emissions either in the form of pre-purchase of emission allowances or through a carbon tax. In both cases, the emitted carbon will have to be paid for, but the former incentivises the reduction of greenhouse gas emissions as well as the development of "green" technologies.

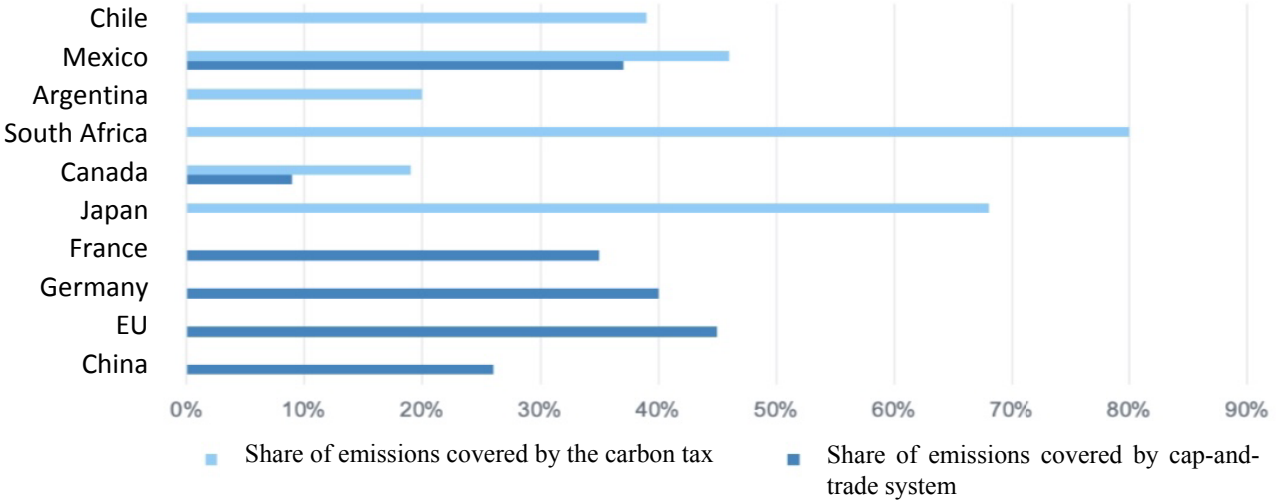

Fig. 5. **Coverage of emissions from existing carbon pricing systems in major countries, 2021**

Source: International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704

INTERNATIONAL CO-OPERATION IN THE FIELD OF CARBON REGULATION

The Organisation for Economic Co-operation and Development has set its agenda for combating climate change and greenhouse gas emissions by adopting an "International Programme for Action on Climate" (IPAC)[7] in 2021 to transition to a carbon-neutral and more sustainable economy by mid-21st century. This programme brings together all OECD countries, as well as six candidate countries (Argentina, Brazil, Bulgaria, Croatia, Peru, and Romania), partner countries (China, India, Indonesia, and South Africa), the G20 countries and Malta.

The European Union has had the world's first international quota trading system (EU ETS) in place since 2005.[8] Until 2008, 95% of EU emission quotas were distributed free of charge to greenhouse gas emitters, then 90% for the next three-year period, with a fine of € 100 per tonne to be paid if the limit was exceeded. Agreements were concluded between the EU and countries that ratified the Kyoto Protocol on the mutual recognition of quotas issued by an individual country under the quota trading system.

As noted above, about 40 per cent of greenhouse gas emissions come from the most carbon-intensive industries: electricity, industrial production, and agriculture. At present, the EU emissions trading system covers the following types of greenhouse gases (which can be relatively accurately measured and verified)):

- Carbon dioxide (CO_2) gas emitted by:

– the electric power industry;

– energy-intensive industry, including petroleum refineries, steel, cement and glass production, pulp and paper mills, and chemical industries;

– commercial air transport;

- Nitrous oxide (N_2O), emitted by nitrogen compounds, glyoxylic acids, and fat mills;

[7] The Climate Action Monitor. URL: https://www.oecd-ilibrary.org/docserver/43730392-en.pdf?expires=1675960254&id=id&accname=guest&checksum=D 2A24AED 6B 67BD 26A26EE 0587EB 634E 0 (accessed on 01.03.2023).

[8] Directive 2003/87/EC of the European Parliament and the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. 13 October 2003. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0087&qid=1676107226821&from=EN (accessed on 01.03.2023).

• Perfluorocarbons (PFCs) from aluminium production.

The above-mentioned companies are legally obliged to purchase greenhouse gas emission quotas. Although the EU accounts for only 8 per cent of global greenhouse gas emissions,[9] it is the most active in setting and implementing climate change targets. In the future, the EU plans to expand and implement the use of emission allowances in sectors such as aviation, maritime transport, and real estate,[10] and to reduce the allowable emission limit by 2.2% annually from 2021 onwards.

In addition, due to the fact that the EU has an active policy of carbon neutrality by the middle of this century, but not all countries have made similar commitments to decarbonisation, the EU government has decided to introduce — Carbon Border Adjustment Mechanism — (CBAM) [5]. This mechanism is essentially a cross-border carbon regulation that equalises the pricing of the international movement of products containing hydrocarbons in terms of limiting greenhouse gas emissions and charges a carbon "fee" depending on the carbon intensity of raw materials and products imported into EU countries [6]. It is assumed that the price of imported products with a high carbon footprint will be correlated with EU domestic prices for similar hydrocarbons, which implies fair competition between countries — importers of carbon products, in accordance with the rules of the World Trade Organisation and the EU's environmental commitments to the global community. Such cross-border carbon regulation implies an additional carbon tax on imports of carbon-containing products, the production of which involves a large amount of greenhouse gas emissions into the atmosphere (e.g., aluminium, fertilisers, cement, electricity). This could also help prevent the relocation of production from the EU to other regions with lower environmental requirements. Presumably, the carbon tax under a border adjustment carbon mechanism would be commensurate with the value of emission allowances under the EU Emissions Trading System (EU ETS). It is still planned to introduce such a carbon tax by 2026. Undoubtedly, these measures will lead to an increase in the costs of European producers and reduce the competitiveness of individual producers [7].

CARBON REGULATION IN RUSSIA

Pursuant to the Decree of the President of the Russian Federation No. 666 dated 04.11.2020 "On Reducing Greenhouse Gas Emissions", the Strategy for the Socio-Economic Development of the Russian Federation[11] (hereinafter — the Strategy) with Low Greenhouse Gas Emissions until 2050 was approved and the national contribution to the implementation of the Paris Agreement was determined.

As stated in the Strategy, "to implement international climate agreements, various policy measures are used at supranational, national and subnational levels to stimulate, among other things, the technological transition of the global energy sector from hydrocarbon-based generation and other fuels to carbon-free energy resources and energy resources with low greenhouse gas emissions".

[9] "Fit for 55": delivering the EU's 2030 Climate Target on the way to climate neutrality. 2021. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC 0550 (accessed on 01.03.2023).

[10] The European Green Deal. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the regions. URL: https://eur-lex.europa.eu/resource.html?uri=cellar: b828d165–1c22–11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF (accessed on 01.03.2023).

[11] Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050. 2021. URL: http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf (accessed on 01.03.2023).

In order to ensure competitiveness, sustainable economic growth and preparation for such a global energy transition, the Strategy considers two scenarios for further development of the Russian economy: inertial and targeted.

The first one assumes following the existing economic model and planned replacement and modernisation of the equipment in use, but this scenario will not be able to meet the Russian Federation's commitments to achieve carbon neutrality by 2060.

Accordingly, the second, target (intensive) scenario was adopted as a basis, which envisages faster growth rates of non-energy exports in the short term, introduction and replication of low- and no-carbon technologies, stimulation of the use of secondary energy resources, appropriate changes in tax policy, development of "green" financing, implementation of measures to preserve and increase the absorption capacity of forests and other ecosystems, introduction of technologies for the capture, use and utilisation of greenhouse gas emissions.[12] In this scenario, energy transition is considered as one of the factors for ensuring the competitiveness of the Russian economy on a global scale [8, 9].

Measures are envisaged to reduce greenhouse gas emissions to 70 per cent of 1990 levels by 2030 and, moreover, an ambitious target has been set to reduce accumulated net greenhouse gas emissions in the Russian Federation to lower values than those of the European Union between 2021 and 2050. This should be facilitated by the development of "green" technologies, such as, for example, the development and implementation of technologies for the capture, processing, utilisation and/or disposal of carbon dioxide from industrial and energy production.

It is interesting to note that the Strategy implies the introduction of a system of voluntary climate projects (which will make the circulation of carbon units possible). The first such pilot project has been launched in the Sakhalin Oblast and will operate until 2028[13] As a result of the experiment, Sakhalin will have Russia's first regional system of international trade in carbon units, and the region could achieve carbon neutrality by as early as 2025.[14]

Russia is developing its own market for carbon units, which should be recognised on the international market. According to Russian economists,[15] in order to trade in carbon units, it is necessary to create a developed system of monitoring and identification of all processes related to greenhouse gas emissions. This makes Russia reliable in international negotiations for the implementation of global climate agreements. It should be noted that Russia is in favour of voluntary action by participants in trading in carbon units, unlike the EU, where a mandatory cross-border carbon tax is expected to be introduced. Our country has taken a course

[12] The Government approved the Strategy for the Socio-Economic Development of Russia with Low Greenhouse Gas Emissions until 2050. URL: http://government.ru/docs/43708/ (accessed on 01.03.2023).

[13] Federal Law No. 34-FL dated 06.03.2022 "On Conducting an Experiment to Limit Greenhouse Gas Emissions in Certain Constituent Entities of the Russian Federation". URL: https://base.garant.ru/403615518/#:~: text=%D0%A4%D0%B5%D0%B4%D0%B5%D1%80%D0%B0%D0%BB%D1%8C%D0%BD%D1%8B%D0%B9%20%D0%B7%D0%B0%D0%BA%D0%BE%D0%BD%20%D0%BE%D1%82%206%20%D0%BC%D0%B0%D1%80%-D1%82%D0%B0,%D0%B3.%20N%2010%20%D1%81%D1%82.%201391 (accessed on 01.03.2023).

[14] International approaches to carbon pricing. URL: https://www.economy.gov.ru/material/file/c13068c695b51eb60ba8cb2006dd81c1/13777562.pdf?ysclid=le30toz4me704691704 (accessed on 01.03.2023).

[15] ESG reset: do environmental, social and governance factors affect the economy?. URL: https://www.vedomosti.ru/esg/green_finance/articles/2022/12/22/956555-esg-perezagruzka-vliyayut-ekologicheskii-sotsialnii-upravlencheskii-faktori-ekonomiku (accessed on 01.03.2023).

to build a national system with recognition of Russian carbon units in the global market afterwards [10].

Although the current geopolitical situation and sanctions policies are forcing EU countries to adjust their decarbonisation plans, the European government is not linking a temporary return to coal as a fuel to EU climate goals and continues to pursue industrial decarbonisation activities,[16] albeit with less enthusiasm.

"The closure of the European market from Russia does not mean that the Russian economy will stop moving towards decarbonisation. On the contrary, it is now crucial to expand the directions of this movement and intensify cooperation with Eastern partners, who are full-fledged participants in the international climate dialogue".[17] Moreover, Asian countries such as India and China are among the largest consumers of hydrocarbon fuels and have also committed themselves to decarbonisation by 2060.

CONCLUSIONS

Combating climate change is one of the most important goals of sustainable development of the world economy for the coming decades. However, due to the current geopolitical situation, changes in the logistics of energy supplies to the European region, and a partial return to the use of coal as a fuel, the issue of decarbonisation is undergoing certain transformations. The near future will show what they will be. Nevertheless, the countries do not intend to abandon the goal of carbon neutrality by the middle of the 21st century and continue to actively use various mechanisms and instruments of carbon pricing.

Russia is also keeping up with the global agenda in the fight against climate change and is developing its national climate projects aimed at testing a regional system of international trade in carbon units with the possibility of subsequent integration into the global system of emission trading under the Paris Agreement.

[16] "Economy Ministry urged not to consider Asia a safe haven from EU carbon tax". 14.12.22. URL: https://www.economy.gov.ru/material/news/v_minekonomrazvitiya_prizvali_ne_schitat_aziyu_tihoy_gavanyu_ot_uglerodnogo_naloga_es.html (accessed on 01.03.2023).

[17] Ibidem.

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The Arab East: Civil Aviation in the Light of Modern Challenges

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ABSTRACT

The article analyzes the features of the development of civil aviation in the Arab East with an emphasis on the beginning of the current century, as the most important period in the life of the Arab nations, on the one hand the time when they suffered huge losses as a result of the global financial crisis, the drama of the Arab Spring, the wars on terrorism, the pandemic and other circumstances, and on the other – the time when they managed to accumulate colossal oil revenues, which were invested in economic construction and especially in infrastructure, including its aviation part. The article is built around a description of the contrasts between Arabian oil exporters and the Arab outsiders, whose difference in growth potentials is exacerbated by the pitfalls and traps of the so-called catch-up development. This model a priori puts weak facilities at a disadvantage, since less wealthy countries experience the greatest difficulties in overcoming problems and challenges across the entire range of socio-economic development topics compared to those that form the basis of infrastructure construction, including the aviation services industry. The article emphasizes that the reduction of the gap in terms of the maturity of transport and logistics connectivity in the region, along with other advances and developments in the field of transport arrangement of the Middle East and North African economic space, could potentially in the future create conditions for a more representative presence of the Arab nations in the system of world economic ties, and at the shorter-range stages of growth it will more fully ensure the current and ongoing tasks and objectives of regional intersectoral and intra-economic connectivity in the interests of integration.

Keywords: airline; fleet; air routes; air services infrastructure; airport facilities; modernization; competition; market

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NEW BENCHMARKS

Infrastructure construction in the Arab region is now developing on many fronts, with a very uneven distribution of construction projects, which is now largely skewed towards the Persian Gulf region. Other sectors of the Arab economy are also experiencing some recovery, which has so far been limited to less intensive processes or very discrete, depending on how regularly credit lines are opened or how large the projects are that have been planned.

In general, the understanding in the Arab region that infrastructure paves the way for the exchange of information, capital, technology, etc. has already become quite firmly established in the Arab countries, which have seen in it not only a means of further mobilising and improving the efficiency of their productive capacities, but also an opportunity to access world experience and knowledge. Following this course has become almost the most urgent requirement for Arab countries at the current stage of their socio-economic development. Therefore, they are now actively seeking various ways to integrate into the global economic space and to consolidate their presence in it, since their continued exclusion from the modern world economy risks isolation from knowledge-intensive means of production and advances in the latest technologies and knowledge, which jeopardises their successful socio-economic development [1].

Currently, the Arab region has begun to pay special attention to the development of infrastructure, as even the relatively advanced construction complex, which for a long time allowed for extensive capital and civil construction (which contributed to increased business activity in other segments of the economic base), began to lag behind, as it was unable to bring the region closer to the level of world leaders.

The new strategies of economic growth adopted by some Arab countries, especially the Gulf monarchies, have contributed to significant shifts in this process of shifting certain emphases of development. It would be more accurate to say that the Arab oil-exporting countries have adjusted their previous economic development plans by prioritising the creation of powerful infrastructure facilities. This approach has begun to reverse the previous course aimed at broad diversification of national economies and the stimulation of non-oil industries. The leading Arab oil exporters have made significant progress in this area, but soon realised that the narrowness of national and regional markets, as well as the scarcity of resources other than oil and gas, prevented them from making satisfactory progress in this area. They therefore turned their attention to other goals, notably the diversification of the service industry, in the hope of realising a significant return. The implementation of this idea, in the form of the construction of superinfrastructures for various purposes, should, in their view, make the Arabian monarchies more resilient in a globalised world economy. In the same way, movement in this direction should offset fluctuations in the liquid hydrocarbons market and ensure that the Arabian monarchies keep pace with the industrialised world in terms of the pace of development.

Few countries in the Arab region have been able to compete with the leaders of the world economy in this field, although some of them have been able to follow global trends to some extent. They have done so by relying on external developments and solutions, partly by copying the lifestyles of economically advanced countries, borrowing their technology, and using the huge funds they had accumulated over the previous decades from oil and gas exports to boost the process.

In the current context, such choices have been available to a limited number of States in the Arab East, but the implementation of a number of projects in this small circle points other States in the region in a very promising direction, albeit with inevitable caveats and adjustments to the scale and pace at which they can achieve their goals.

FACTORS OF GROWTH

The largest medium-term project over the past 10–15 years has been the modernisation of the transport sector through a dramatic expansion of the modern civilian air fleet and the facilities required to support it. This is already transforming the Arabian Peninsula into a highly developed centre for world-class air services, passenger services and a concentration of modern aviation equipment, as the Gulf monarchies have set themselves the task of raising the importance of their civilian air fleet, increasing its role in international air transport by providing competitive services and thus "capitalising" on their geographical location.

Commercial aviation is expanding in this area of the Arab region for a number of reasons, the most important of which is the "oil" nature of their economies and the successive growth of revenues from the export of oil and gas abroad, because even at the stage of development of oil and gas fields, the latter circumstance allowed these countries to resort to the then inexpensive transport of people and cargo (initially in small consignments) mainly within the oil-exporting countries [2].

Another impetus for the relatively widespread use of air services in the Arabian Peninsula was the need to quickly transport growing numbers of foreign workers, which led to an increase in air traffic on routes already outside the peninsula countries. In a later phase, mass tourism, which demanded a new, higher level of service and appropriate aviation equipment, was a factor that fuelled the development of the aviation industry. In addition, due to the marked improvement in living standards in the Gulf States, the demand for quality components of the aviation business increased sharply, which began to be subject to higher and more sophisticated requirements.

The conviction of the leaders of the Arabian monarchies that air transport, as a technically sophisticated and advanced part of the infrastructure complex and the entire national economy, could become a means of modernising many sectors of the local economy was also a crucial factor. This is evidenced by the practice of the countries of the Gulf Cooperation Council (GCC) or Cooperation Council for the Arab States of the Gulf, which have consistently created conditions for entering the global air transport market. However, when assessing this phenomenon, it should be borne in mind that modern civil aviation as an industry is a relatively recent phenomenon, the aircraft fleet is formed at the expense of imports, and flight crews and technical personnel are staffed mainly by foreign personnel. The Arab side's own contribution is expressed in maximum financial support and project promotion, and it is consistently moving towards making its civil aircraft fleet a basic element of regional traffic and the Gulf region an important centre for intercontinental air services.

BUILDING UP THE INDUSTRY

It should be immediately noted that the Gulf Cooperation Council (GCC) countries largely succeeded in doing so, as in 2018 (the last year before the COVID-19 pandemic that severely disrupted global air traffic) they accounted for 97.6% of cargo and 83% of passenger traffic for all Arab countries,[1] with the former growing 9.4 times and the latter 6.7 times between 2000 and 2018. In the following two years, due to COVID-19, total Arab passenger traffic, although down 67.7% compared to 2018, nevertheless accounted for 8.6% of global air traffic. Meanwhile, Qatar Airways, which decided to continue full operations during the pandemic, even became the world's largest airline in terms of passengers carried.[2]

In addition to Qatar Airways, which has 182 aircraft operating to 164 destinations, several other Arabian airlines now claim leading roles in international air travel.

Two of them belong to the UAE, which has so far created a very strong foundation for strengthening its position, and the process has been so intense that it has even given rise to acute rivalry between the airlines of the two emirates. However, the serious competition between economic entities in the UAE aviation business, which has been going on for many years, is still creating new impulses for the development of the aviation industry in this country. We are talking about such airlines as Emirates (owned by the Emirate of Dubai, owns 278 passenger aircraft flying to 143 destinations) and Etihad Airways (owned by the Emirate of Abu Dhabi, has 105 aircraft operating regular flights to 86 cities of the world).[3]

The Kingdom of Saudi Arabia is also striving to become an aviation powerhouse of sorts in the region [3]. Its Saudia Airlines is one of the oldest air carriers in the Gulf region. At the same time, it is one of the largest airlines in the Middle East, which is

[1] Calculated according to: World Development Indicators Databank 2020.

[2] URL: https://www.icao.int/Pages/default.aspx (accessed on 09.01.2023).

[3] URL: https://aeroportpro.ru/airlines (accessed on 07.01.2023).

constantly growing and modernising. But due to the rise of other airlines owned by GCC countries, the increase in their aircraft fleets and the explosive construction of airports, Saudia began to lose ground to the UAE and Qatar. It now operates 90 routes typical of other regional airlines, i.e., to the Middle East, Africa, Asia, Europe and the US, and the number of aircraft at its disposal has reached 145. The flights are mainly operated on fixed routes, with domestic charter flights and international traffic of this category mainly during Ramadan and Muslim pilgrimage to Mecca [4]. The number of passengers carried, which grew very rapidly in the previous decade, has now stabilised at around 10–12 million per year.[4]

It is clear that the intensive expansion of the aircraft fleet in the GCC countries and the dramatic increase in passenger traffic have required them to make serious efforts to expand the capacity of existing airports, build new passenger and cargo terminals, etc.

For example, the new airport that opened in Doha (Qatar) in 2014 with the capacity of 29 million passengers per year required a major renovation and increased capacity to 50 million passengers per year for the 2022 FIFA World Cup.[5]

Kuwait's plans to increase its own share in international air travel led to the announcement in November 2021 of its intention to implement eight new projects worth $ 14bn to renovate the country's main airport, including the construction of a new terminal, runway, aircraft refuelling facility and so on.[6]

All GCC airlines are constantly developing new routes, with a particular focus on the possibility of increasing flight frequencies, and are therefore concentrating mainly on the implementation of major projects. In fact, their management, making ample use of the strong support of the authorities, has set itself highly ambitious goals of turning airfield complexes into terminals of global significance, which is coupled with their idea of surpassing their US, European and Chinese competitors in a number of air service industry development indicators. With the new wide-body airliners, GCC companies hope to have a real chance, if not to dominate the world's major air routes, at least to significantly displace competitors on some of them, including by gradually transforming a number of their cities into centres of international passenger and cargo services.

In any case, to date, cities such as Doha (Qatar), Al Kuwait, Dubai, and Abu Dhabi (UAE), Muscat (Oman), Manama (Bahrain), Riyadh, Jeddah, and Dammam (Saudi Arabia) have already become owners of such airline complexes, resulting in, for example, the fact that Dubai (3rd after Atalanta and Beijing), Doha (61st) and Riyadh (81st) were among the top 100 airports in the world in 2019.[7] In addition to the Arab airlines mentioned above, other major airlines include FlayDubai (61 aircraft, flying to 99 destinations), Air Algerie (56 aircraft, 72 destinations), Egyptian Air (54 aircraft, 50 destinations), Royalair Maroc (54 aircraft, 96 destinations) and Oman Air (51 aircraft, 50 destinations).[8]

AVIATION OUTSIDERS

As for some other Arab countries, where the aviation industry had been doing very well until the early 2000s, many of them were caught up in a series of violent internal and external conflicts called the Arab Spring, some of which turned into protracted armed

[4] URL: https://aeroportpro.ru/airlines (accessed on 07.01.2023).

[5] URL: https://nppmeridian.ru/bilety-i-registraciya/doha-aeroport.html (accessed on 02.02.2023).

[6] URL: https://ru.rayhaber.com/2021/11/Кувейтский-аэропорт-будет-отремонтирован-компанией-Limak-Construction/ (accessed on 02.02.2023).

[7] URL: https://www.airlines-inform.ru/rankings/world_airports_2019.html / (accessed on 02.02.2023).

[8] URL: https://aeroportpro.ru/airlines (accessed on 02.02.2023).

confrontations, compounded by foreign military intervention and opposition to aggression by the terrorist organisation Islamic State (ISIS). As a result of these and other negative developments in countries such as Iraq, Syria, Libya, Yemen, Sudan, Somalia, Lebanon, and Tunisia, the aviation industry was left in a shattered or semi-destroyed state. Although some of them have started to gradually recover from the crisis, due to limited or outright lack of financial and material resources, the practical absence of the necessary qualified personnel, etc., even their former positions in regional and international aviation markets have not yet been restored. For example, at the end of 2022, Syrian airlines had only nine aircraft operating to 22 destinations, Libyan airlines had nine aircraft (18 destinations), Sudanese airlines had four aircraft (21 destinations), Yemeni airlines had four aircraft (12 destinations) and Somali airlines had ceased operations altogether.[9]

It can be assumed, of course, that the plans to build up aviation infrastructure in these countries (especially in the context of a gradual recovery from the current crisis situations) could lead to accelerated development of their national aircraft fleets and modernisation of airport facilities. However, this process is hampered by such factors as ongoing internal political instability, sanctions imposed by the US and EU, lack of ability to make independent decisions on strategic issues related to the development of national aviation industries, and others.

On the whole, it can be said that in creating and developing an extensive air services infrastructure and building large facilities that could revolutionise the economic landscape of the region, almost all Arab countries, although very ambitious, are not yet in a position to compete with the leaders in this field — Abu Dhabi, Dubai, Qatar, Saudi Arabia, Oman and Bahrain, which are currently among the world's largest buyers of wide-body aircraft and customers for airport construction and modernisation of airport facilities.

THE COMPETITIVE FIELD

It should be noted that at present there are a number of things that promise certain problems for all Arab airlines, of which there are currently more than 40. For example, it is clear that Western countries are hardly going to leave their long-won positions, which help them to maintain large air fleets [5]. In addition, many Arab airlines are little known to a wide range of consumers (especially on the American continent and in China) and therefore, attracting potential passengers, have to overcome the very persistent predisposition of the Western and Chinese population to their own companies. For this purpose, they, in particular, conduct an extensive advertising campaign in the Western media and the Internet, while the leading Arabian airlines also invest heavily in some of the most popular European football clubs, whose players' jerseys (as well as in the stadiums of some European countries) now bear the names of, for example, Qatar Airways or Emirates rather than, say, Air France or British Airways.

Arab air carriers are also constrained by the international Open Skies agreements (The Treaty on Open Skies) on the principles of commercial air transport and liberalisation of the air services market, which force them to strictly follow the competition rules established by Western countries, limiting the room for manoeuvre to capture certain niches in the global air transport market.

The leading Arab carriers are striving, if not to catch up, at least to seriously approach the main Western and Chinese competitors before the volume of offers exceeds the needs of the air services market. In the short term,

[9] URL: https://aeroportpro.ru/airlines (accessed on 05.02.2023).

this is unlikely to happen, as the recovery phase of the global aviation industry after the COVID-2019 pandemic and the transition to super airliners in transcontinental transport has only just begun. Therefore, the Arabian calculation is clearly built taking into account the need to fit into this process, and the most modern airliners purchased in 2019–2022, as well as an increased level of comfort of service even on budget flights are offered to passengers.

It seems that Arab air carriers can do it, because, spending billions of dollars on prestigious projects, they are able to occupy a niche, the size of which may eventually be determined not so much by the real state of affairs on the market as by political manoeuvres around this area.

It is obvious that, given the overall success of their aviation business, Arabian airlines are all together actively working (each — to the best of their abilities) to turn the subcontinent into one of the world centres of air services, and this process is not without internal competition (which is quite natural), which does not destroy the business, but moves it forward [6]. But it should be borne in mind that the expansion of their capabilities may be perceived as a challenge by major Western air carriers, who will hardly react favourably to the emergence of powerful high-class Arab airlines in the market of aviation services, capable of acting as their direct competitors. It is clear that the relations between companies in a global context are clearly regulated by international agreements, as mentioned above. But, if we take into account the current trends that are reversing the polarity in global economic and political practices, encouraging the mutation of the unacceptable yesterday into the permissible today, such a "dodge" will "blur" any efforts and will contribute to turning the subcontinent into a zone of competition between aviation giants. The Arabian, much less the rest of the Arab aviation industry, can hardly by itself pose a threat to the activities of the European or American aviation industries. Rather, it is logical to assume that it is the West, if it finds it useful for itself, that will start applying sanctions against any "renegades" in order to get what it is looking for. And Arabian companies, as potential competitors, may be the first to attract its attention.

The Arabs are aware of the possibility of such a development and therefore pursue a cautious policy, realising that, for example, an excessive increase in the share of airlines, primarily Arabian, in the global transport market could threaten the interests of Western companies. But at the same time, the Gulf monarchies themselves, which have clearly been expanding their positions in this market in recent years, are keen not to saturate it, as such a development could lead to undesirable consequences for them in the form of a drop in load efficiency per aircraft, reduced profitability of flights and even the forced decommissioning of a certain number of aeroplanes.

So far, there has been a kind of extensive competition between the Arab participants in the aviation business, mainly related to the build-up of capital assets by expanding the aircraft fleet through the construction and modernisation of airports, upgrading flight control systems, etc. Launching this process to create an advanced platform that demonstrates the highest level of technological sophistication in the aviation industry can be seen at this stage more as a manifestation of ambition, as the equipment saturation of these facilities is already high and further investment of resources in them may be excessive in nature.

But the movement in this direction can also be regarded as preparation for the transition to real competition for passengers and aircraft capacity, which is likely to be a more serious stage in the inter-Arab market competition, although it seems that at the moment the

roles between the main Arab "players" are to a greater or lesser extent distributed. So far, this has been facilitated by the situation on long-haul flights, in which the outstripping demand for air services on spot markets (such as Tokyo) allows the four major Arab airlines to operate simultaneously without much damage to their economic performance or to their Western competitors.

In general, at the moment, the balance of interests on various positions is maintained and no resonant conflicts are seen in the near future, but if the balance of interests is disturbed, they may become a reality, and then open rivalry can hardly be avoided.

THE PLANS OF THE ARABIAN MONARCHIES

Competitiveness, and perhaps even latent competition, is accompanied by activity on different fronts and is expressed in the desire to be ahead of the curve. For example, Emirates has invested heavily in Western development of environmentally friendly engines for the A-380 airliner, considering them preferable because the attention in the West to "green" issues may create additional preferences for the air carrier in organising flights with these engines to those countries that pay more attention to environmental protection measures.

An environmentally friendly approach seems very promising for GCC airlines, especially in light of the successful experience of Qatar Airways, which, back in 2009, flew the world's first commercial biofuel flight, demonstrating its suitability as an alternative fuel for aircraft with reduced carbon dioxide emissions into the atmosphere.[10]

It is also important to note that by purchasing significant quantities of aircraft, the Arab states of the Persian Gulf simultaneously seek to receive dividends from their investments in such deals in the form of opportunities to establish their own aircraft maintenance bases and to carry out preventive and overhaul repairs of aircraft [7]. This is part of their plans to diversify their production activities and create alternative industries for the period when the demand for oil and gas resources will decline.

In this context, the GCC countries are endeavouring to create a kind of "network structure" in the aviation business. Their airlines are cost-consciously endeavouring to participate in the development of the aviation industry and its infrastructure at different levels and in different directions. In transcontinental aviation, they have already laid the foundation in the form of modern aircraft and the ground base for their use. Relying on their accumulated material and financial assets, they seek to short-circuit and appropriate any processes in their area of responsibility and try to extend their influence towards the rest of the Arab countries, leaving fewer and fewer chances for foreign business to penetrate the Arab region by restricting the activities of external "players".

In particular, the GCC countries are claiming their own vast niche in the long-haul passenger transport market, which already enjoys good positions on the world's major routes. In addition, while pursuing the idea of creating a national long-haul air fleet, Arabian carriers are not overlooking charter and discount services in other Arab countries, saturating their markets with their services wherever possible.

When planning to expand their airline business, the GCC countries are paying great attention to low-cost companies, which traditionally have a significant share of the airline market. After all, discounters operate in the Arab region on routes with flight times of less than four hours, and their stay at arrival points is minimised due to the efficiency of local services, simplified passenger flow patterns in the airport area, and the precise actions of maintenance staff.

Another characteristic feature of the GCC aviation business is the presence of a number of

[10] URL: www.aex.ru/inform//1728/ (accessed on 12.02.2023).

private companies with fleets of luxury image aircraft that cater to government delegations and corporate clients.

The Arabian monarchies' plans to retain their leading positions in the air transport system in the region will remain relevant, as the nature of development of the most advanced forms of this business is determined here. Its support at a high governmental level serves as an impetus for the growth of the economies of these countries, and also serves as an example for other states in the region, where the problem of economic modernisation is of paramount importance. It is obvious that the aviation sector in the GCC countries has already developed into an industrial complex, which is now gradually becoming one of the leading elements of modern economic growth in these countries, where local development strategies are aimed at moving away from a unilateral focus on energy exports and maximising the diversification of sources of accumulation. These objectives and plans are even more relevant for the "underfunded" countries of the Arab region, which are searching for additional resources to lift their economies out of stagnation.

Foreign capital, represented by companies and firms from the industrialised centres of the Western world, is also actively involved in the modernisation of the Arab air transport system. They not only take part in the modernisation of national fleets, but also lay the foundations of ground infrastructure that corresponds to them in terms of quantity and quality, being particularly active in the GCC countries, considering them as a solvent source that guarantees payment for the supply of equipment and materials and the receipt of orders.

For Western manufacturers, involvement in large-scale production processes means, first and foremost, actively expanding the capital-intensive segment of the currently largest regional market for aircraft and other related products, as well as securing sustainable long-term employment and bulk orders at their industrial plants for the long term. Equally important is the additional opportunities to realise the latest engineering ideas in the field of engine building and aircraft equipment while relying on Arab capital.

For Arab countries, co-operation with foreign capital means access to the most advanced segment of modern production, the possibility of transferring some of the advanced technologies to the national soil and creating new economic sectors with a large innovative component. In addition, they form a very significant launching pad for successful operations in the global airspace and have guarantees of growth for future commercial activities in the lucrative intercontinental connectivity system. The Arab region, especially its most financially secure part, has thus sought to carve out a niche for itself in the international division of labour. This result can be seen as an example of skilful planning and implementation of large-scale projects and deep strategic calculation, as well as a testimony to the success of Arab entrepreneurship.

It is clear that the importance of the measures taken by the Arabian monarchies in their aeronautical endeavours should not be exaggerated, since their effectiveness can only be proven by subsequent events and the practical results of the transactions that have taken place. Nevertheless, it is reasonably certain that the beginning of the high-tech phase of the Arab economy is closely associated with civil aviation, which is now a clear reflection of the economic achievements of the Arab regimes and has made it possible to bring to the forefront sectors that were previously in the deep shadow of the oil business in those countries.

However, civil aviation should not be perceived as a universal means of achieving high growth rates and solving transport and logistics problems. Civil aviation itself is an important component of the national economy, which is also visually appealing, attracting attention by the expediency of engineering solutions, as well

as fulfilling a propaganda function, giving the local population an inner sense of belonging to the state, which has the ability to maintain powerful aviation, luxurious airports, provide the highest level of service, etc. But it should also be realised that aviation is, first and foremost, a complex mechanism for the production of important services, and as such it can only work effectively in close conjunction with other sectors of infrastructure and the economy as a whole that are equal in technical level.

AVIATION COMPONENT AS A FACTOR OF DEVELOPMENT

The very attractive example of the Arabian monarchies is encouraging other countries in the Arab region to look for new ways to modernise their reproductive mechanism, although many of them are still not ready to make breakthroughs in world markets, especially in a high-tech industry such as aviation.

However, the modernisation of economic structures in the Arab region does not necessarily follow the trend of increasing air services, although a number of these States suffer from "aviation insufficiency", primarily due to a lack of financial resources and a weak ability to mobilise savings from domestic sources, which significantly limits measures related to the development of their civil aviation. The relatively small size of the territory of some Arab States is important, as a result of which their demand for domestic air transport of passengers and commercial cargo is relatively low. However, the situation may be different for external air services (as evidenced, for example, by the experience of Qatar or Bahrain), but again it depends on limited material capacity, and the demand for international air services is currently met mainly through a combination of different financing options.

It is no coincidence that in Arab countries, capital-intensive industries, including aviation, and other productive infrastructure continue to be owned by the state, which acts as a guarantor of their maintenance and future development. This situation has two dimensions. The first has to do with the speculative nature of a significant part of Arab national private capital, which is very often oriented towards a quick turnover of invested funds and therefore generally avoids participation in socio-economic development projects with long payback periods. The second "emerges" in the form of government bureaucracy, corruption, and inertia, which create serious obstacles to attempts at technical re-equipment of the sectors on which the progressive socio-economic development depends.

Both of these factors have a negative impact on the economic infrastructure in those Arab countries where the need for such facilities is particularly great. At the same time, transport infrastructure has become one of the main issues for the full existence of several states, including Syria, Libya, Yemen, Lebanon and Sudan, whose economies have lost most of their facilities as a result of uprisings, wars and devastation. In fact, they are deprived of even the prospects for the restoration of their infrastructural potential and are particularly dissonant against the background of their antipodes in the form of the monarchies of the Arabian Peninsula, which are intensively building a whole range of transport and logistics enterprises, which have become an effective means of finding their own niche in the global movement of goods, capital, and services.

The affected countries are also different from those classified as medium-developed countries, but they cannot mobilise sufficient resources to follow the prescriptions of the leaders of the transport revolution in the region. They have relatively recently come to realise the need for urgent measures to close the gap with global practice in this area of economic activity. Of course, in their case too, it is difficult to find a single link capable of synthesising the merits of several divisions of the industry, by investing in which other structures could be gradually reanimated. However, all the objects are

individualised and specialised in areas which only in the form of the totality of all enterprises and systems can ensure the viability of the productive forces and society.

In many cases, Arab outsiders have alternatives to air transport in the form of water, road, or rail. Nevertheless, they favour the re-establishment of aviation as an organic and necessary complement to reproductive mechanisms, helping to significantly speed up the delivery of passengers, cargo, and other items to their destination.

Today, virtually all but a few of the most disadvantaged member countries of the League of Arab States are focusing on projects to revitalise or improve infrastructure, including civil aviation, in accordance with their objectives and circumstances. With its presence, the whole project of infrastructural development of national economies becomes universal and can contribute to the solution of many fundamental problems, including the optimisation of the domestic market, a more rational distribution of productive forces, and more efficient international trade and economic relations. Arab national and regional infrastructure, coordinated and modelled on the GCC template and aligned with domestic needs and modern norms, has the potential to significantly boost inter-Arab economic integration, which will have crucial implications for better positioning all Arab countries in the global economic nexus.

The general trend today is that transport and logistics infrastructure, in all its diversity, is likely to be the vehicle that will set the Arab region on a more sustainable development path. It is no coincidence that virtually all the capable States of the region are taking a comprehensive approach to the subject and are endeavouring to expand such sectors as rail transport, maritime transport, air transport, power lines, pipelines for various purposes and irrigation infrastructure in parallel. In other words, the infrastructural development of the Arab economic space is clearly becoming the most talked about issue on the agenda of the Arab East, reflecting the desire to bring the region's logistical base to a new level and the intention to orient the countries towards an accelerated growth mode, which can be achieved by promoting its transport components.

It is this approach that gives the Arab reproduction system a noticeable mobility and manoeuvrability, as it creates prerequisites for facilitating the region's interaction with the outside world [8] and within the region itself, as well as for increasing employment through the creation of many jobs in large-scale and multifunctional infrastructure and other projects, expansion of centres for training qualified personnel in new specialties, etc. [9].

A broad approach to aviation and other components of infrastructure support of development processes is also important from the point of view that the Arab region over the past two or three decades has begun to lag economically behind a number of other developing countries in the East, which has posed another challenge to local residents.

Removing it will be a new challenge for most Arab countries, as it will require the mobilisation of additional resources to overcome the difficulties. This situation is reproduced on an ongoing basis, and at each stage it is important to recognise which approach is more necessary and useful for a particular Arab country — gross or breakthrough in certain areas, as in the case of civil aviation [10]. The option of developing the airline business along the lines of the Arabian monarchies is generally quite harmonious and does not disturb the growth proportions. In other cases, it will require a precise understanding of what the state is striving for — development without growth or growth without development, and what approaches to this topic will be preferable in terms of raising the overall level of production and modernising the mechanisms of management of the national economy of each particular Arab country.

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Monitoring of Inflation in the New Geopolitical Reality

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ABSTRACT

The article is devoted to the assessment of the inflation rate based on the aggregated inflation index, which characterizes the dynamics of business processes in the main sectors and spheres of the national economy in the conditions of a new geopolitical reality due to the coronavirus pandemic and sanctions wars in connection with Russia's special military operation in the Donbas and Ukraine (SMO). The object of the study is the monitoring of inflation, acting as an up-to-date leading socio-economic barometer formed through the integration of private inflation indicators. During periods of macroeconomic instability, private inflation indices ambiguously reflect the real situation about the ongoing production and inflationary processes in the national economy. As a result, the decisions made are based mainly on unilateral expert analysis, which reduces the effectiveness of the decisions made. The article proposes an approach based on the selection and integration of private inflation indicators and the construction of an aggregated index using statistical methods. This makes it possible to more accurately and quickly calculate the impact of prices and tariffs on the development of key economic complexes, which determines the change in income levels and, accordingly, the quality of life of the population. The proposed methodology opens up significant prospects for monitoring inflation in comparison with the consumer price index used in Russian practice. The result of the work were the conclusions of the authors obtained by analyzing the calculations of the dynamic series of aggregated and partial inflation indices. It is determined that it is advisable to use the aggregated inflation index when indexing pensions, justifying the subsistence minimum and other macro indicators characterizing the level of economic growth and social progress. The aggregated inflation index is proposed to be considered as a target macro indicator of strategic development.

Keywords: macroeconomic instability; prices and tariffs; inflation; aggregated and private inflation indices; weighting factors; accounts payable; pension indexation

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INTRODUCTION

Inflation is an important barometer of social, economic, financial, and monetary stability of a leading type, from which the "health" of a nation is inferred. "Inflation is a reflection of all socio-economic imbalances in the country" [1]. The higher the inflation, the higher the risks in the national economy, and thus more expensive capital for its residents. This reduces the efficiency of economic activity, and sometimes makes it practically impossible in sectors and spheres of the national economy in the conditions of the new geopolitical reality.

In the world economy, globalisation has led to a new type of relations between countries, characterised by the export of inflation. Developed countries, owning the world reserve currencies, have the opportunity to reduce inflation in their economies at the expense of inflation growth in the economies of developing countries, restraining the growth of money supply and increasing their own revenues from foreign economic activity. As a rule, this is realised through the provision of international loans denominated in national or collective currencies of eurozone countries and the United States, export of goods and services at high prices, as well as through the reorientation of industrial production to low-cost countries [2]. "Imported inflation,

along with other inflationary factors, affects the exchange rate of the national currency against foreign currencies as well as the rate of price growth in the country" [3]. Thus, the countries — exporters of inflation strengthen their competitive position and make the received resources cheaper [4].

It is statistically proven that the exchange rate of the national currency of the CIS countries depends on the US dollar [5]. In Russia this influence is less significant, in contrast to the Republic of Belarus [6] and other CIS countries. When the inflow of foreign capital to developing countries grows, the output and supply of goods and services increases, which at the initial stage positively affects the living standards of the population. In the situation of "investment hunger" caused by high interest rates, the activities of national non-financial corporations of developing countries are often unprofitable. This is confirmed by the growth of inflation.

In the current geopolitical situation, attempts are being made to isolate Russia through sanctions wars (trade and economic, financial, monetary, information and communication, humanitarian) in order to undermine the country's state sovereignty. Logistical chains of links between producers of goods and services, as well as financial, monetary, transport and other organisations serving these links around the world are being destroyed. This leads to significant structural shifts in global production and consumption, and, as a consequence, to a sharp rise in inflation in the countries of the collective West (over 9% in the US and 10% in the eurozone and the UK). As a result, there is a threat of Russia's transition to a closed-type economy, primarily in relations with developed countries with world reserve currencies. As a consequence, inflation in Russia has changed its character and moved from monetary to non-monetary type. Stabilisation tools in this case become methods of "manual" management and increasing government intervention in the economy, which objectively increases the relevance of the development of new measures of inflation [7, 8].

To measure inflation, consumer price indexes (CPI), core and forecast inflation, etc. are used. [9, 10]. In the countries of the European Union (EU) since 1997, harmonised price indices have been used, which allow us to assess inflation in general in the EU countries with different geographical and natural-climatic conditions, as well as socio-economic characteristics and consumption patterns [11, 12]. However, these measures are based on the monetary concept of inflation, which proceeds from the well-known provision of the quantitative theory of money about the existence of a direct relationship between the money supply and the general price level in the economy [13]. At the same time, the inflationary process is a socio-economic phenomenon reflecting reproduction imbalances in various spheres of the national economy [14, 15]. Inflation expectations affect the decision-making by economic entities, which in turn determines the vector of development of the country as a whole [16].

The importance of obtaining objective, reliable and timely assessment of the inflation rate in the implementation of the state socio-economic policy under the new geopolitical reality characterised by threats of high financial and macroeconomic instability are the main reasons for the search for new measures of inflation. Their application, along with private measures, will increase the accuracy, efficiency, and objectivity of inflation assessment [17].

AGGREGATE INFLATION RATE INDEX

The proposed aggregate inflation index (AII) is a gauge that makes it possible to supplement the system of private inflation indicators (PII) and summarise them taking into account the weight, for the determination of which statistical methods are applied. Such an approach has a number of advantages. Not

one, but several private inflation indicators from different industries and spheres of the national economy are used. In addition, the aggregate inflation index has a greater stability of dynamics, since the growth rates are used rather than cost values of indicators, which, with regular revision of average annual prices by the Federal State Statistics Service (Rosstat), ensures their more stable dynamics.

Formation of aggregate inflation index includes the following steps: selection of private inflation indicators, estimation of weights with which they are included in the aggregate index, and determination of the aggregate index itself.

At the stage of selecting indicators for inclusion in the definition of the aggregate inflation index, it is necessary to justify their economic feasibility and relevance in the context of changing geopolitical reality. It is also necessary to take into account their information availability: frequency of publication (monthly, quarterly and annual data for the entire period of the study); timeliness and regularity of data collection; their stability, taking into account the risks of replacement in the future. Therefore, private inflation indicators provided by Rosstat serve as the basis for the aggregate inflation index. Price change is one of the most representative and operational sectors of government statistics. For example, Rosstat calculates consumer price indexes (CPI) based on the change in the cost of the consumer basket, which currently consists of 566 items of goods and services.

In economic practice, there are alternative measures to Rosstat's inflation indices, such as the "FMCG Deflator" from the Romir research holding. This meter takes into account the prices at which purchases were realised, not for a basket of products and services at the time of registration, as Rosstat does. Therefore, the deflator actually demonstrates the average personal inflation of each consumer. However, this measure does not take into account the prices at which services were sold, and, in addition, it is characterised by low responsiveness compared to Rosstat's price indices (*Fig. 1*).

The first private inflation indicator used in the construction of aggregate inflation index is the consumer price index as the main internationally recognised indicator characterising the inflation rate.

The second private inflation indicator is the index of producer prices of industrial goods, as producer prices largely determine the investment and consumer behaviour of the population and businesses in Russia.

The share of food expenditures in the world practice is one of the generalising indicators of living standards: if the population spends more than 60% of income on food, the country is considered poor, and the population is considered low-income. In the EU countries this indicator does not exceed 20%. The consumption structure of the Russian population changes depending on the macroeconomic situation in the country's economy. Thus, in the 1990s the share of food products increased sharply, during the period of economic growth in the 2000s the share of expenditures on food products decreased, and after 2014 it increased again [18]. According to Rosstat, this indicator in 2021 amounted to more than 61%, which is higher than in 2015–2020. Therefore, the third private inflation indicator used to form the aggregate inflation index is the producer price index of agro-industrial products sold by agricultural organisations.

According to Rosstat, freight transportation tariffs increased by 14.7% in 2022.

Due to sanctions restrictions, international transportation companies — the main "culprits" of inflationary processes — left the Russian market or suspended their operations. In this connection, the prices for spare parts and new trucks rose sharply. All this affected the cost of goods and services. Thus, the fourth private inflation indicator used to form the aggregate

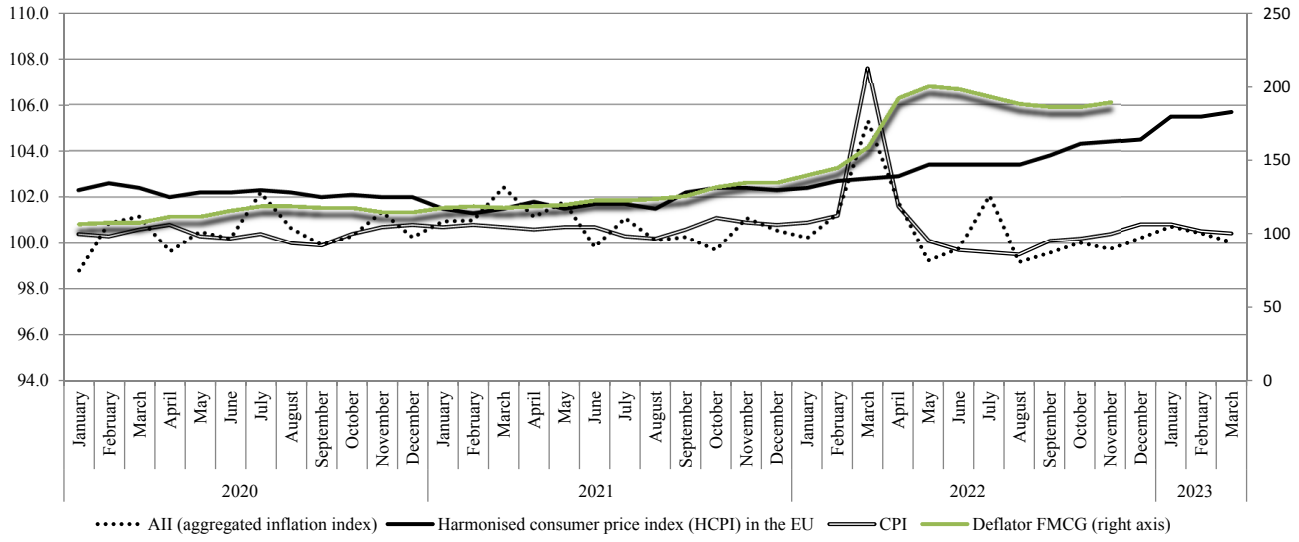

Fig. 1. **Dynamics of aggregated inflation indices, %**

Source: Rosstat, Eurostat. URL: https://ec.europa.eu/eurostat/databrowser/view/prc_hicp_manr/default/table?lang=en; Romir. URL: https://romir.ru

inflation index is the index of tariffs for freight transportation.

When calculating inflation, an important role is played by real estate prices, which are influenced by a large number of factors, the main of which can be considered the cost of construction. Taking into account the prices of producers of construction products in the aggregate inflation index will make its assessment more accurate, because the volume of housing sales transactions in Russia is consistently high. The total number of equity participation agreements (EPAs) registered by the Federal Service for State Registration, Cadastre and Cartography (Rosreestr/ Rosregistry) in the period from January to December 2021 in Russia as a whole amounted to 898.6 thousand, which is 17% higher than in 2020.[1] Despite the 22% decrease in the number of equity participation agreements in 2022, real estate remains the only protective asset for Russians. The decisions taken by the Russian Government to extend the preferential mortgage regime allow us to assume further growth in construction volumes. At the same time, according to Rosstat data, the growth of producer prices for construction products in 2022 against the figures of December of the previous year was continuous — from 2.9% in Q1 to 5.4; 6.5 and 8.1% in Q2, Q3 and Q4, respectively. Therefore, the fifth private inflation indicator is the producer price index for construction products.

Due to the aggravation of the sanctions wars, the sixth indicator of overdue accounts payable of organisations was included in the list of private inflation indicators. The contribution of this indicator to the growth of producer prices is still significant. Thus, according to the results of 2022, there are three creditor companies per one debtor company. According to Rosstat data, the average debt per creditor company in 2022 amounted to 285 million roubles.

The proposed list of private inflation indicators takes into account the demand component of inflation, including in the sphere of production, as well as "hidden" inflation in the real sector of the economy. Thus, aggregate inflation index allows to characterise more fully the dynamics of inflationary processes in the national economy.

[1] Rosreestr: official website. URL: https://rosreestr.gov.ru (accessed on 17.05.2023).

Obviously, the composition of private inflation indicators needs to be refined over time, although this is very difficult due to the problems of obtaining complete and reliable statistical information. Therefore, to determine the integral index we use an approach based on calculation of weights of private inflation indicators by pair correlation coefficients between them. The pairwise correlation coefficient allows us to assess the closeness of the relationship between two private inflation indicators included in the integral index. The more strongly a particular private indicator is related to other private indicators, the more weight it will have when included in the integral index.

In this case, the weights of private inflation indicators are a determinant of the specific weight or share of private indicators in the aggregate, since the sum of all weights determines all interrelationships between private indicators. In this regard, they should not be negative and in the sum be equal to one. The first condition can be achieved by summing up the pair correlation coefficients for individual private inflation indicators, and to fulfill the second it is necessary to normalise the obtained sums. Thus, it is logical to use the matrix of pairwise correlation coefficients to determine the weighting coefficients of aggregate inflation index. Then the numerator is the sum of absolute values of pair correlation coefficients for each private inflation indicator, and the denominator is the sum of absolute values of all coefficients:

$$W_j = \frac{\sum_{j=1}^{m} |r_{ij}|}{\sum_{j=1}^{m} \sum_{i=1}^{m} |r_{ij}|}, \quad (1)$$

where r_{ij} — is the linear correlation coefficient between i and j private inflation indicators (i, j — 1, 2 ..., m); m — is the number of private inflation indicators.

The aggregate inflation index itself is determined through a linear combination of private inflation indicators with weighting:

$$АИИ = \sum_{j=1}^{m} X_j W_j, \quad (2)$$

where X_j — PII (private inflation indicator).

The proposed approach in determining the aggregate inflation index is mathematically sound, as it is based on mutual dependencies of private indicators. This allows us to obtain objective results of calculations and leads to prompt correction of calculations due to changes in the number of private indicators for their aggregation.

A more detailed algorithm for the construction of aggregate inflation index is presented in the paper [17].

PRACTICAL RESULTS OF CALCULATIONS AND INFLATION TREND ANALYSIS

Monthly dynamics of the selected private inflation indicators is represented by their growth rates from January 2020 to March 2023 inclusive (*Table 1*). This corresponds to the periods of the coronavirus pandemic and sanctions wars unleashed by the collective West in connection with the start of the SMO (special military operation).

Table 1 gives the updated weights of the indices: 0.22; 0.17; 0.17; 0.12; 0.18 and 0.14. In [19], the period from January 2019 to June 2020 was analysed. In this case, the PII (private inflation indicator) weights had the values: 0.25; 0.17; 0.15; 0.12; 0.22 and 0.09, respectively.

Comparing the above results of calculation of weights, we can conclude that the weight of the index of overdue accounts payable, which characterises hidden inflation, increased most significantly (by 5 p.p.), and the maximum fall in weight (by 4 p.p.) was observed in the index of producer prices of construction products. The weight of the consumer price index also

Table 1

Values of private inflation indices and the aggregated inflation index, % of the previous period

Periods	Consumer price index for goods and services	Producer price index for industrial goods	Producer price index of agricultural products sold by agricultural organisations	Freight transport tariff index	Producer price index for construction products	Index of overdue accounts payable	Aggregate inflation index
	1	2	3	4	5	6	7
Weights	0.22	0.17	0.17	0.12	0.18	0.14	1.00
2020							
January	100.4	101.2	99.5	98.9	100.2	90.6	98.8
February	100.3	99.4	100.2	100.1	100.6	105.4	100.9
March	100.6	98.7	100.1	100.8	102.7	104.6	101.2
April	100.8	92.8	101.6	104.2	100.4	98.8	99.6
May	100.3	97.2	99.4	99.8	99.7	107.8	100.5
June	100.2	106.1	99.7	99.9	98.6	95.9	100.2
July	100.4	104.3	101.0	99.7	100.9	107.7	102.2
August	100.0	101.0	100.5	100.0	100.9	101.7	100.7
September	99.9	100.7	100.5	100.1	100.6	97.3	99.9
October	100.4	100.3	103.0	94.6	100.5	101.5	100.3
November	100.7	101.0	103.1	107.4	100.0	97.3	101.4
December	100.8	101.5	103.8	99.9	99.7	94.6	100.3
2021							
January	100.7	103.4	101.8	103.1	100.4	96.2	100.9
February	100.8	103.5	102.6	100.0	100.2	98.2	101.0
March	100.7	103.6	101.7	100.0	100.4	109.3	102.4
April	100.6	102.7	101.7	103.5	100.9	97.7	101.1
May	100.7	102.3	100.1	99.9	100.5	108.3	101.8
June	100.7	102.9	99.1	100.0	100.5	94.6	99.8
July	100.3	102.6	99.2	99.7	101.4	103.6	101.1
August	100.2	101.5	100.0	100.0	100.7	97.9	100.1
September	100.6	99.0	101.8	100.0	100.5	99.4	100.3
October	101.1	100.4	103.4	98.4	100.5	92.2	99.7

Table 1 (continued)

Periods	Consumer price index for goods and services	Producer price index for industrial goods	Producer price index of agricultural products sold by agricultural organisations	Freight transport tariff index	Producer price index for construction products	Index of overdue accounts payable	Aggregate inflation index
November	100.9	102.7	101.3	100.1	100.8	100.4	101.1
December	100.8	100.8	100.3	100.0	100.8	100.4	100.6
2022							
January	100.9	100.1	100.4	103.6	101.3	94.9	100.2
February	101.2	103.9	100.6	100.1	101.1	100.3	101.3
March	107.6	105.9	101.5	103.2	106.3	105.9	105.3
April	101.6	106.3	102.1	100.3	98.4	101.8	101.8
May	100.1	93.1	98.9	98.3	101.2	104.0	99.2
June	99.7	96.1	98.2	104.2	100.1	101.9	99.8
July	99.6	97.8	98.8	117.8	100.4	103.7	102.1
August	99.5	98.9	98.8	100.2	100.6	96.7	99.2
September	100.1	99.2	99.1	100.2	100.2	98.4	99.6
October	100.2	97.5	98.9	98.4	100.6	104.8	100.0
November	100.4	99.6	99.3	100.0	100.5	98.2	99.7
December	100.8	99.2	99.4	100.9	100.2	100.8	100.2
2023							
January	100.8	99.1	100.1	103.4	100.7	100.9	100.7
February	100.5	100.9	100.2	100.9	100.6	99.2	100.4
March	100.4	100.2	99.8	100.1	100.1	99.2	100.0

Source: Rosstat, developed by the authors.

fell significantly (by 3 p.p.) (by 2 p.p.). Only the weights of indices of industrial production and tariffs for freight transportation remained unchanged, which indicates a relatively high stability of the dynamics of changes in prices and tariffs in these industries during the period of coronavirus pandemic and sanctions wars in connection with the conduct of the SMO.

Figure 2 shows the intra-annual dynamics of average indices (consumer price indexes and aggregate inflation index). On its basis we can conclude that in the second half of the year the

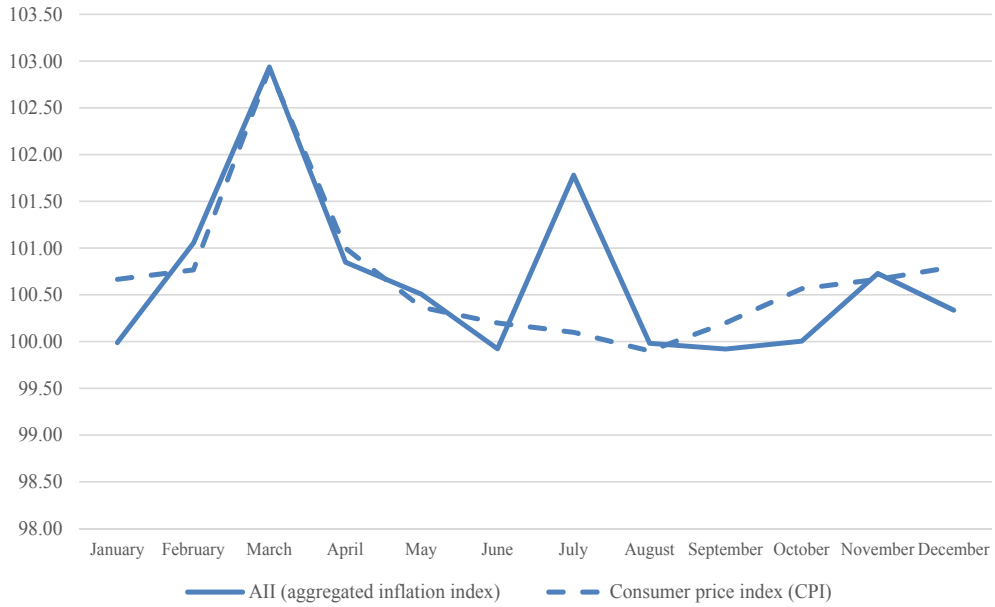

Fig. 2. **Inside the annual dynamics of the aggregated inflation index and CPI (average indices for the same periods), %**

Source: Rosstat, developed by the authors.

nature of the dynamics of the indices under consideration does not coincide. consumer price indexes do not capture price growth in July, decrease in October and December.

According to *Fig. 1,* we can conclude that the volatility of inflation in Russia is higher than in the EU countries. Starting from September 2021 HCPI has a stable growth, while inflation indices in Russia since January 2023 record a downward trend. Note that in 2023 Russia is among the leading countries in terms of inflation reduction in its economy. Figure 1 also shows the dynamics of the alternative inflation index of the FMCG deflator, which reflects the average personal inflation for the population. As we can see, there is a lag of about two months: price growth in March 2022 was reflected in the personal inflation of the population in May 2022.

The period from February to April 2022 is characterised by a sharp rise in prices due to political events that led to instability in the economy, changes in the conditions of economic activity. Already in May 2022, Russian inflation indices recorded its level lower than in previous years, which indicates the stabilisation of the country's economy, its adaptation to external shocks. Under the conditions of the beginning of Western sanctions (February, March 2022), the reaction of consumer price indexes is stronger than that of the aggregate index, which indicates the dominance of consumer inflation in the formation of inflation in the economy as a whole. This, in turn, confirms the non-monetary nature of inflation in Russia. Let us conduct a comparative analysis of the dynamics of the aggregate inflation index and private inflation indicator, on the basis of which it was constructed, using the data from *Table 1.*

The results of the analysis show that the reflection of the inflation process in the form of a single private indicator does not quite adequately show the overall picture of inflation. In 2020, differences in the trends of aggregate inflation index and consumer price indexes are observed in January, April, and September. In January, February, March and May, the values of aggregate index and producer price index of industrial goods are not unidirectional.

In Q2 2020 the value of the aggregate index reflects the opposite trend to the producer price index of agricultural products sold by agricultural organisations. And the dynamics of the aggregate inflation index and the index of tariffs for freight transportation in Q1, August, September and November 2020 reflects the trends of inflationary processes in the same manner.

The dynamics of the producer price index of construction products in 2020 does not agree with the dynamics of the aggregate index in half of the periods. Dynamics of overdue accounts payable index is more consistent with the dynamics of aggregate inflation index (except for June, September, November, and December).

In January 2021, the growth rate of consumer prices amounted to 100.7%. But if we take into account the fact that producer prices of industrial goods increased by 3.4%, and agricultural producers increased by 1.8%, the resulting value of the aggregate inflation index — 101.0% — more accurately reflects the state of the inflationary process this month.

A similar situation was observed in February. The aggregate inflation index revealed an increase in inflation by 1.0%, as producer prices of industrial goods increased by 3.5%, and those of agricultural producers — increased by 2.6%. Consumer price indexes showed growth by 0.8%. A similar situation occurred in March 2021, when the growth rate of overdue accounts payable, which characterises "hidden" inflation, amounted to 109.3%, while the consumer price index — 100.7%, as a result of which the aggregate index showed an increase in inflation by 2.3%.

In April 2021, freight transportation tariffs rose by 3.5%, producer prices of industrial goods by 2.7%, and those of agricultural producers rose by 1.7%. At the same time, the consumer price index showed an increase in prices by only 0.6%, while the aggregate index revealed an increase in prices in the economy by 1.2%.

In May, the aggregate index showed price growth by 1.0% more than consumer price indexes, as its value took into account the growth of producer prices of industrial products by 2.3% and overdue accounts payable by 8.3%.

In 2021, the values of aggregate inflation index and consumer price indexes characterised the same inflation trends (except for June and October), but the values of aggregate index were ahead of the values of consumer price indexes. In favour of the aggregate inflation index are the facts that it takes into account changes in prices of agricultural producers and the level of overdue accounts payable. Thus, in July, the growth of overdue accounts payable (i.e., hidden inflation in the economy) by 3.6% was reflected in the value of aggregate inflation index — 1.1%, while consumer price indexes showed an increase of 0.3%.

In August, consumer price indexes and aggregate inflation indexes showed the same growth of prices, although the index of overdue accounts payable decreased by 2.1%. However, other private inflation indicators recorded growth of prices or their stabilisation. The value of the aggregate inflation index amounted to 100.2%, and consumer price indexes — 100.2%. In September 2021, all private inflation indicators, except for the agricultural producer price index, were below the level of consumer price indexes. At the same time, the aggregate index showed price growth by 0.3%, and consumer price indexes — by 0.6%.

The situation in October 2021 is interesting, when two private price indices reflected a significant decline. Consumer price indexes had a value of 101.1%. At the same time, the value of aggregate inflation index was 99.8%, which is more objective. In November and December 2021, all private inflation indicators showed an increase in prices. Aggregate inflation index also showed an increase in prices in November by 1.1% (which is more than the value of

Table 2

Annual dynamics of pension indexation, aggregated inflation indices and consumer price indices, % compared to the previous period

Indicators/year	2020	2021	2022
CPI	104,9	108,4	112,1
aggregate inflation index	106,0	110,5	108,5
Planned indexation of pensions	106,6	108,6	108,6
Actual indexation of pensions.	106,6	108,6	115,3

Source: Rosstat, developed by the authors.

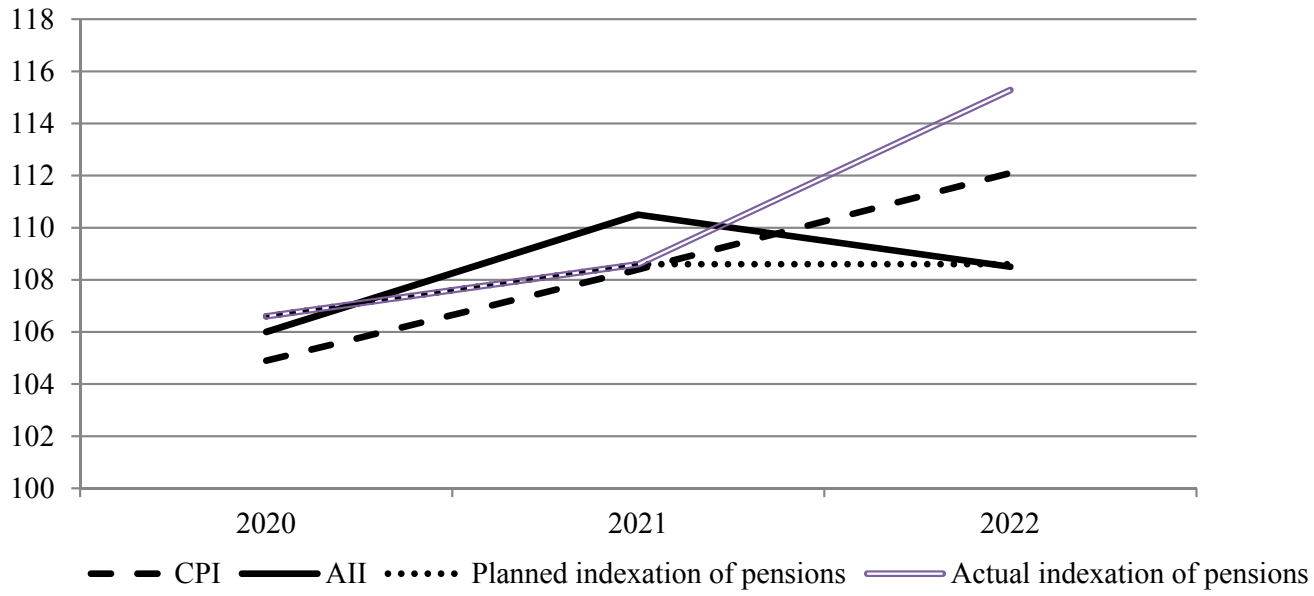

Fig 3. **Dynamics of the aggregate inflation index, consumer price index and pension indexation, %**

Source: Rosstat, developed by the authors.

consumer price indexes), in December — by 0.6% (less than the value of consumer price indexes). This is due to the change in producer prices, which is taken into account to a greater extent in the aggregate inflation index value.

In January 2022, compared to December 2021, the consumer price indexes changed by 0.9%, although the growth of prices for freight transportation amounted to 3.6% and producer prices for construction products amounted to — 1.3%. At the same time, the index of overdue accounts payable decreased by 5.1%. The aggregate inflation index "caught" this decrease. Its value recorded the growth of prices in the economy by 0.3%. It should also be noted the importance of taking into account in inflation measures the indicator of overdue accounts payable, the change in which reflects "hidden" inflation.

In March 2022, there was a large-scale growth of prices. The value of the average monthly consumer price indexes was 107.6%; the producer price index of industrial goods — 105.9%; the price index of agricultural products — 101.5%, the index of tariffs for freight transportation — 103.2%, the producer

price index of construction products — 106.3%, the index of overdue accounts payable — 105.9%.

In the second quarter of 2022, aggregate inflation index "caught" the decrease in the inflation rate in the economy faster than consumer price indexes. Thus, the value of consumer price indexes in May 2022 amounted to 100.1%, and aggregate inflation index — 99.2%.

In the second half of 2022, the compared inflation indices had multidirectional dynamics in July, September, and November, which is mainly due to changes in overdue accounts payable.

In the first quarter of 2023, the trends of consumer price indexes and aggregate inflation index coincided. However, the aggregate inflation index recorded a lower inflation rate, as in January there was a decrease in producer prices of industrial goods, and in February and March there was a decrease in overdue accounts payable.

Table 2 and Fig. 3 present the annual dynamics of aggregate inflation index and CPI, where we can see that their values differ significantly.

To summarise, we can say that in periods of instability, i.e., a sharp rise or fall in prices in different sectors of the economy, the value of aggregate inflation index significantly differs from the values of private inflation indicators.

APPLICATION OF AGGREGATE INFLATION INDEX

Let us consider the practical application of aggregate inflation index on the example of pension indexation.

The analysis of the data presented in *Table 2 and Fig. 3*, showed that there is a significant difference in the values of aggregate inflation index and consumer price indexes (in 2020 by 1.1%, in 2021 by 2.1%, in 2022 by 3.6%).[2]

[2] The annual levels of CPI and AII are shifted one year ahead in Table 2 and Fig. 3, since the indexation of pensions of the current year is determined, as a rule, on the basis of the CPI value of the previous year.

From 2020 to 2021 inclusive, the situation in the economy destabilised due to external and internal shocks of the coronavirus pandemic. At the same time, the dynamics of aggregate inflation index exceeded consumer price indexes.

In 2022, aggregate inflation index demonstrated downward dynamics with stable growth of consumer price indexes.

According to our estimates, the indexation of pensions in 2020 outpaces consumer price indexes by 1.7%, in 2021 — only by 0.2% and in 2022 — by 3.2%.

In 2021, aggregate inflation index will outpace the growth of pensions by 1.9%, taking into account their one-time additional indexation.

In 2022, insurance pensions of non-working pensioners were indexed twice. At the same time, their planned indexation from January 1, 2022 was supposed to increase by 8.6%, but the aggregate inflation index amounted to 8.5%. Thus, it is more appropriate to use the aggregate inflation index for indexation of pensions.

There are many ways of constructing inflation indices. Aggregate inflation index, calculated according to the methodology described in the article [20] and other works, was widely used in 1998–2010 to analyse inflation in Russia. The improved methodological approach to determining the aggregate inflation index proposed in this article can be appropriately applied in planning the indexation of pensions, subsistence minimum, minimum wage and other macro-indicators characterising the level of social progress.

CONCLUSIONS

The current situation in which the world economy finds itself is characterised by a high probability of stagflation, the consequence of which is the threat of collapse of the world economic and

financial system and "pandemic" of prices. It is practically impossible to predict the moment when the transition from the world economic model based on globalisation and the dominance of financial capital to a new model of development of a multipolar world, currency zones and political unions is realised. One of the leading indicators, based on which it is possible to establish how the economies of countries cope with the new realities, is the inflation rate.

The inflation indicators used in practice, primarily the consumer price index used by the current management system, incompletely and ambiguously characterise the situation about the ongoing inflationary processes in the strategic development of countries. This is due to the fact that the reaction of economic agents to changes in the conditions of their activities is different, especially in periods of instability and external shocks, which include the period of coronavirus pandemic and sanctions wars in connection with the conduct of the Special Military Operation.

The consumer price index plays the role of a cross-country criterion, but its potential is insufficient for a correct assessment of inflation due to changes in its content. A significant disadvantage of the consumer price index as a measure of inflation is that it lags in capturing the impact of price hikes caused, as a rule, by non-monetary geopolitical factors, which are difficult to predict and cannot be formalised. At the same time, these factors are becoming increasingly persistent for most countries in the world.

In this regard, it is necessary to use new measuring instruments. The proposed AII (Aggregate inflation index) as an integral measure of inflation — provides a more correct assessment of its level for the calendar period under study. Aggregate inflation index takes into account the dynamics of prices in the most important national economic complexes (consumer, industrial, agricultural, transport, construction, financial), which to a large extent form consumer, investment and financial behaviour of the population and businesses.

The proposed approach of aggregation of private inflation indicators on the basis of statistical methods opens new perspectives for inflation monitoring. The list of private indicators, which are included for calculation of aggregate inflation index, is basic and can be supplemented by new private indicators. Moreover, they do not necessarily have to be direct measures of inflation. In particular, in the period of financial and macroeconomic instability it was proposed to use the indicator of overdue accounts payable of organisations, which ensured the accounting of hidden inflation in the economy in the aggregate inflation index. In this regard, the Aggregate inflation index can be regarded as a target indicator and used in the development and implementation of a new model of strategic development, ensuring maximum mobilisation of resources in priority areas.

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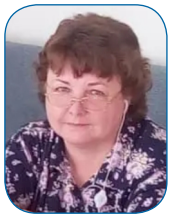

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B.I. Tikhomirov — description of the results and formation of the conclusions of the study.
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Sustainable Value Chain as a Tool for the Development of ESG-Models of Petrochemical Industries

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ABSTRACT

The article presents the results of a study aimed at substantiating the need to develop the principles of sustainable development in the oil and gas sector of the economy, which, in turn, determines the change of the raw commodity material model of economic development and the transition to the ESG principles of all enterprises within the industry to ensure the targets of the concept of sustainable development. The search for new ways to manage the added value of the oil and gas sector of the economy is determined by the shift of interests towards renewable energy sources, which limits the use of conventional hydrocarbons and, as a result, leads to a reduction in demand for them. Within the framework of a certain problem, the authors consider the value chain of the oil and gas sector of the economy, taking into account the implemented ESG principles, which allows taking into account the interests of all participants: government-business-science-education. The authors define the current state of industrial development at the point of bifurcation, which necessitates the transformation of existing business models by improving the concept of added value through product life cycle assessment. The authors also identified the principle of emergence of ESG-transition of industrial enterprises, contributing to the widespread introduction and implementation of the principles of sustainable development in the oil and gas sector. In addition, the article discusses circular business models involving the practice of increasing the added value of petrochemical industries by transforming the value chain. Taking into account the regularity of added value from the production cycles of Stan Shi's product, the authors constructed a «Smiling curve» of changes in added value for the oil and gas sector of the economy, which once again proves that high added value in the oil and gas sector of the economy is created in the petrochemical industries. Taking into account these circumstances, the authors proposed a sustainable life cycle of products of petrochemical industries (using the example of polypropylene).
Keywords: petrochemical production; ESG models; sustainable development; oil and gas sector of the economy; value chain; Smiling curve; circular business models; low-carbon regulation; ESG transformation

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INTRODUCTION

In today's dynamically changing environment, business development in monopolised industries is a complex task. This is due to the transition to a new technological level involving accelerated innovation progress, automation, and digitalisation of all production processes, which poses certain environmental, social, and managerial threats both for an individual business entity and the economy as a whole. First of all, the changes taking place in the economy will affect the oil and gas sector, as these industries are energy-intensive (due to the geographically limited possibility of using renewable energy sources), import-intensive (as the equipment of oil and gas chemical plants is predominantly imported) and carbon-intensive (due to the fact that the main volume of greenhouse gas emissions along the aggregated value chain falls on the extraction of hydrocarbon raw materials and accounts for 59% (3,297 million tonnes of CO_2)[1] [1–4]. Further, the related industries will be subject to transformation, in particular, machine building. In addition, the global economy is on the threshold of the new industrial period, which implies a shift of interests to product life cycle management. This favours the development of tools for shaping the business models of oil and gas industries by improving the value chain.

The conceptual basis of this study was the theoretical approaches to value formation by A. Smith, D. Riccardo, K. Marx, etc., defining the concept of surplus (added) value, as well as the problems of value chain development reflected in the works of M. Porter, G. Gereffi, M.V. Mayer, and studies of the regularity of changes in added value at different stages of the product life cycle by Stan Shea. [5–9].

[1] Strategy of socio-economic development of the Russian Federation with low greenhouse gas emissions until 2050. URL: http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf (accessed on 05.05.2022).

MAIN PART

According to Stan Shea's research, value added is only created at the ends of the Smiling Curve, i.e., if we talk about the oil and gas sector,— in the oil and gas chemical industries. However, growth points have not yet been reached, so it is advisable to improve the value chains of such industries (*Fig. 1*).

Thus, the improvement of the oil and gas sector value chain management (VAC) should be determined by the reallocation of priorities towards oil and gas chemical (OGC) industries. In addition, the increase of the chain can be achieved only through the organisation of sustainable (circular) petrochemical industries, i.e., through the use of polypropylene processing products in the production process. This is possible only by following ESG principles and introducing them into petrochemical production cycles, which will also contribute to the achievement of sustainable development goals (*Fig. 2*)

The concept of product value creation developed by Michael Porter can be complemented by elements that develop the activities of the OGC industries and increase the value chain, which take into account ESG principles. This will contribute to the importance of the concept of sustainable development of the oil and gas sector of the economy, since the elements introduced in the value chain are consistent with the principles of sustainability and allow the application of circular models in the oil and gas sector of the economy, involving: closed-cycle production; energy substitution technologies, CO_2 capture; extension of the product life cycle. Therefore, when forming an ESG strategy and changing the old model of economic development, it is necessary to take into account the objectives minimising the negative and increasing the positive impact on the value chain. Thus, according to the authors, the priority for the development of ESG models of oil and gas chemical production facilities is: reduction of

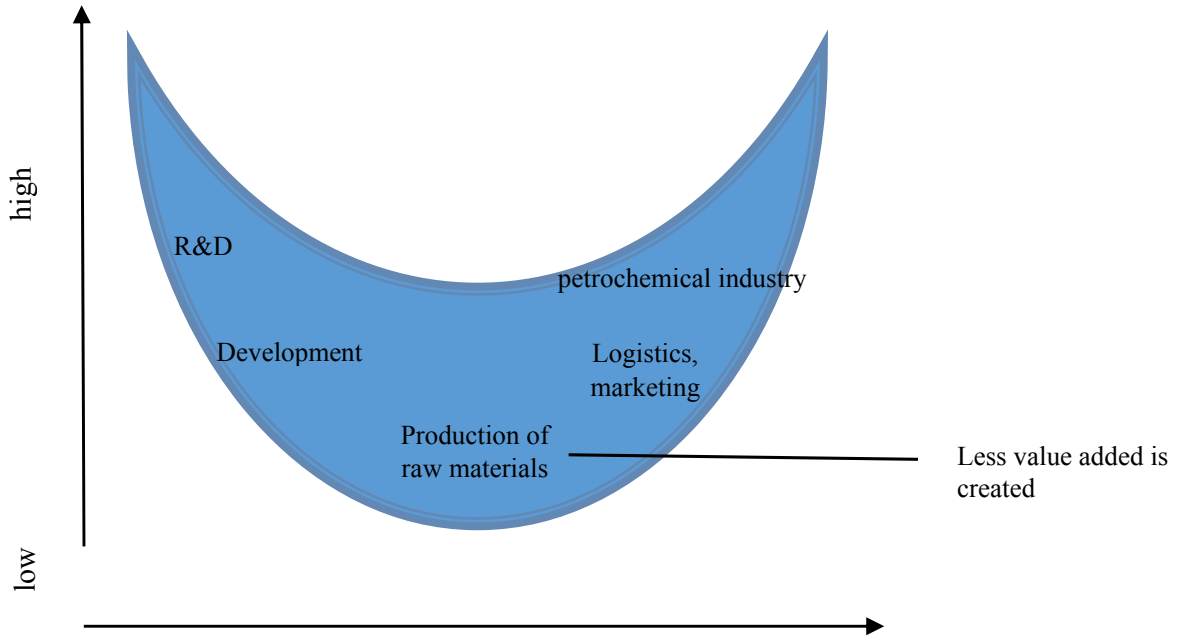

Fig. 1. **Smiling Curve of the added value of the oil and gas sector of the economy**

Source: created by the authors on the basis of Stan Shi's research.

CO_2 emissions; improvement of CO_2 capture technologies; improvement of RES (renewable energy sources) technologies; reduction of injuries; creation of new jobs; increase of transparency of company management actions and openness of indicators for achieving the SDGs; reduction of the corruption component. All this will contribute to the achievement of sustainable development goals [10–12].

The most promising and sustainable business models for the formation of circular value chains of petrochemical industries are product life cycle extension, resource recovery and circular supply (see *the Table below*).

Among circular business models, there are also platforms of product sharing through rent, hire, leasing and the "service instead of product" model, based on the exploitation of the product with the ownership of the product remaining with the manufacturing company. It should be noted that the formation of sustainable business models in oil and gas chemistry achieves the principle of emergence, which consists in the fact that some of the industries that have implemented ESG strategy in their business models create conditions for ESG-transformation of other industries in this market (industry). This contributes to increased competitiveness within the industry, business development and related industries (in particular, mechanical engineering).

According to the authors, ESG-transformation of petrochemical business models is possible when improving the value-added chain by influencing the assessment of the life cycle of petrochemical products, where it is supposed to take into account the dependence of the production impact on the environment throughout the entire cycle of the chain (from production to product utilisation). Thus, the cycles of the value chain where ESG principles are implemented have the least negative impact on the environment, because at each stage it is assumed to evaluate indicators characterising one or more ESG principles, which is in line with the sustainable development goals (*Fig. 3*).

With this in mind, the model of circular cycles of polymer production (high value-

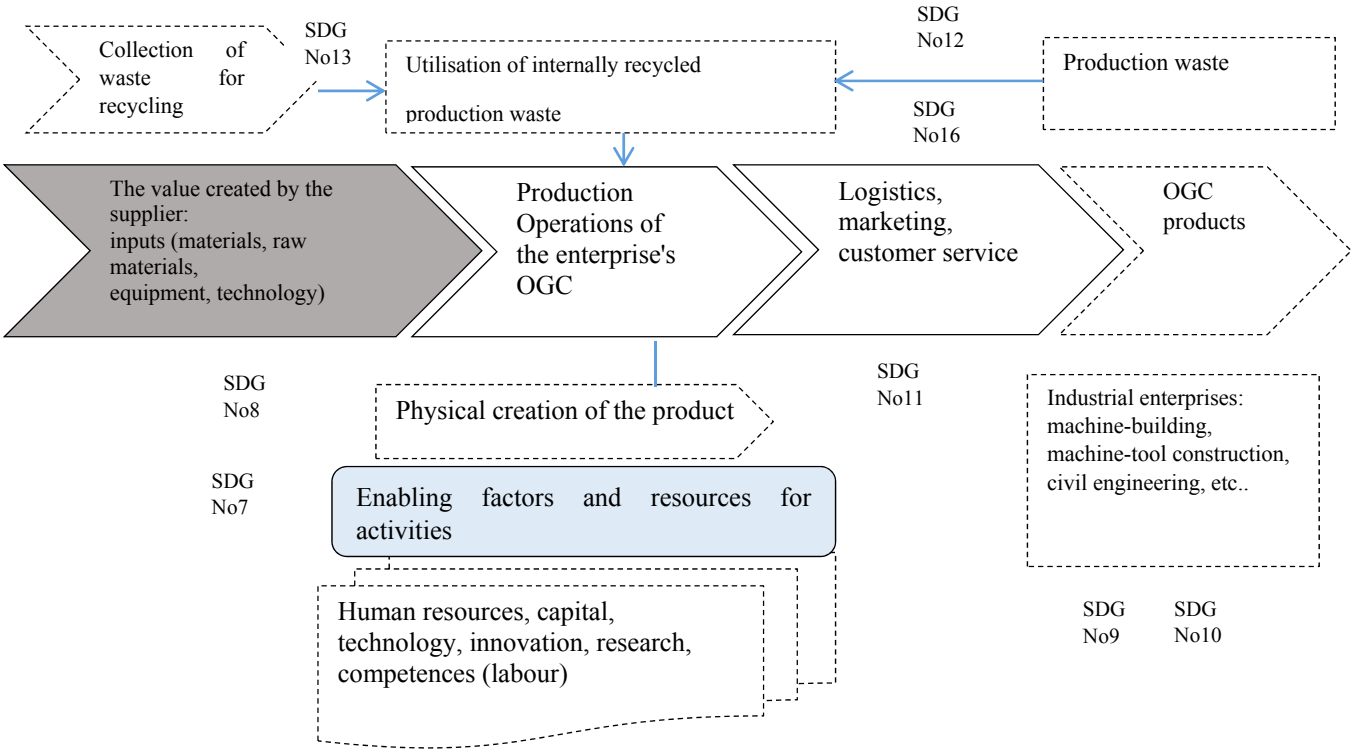

Fig. 2. **Sustainable value chain of products of petrochemical industries**

Source: developed by the authors on the basis of M. Porter's value creation system.

added products of OGC industries) assumes the use of not only hydrocarbons but also recycled raw materials in the main production. Today, the use of recycled materials is limited in high value-added production (in particular, in oil and gas chemistry), which hinders the increase in added value.

CONCLUSIONS AND RECOMMENDATIONS

Further development of the industry is impossible without a transition to a more sustainable model (*Fig. 4*).

To achieve the goals of sustainable development and accelerated implementation of ESG principles in the practice of domestic oil and gas chemical industries, it is necessary to replace the existing business models with circular ones, such as the model of product life cycle extension (use for synthesis of polymer products not only traditional sources of raw materials: oil, gas, straight-run petrol, but also processing products obtained as a result of treatment of recycled polymer waste); the model of resource recovery (organisation of closed-cycle production); circular supply (transformation of the energy balance within the enterprise: replacement of traditional sources with renewable ones, reduction of energy intensity of production facilities, application of energy substitution technologies). This creates new opportunities for improving the value chain of petrochemical production. Thus, when the value chain is supplemented with the cycle of production of goods from recycled materials, the first one increases, hence the added value of the oil and gas sector of the economy and industry as a whole increases. However, the transformation of the existing model of development of domestic oil and gas chemical industries is complicated by the inconsistency of the goals of the "state-business-education-science" spiral defined in the strategic documents

Table

Types of business models that take into account ESG principles in petrochemical industries

Type of business model	Characteristics	Practice
Business model of product lifecycle extension	Applicable in various industries, it implies early identification of problems (regarding repair, reconstruction, modernisation). For example, in order to increase the service life of equipment, it is necessary to carry out timely maintenance	It is used for oil and gas chemical production; it involves construction of polymer processing plants to obtain secondary raw materials or upgrading of pyrolysis facilities to produce polypropylene with the ability to process recyclable materials
Resources Recovery	Applicable to industries in which the production of a commodity is carried out through a closed cycle	Renewable production and consumption concept involving the use of Vivilen brand plastic waste and recyclable materials in production; actively implemented in SIBUR Group's business model (in the long term, it is planned to use 100,000 tonnes of polymer waste annually in the production process in own projects and projects with partners).
Circular supplies	Replacing traditional resources with renewable sources	SIBUR is integrating the use of oil and gas by-products into its business models to reduce CO_2 emissions. Petrochemical leaders in Russia have also implemented an automated energy balance system to track and reduce energy intensity in production

Source: created by the authors according to the data of petrochemical industries.

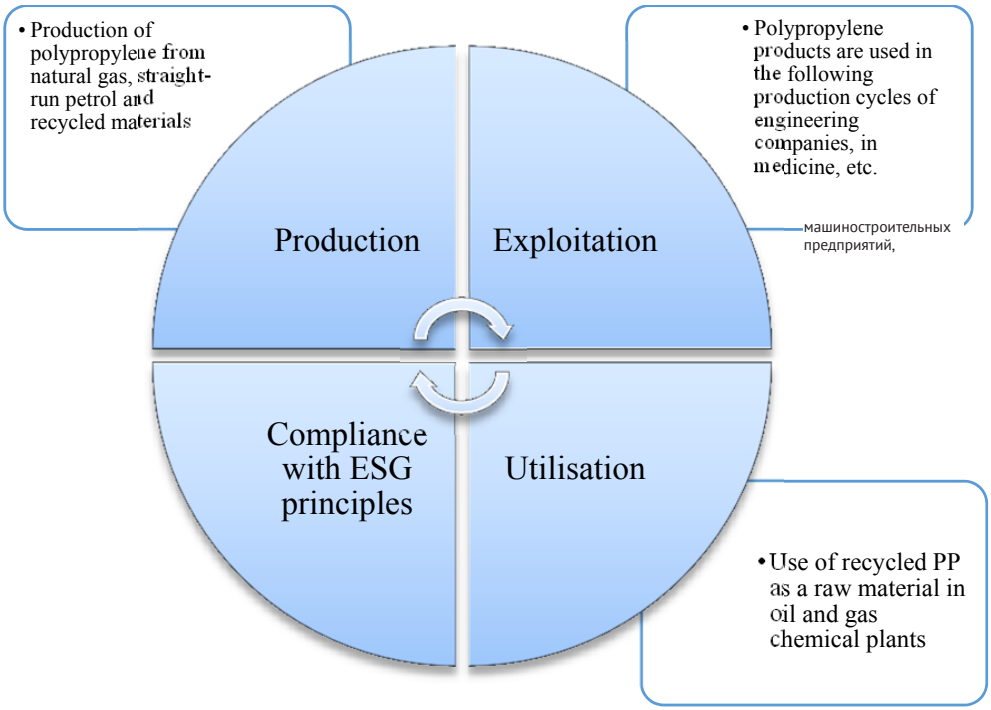

Fig. 3. **Circular life cycle of products with high added value in the oil and gas sector (on the example of polypropylene), taking into account the principles of ESG**

Source: developed by the authors.

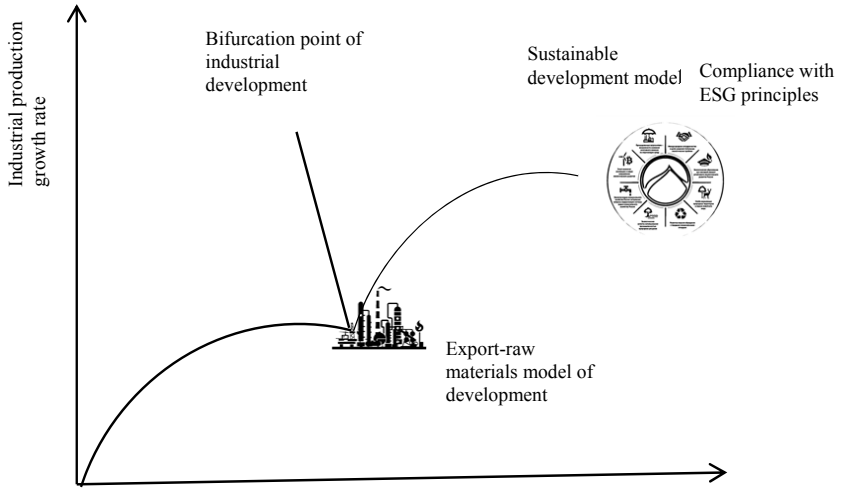

Fig. 4. **The point of bifurcation of the current state of development of the national economy, in particular the non-resource sector of the economy**

Source: developed by the authors.

of sustainable development of the Russian Federation. This contributes to the delay in the transition to a sustainable development model. In addition, when changing the raw material model, oil and gas chemical business can compete both within the industry and on the global market, as compliance with ESG principles creates new points of growth not only for production facilities, but also for the entire national economy.

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S.Yu. Shevchenko — formulating the relevance of the study.

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The Financial Function and the Creation of Firm Value

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ABSTRACT

A sure sign that the society needs a firm's product is its willingness to buy such a product in amounts and at prices that ensure the firm's profits. In turn, the firm's sustainable development depends on its ability to convert profits into increased company value by improving the efficiency of current processes, developing new products and implementing innovative business models. The purpose of the study is to determine the directions of the corporate financial service and the ways of its assistance to maximize the value of the firm in the current environment. Theoretical and methodological basis of research was made by scientific works of foreign scientists and experts on the formation of company value. Methods of qualitative and quantitative analysis of scientific publications, analytical materials of famous consulting organizations, statistical data were used. The author proves in the article that the modern corporate financial service has the ability and capacity to manage the creation of value inside and outside the balance sheet of the firm, to actively contribute to the effectiveness of the use of its tangible and intangible assets. In this regard, the author proposes to reclassify the financial function from supporting the firm's core activities as part of the firm's infrastructure in the value chain to a primary function

Keywords: financial function; value creation; profit maximization; tangible and intangible assets

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INTRODUCTION

In an environment of increasing external uncertainty, lack of stability and high speed of change in technology and customer requirements, achieving sustainable long-term growth, preventing loss and creating additional company value is proving particularly challenging.

The firm's finance function, which has traditionally been dedicated to recording, reporting, controlling physical assets and handling cash transactions, plays an important role in achieving this goal. These responsibilities have largely determined the perception of this service as a "bookkeeper" or "corporate policeman" [1, 2]. However, as noted by J.S. Moag, W.T. Carleton and E.M. Lerner, it "does not correspond to the essence of modern finance". Another side of the finance function, especially demanded in the new conditions, is the analysis of all corporate processes from the point of view of improving their efficiency to increase competitiveness and maximize the company's profits, its sustainable development, creation and increase in the value of the firm.

By automating routine processes through their digitalisation, the finance function is increasingly focused on helping the firm's management focus on what matters for long-term success, while helping to meet investors' expectations for short-term results. The challenge, however, is that cash flows, which are the direct responsibility of the finance function to assess, are also affected (in addition to the supply of raw materials, supplies and components, production structure and sales of finished goods) by a rapidly changing consumer culture, brand reputation, employee and community relations. At the same time, a significant part of the firm's value is determined by the viability of the business model and strategic factors — intangible and difficult to monetize. "Such intangible factors and assets are usually reflected in market premiums, which represent the difference between the market value and the book value of the company, and thus this "intangibility"

is transformed into something tangible in the form of growth in the capitalisation of the company, which is logical since the development of the economy is increasingly based on skills, knowledge, digital and other technologies rather than on physical or tangible assets" [4]. In the United States and the ten largest economies of Western Europe, investments in intangible assets accounted for approximately 30% of total capital investments in 1995, and in 2019 — already 40% [5]. McKinsey's March 2021 global survey of the current state of the global economy in 21 industries found that the fastest-growing large companies with average growth rates of around 20% (those in the top quartile of gross value-added growth) invested 2.6 times more in intangible assets in 2018–2019 than companies with 3% average growth (which turned out to be about half of the 861 organizations surveyed). That is, increased investment in intangible capital correlates well with higher growth rates of company value added [6].

Thus, we can agree with the International Federation of Accountants' assertion that "finance [as traditionally understood by the author] tells only part of the story of value creation, which is created and destroyed off the balance sheet".[1]

CREATING VALUE INSIDE AND OUTSIDE THE FIRM'S BALANCE SHEET

To create value within the firm's balance sheet, for which the traditional finance function is responsible, the following tasks are most important:

1. Optimisation of the capital structure in terms of its cost, availability, volume and maturity of capital, taking into account the needs of basic production, which allows to give impetus to the development of the firm in the creation of new value, while failure can plunge it into a chaos of liquidity, which can lead to bankruptcy.

2. Efficient use of accumulated cash reserves in the firm's accounts: investing them to create additional value, allocating them to early repayment of financial liabilities, paying dividends or repurchasing shares. Otherwise, accumulated resources are evidence of an inefficient business model, as the firm cannot scale its activities, which require cash to invest in, and its diversification is not feasible.

3. Motivating production units to rationally use fixed assets, which ensures the production of goods with the maximum possible added value in a given configuration of equipment. This is extremely complex, but the methodology of through-costing allows us to show how to change the structure of manufactured products in order to maximise profits.

4. Management of currency, credit, production, and accounts receivable risks, which has always been an unusual task. Structurally, it is solved by insurance or hedging with market instruments. But even a well-insured risk, when realised and compensated, nevertheless interrupts production activities, thus damaging the continuity of the process, the timeliness of fulfillment of obligations to customers, because if it is, for example, equipment, it takes time for it to be produced, delivered, and put into operation. In hedging risks, it is often more effective, especially when such an instrument is not available, to create an asset within the entity that is equal in amount, currency, and maturity to the hedged liability, which has the same risk characteristics as the liability to be hedged but, upon the occurrence of a risk event, neutralises the negative movement of the corresponding liability. This approach is referred to as *natural hedging of risks*. In any case, the task of the financial service is most likely to create conditions to prevent the very realisation of the risk. Measures to prevent it also cost a lot of money, but they allow to ensure the continuity of production, the stoppage of which, as a rule, causes many times more damage to the company than such costs.

In order to prevent loss and create new value for the objects reflected in the balance sheet, complex prospective modelling is the most effective. It includes the assessment of each risk object under

[1] A vision for the CFO & finance function. IFAC; 2019. 24 p.

a large number of scenarios (including stress situations), taking into account that changes in one object are very likely to affect another. For example, the geography and structure of sales may change the product program of production and currency risks.

Sophisticated multi-factor modelling with respect to all or most of the circumstances under consideration is capable of revealing risk information covering all of a company's financial positions; it can also explain and justify a financial management strategy and, once approved, will allow adequate action to address inefficiencies.

The above-mentioned issues of management of material positions, which are reflected in the company's balance sheet, do not cover other resources that ensure the firm's activity and remain off-balance sheet, namely: intellectual, human; environmental resources; social and ethical relations in the team and with society. The efficiency of management of these off-balance sheet resources largely determines the long-term cash flows of any company and, consequently, its value for shareholders. This point is important because long-term investments in shares act as one of the most important long-term instruments that ensure the safety and increase of money savings of the population with the prospect of their use after the end of active activity, transfer into inheritance or for large acquisitions. For example, in the USA, short-term investors hold only about 25% of company shares, while 75% are held by owners for a long time and are distributed as follows: 33% is held by long-term private investors, 25% by long-term institutional investors and 17% by index funds [7]. In this respect, the results of the survey of long-term investors on how they relate to quarterly earnings and news affecting long-term results are indicative (*Table 1*).

The head of the world's largest investment fund, BlackRock, reiterates this approach in his message to CEOs: "Most of our clients are investing to fund retirement. Their time horizons can span decades. The financial security we strive to help our clients achieve is not created overnight. It's a long-term endeavour, and we take a long-term approach … Long-term profitability is the measure by which the markets will ultimately determine the success of your company".[2]

Focusing on a sustainable positive financial result through ambidextrous approach to the organisation of the company's activities [8] ensures the growth of its value over a long period of time, which allows owners to benefit not only from dividends, but also from the growth of shares. At that, the growth of such total shareholder return (Total Shareholder Return — TSR) is proved not only over a relatively short period of time (from January 1996 to June 2022, the average annual inflation-cleared total return on the S&P 500 index was 6.8%, and nominally 9%), but also over the last 200 years (the average annual inflation-cleared growth rate of US stocks over this period was 6.5–7.0%). In nominal terms, the annualised return on indices of other markets (MSCI World, Emerging Markets and ACWI) also ranged from 8 to 10% for decades [9]. Such growth benefits not only the owners of companies, but also society as a whole, since the received income increases current consumption, i.e., creates additional demand, which is realised, among other things, in greater employment or allows investing in the development of the most promising companies, whose activities create additional benefits for society or make existing goods and services cheaper, more convenient and safe, and, accordingly, increases the standard of living of the population.

Longevity is not only the time horizon of the investments of the vast majority of private investors, but also a confirmation of the effectiveness of the market relationships within which such investments exist. Numerous intangible factors strongly influence the value of companies in which money is invested, and also have a significant impact on people's faith in such relationships, which benefits the entire society, not just the most successful segments of it. For a society,

[2] The Power of Capitalism. Larry Fink's 2022 letter to CEOs. URL: https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter (accessed on 06.08.2022).

Table 1

Attitude of the long-term investors to the issues of the firm's activity affecting its short- and long-term results, %

Event	Doesn't bother at all	Moderately bothers	Bothers most of all
The Company announces in advance that it will cease to provide quarterly EPS (Earnings per share) guidance after 1 year	19	5	0
The new CEO is redefining the corporate purpose to solely "maximise shareholder value"	5	12	7
Significantly less investment has been announced in research and development for the next few years, but with using cash for share buybacks	3	13	8
Employee satisfaction has declined sharply	0	15	8
Significant changes made to the asset base asset base (or capital structure), resulted in an increase in financial leverage	2	13	9
A strong management team is expected to retire in a few years, and weaker managers will take over the management team	0	14	10
The Company publishes data indicating that it is not adequately addressing environmental or social issues	1	10	13
There has been a sharp decline in customer satisfaction (although this is unlikely to affect financial results in the next 18 months)	1	9	14
There are questionable practices in the supply chain (human rights/environment), which poses a significant risk to reputation	1	8	15

Source: compiled by the author according to URL: https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/how-to-build-an-alliance-against-corporate-short-termism

each member of which is a consumer of goods and services produced by companies involved in the market economy, it is important not only the quality and availability of such products, but also the state of the environment, the opportunity to develop and apply their abilities, ethical relations, etc. Therefore, to "make market relations inclusive and their benefits more widely and equitably distributed", the non-profit Coalition for Inclusive Capitalism (The Coalition for Inclusive Capitalism) in its policy paper notes[3] the need to take into account intangible factors, including innovation, pointing to the difference in approaches to valuing companies based on current accounting reports and taking into account the intangible factors of company development, which are manifested in their market capitalisation (*Fig. 1*).

CONTRIBUTION OF THE FINANCE FUNCTION TO VALUE CREATION

The focus on creating sustainable long-term value for the company challenges the finance function to change the substance of its work from recording the flow of tangible assets, preparing formal accounting reports and cash management to a business partnership in business development and value creation. Accordingly, it requires a transition

[3] Embankment Project for Inclusive Capitalism. The Coalition for Inclusive Capitalism; 2018. 122 p.

Fig. 1. **Attitudes towards the valuation of companies from an accounting and market points of view**

Source: compiled by the author according to URL: https://coalitionforinclusivecapitalism.com/epic/

from a role isolated from the rest of the company's activities to the inclusion on the financial results of the firm as a whole in the context of its business development, the situation in the industry and in the economy. Embeddedness in the joint work on solving tasks to achieve the main goals of the company (maximisation of value on the basis of profit growth) forces the financial service to change the nature and directions of its activities (*Table 2*).

As a result, the finance department finds itself involved in both tactical tasks of improving individual processes and introducing innovations, as well as in the discussion of strategic development, where it presents its views on risk management to preserve and increase the value of the company. Moreover, not just a vision of a problem, but also a plan to overcome it. If such a plan is approved, the finance department is involved in monitoring and facilitating its implementation. In this way, the finance function is fully immersed and involved in the activities of the entire company, rather than isolated from it (it does not matter whether the function itself is isolated or whether it does not have a mandate to do so). The position of the financial service, which is to ensure that any changes in the company's activities (regarding production technology, purchasing and sales strategy, business model) would ensure maximisation of the financial result, is unique for any firm. It is determined by the fact that, firstly, it is the only division of the company that looks at any situation from this point of view,

Table 2

Areas of work of the financial service, affecting the creation of company value

Direction No. 1	Comprehensive understanding and confidence in business performance and results
Direction No. 2	The transition to a new role is possible due to: — customer centricity; — the use of digital technologies and massive data processing; — A change in mindset to active participation in business development
Direction No. 3	To be at the centre of decision making requires: — In-depth insight into all facets of the business; — productivity and efficiency; — risk management; — active communication with other departments; — a climate of trust in the company
Direction No. 4	Development of proposals relating to the main issues of creating, preserving and increasing the value of the company

Source: compiled by the author according to URL: https://www.ifac.org/knowledge-gateway/preparing-future-ready-professionals/publications/vision-cfo-finance-function

and secondly, the financial result is the main priority of the owners of the company, as well as its creditors, due to which the former can increase their capital, and the latter can guarantee the return of funds lent to the company.

Therefore, it is necessary to "pull" the financial service out of self-isolation, if it has closed itself in the "ivory tower" of accounting, reporting and credit and settlement operations, to empower it and make it responsible for researching all aspects of the firm's work. The main reason for empowering the finance function is that each division acts as a link in the firm's value chain whose work affects the bottom line. It is important to consider the aggregate (monthly, quarterly, or annual) results of the company's activities, but without a thorough analysis of their causes (which lie in the work of individual departments or specialists) it is impossible to understand the source of the problem and find a way to solve it. The financial service can and should identify the inefficiency of some process and draw the attention of the management of the relevant division to it in order to jointly develop a way to eliminate it.

In this context, it seems natural that it is in manufacturing corporations, where processes are the most diverse and complex, that financial services as a business partner have become "fundamentally important in decision-making". According to a joint ACCA and PwC global survey, this is the case in more than 40% of these corporations, while financial services play a less significant role in other segments of the economy.[4] In other words, it can be stated that corporations have positively assessed the need to change the functionality of the financial service and actively use it as a business partner. Therefore, as McKinsey consulting company notes, financial services of large international companies are the second after CEOs to initiate transformations for the above purposes. At the same time, 23% of the proposed transformations relate to the entire company, 27% — relate to individual divisions, and only half — to the work of the finance department itself.[5]

[4] Finance insights — reimagined. Association of Chartered Certified Accountants and PricewaterhouseCoopers LLP; 2020. 68 p.

[5] The new CFO Mandate: Prioritize, transform, repeat. McKinsey& Company; 2018. 12 p.

NEW TECHNOLOGIES IN FINANCIAL SERVICES AND CORPORATE INNOVATION

New technologies that automate standard routine operations and help analyse and process data are the main tools for improving the efficiency of the finance function. While there are positive developments in this direction, the same McKinsey report indicates that in 2/3 of large global companies in 2018, only 25% of financial services work was automated or digitised. Consequently, this affects the areas of the finance function that utilise digital technologies and those that do not, but could benefit most from them (*Fig. 2*).

Reflecting this situation, IBM, in its 2022 Global Finance Function Development Study report, notes that over the past 10 years (2013 to 2021), the efficiency of traditional finance function task execution has improved from 50 percent to 57 percent.[6] It seems that the growth of this indicator is due to the relative ease of automation of routine processes. At the same time, increased uncertainty and the accelerated development of new technologies have had a negative impact on the feasibility of the strategic objectives made earlier and on the ability of companies to achieve them, as well as on the quality of management of related risks. All of the above has led (hopefully temporarily) to a decrease in the efficiency of strategic planning and realisation of strategic goals from 51% to 38%, and of risk management from 64% to 44%.[7] It is clear that financial services need to step up their efforts in these high-demand areas, given the great potential of digital technology to support strategic objectives and risk management.

But the introduction of new technologies is important not only in the work of the financial service, — there is much more return when they are used in the activities of the entire company. That's why it makes sense to focus on analysing innovations offered by divisions, the implementation of which should provide so-called "net new growth" — the creation of something that did not exist before. McKinsey, as part of a global study, examined the elements of innovation mastered by multinational companies,[8] and found that the added economic value over and above the cost of capital (economic profit) grows exponentially (*Fig.* 3), depending on the number of elements used: strategy and the set of products produced: the desire to innovate (1) and selecting the most appropriate innovations for the firm's core business (2); unique value proposition (3) and innovation development (4); innovation adoption (5) and scaling (6); building an organisation's culture mobilised to innovate (7) and motivating innovation (8).

The latter is especially relevant to the work of the financial service, whose task becomes to stimulate innovation that improves the financial result of the company. According to the results of the study, McKinsey notes: "If a company has mastered only a few of the elements mentioned, it will not have a significant impact on economic profit. Unfortunately, most companies are in this position. They may set good goals and allocate resources to innovation, but they don't evolve their business models to capitalise on new offerings." However, when 5 or 6 of these techniques are widely used in an organisation, the economic return is 60% higher than if none of them were used. On the other hand, if 7 or 8 are mastered, the economic return is 2.4 times greater.

In this context, it is natural that even in the face of the approaching economic crisis, 84% of finance executives at the world's 772 largest Fortune1000 companies indicated in August 2022 that they are focusing on transforming their organisations' business processes to drive growth through innovation. They cite building predictive models and strengthening their scenario analysis capabilities as one of the most important tools for doing so.[9]

[6] Strategic Intelligence: CFOs as architects of action and champions of change. IBM Institute for Business Value; 2022. 52 p.

[7] Strategic Intelligence: CFOs as architects of action and champions of change. IBM Institute for Business Value; 2022. 52 p.

[8] In conversation: The CFO's critical role in innovation. McKinsey& Company; 2022. 7 p.

[9] CFO and finance leaders. PwC, August 2022. URL: https://www.pwc.com/us/en/library/pulse-survey/managing-business-risks/cfo.html (accessed on 27.08.2022).

Fig. 2. **Mismatch between the level of use of digital technology and its capabilities, %**

Source: compiled by the author according to URL: https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/mastering-change-the-new-cfo-mandate

The results of another empirical study show why it is important for the finance function to focus on growing and improving the efficiency of its company in order to create value for shareholders (and thus for society through the creation of products it needs, which thanks the company for this by buying more of these products and often at a higher price, which provides the company's profits). McKinsey's analysis of 1,621 of the world's largest public companies in various industries with average revenues of more than $ 1 billion per year for 15 years (2005–2019) revealed that the following business approaches are critical to maximising value:

- prioritising the creation of a competitive market advantage in its product;
- preference for profitable, fast-growing market segments;
- the need to increase sales volumes faster than competitors;
- maximum concentration on its core competencies;
- supporting growth in areas that are within core competencies but not yet core competencies;
- focusing on growth in areas where the company has a competitive advantage;
- ensuring success in the home market;
- realising that the success of international expansion depends on success in its home market;
- combining organic growth with acquisitions of competitors in its industry;
- realising that divestment of non-core businesses provides growth in key areas of value creation [10].

Moreover, the more of these approaches a company uses (which speak of creating superiority over competitors in its core business in terms of operational efficiency and effectiveness of the business model applied), the higher its result in value creation (*Fig. 4*). It turned out that the majority of the surveyed companies (63%) are not yet able to follow more than three approaches, which condemns their shareholders to lower annual returns, compared to companies more consistent in moving in this direction.

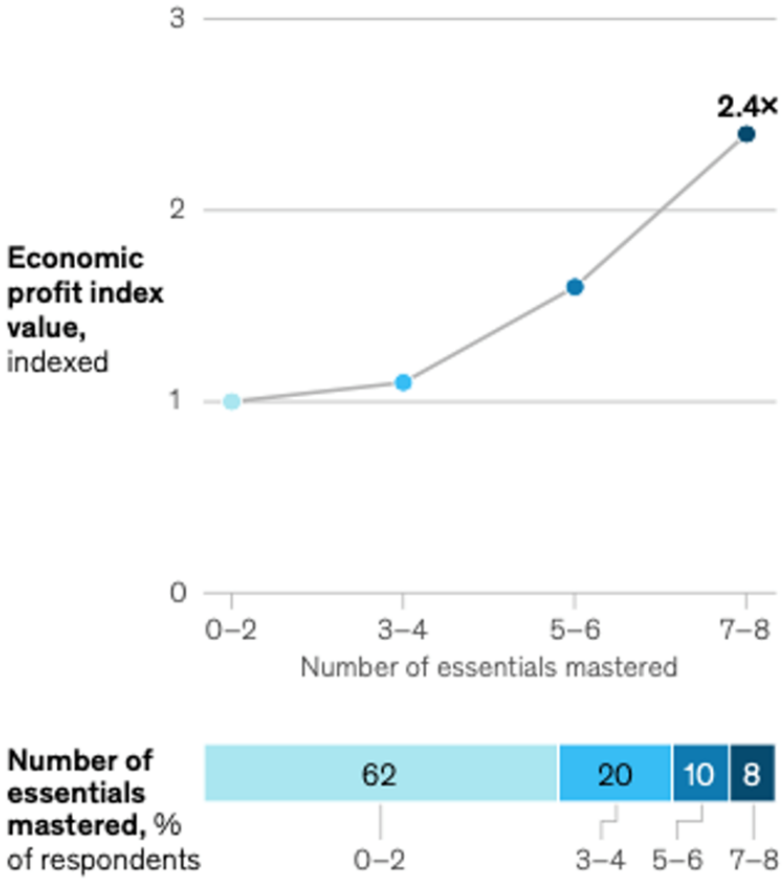

Fig. 3. **Dependence of economic profit on the level of mastering by companies of the elements of innovation activity**

Source: compiled by the author according to URL: https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/in-conversation-the-cfos-critical-role-in-innovation

This situation obliges financial services to intensify their efforts to find weaknesses and discover new opportunities for their companies in order to achieve the main goal of maximising value through profit maximisation.

REFLECTING THE ROLE OF THE FINANCE FUNCTION IN THE VALUE CHAIN

A firm can only create value for its shareholders by producing a commodity that society is willing to buy in a quantity and at a price that will allow the firm to generate sustainable profits. Thus, the production of a commodity is the instrument for value creation. The latter is the main goal of the owners who have invested their funds in the organisation in order to multiply them, preferably above the cost of capital, i.e., to generate economic profit.

In the value chain creation M. Porter [11] distinguished the main activities related to the creation of the product and its sale, and supporting activities that serve the main ones. The traditional understanding of the latter is reduced to ensuring the production of the commodity by human resources, improvement of technologies, timely delivery of raw materials and components, provision of accounting and legal services, cash, quality control, etc. The problem is that a single service unit is not concerned with value creation, because each of them has more specific tasks: attracting qualified personnel, improving technological processes, providing production with materials of the required quality, accounting for the movement of material assets, timely issuance of reports, making settlements, etc.

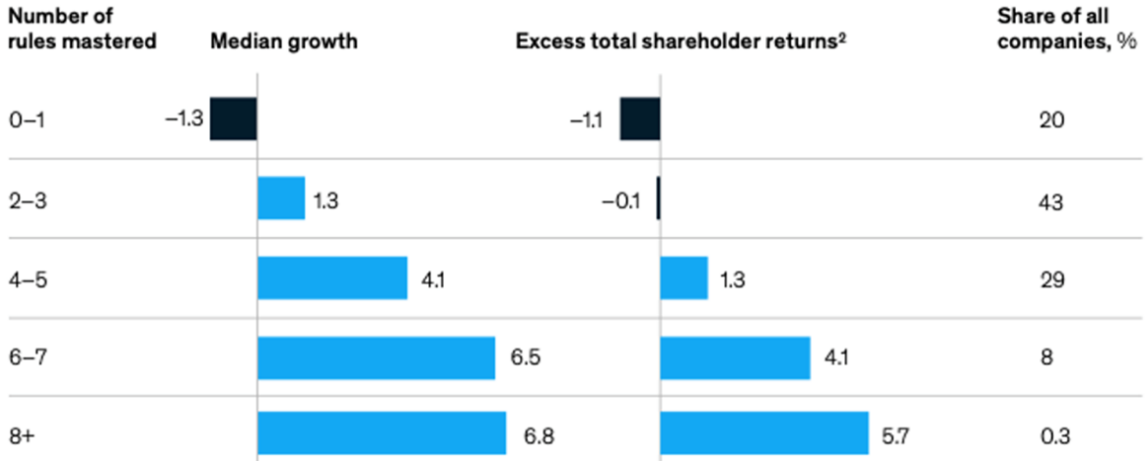

Fig. 4. **Growth in company and shareholder revenues as a function of or depending on the number of value growth approaches used, comparing average annual growth rates in 2005–2009 and 2015–2019, in %**

Source: compiled by the author according to URL: https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/the-ten-rules-of-growth

But none of the units, including the core units, until recently had a direct value creation objective. They achieved their goals within the allocated financial budget or by finding a creative solution to a problem. Consequently, the financial result for the firm as a whole was of no concern to the divisions, and the finance department simply stated it. Relatively recently, value management (rather than value capture) has become a priority for the finance department.

Its work on value management, the increase of which is fundamentally important to the owners of the firm, is carried out in two directions within the ambidextrous approach to its organisation: addressing operational efficiency and long-term sustainable value growth through technological and product innovation, as well as the new business models. At the same time, the key aspect of the new work of the finance department is its ability, having retrospective and forecast summary and special data on the company's activities, to analyse the actions of divisions from the point of view of value creation, as well as to prepare appropriate proposals for their improvement. As a result, it is not the technologies themselves or individual actions of any division that become important, but their contribution to value creation.

For example, the sales team has a target for revenue in a certain period of time. The easiest way to fulfill it is to use cheaper products in the existing product line, as there are more customers in this segment. But, as a rule, cheap products have lower profit margins than expensive ones due to high competition, and, accordingly, there is a risk of failing to achieve the goal of generating added value over and above the cost of raw materials, which will cover other costs, including fixed costs, and also allow the transition to profit. It is in this, and not in the volume of revenue, that the true goal of sales lies. To avoid this risk, the finance department should set sales targets not for the amount of revenue, but for the total amount of margin that sales of the firm's products will generate. The sales margin target is formed not only taking into account operating costs in excess of raw materials and consumed components, but also includes requirements for interest payments on borrowed loans, financing of investment projects, investors' expectations of dividend payments, etc. The realisation of such a task requires a completely different approach to sales strategy and tactics.

Another example is the work of a production unit, which, in order to successfully fulfill the production plan, is concerned about the constant

availability of all necessary specialists at the production site, the serviceability of equipment, the mastering and correct operation of it by workers, and their safety. At the same time, they do not care about costs, such as, for example, the number of workers operating a particular equipment, because the main thing is that it should produce according to the plan, and therefore the number of workers is often higher than necessary. The finance department may take a different view of the situation and, for example, propose to reduce the number of workers to maintain this equipment and increase the salaries of the remaining specialists by redistributing half of the savings on the payroll due to increased productivity and responsibility for meeting the production plan. Such an approach will not only eliminate management's concerns about plan fulfillment, but will also ensure retention of the most highly skilled employees and increase their motivation to improve productivity. In addition, labor costs will be reduced.

Or let us consider the problem of defects in production. As a rule, it arises from non-compliance of workers with technological requirements for the operation of equipment and the material used. Usually, the problem is solved by introducing fines for defects for workers. However, in the overwhelming number of cases, the amount of the fine, which is limited to a portion of the worker's salary, does not cover the company's losses from defects. Realising this, the finance department can suggest a different approach, which provides a bonus for work without defects or below the level set for them, which is much better in motivating workers to comply with technological discipline and also provides a reduction in the costs of defective products, if — ideally — not their total elimination in the firm.

In considering the role of innovation in value creation, it is useful to note that the mere idea of a new technology, process improvement or business model does not in itself translate into an increase in firm value. This happens only after the idea has been comprehensively thought through to incorporate the innovation into the firm's operational processes in terms of its ability to create value. In this endeavour, the role of the analytical finance function is essential, which can evaluate the innovation and propose a configuration for its use that achieves the firm's primary financial objective. Practice shows that there is a huge number of innovations in established companies and start-ups that seem to be investment attractive, but do not ensure the firm's entry into profitable operations and, consequently, the creation of value for shareholders over a long period of time of the innovation's application. At the same time, the growth of the company's capitalisation without generating profits during the period of investors' euphoria about the idea is hardly worth taking into account.

Such analytical and creative activity of the financial service, which is aimed at achieving the main goal of any firm — value creation — is radically different from the image of this service half a century ago, when M. Porter developed the value chain theory.

If the purpose of the value chain is to demonstrate all its links and the role of each of them in this process, then the management of value creation is one of the key aspects of the value.

In this regard, it seems that it is necessary to reclassify the analytical part of the financial function from *supporting* the main activities of the firm as part of the company's infrastructure in the value chain to the *primary* one, since it has a significant impact on value generation, even without being a direct participant in the production of the product. In other words, the work of the finance function in managing value creation is no longer "servicing" (which may refer to accounting, reporting, calculations) the main activities of the company, but makes a "direct" contribution to its increase.

M. Porter allowed the transfer of some supporting functions into the primary ones, but only taking into account the peculiarities of a particular firm's activity. At present, the inclusion of analytical activities of the financial service in

Table 3

A renewed value chain for the firm

Areas of the firm's activities that support the main ones	Firm infrastructure without the analytical part of the finance function					
	Knowledge and skills of the firm's personnel					
	Technology support for the firm's operations					
	Procurement					
The main activities of the company are as follows	Inbound logistics	Internal operational processing	Value creation management	Outbound logistics	Marketing and sales of products	After-sales customer service

Source: compiled by the author.

the number of the main ones seems reasonable for any firm, because through it the above-mentioned tasks of creating additional, not only added value, which is the difference between material costs and price, are solved. This vision of the firm's value chain creation is shown in *Table 3*.

The fairness and appropriateness of this conclusion is justified by the fact that companies with financial services that act as partners in solving strategic tasks of business development, consistently provide an operating margin of 2 p.p. more than those where the financial service adheres to traditional approaches to the conduct of its activities.[10] In the world's largest companies, this difference adds tens of billions of dollars to the bottom line each year.

CONCLUSIONS

Anticipating the future is not a trivial task, and the expanded role of the modern finance function is precisely to achieve financial success over the long term. The only way to create value, as the above suggests, is to study the present as thoroughly and comprehensively as possible, those aspects of it that can already be improved now, and even more importantly, to notice and nurture those new growths that can bring benefits in the future. This ability to understand the present is the key to success in the future.

The transformation of the finance function from a registrar to a business partner of the firm's management and departments, which is realised through the analysis of all areas of the company's activities with the preparation of proposals for the use of existing reserves and the introduction of new process and product solutions in order to maximise profits and on this basis the sustainable growth of the firm's value, provides the financial service with a new role in the value chain.

New value that is created mainly through technological or business model innovations, as well as improved operational efficiency, strengthens the firm's competitiveness, which positively affects its valuation by the market, which in turn is positively reflected in its market capitalisation. As a result, the interests of shareholders and society are fully satisfied, which receives the product demanded by it at a price acceptable to it.

[10] Strategic Intelligence: CFOs as architects of action and champions of change. IBM Institute for Business Value; 2022. 52 p.

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Process Approach to the Analysis of Management Efficiency at Transport Enterprises

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ABSTRACT

The article discusses theoretical and practical issues of the effectiveness of process management at transport sector enterprises in the Russian Federation. The comparative characteristics of management functions and business process functions are given, the importance of implementing individual business processes and subprocesses and their impact on management efficiency is emphasized. **The purpose** of the study is to expand the methodological tools that make it possible to form the most optimal model of business processes, which allows to increase the overall efficiency of management, to explore process-oriented management tools and their role in a dynamically changing market environment, as well as to outline a number of planning and preventive measures. The objectives of the study are to describe the methods of implementing the process approach at the enterprises of the transport sector, which contributes to improving the effectiveness of management in general. **The methodological basis** of the research is the concepts of management theory, the theory of evolutionary economics. The article used an instrumental and methodological apparatus based on synthesis and analysis, management engineering, classification and identification. The author presents a developed toolkit that allows you to determine the most optimal set of business processes at enterprises in the transport sector in order to increase efficiency.

The practical significance of the study lies in the presented typology of business processes for enterprises of the transport sector, which allows to significantly reduce the costs of the management apparatus, as well as indirectly prevent the occurrence of damage. In addition, the authors have clarified the concept of the process approach in relation to the functioning of transport firms and companies.

Keywords: process approach; management efficiency; business processes; subprocesses; transport companies; process characteristic

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INTRODUCTION

One of the most optimal and rational methods of considering management problems is the process approach. A number of authoritative experts are of the opinion that the basis of a productive management process is its composite decomposition into proportional components according to the relevant criteria [1, p. 83]. In this case, a specific list of management processes is compiled, the list of owners (those who perform management), as well as process performers (those who are oriented towards consumers at the output) is determined.

Thus, in order to build effective operations, any enterprise, including transport, should segment in its work management processes aimed at specific customers. In the framework of the process approach business processes are considered as business management processes [2, p. 40], which are often associated with the emergence of transaction costs and direct production of goods and services.

The main task is the correctness and expediency of determining the owners of business processes, who are fully responsible not only for the quality of their implementation, but also for the control of certain performance indicators (these indicators are calculated separately for specific areas of activity and compared with critical normative values) [3, p. 20].

This allows managers in most cases to "keep their finger on the pulse", i.e., to adequately react to market outflows and take necessary corrective measures.

Russia's large industrial cities already have a traditionally established sustainable network of transport enterprises, which has its own specifics depending on the region, specifics of pricing in terms of transport tariffs, and the ability to interact with other industrial infrastructure.

However, any change in the market environment (increase in energy tariffs, fuel tariffs) imposes rather strict requirements on the owners of processes at the enterprise (availability of qualified personnel, advanced training). Also, process owners must take into account external negative factors: increased competition, higher taxes, border closures, force majeure circumstances.

In this regard, the scrupulous development and application of an effective process approach is a large-scale multidimensional task. The main problem lies in the fact that transport companies existing on the market for more than 15 years are not able to competently describe and visualise business processes for their owners [4, p. 150].

The effectiveness of the management process consists in competent and efficient response to the emerging situation, correct application of standard algorithms, detection of "narrow", problematic sides.

The application of the general concept of the process approach at the enterprise allows not only to outline and designate in detail the processes themselves, but also to find the existing formal and informal links between them, to adjust the control vector of influence and to determine the necessary amount of resources to achieve the result. All this contributes to the emergence and formation of an optimal managerial organisational structure of the enterprise, which will be created on the basis of clear regulations, guidelines, algorithms and developed measures of a planned preventive nature.

The specificity of transport sector enterprises is precisely in the rational construction of such a passenger transport system, which would meet all the requirements of comfort, safety and convenience of moving passengers and cargo in the minimum time to the destination point.

METHODOLOGY. FEATURES OF IDEF0 MODELLING

IDEF0 methodology was developed by Douglas T. Ross in the early 70s of the last century

and was called SADT (Structured Analysis & Design Technique) [5, p. 2]. It is based on a graphical language for describing (modelling) systems, which has the following properties [6, p. 100]:

- the ability to break down the main production process as completely as possible into sub-processes that reflect the smallest financial and economic relationships and their importance in relation to process owners;
- convenient visualisation of sub-processes to which econometric modelling methods can be applied;
- user-friendly interface that facilitates the perception of the graphical language;
- accessibility and comprehensibility of terms for analysts, experts, and managers, which serves as a tool of necessary interaction for successful teamwork.

These properties predetermined the choice of IDEF0 methodology as a basic tool for analysing and synthesising business processes in production.

So, within the framework of the process approach at the transport enterprise it is convenient to apply IDEF0 methodology,[1] which allows to construct a layout and detailed description of all business processes existing at the enterprise, including the type of organisational (staff structure), description of information flows, controlling and verification systems.

Using a graphical language based on the IDEF0 method, a visualisation of the process model is created, including a full set of business, transport, and other links in close interaction with other market actors. First of all, layouts and diagrams of business processes are drawn up, subordinated to hierarchical principles, where at the top level the main management functions are represented; then their deciphering, detailing and classification are given. A set of business processes is an integral unified model based on certain regulations, circulars, information communication channels, etc.

In accordance with the IDEF0 methodology it is advisable to develop and propose a layout for transport sector enterprises [7, p. 110]. It will reflect the whole necessary list of business processes that make up the activity of any transport enterprise, which will allow to identify not only emerging problems, but also individual features and patterns of processes.

A separate place in the layout is given to the "top level" function, designed for managers and top-level managers. It is of key importance in the activities of transport sector enterprises. Also, within the framework of the general development of the management model layout, the modelling of the behaviour of the main clients of transport enterprises — passengers — is given.

The activities of transport sector enterprises can be subdivided into the following business processes:

- organisation and planning of passenger transportation;
- direct implementation of carriage by the carrier company;
- ensuring and guaranteeing passenger transport safety;
- control over the implementation of passenger carriage;
- passenger transport management;
- monitoring of passenger transportation [8, p. 125].

The degree of detailing of each transportation process is conditioned by its specific complexity and characteristic features, which are determined by the necessary performance indicators.

IDEF0 methodology is a multidimensional and large-scale task that includes a complete analysis of business processes of the entire enterprise considered as a single mechanism. This approach is more preferable for top

[1] IDFE 0 modelling methodology. Information Technology Reference Materials. URL: https://itteach.ru/bpwin/metodologiya-idef0 (accessed on 09.01.2023).

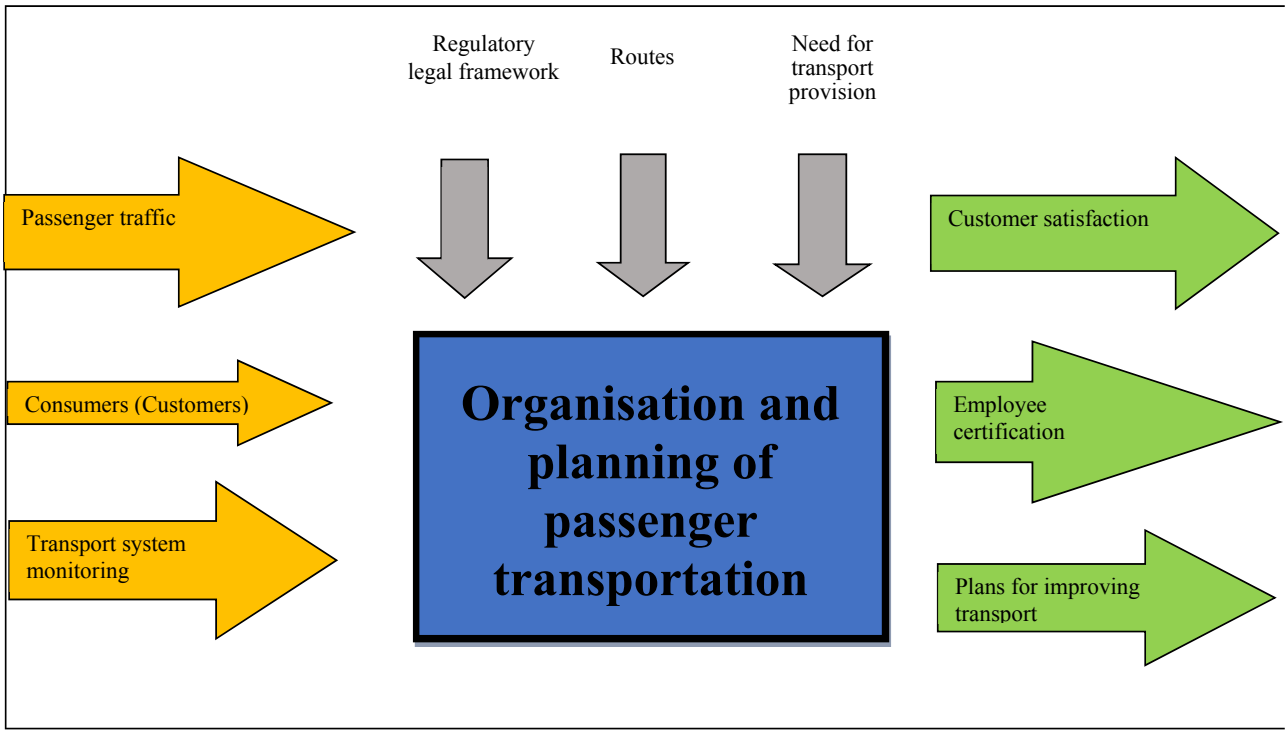

Fig. **The process of "Organization and planning of passenger transportation"**

Source: compiled by the authors.

managers of the company, who directly supervise business processes, as it implies a new method of control and analysis of management in transport [9, p. 200].

In essence, any management process at enterprises of the transport sector is divided into the following components:

- planning and design;
- implementation progress;
- tracking and monitoring;
- identification of reasons for deviations between actual and planned values by relevant performance indicators.

The IDEF0 model allows to obtain not only a detailed description of each business process at a transport enterprise, but also to determine the necessary amount of resources and capacities to ensure a targeted controlling influence on the performers [10, p. 75].

The description of the targeted impact is presented in the *Figure* below.

Within the IDEFO methodology, the following processes can be identified:

- management of transport activities;
- carriage of passengers;
- direct carriage;
- transport and carriage control;
- monitoring of customer satisfaction.

The "Vehicle Market" business process is also important, as it includes the analysis of the existing fleet, vehicle replacement plan, as well as the disposal of obsolete vehicles. In addition, the importance of the process "Provision of material resources" and "Quality control of material and technical support" can be separately emphasised.

The process "Planning and modernisation" of infrastructure includes analysis of the software market, planning for the introduction of licensed software, as well as obtaining information in the necessary amount for making management decisions.

An important role in the process approach is played by the so-called critical success factors (CSFs), which provide process owners with the necessary operational data on the

Table 1

The process of "Passenger transportation implementation"

No.	Name of processes	Key indicators by process	Critical Success Factors (CSFs)
1	Organisation and planning of transport	Monitoring of transport routes. Optimisation of routes and flights. Drawing up a preliminary transport plan. Adjustment of the transport plan. Preparation of the final transport plan in terms of time (week, month, year). Instruction of drivers and conductors	Availability of highly qualified personnel to support the transport process (drivers, conductors, repair workers, electricians, fitters, etc.). Availability of timely information about the traffic situation and transport workers. Ability to flexibly change routes and rearrange schedules in case of technical accidents or force majeure. Continuous monitoring of emerging problems on transport lines
2	Direct transportation of passengers	Optimal transport lines. Ensuring work is carried out in accordance with the schedule. Responsible work of dispatchers and dispatch services. Activities of control and revision services. Planning a certain scheduled number of alternative routes on transport lines	Degree of availability of vehicles directly ready for operation (fleet of cars, buses, trains, etc.). Introduction of innovative vehicles (e.g., new wagons, carriages, cars etc.). Availability of reserve capacity. Availability of effective online information dispatch and control. Degree of information support equipment for vehicles
3	Degree of customer satisfaction	Number of claims during the reporting period. Number of complaints and suggestions	No complaints or claims
4	Monitoring of quality indicators of the transport process	Ideas and suggestions for improving the quality of the transport process	Promptness and reliability of the information provided

Source: compiled by the authors.

key performance indicators of business processes. Based on this operational data, an action plan is drawn up for the execution and implementation of control procedures and processes. The next stage consists in clearly defining the list of process owners (POs) that correspond to the staff structure on the basis of the approved regulations of top management; then scrupulous work is carried out on the development of statutory and legal acts regulating the activities of the enterprise services on the basis of the Charter.

Let's consider the process "Management of transport sector enterprise functioning". Let us highlight the main sub-processes. The owner of this process is the director of the transport sector enterprise himself, while top managers are assigned to specific areas of activity.

Assigning process owners is one of the most difficult tasks. Here, managers and executives at all levels in the existing hierarchy must be considered. It is also important to constantly introduce new innovations, apply the latest

Table 2

The Process of "Direct transportation of passengers"

Provision of a resource base	Subdivisions of the transport company
1. Availability of an appropriate fleet of vehicles (vehicles are technically sound and ready for operation). 2. Fleet of vehicles to be written off. 3. new modernised machines/wagons	Technical Services, traffic safety department, occupational safety centre
1. Qualified drivers / engine drivers. 2. Drivers/engine drivers who have been re-qualified	Financial Services
Conductors to work on the line	Logistics services
Provision of electronic tickets	Accounting
Information support	Information services
Management tools	Technical Departments
Informational support	IT Departments

Source: compiled by the authors.

techniques to improve the management process.

Now let's consider the process "Implementation of passenger transport". It is entirely aimed at the end user — the client who uses a certain transport network (i.e., moves around the city on the appropriate type of urban transport: metro, bus, etc.). [11, p. 183]. The transport process itself concerns all types of categories of economically active population, which moves around the city due to business necessity, and therefore it requires the maximum provision of safety and comfort. Important features are also transport accessibility, the minimum waiting time for transport, the number of minutes spent on the road. Transport fares, the possibility of timely replenishment of transport cards, and the capacity of vehicles (including during the rush hour) are also important.

The Department of Metropolitan Transport itself can act as a customer for certain types of transport services and develop new optimal transport routes.

The process "Carriage and transportation of Passengers" includes a significant amount of information about all comments, wishes and suggestions of passengers to improve the effectiveness of the transport process, the degree of comfort and reduction of travel time, including cheap fares for a certain stratum of the economically active population [12, p. 70].

It turns out that the output of individual processes of the transport sector enterprise receives either a motivated customer who reached the destination with a certain comfort and spending minimal time, or a dissatisfied passenger who got into a traffic jam due to the traffic situation or breakdowns of a purely technical nature.

Table 1 illustrates a number of critical success factors (CSFs) that directly determine the state of performance indicators, which are then compared to the normative (planned) values.

Table 2 shows the relationship between the relevant services of the transport company and the resource base to ensure the reliability of vehicle operations.

Table 3 presents a specific set of management functions that relate to the current operational activities of transport sector enterprises. In general, this is justified by the need to respond to force majeure

Table 3

Management functions

Name of the process	Transport company services
1. General organisation and planning of passenger transportation	
1.1 Availability of existing/agreed new routes. 1.2 Modification of existing routes. 1.3 Availability of main timetable. 1.4 Availability of an alternate timetable. 1.4.1 Monitoring and adjustment of routes	Technical Services Maintenance department
2. Organisation and planning of transport routes for the month	Planning Division
2.1. Daily transport planning 2.1.1 Daily assignments. 2.1.2 Monitoring of daily AP assignments. 2.1.3 Reallocation of assignments	Traffic Service
3. Receipt of proceeds	Financial Services
4. Control of drivers' and conductors' work on the line	Control and Audit Department
4.1. Ensuring the reliability of passenger transport 4.1.1 Road monitoring 4.1.2 Consideration of the overall road situation. 4.1.3 Consideration of seasonal variations (urban and suburban routes). 4.1.4 Road surveys for child transportation	Traffic Safety Department
4.2. Monitoring of activities 4.2.1 Control and monitoring of transport safety. 4.2.2 Monitoring and analysing the condition of drivers/engine drivers. 4.2.3 Accounting of document turnover on transport safety	Traffic Safety Department
5. Reliability of route fulfilment (%) 5.1 Control of timetable closure. 5.2 Fixing accidents and analysing their causes. 5.3 Instructing dispatchers on the possibility of changing routes. 5.4 Modelling the transport situation on the route. 5.5 Attracting additional fleet of vehicles	Traffic Department
6. Transport monitoring	Information and Analytical Department
The volume of revenue received from passenger transport: – by flights; – according to the schedule; – by day of the week/month/quarter. Analysis and identification of inefficient routes. Change in revenue after adjustments in timetables. Identification of inefficient routes and time to adjust them. Measurement of passenger satisfaction. Development of an efficient timetables algorithm	Analytical Department

Source: compiled by the authors.

circumstances, which require rapid changes in transport routes or their partial cancellation.

Table 3 clearly demonstrates that the most important management functions are controlling traffic, taking into account the detection of inefficient problem routes and analysing the quality of customer service.

For the successful realisation of any process, it is important to a large extent to possess the necessary resources, that the key success

Table 4

Characteristics of the "Resource availability" process

No.	Processes	Critical Success Factors (CSFs)	Information monitoring	Performance indicators for the fulfilment of objectives
1	Provision of qualified personnel	Creation of attractive working conditions. Availability of social guarantees, system of employee incentives and bonuses	Availability of highly qualified personnel. Professional development and retraining of personnel. Improvement of labour legislation and local regulations on labour improvement	Indicator of full staffing of employees in various categories (drivers, machinists, conductors, etc.). Staff turnover rate
2	Provision of rolling stock ready for operation with technological equipment and energy carriers	Availability of innovative equipment units in the transport company's fleet of vehicles. Availability of reserve capacities. Availability of repair workshops. Optimal consumption of Electricity and energy resources	Immediately ready for operation units of equipment/machines/wagons Analysis of causes of technical failures of machinery and equipment. Number of defective machines. Availability of spare parts for repair of machines. Accounting of emergency shutdowns of necessary energy resources	Full technical readiness indicator by transport equipment fleet segments. Fleet utilisation rate (%). MTBF (Mean Time Between Failures) indicator. Availability of operational information on reserve capacities

Source: compiled by the authors.

factor in any activity predetermines [13, p. 400]. The process "Availability of resources" is a typical example of how efficiency depends on the quantity and quality of machines. The availability of repair shops and skilled craftsmen is also important [14, p. 55].

The process "Resource endowment (availability)" includes the availability of workable machines (wagons), including innovative ones, as well as skilled labour and energy resources, the cost of which can vary depending on market conditions.

The characteristics of the respective processes are given in *Tables 4 and 5*.

The process of "High-tech information support" is important, which acts as a link between the other processes, because the quality of management decision-making depends on the speed of information transmission and processing. At the same time, there is a requirement to the information itself, which should be as meaningful, prompt, and reliable as possible [15, p. 27], and most importantly — accessible to managers at all levels.

The output of this process is a satisfied customer, whose needs have already been taken into account due to the timely exchange of data.

Within the framework of information support is the technological infrastructure, as well as structural units of the transport company (services, departments, management) [16, p. 790].

Thus, the consideration of processes as integrated components of the whole allows not only to scrutinise the features of subprocesses, but also to find "bottlenecks", which generally contributes to improving the quality of management.

Based on the presented methodology, we can conclude that the process approach is an integrated set of methods and procedures of

Table 5

The Process of "Availability of material and technical resources"

No.	Processes	Critical Success Factors (CSFs)	Information monitoring	Performance indicators for the fulfilment of objectives
1	Organisation of logistics supply	Planning of the procurement process in the planning period. Approval of prioritised list of inventory items according to technical specification. Securing funding in accordance with emerging needs in the required volume. Informatisation of stock control and bid collection system	Control over the minimum permissible level of reserve capacity in warehouses according to the specifications of the relevant equipment. Determining the shortage of necessary repair spare parts and determining the possibility of their immediate acquisition	Updating purchase requisitions for relevant equipment. Monitoring of regular suppliers and subcontractors. Management cost accounting
2	Implementation of the logistics plan	Market monitoring to determine the most attractive supplier. Compliance with delivery dates	Reduction of reserve capacities at warehouses below the normative values	Availability of an irreducible stock of spare parts in warehouses. Determination of vehicle downtime due to shortage of required spare parts

Source: compiled by the authors.

managerial functioning of the enterprise to improve the effective management of business processes. In this case, the developed system of performance indicators for each business process, which are compared with the planned (normative) ones for given time intervals, is of great importance.

RESULTS OF THE RESEARCH

1. The introduction and integration of the process approach in transport sector enterprises allows to improve the overall management efficiency; at the same time, individual sub-processes set local performance indicators, which result in aggregate generalised indicators at the output, which allows to create a convenient platform for control.

2. The use of the process approach eliminates administrative and information barriers between individual services of a transport company; it improves its competitiveness and the quality of transport services.

3. The application of the process approach is beneficial in order to increase overall labour productivity, reduce costs, and continuously improve management functions.

4. The process approach in transport sector enterprises contributes to the overall harmonisation of business procedures, increasing dynamism, flexibility and prompt response to market downturns and upswings.

CONCLUSIONS

Within the framework of this study, the authors have proposed a process toolkit that specifies the division of the management system into sub-processes at enterprises of the transport sector. The application of the proposed concept of process procedures for transport enterprises will minimise the loss of resources in the short and medium term, reduce financial costs, and optimally modernise the fleet of necessary machinery equipment. In this case, it is important to rely on the principle of rational distribution of competences, powers, and joint responsibility within the functioning management structure,

according to which the owners of processes are able to improve them, based on breakthrough and innovative technologies.

Further improvement in the efficiency of transport companies' business processes may require additional optimisation and the application of new technologies, which would enable a tighter procedural interaction between the processes of core and auxiliary activities, taking into account the emerging synergy effect.

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Methodological Tools for the Implementation of Oil and Gas Projects on the Arctic and Continental Shelf

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ABSTRACT

The presented article considers the methodological tools for the practical implementation of offshore hydrocarbon projects from the perspective of the system-functional approach. The research analyzes the provisions of the concept of integrated field development in the context of the policy of import substitution in the Russian oil and gas industry. A number of directions of methodological tools application have been identified and distinguished: environmental, technological, transport, infrastructure (including construction and improvement of new supply routes). The article shows how the sustainable development of all segments of the oil and gas complex, the institutional platform on which they are based, and the introduction of the latest technologies — all contribute to the integrated development of offshore hydrocarbon reserves.

Keywords: oil and gas complex; oil and gas project; state regulation; Arctic shelf; continental shelf; import advance; national security; energy security

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INTRODUCTION

The sanctions policy against Russia has resulted in the development of strategic and programme-targeted documents aimed at import substitution in the oil and gas industry and tightening the access of foreign companies to the development of Russian fields. Interaction between the state, oil and gas business and various institutions allows consolidation of regulatory measures, including the creation of advanced development territories, provision of special conditions for the implementation of Arctic projects, preferential regimes and benefits, development of interaction with domestic consumers, organisation of two-way feedback, elimination of contradictions between the actions of various departments and levels of government, which is reflected in the socio-economic indicators of the Arctic region and constituent entities of the Russian Federation. In terms of the conditions for the presence and functioning of foreign companies, restrictive measures are established to ensure national and energy security and to utilise the industrial potential of Russian enterprises.

PRACTICAL IMPLEMENTATION OF THE CONCEPT

The oil and gas complex (OGC) as an object of government regulation (GR) involves a comprehensive study of domestic and global energy demand, the use of accumulated economic potential, the subsequent implementation of strategic and programme-targeted documents aimed at the establishment of large production centres in the Arctic region, the improvement of subsoil use and the regulatory mechanism as a whole. The analysis of the economic potential of the Arctic regions makes it possible to identify key points and projects for breakthrough economically

sustainable development, to expand the interaction of OGC with related industries, to take direct and indirect regulatory measures aimed at the integrated implementation of projects [1–3].

This results in the selection of specialised companies and the development of proposals for the development of production centres that have a favourable impact on the social and economic indicators of the regions where energy companies operate. As a result, many companies specialising in the provision of specific works and services, equipment supply, etc. are involved in field development. The elaboration of mechanisms for the execution of regulatory actions, practical implementation of regulatory legal acts (RLAs) (i.e., the execution of the GR control function at various stages of oil and gas projects) determines the importance of creating federal and regional institutes for the professional development of employees within the framework of projects for the development of deposits on the Arctic and continental shelf. Expansion of sectoral interactions favours the activities of participants of economic relations, contributes to the improvement of socio-economic indicators, involves the use of special regulatory tools taking into account the specifics of the implementation of a particular project, in some cases adjusting the management structure of enterprises in the presence of bilateral ties.

The implementation of the industrial potential of enterprises is conditioned by the need to improve the efficiency of field development. This involves the formation of economic criteria for the efficiency of their development, selection, competitive procedures for choosing an operator company, which subsequently invites contractors, service, and other enterprises to participate in oil and gas projects, co-operates with them, develops an investment project for the development of reserves, proposals to improve efficiency, and the possibility of their practical application.

Management and technological experience of foreign companies is utilised, taking into account compliance with environmental requirements and national legislation. GR measures are aimed at promoting economically sustainable development of oil and gas companies; improving socio-economic indicators of project implementation; utilisation of industrial potential; development of technological direction; expansion of the range of works and services provided by Russian companies; modernisation of enterprises and equipment. Stability of the tax policy implies an increase in budget efficiency, improvement of financial and economic results of enterprises, inflow of additional capital investments, development of new directions of project development. Taking into account various positions of oil and gas entities allows the government to avoid certain risks, including those related to ensuring environmental standards.

Special emphasis is placed on the transportation of extracted hydrocarbons to processing points and then to end consumers (both enterprises and the private sector). In this way, upstream centres, production facilities and major distribution points are linked together. The development of oil and gas reserves involves the construction of pipeline branches and the introduction of new tanker fleet units. A separate issue is the delivery of equipment and fixed assets to the fields in compliance with environmental requirements. In other words, the creation of favourable investment conditions, as well as the development of infrastructure for various types of transport, contributes to the development of the Arctic and continental shelf reserves. This contributes to linking communications between individual regions; it promotes the development of trans-shipment points and storage systems in the

region, the development of the largest fields, and the expansion of innovative opportunities for production.

The construction of new transport branches increases the efficiency of deliveries and reduces their cost. The introduction of technological solutions makes it possible to accelerate transport times, for example, to ensure delivery routes via the North Pole to the USA and Canada. The development of the transport sector increases the competitiveness of Arctic hydrocarbons in the global energy market. It connects and establishes communication between the main points of the Arctic shelf and internal and external consumers. The Northern Sea Route (NSR) is becoming a connecting transport artery between Europe, Asia, and America; relatively small inland routes, which are its branches, are being developed and used to supply equipment. In this aspect, the Arctic region serves as a transit transport connection.

Field development determines the importance of timely supply of necessary fixed assets and production funds for the development of reserves, increasing the economic efficiency of hydrocarbon transport, establishing new routes and branches [4]. This provides the possibility of additional geological exploration and drilling works, i.e., promotes the integrated development of shelf water areas, suggests a significant increase in cargo flows, additional revenues to the budget, the solution of certain technological issues, including those related to ensuring the defence capability of the state. Reduction of transportation costs contributes to the competitiveness of Arctic coal and hydrocarbons on the world energy market by eliminating certain intermediaries from the sales chain. In fact, the potential of hydrocarbon storage and transport segments is developed and expanded, new markets, processing and chemical enterprises are created, and demand for hydrocarbons in the Arctic regions is secured.

At the present stage, the service segment is being improved, construction of the necessary infrastructure is underway, and major shipbuilding projects are underway, with capacity building in the main port cities, which occupy key positions in the development of Arctic oil and gas production centres. Particular attention is paid to cities and major settlements along the NSR, where production facilities that provide oil and gas products to the neighbouring regions are located.

The development of Arctic fields is being carried out systematically: the main ports are becoming geostrategic destinations, cargo turnover is increasing, including due to hydrocarbons produced in the region. As a consequence, the need to improve the storage system, terminals, etc. is growing. Development of the transport segment in the OGC is associated with the implementation of existing territorial and foreign economic opportunities, expansion of throughput capacities (including oversized vessels), improvement of socio-economic indicators of coastal areas. In turn, the development of ports and storage systems makes it possible to increase the efficiency of transport flows taking into account ice conditions, to commission new vessels, and to realise natural resource and industrial potential.

The state policy takes into account the target benchmarks for the comprehensive development of all segments of the Arctic region's oil and gas industry. It envisages expansion of sales channels, industry interaction and co-operation; large-scale geological exploration aimed at discovering new fields; flexibility in taking regulatory measures due to the internal and external environment; development of shipbuilding, air transport and related infrastructure [5].

The issues of ensuring environmental security affect social and technological aspects. There is a growing need to improve normative and legal acts; to legislate the rights to Arctic territories, transit in relation

to the NSR, shipping; to analyse legal practice and positions of the Arctic states; to take into account economic and political contradictions. The expansion of transport flows is impossible without the involvement of multiple economic actors, in most cases several states. Transportation of hydrocarbons is associated with the legal factor, peculiarities of the legislation of foreign countries, development of port infrastructure in different water areas, creation of new, more economically attractive supply directions, their financial support, implementation of technological solutions, monitoring of the results, etc.

Phased implementation of projects implies that new participants with the necessary resources, capable of improving organisational, financial, and economic activities, bringing new management solutions and technological innovations, can enter them. The establishment of production centres allows for additional benefits from transit traffic and cargo turnover, geographical location, infrastructure, energy security and synergy effect. This takes into account the provision of Arctic ports with production funds, developed social sphere, natural and climatic factors, various forecast scenarios, multifunctionality in relation to different types of vessels, promotion of oil and gas service development.

The ice situation is monitored in real time, aimed at field development and transit opportunities, coordination, and safety of transport routes through the use of modern technological solutions, pragmatic regulatory impact aimed at removing restrictions, application of incentive measures, development of a common position of the state and oil and gas companies on important industry issues, financial support for projects, expansion of the network of interactions.

Joint and collaborative development of offshore fields makes it possible to compensate for some of the risks and depletion of individual deposits in the continental part in order to achieve acceptable economic results. Individual supply routes and oil and gas service solutions are envisaged for each Arctic project. Within the framework of various segments of OGC, the legislation stipulates conditions for the admission of foreign companies, which bear responsibility, bring technologies, and perform certain organisational and management functions. In turn, Russian enterprises interested in active development of foreign offshore reserves also participate in foreign projects under production sharing agreements (PSAs).

The implementation of the proactive import substitution policy promotes the development of domestic industrial production [6, 7]. The state makes part of the investments in the development of the Arctic: new promising water areas are analysed, the possibilities of putting large deposits on the state balance are studied. Restriction of access of foreign companies, their financial and investment resources — serves as a factor in ensuring national and energy security. The largest contracts are concluded taking into account long-term economic and political co-operation in the energy and related areas and the introduction of the latest technological solutions. This allows Russian companies to effectively develop hydrocarbon reserves, implement oil and gas projects, and expand the socio-economic effect in the strategic perspective. Inter-enterprise cooperation facilitates the development of managerial and technical solutions, the creation of patents, and the involvement of relatively small companies from various sectors of the economy [8–10].

A significant factor in the economically sustainable development of OGCs is the legal and regulatory framework for ensuring national and energy security. Foreign enterprises are designed to stimulate field development, improve financial and economic indicators of project implementation, promote technological developments of Russian companies, increase

their capitalisation, participate in global oil, and gas cooperation, apply the accumulated scientific and technical experience, and expand their impact in new markets. The development of OGC-related industries is conditioned by scientific and technological progress (STP) and the need to introduce digital technologies. Legislative acceleration of the processes of field development and project implementation makes it possible to increase the efficiency of licence granting and subsoil use in general, orienting enterprises towards proactive import substitution in the oil and gas industry.

Due to the fact that Arctic projects are characterised by particularly difficult natural, climatic and geological conditions of field development, there is a need to ensure safety at production facilities, prevent man-made and human-caused emergencies, expand the fleet of specialised vessels, establish differences between Russian legislation and international law when operating in the Arctic.[1] At the same time, the enterprises fulfil in full their obligations in terms of subsoil use, technological and environmental safety; they take into account the potential increase in economic costs. This implies flexibility in making management decisions, the possibility of using fixed assets in the implementation of other oil and gas projects, simplification of licensing, reduction in the time of state control procedures.

The development of Arctic fields should not be postponed indefinitely. Improvement of the customs and tariff form of OGC GR, legislative adjustment of certain units of the conceptual and categorical apparatus are due to the fact that some measures and restrictions preventing the development of reserves are being excluded from the regulatory framework. For example, administrative barriers between the Eurasian Economic Union (EAEU) states continue to be removed, transparency of trade operations and foreign economic activities with foreign countries is increased through interdepartmental cooperation, and delivery times for products are accelerated. As part of the implementation of major projects, special regulatory and legal acts and subordinate acts are being drafted regarding special procedures, privileges, preferential regimes, taxes, customs duties, and payments to budgets of various levels, payment terms within the framework of concluded contracts, measures of responsibility for non-fulfilment of such contracts, etc. In other words, the governmental bodies are adjusting the existing regulatory and legal framework with regard to budget and tax policy, accelerating the processes of regulatory decision-making, analysing the positions of enterprises and international best practices, coordinating the work of various government agencies.

Separate legislative measures are being taken to ensure technological and environmental safety within the framework of both national regulatory and legal acts and international law; procedures in foreign economic activities are being improved to remove existing barriers and bring national legislation and EAEU legal norms into compliance. This takes into account the different positions of oil and gas participants in the implementation of offshore projects, in particular with regard to the distribution of the fiscal burden on offshore oil and gas projects.[2]

One of the directions for improving the methodological tools is the specification of the

[1] United Nations Convention on the Law of the Sea (UNCLOS). URL: https://base.garant.ru/2540700; Convention on the Continental Shelf. URL: https://base.garant.ru/72164534; Convention on the Territorial Sea and Contiguous Zone. URL: https://base.garant.ru/2540247; Convention on the High Seas. URL: https://base.garant.ru/70255080

[2] Federal Law No. 268-FL dated 30.09.2013: (as amended on 28.12.2016) "On Amending Parts One and Two of the Tax Code of the Russian Federation and Certain Legislative Acts of the Russian Federation in Connection with the Implementation of Tax and Customs Tariff Incentives for Hydrocarbon Extraction Activities on the Continental Shelf of the Russian Federation". URL: https://base.garant.ru/70461612

differential taxation scale depending on the conditions of the project being implemented, which is designed to stimulate the development of fields with a significant delay in the date of commercial exploitation of some of them. This is especially relevant given the complex natural, climatic, geological and ice conditions. Sustainable development of the enterprises is conditioned, among other things, by the transparency and predictability of the state policy in the field of subsoil use, the adoption of legislative measures aimed at accelerating the development of hydrocarbon reserves, and the possibility of communicating our own position to government authorities.

The forms and tools of OGC GR applied within a particular field are subject to adjustment in connection with changes in the volume of recoverable hydrocarbons or production start dates. They are on the balance of the state and oil and gas companies, which are not interested in delaying the development of reserves [6, 7]. The level of tax burden of field development is determined by various factors: expected production volume, incurred costs, financial and economic results, etc. Licensing conditions, tax and customs measures are also subject to adjustment for a number of projects. This is due to the clarification of field boundaries and the volume of proved reserves, and allows enterprises to improve the efficiency of development.

The development of the unique explored reserves of the mineral resource base (MRB) implies ensuring a favourable investment climate, creating the necessary infrastructure, which is associated with the socio-economic development of the subarctic regions, providing employment for the local population while respecting environmental requirements. Many industries are linked to oil and gas production centres, which allows enterprises to reduce costs and strengthen economic performance. Arctic shelf development requires calibrated regulatory measures for each project, which together aim to achieve uniform performance without internal opposition between different economic directions.

The mechanism of OGC GR implies functional distribution of responsibilities, subsequent control function, responsibility measures for enterprises. The related industries and productions can function independently of each other. Accordingly, the task of the GR is to combine them to achieve the designated goals, thus having a directed impact on all aspects of field development, development of new orientations. The development of related areas contributes to the establishment of oil and gas production centres, provides socio-economic benefits to the Arctic territories, and allows for the expansion of export supplies when destructive factors are eliminated, as well as when organisations that have not adapted to the changing economic conditions leave the market.

The development of hydrocarbon reserves on the Arctic and continental shelf should not disturb the unique ecosystem of the region, but, on the contrary, should contribute to achieving the best results within the framework of the environmental direction. Certain organisational and regulatory decisions are made taking into account the experience of developing continental reserves. Thus, economic performance is not the only performance criterion: the methodological toolkit used is oriented towards the environmental component and involves responding to emerging situations, eliminating possible risks, applying the safest technologies, and resulting infrastructure solutions. Analysing the impact on the region's ecosystem allows us to identify negative factors, effective forms and tools of oil and gas exploration and government regulation, and conduct an environmental scenario analysis of field development. Comprehensive consideration of various factors and their interrelationships can lead to a sustainable development trajectory

in the development of hydrocarbon reserves of the Arctic and continental shelf, which is linked to macro-economic goals and objectives in the context of the implementation of the state energy policy.

The oil and gas industry follows common environmental guidelines and matches them with national interests in environmental protection and conservation, while identifying the overall disruptive impact of all factors. Within the enterprises, there is two-way communication between the different levels in the organisational structure, which allows for more efficient operations and promotes the development of production centres in the Arctic. The regulatory impact extends to OGC-related industries, as it is the total socio-economic effect that is important. Technological changes should not lead to irreparable ecological damage to the Arctic ecosystem. The resulting indicators of all impact factors, in our opinion, are most fully disclosed from the standpoint of the system-functional approach. The absence of contradictions between regulatory measures, which is characteristic of all oil and gas companies, is aimed at the step-by-step implementation of long-term goals and is adjusted to different positions and approaches to resource development.

The state pays attention to the activities of global energy and financial corporations, foreign governments, and international institutions, as well as the extent of their impact on domestic economic processes. Thus, the factors that can influence the implementation of oil and gas projects, including through the use of digital technologies, are studied. In particular, this applies to the structure of domestic and external consumption of hydrocarbons in general and by types of products, supply directions, social, demographic and ethnic factors in the regional context. In fact, the supply chain is being improved and deep processing of high value-added products is being carried out.

The regulatory measures taken are functioning on a permanent basis, without temporary gaps, to avoid additional risks in the implementation of offshore projects, and to pursue a pragmatic state policy in the context of intertwined economic, political, environmental, and other factors. This implies possible adjustment of the mechanism of oil and gas exploration and government regulation and stimulation of internal sources of development, for which regulatory measures act as a natural organic supplement.

Improving the efficiency of subsoil use takes into account trends in the development of alternative energy sources, various environmental criteria and their assessment: the extraction of hydrocarbons does not undermine possible production volumes. The integrated development of oil and gas projects on the Arctic and continental shelf is the most pragmatic, given the lack of opposition of economic entities to each other. An important aspect is the fair distribution of licence areas between energy companies, aimed at maximising the economic effect in the absence of internal and external destructive factors. Rational nature management implies the achievement of acceptable financial and economic indicators, taking into account the fulfilment of environmental obligations. The emphasis is placed on programme-targeted planning methods and long-term forecasting.

CONCLUSIONS AND RECOMMENDATIONS

The development of reserves implies a comprehensive study of various impact factors; it is important to coordinate actions between oil and gas companies and state authorities that exercise environmental control over various qualitative and quantitative parameters. Subsoil use is intended to contribute to the socio-economic development of the Arctic regions and the preservation of the unique

ecosystem. In turn, enterprises try to maximise the return on available resources, giving a special role to the prevention of various risks (which is more expedient than the elimination of environmental, technological and other consequences), systematic consideration of emerging situations, and the choice of long-term priorities.

The theoretical and methodological tools allow to improve the institutional platform, expand promising areas of development, and adjust the existing mechanism of hydrocarbon exploration and government regulation in relation to the Arctic and continental shelf. Improving the efficiency of subsoil use is impossible without the development of related industries and productions, the formation of oil and gas production centres, improving the quality of forecasting, expanding the source data on the basis of which additional investments are attracted, regulatory decisions and targets are adjusted. Particular attention is paid to growth points that can have a key impact on the planned development of the entire Arctic region and the preservation of the environment: in most projects, the technological component prevails over the potential economic effect. Modern technologies have a direct impact on the completeness of geological exploration of territories, hydrocarbon recovery and processing processes.

Regulatory measures are developed by the federal centre and constituent entities of the federation due to the organic interaction between government authorities and oil and gas companies. Investments require comprehensive data on the current situation and development prospects, as well as management and regulatory decisions. OGC GR is aimed at strengthening internal and external interactions and improving the environmental situation. The extraction of hydrocarbons is a component of the mechanism for developing the Arctic region's deposits and is interrelated with ensuring environmental safety, preserving the environment, suppressing external negative impact on the Russian economy, and a comprehensive analysis of various groups of factors. In this regard, it is important to pragmatically distribute functional responsibilities between government authorities and responsible executors, to make changes in the regulatory and legal framework, including state strategies and programme-targeted documents.

Digital technologies allow using the economic and resource potential of the state more efficiently. According to various parameters, the most suitable fields are identified from the point of view of their commercial exploitation [11], relatively easier conditions of extraction and transport, and the formation of optimal logistical routes. One of the main factors in the development of Arctic fields is remoteness from the coastline, as well as geological conditions of extraction. As a result, the development of Arctic and continental shelf fields has a significant impact on the national economy, the structure of internal processes; it ensures the increase in the sustainability of interrelationships in the context of increased competition for the most promising licence areas and disputes over the ownership of water areas at the international level.

The multiplicity of impact factors necessitates the concentration of production facilities, distribution of responsibilities, goals, and objectives among economic agents. Particular attention is paid to the justification of licence area boundaries due to the possible transition to a new taxation and payment system. This will make it possible to improve certain subsoil use projects, eliminate contradictions between oil and gas companies for the right to obtain licences and to put subsoil areas on the balance sheet of the government, and will promote the development of geological exploration and production technologies.

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