Nexo Revista Científica
Vol. XX, No. 0X, pp. XX-XX/Mes Año

ISSN-E 1995-9516
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http://revistas.uni.edu.ni/index.php/Nexo
http://dx.doi.org/10.5377/nexo.vXXiXX.XXXX

The benchmarking analysis of ESG transformation models of socio-economic systems in various countries

El análisis comparativo de los modelos de transformación ESG de sistemas socioeconómicos en varios países

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(recibido/received: 17-junio-2023; aceptado/accepted: 01-octubre-2023)

ABSTRACT

The purpose of this work is to conduct the benchmarking analysis of ESG-transformation models of socio-economic systems in various countries, such as the Russian Federation, the United States of America, Germany and China. The work used the combination of systemic, dialectical and historical approaches that allow comparing three aspects of the sustainable development of socio-economic systems: environmental, social and economic. The dynamic analysis of the sustainable development of the countries for the period 2010-2022 was carried out according to various indicators that make up the system of ESG projections and correspond to the goals of the sustainable development. The comparative analysis of the sustainable development of the countries for 2022 was carried out according to various projections of the sustainable development. To achieve the goal the article has formed the system of measurable indicators that are used in the official statistics and reflect the economic, social and environmental aspects of the sustainable development of society. The proposed system of the indicators satisfies the principles of the comparability, necessity, sufficiency and reliability allows you to evaluate the effectiveness of ESG transformation for different countries and carry out cross-country comparisons.

Keywords: Sustainable development, ESG transformation, environmental, social and management factors, integral index, benchmarking analysis.

RESUMEN

El propósito de este trabajo es realizar un análisis comparativo de modelos de transformación ESG de sistemas socioeconómicos en varios países, como la Federación de Rusia, los Estados Unidos de América, Alemania y China. El trabajo utilizó la combinación de enfoques sistémicos, dialécticos e históricos que permiten comparar tres aspectos del desarrollo sostenible de los sistemas socioeconómicos: ambiental, social y económico. El análisis dinámico del desarrollo sostenible de los países para el período 2010-2022 se realizó de acuerdo con diversos indicadores que integran el sistema de proyecciones ESG y corresponden a las metas del desarrollo sostenible. El análisis comparativo del desarrollo sostenible de los países para el año 2022 se realizó según diversas proyecciones del desarrollo sostenible. Para lograr este objetivo, el artículo ha creado un sistema de indicadores mensurables que se utilizan en las estadísticas oficiales y reflejan los aspectos económicos, sociales y ambientales del desarrollo sostenible de la sociedad. El sistema

de indicadores propuesto satisface los principios de comparabilidad, necesidad, suficiencia y confiabilidad, permite evaluar la efectividad de la transformación ESG para diferentes países y realizar comparaciones entre países.

Palabras claves: Desarrollo sostenible, transformación ESG, factores ambientales, sociales y de gestión, índice integral, análisis benchmarking.

1. INTRODUCTION

According to the monetary concept of the economist Milton Friedman the main duty of economic agents is to maximize income. For many decades, environmental, social and governance objectives were not considered relevant for most companies that focused on profit maximization. It was believed that ESG objectives had a negative impact on the company's financial performance, as they were associated with increased costs (Friedman, 2017).

Over the past twenty years, the environmental, social and governance issues have shown their impact not only on profitability, but also on financial viability of a number of firms, industries, regions and even countries. Globally, there has been the increase in environmental, social and governance awareness. The economic entities are increasingly characterized by their non-financial information, in particular the environmental, social and governance assessments, most of them have sustainable development programs.

The sustainable development has an important feature - it can only be global (spread to all of humanity, since the nature and problems of global nature are the same for everyone). The solution of global problems within one country is impossible. The connection of the sustainable development with the globalization is noted by the world scientific community: “the process of transition to the sustainable development is global, and a single country cannot switch to this path, while the other countries will remain within the old development model. That is why it is important to use the unfolding process of globalization and direct its economic, environmental and social components towards the implementation of sustainable development goals”. The globalization is the basic process for creating the unified legislation in the field of the sustainable development, bringing all the countries in order and giving them the environmental orientation.

2. LITERATURE REVIEW

In 2020 the Davos Forum was held under the auspices of the theme “ESG transformations. ESG is the set of characteristics of managing the socio-economic system which achieves the solution to the problems of implementing the "green economy", reducing the social inequality, non-transparency of business and low social responsibility (Sokolova, Teymurov, 2021). The companies evaluate their activities in accordance with the principles of the sustainable development. For these purposes, various ESG indicators are used.

The Environmental component contains issues such as the climate change, deforestation, air and water pollution, land exploitation and biodiversity loss. Thus, it evaluates the company's efforts in terms of the energy efficiency, greenhouse gas emissions, waste management, water and resources (the indicators: waste generation, water consumption, emissions of harmful substances, energy consumption, etc.). Billio et al. (2021) showed that the greener firms increased profits and improved stock returns.

The social component includes aspects related to, for example, gender policy, human rights protection, labor standards, labor and product safety, public health and income distribution that affect employee satisfaction (the indicators: staff turnover, wages, gender composition, etc.).

Finally, the governance component is related to such aspects as independence of the board of directors, rights of shareholders, remuneration of managers, control procedures, disclosure of information and management strategies.

The concept of the "sustainable development" is applicable to various economic systems. For example, the sustainable development of a region is “the process that combines the equivalence and indispensability of all three factors of the sustainability: the social (level and quality of life), environmental (nature conservation), economic (economic prosperity) and reflecting the quality of the life of the population of this region” (Dovbiy et al., 2022).

The work of Spitsyna (2022) provides the analysis of the best practices for integrating ESG principles into the management system at the level of the constituent entities of the Russian Federation. To consider the experience of ESG transformation, such subjects of the Federation were selected as:

– The Sakhalin Region, where the regional climate program is being piloted;

– The Khanty-Mansiysk Autonomous Region – Yugra, where the integration of the principles of the sustainable development into the management procedure is the most comprehensive and includes the Regional Development Strategy, SDG plans and regular monitoring of their achievement;

– The Rostov Region, which is the first region where the comprehensive statistical analysis of the sustainable development goals was carried out according to the list of national indicators of the sustainable development;

– The Nizhny Novgorod Region, which is developing the ESG agenda by integrating the efforts of the public authorities, business and population.

The most important source of revenues to the budget of the Russian Federation is the income of the oil and gas industry. In this regard, oil and gas companies should become examples of the sustainable development and implementation of ESG principles in Russia. They have great opportunities to change their approaches to waste processing and disposal and set the example for the other industries (Gazprom Group policy in the field of sustainable development, 2021).

One of the industry leaders in the field of ESG transformation in Russia is the railway industry represented by Russian Railways. The industry is actively taking the environmental measures and the investment costs for ecology and environmental protection are growing every year. There is a program for energy saving and energy efficiency improvement as part of the implementation of the Energy Strategy until 2030. The significant part of the energy savings is associated with the successful implementation of measures to improve the technological processes of train traffic control. Among the environmental innovations, one can single out the set of measures to neutralize and recycle the significant part of the waste generated as a result of production activities (Kniga, 2021).

The ESG transformation has also affected such specific sectors of the national economy as healthcare and education. According to Morozova (2022) the healthcare industry, in addition to the actual activities of medical and preventive organizations, the industrial production of medicines, equipment for the treatment and promotion of health, can indirectly include the widest range of economic activities, since in modern conditions the resulting level of healthcare - life expectancy - is the most important indicator of the socio-economic development.

Next, we will consider the industry-specific features of the implementation of ESG principles in Russia. One of the most advanced in the field of ESG transformation is the nuclear industry. The article by

Bakhareva (2022) analyzes the practice of applying ESG principles in the state corporation Rosatom, which in the course of its activities influences the implementation of all the seventeen Sustainable Development Goals (SDGs). All the three components of the ESG transformation are in focus, accompanied by the implementation of various activities and programs.

A large number of different authors considered ESG-transformation models in relation to socio-economic systems of various levels. For example, Eccles & Serafeim (2013) considered the issues of the compromise between the financial results of the companies and their environmental, managerial and social performance. It is proposed to analyze and rank 43 ESG indicators in relation to 88 industries on the assumption that informing stakeholders about achievements in the field of ESG will increase the investment attractiveness of the analyzed companies and economic activities. So-called “materiality maps” have been created which present the ranking of indicators based on their importance for a particular industry.

The study by S. Al-Tuwaijri, T. Christensen and K. Hughes provides the comprehensive analysis of the relationship between environmental disclosure, environmental and economic performance. It is concluded that “good” environmental performance is strongly associated with “good” economic performance, as well as with more extensive, quantifiable disclosure of information about the environment, specific abatement measures and pollution incidents (Al-Tuwaijri, Christensen, Hughes, 2004).

Chouaibi & Chouaibi (2021) investigated the potential impact of the integration of social and ethical practices on the market assessment of environmental, social and managerial aspects of enterprises using the green innovation effect. The sample used included 523 international companies listed in the ESG index and headquartered in the North America and the Western Europe which formed the panel of 7845 observations over the period 2005-2019. The empirical results have shown that the social and ethical strengths of the company increase the value of the company when implementing "green" innovations, while weaknesses reduce it.

Wang et al. (2023) showed that corporate efforts to improve environmentally friendly technologies are critical to improve the sustainability of companies. It was found that the companies covered by ESG rating agencies significantly increased the release of green innovations, mainly due to the increase in the number of patents for green inventions.

Wen et al. (2022) demonstrated the relationship between the quality of ESG disclosure by companies and ESG investment growth based on the set of company-level panel data across countries/regions. The analysis of the sample of companies from 49 countries and regions, including both developed and emerging markets, showed that the quality of ESG disclosure has a greater impact on scaling up ESG investment.

Andries & Sprincean (2023) investigated the impact of environmental, social and governance factors on the cost of financing banks. Using the sample of 493 banks located in 39 advanced and emerging market economies over the period 2003-2020, the authors found that banks benefit from incorporating ESG practices into financial decisions. The companies with long-term commitment to sustainability demonstrate greater information transparency, which causes reduction in information asymmetry between contracting parties and leads to higher demand for bank shares or bonds.

Bax et al. (2022) have shown that additional non-financial information can improve the accuracy of performance forecasts and risk assessments. Based on real European and American data, the authors quantified systemic risk in the period 2007-2021. The empirical analysis has shown that companies with high ESG scores tend to exhibit low risk scores.

Darnall et al. (1922) believe that guiding environmental, social and governance reporting principles are institutional rules that can enhance the credibility of ESG-related public disclosures by firms. The authors

note the problem of inconsistency in the content of companies' reporting on ESG indicators, in the quality and accuracy of the information disclosed. Unlike the financial reporting, which is prepared in accordance with established accounting standards, ESG reporting practices are voluntary and less clearly defined.

Wasiuzzaman & Subramaniam (2023) assessed possible differences in the impact of the gender composition of boards of directors on the practice of ESG disclosure by companies in developed and developing countries. The data from 48 both developed and developing countries for the period 2004-2016 were used. It was found out that, in general, female leaders have the positive effect on the quality of disclosure of ESG and its individual components.

Mansouri & Momtaz (2022) analyzed whether investments in the sustainable development pay off. Understanding the economic implications of sustainable entrepreneurship is not only important for entrepreneurs and investors; it is also important for public policy because the lack of financial incentives requires government subsidies for sustainability-oriented businesses.

The presented review indicates the significant increase in interest in the processes of ESG transformation in various countries. At the same time, the considerable attention has been paid in the literature to implementation of ESG principles in individual companies, industries and regions. The benchmarking analysis of the countries of the world in terms of the level of the sustainable development and TSG-transformation will be significantly less affected. This is largely due to the different standards of statistical reporting adopted in different countries. We hope that our study will partially fill this gap.

3. METHODS

Modern methods of the benchmarking analysis of sustainable development of socio-economic systems

The analysis of scientific articles confirmed the relevance and significance of the evaluation and disclosure of indicators in the field of ESG. However, the problem of comparability of indicators for assessing the level of ESG of companies, industries, regions, countries has been identified. The study of such discrepancies makes it possible to form approaches to the development of the regulatory framework in the field of ESG assessment, to eliminate information gaps by clarifying reporting parameters and increasing the transparency of methodological approaches.

The benchmarking analysis of the sustainable development of countries is necessary for the controlled forecasting of the ESG transformation process, which will be based on the assessment of the results achieved and the effectiveness of the used means, as well as the level of achievement of the set goals. Taking into account the fact that the concept of the sustainable development is evolving, then for the analysis it is necessary to form the system of measurable indicators that could reflect the economic, social and environmental aspects of the sustainable development of society and link them together.

The macro level of the benchmarking analysis

The world practice of assessing the sustainable development of mega-, macro- and micro-level systems demonstrates a wide variety. Summarizing the modern experience of methods of the benchmarking analysis of the sustainable development of the countries, it is possible to group methods into two groups of approaches:

1) calculation of the integral, aggregated indicator that allows assessing the degree of sustainability of socio-economic development. Aggregation is carried out according to three projections: environmental-economic, environmental-socio-economic and environmental indicators.

2) use of the system of indicators characterizing certain aspects of the sustainable development and decomposed into subsystems: economic, environmental, social, institutional.
In international practice, the following integrated aggregated indices have been developed that reflect various aspects of the sustainable development:

1. The Aggregated Living Planet Index is used to assess the state of the planet's natural ecosystems, developed by the World Wide Fund for Nature. The index is calculated as the average of three indicators: the number of animals in forests, in aquatic and marine ecosystems (Living Planet Index, n.d.).

2. The Ecological Foot-print reflects the consumption of food and materials in terms of biologically productive land area and sea area equivalents that are needed to produce these resources and absorb the resulting waste, as well as the energy consumption in area equivalents required to reduce the corresponding CO_2 emissions (Global Footprint Network, n.d.).

3. The Environmental Sustainability Index is calculated using 22 indicators, each of which is determined by averaging 2-5 variables. Variables are grouped into sections characterizing: air, water, soil and ecosystems; the level of pollution and impact on the environment; society's losses from environmental pollution in the form of product losses, diseases, etc.; social and institutional opportunities to solve environmental problems; the ability to solve global environmental problems by consolidating efforts to preserve nature.

4. The System for Integrated Environmental and Economic Accounting makes it possible to take into account the environmental factor in the national statistics. The system integrates the natural capital into the national wealth along with the capital produced by human labor and makes it possible to estimate environmental costs (depletion of natural resources and environmental and economic damage from pollution). The natural capital includes renewable resources (such as forests) and non-renewable resources (soil and subsoil assets) as well as environmental services (World Development Indicators, n.d.).

5. The OECD system of environmental indicators includes three sets of indicators (Report on the aggregation of Indicators for Sustainable Development, 2001): environmental - to assess the effectiveness of activities in the field of environmental protection; sectoral - to ensure the integration of environmental issues in sectoral policy; derived from environmental reporting, to ensure both that environmental issues are incorporated into sectoral policies and that natural resource management and use are sustainable. The basis of this system is the “pressure-state-response” model, which forms causal relationships between economic activity, environmental protection and social conditions.

6. The indicator system developed to improve environmental management in Central America includes four types of indicators: pressure, status, impact, response. The indicators are structured according to the main development issues: land use, deforestation, fresh water consumption, infrastructure, natural disasters. The indicators are presented in the form of geographic information systems, which makes them visual and facilitates planning and decision-making processes (OECD Environmental Data Compendium, n.d.).

7. The Human Development Index reflects the social aspect of the sustainable development (Anielski, Rowe, 1999). The HDI was developed within the framework of the United Nations Development Program (UNDP) and is based on three indicators: the longevity, the achieved level of education and the standard of living.

8. The Genuine (Domestic) Savings is the result of gross capital formation adjustment. First, net domestic savings are defined as the difference between gross domestic savings and depreciation of produced assets. Then, net domestic saving increases by the amount of spending on education and decreases by the amount of natural resource depletion and pollution damage (Environmental Indicators for Agriculture: Methods and Results, 2001).

9. The Genuine Progress Indicator includes indicators: crime and family breakdown, domestic and voluntary work, income distribution, resource depletion, pollution, long-term environmental damage, leisure time change, defense spending, lifespan of durable goods, addiction from foreign capital (Lawn, 2003).

10. The World Development Indicators of the World Bank make it possible to evaluate the achievement of goals of economic growth and the fight against poverty set by the UN. The indicators are grouped into six sections: General, Population, Environment, Economy, State and Markets, Global Connections (Bossel, 1999).

11. The Indicators of the Sustainable Development were developed by the UN Commissions on the Sustainable Development. The system includes 132 indicators, which are grouped into four groups: social, economic, environmental and institutional. The indicators are categorized according to their target orientation: indicators are the driving forces that characterize human activities, processes and characteristics that affect sustainable development; status indicators characterizing the current state of various aspects of sustainable development; response indicators that allow for the political or some other response to change the current state.

12. The Sustainable Development Goals Index is a composite indicator of progress covering 85 indicators across all 17 SDGs. The index is calculated as the arithmetic average of 17 projections based on 100 indicators. 100 is full achievement of the goal, and 0 is the lack of achievement. The final figure reflects the average level of the country for all SDGs (JRC Statistical Audit of the Sustainable Development Goals Index and Dashboards).

13. The Sustainable Society Index is a combined indicator that measures achievements of countries and individual regions in terms of sustainable social development which is calculated according to the methodology of the Sustainable Society Foundation (Sustainable Society Index, 2018). Achievements of countries are evaluated on a scale from 0 (least sustainable) to 10 (most sustainable) based on 24 indicators in three dimensions: human well-being, environmental well-being, economic well-being.

The development of indicators requires a large amount of information, the availability of which is not always possible. At the same time, the abundance of indicators included in the system makes it difficult to use them in many countries due to the lack of necessary statistical data.

The micro level of the benchmarking analysis of sustainability

At the micro level, ESG assessments are developed by various rating agencies (for example, Bloomberg and Reuters) and are aimed at assessing effectiveness of companies' ESG, taking into account various criteria and measurements. However, different rankings often give mixed results (Bax et al., 2022).

Currently, there is the development of the market of rating agencies, while many researchers confirm the difference in performance of different ratings. Differences in ranking results are often associated with different data sources. Different rating agencies take different ESG metrics into account and give them different weights when scoring. As a result of the lack of reliable, timely and structured information, different rating agencies rely on their own assumptions or the opinions of third parties, which further exacerbates the subjectivity of the assessment process. In this regard, there is a problem of comparability of ESG reports of various companies (Who Cares Wins: Connecting Financial Markets to a Changing World, 2017).

A number of studies show that a different set of indicators is used to evaluate companies in different industries. As a result, there is a problem of multi-criteria when comparing activities of companies in

different industries. The separate problem is the use of different ESG indicators to assess performance of companies in different countries. One more issue relates to the varying amount of information that firms disclose. For example, some firms' ESG reports contain little factual text explaining their sustainability activities, varying significantly (Iazzolino et al., 2023).

The results show that ESGs affect performance of companies in different sectors in different ways, with some being more sensitive than others to ESG factors. In particular, social and governance performance has a positive effect on economic performance, while environmental performance does not have significant relationships with economic performance (Darnall et al., 2022).

The sustainable development of companies is an integral part of the modern business strategy. Companies that invest in sustainability can reap benefits in terms of improving their reputation, increasing customer and investor loyalty and reducing risks associated with climate changes, social conflicts and human rights violations. However, comparing the level of sustainable development of companies in different countries is a difficult task due to the problem of multi-criteria. Different companies use different ESG metrics, making it difficult to compare their performance. For example, a company in the oil production industry will be valued differently than a company in the electricity generation industry.

The authors of the article (A review of the ESG landscape, 2021) researched 24 ESG rating providers and found that they all use different methodologies and metrics to rate companies. Some providers focus on environmental performance, the other on social or governance ones. Kotsantonis & Serafim (2019) found that more than 20 different indicators are used only to describe the health and safety of employees in the framework of social policy assessment: the level of lost time accidents; lost time accident frequency rate; injuries resulting in disability; accident rate; the number of lost working days; shortened working days as a result of occupational injuries; time lost due to occupational injuries or diseases, etc.

However, there are studies that try to solve the problem of multi-criteria when comparing the level of sustainable development of companies in different countries. For example, Shmeleva & Shmelev (2019) analyzed development indicators of 143 cities around the world, including London, New York, Hong Kong, San Francisco, Los Angeles, Sao Paulo, Rio de Janeiro, Buenos Aires, Paris, Berlin, Stockholm, Moscow, Beijing, Seoul, Singapore, Shanghai, Sydney and Tokyo, using the multi-criteria assessment method for 20 indicators. The main factors influencing CO_2 emissions in the cities have been identified, including the share of coal and renewable sources in the energy sector, the level of development of public transport, the features of cycling and walking, the degree of waste recycling and the carbon tax.
Thus, the problem of comparability of indicators for assessing the level of ESG of companies from different industries and countries is obvious. The study of the experience of ESG assessment by various organizations, rating agencies and authors of original articles made it possible to form the approach to the comparative analysis of sustainable development of countries and assessment of their ESG indicators.

The authors' benchmarking methodology

For benchmarking of the sustainable development and ESG transformation, 4 countries were selected, located in different parts of the world and having different levels of economic development: the USA, Germany, China and Russia. The main goals are:

– the dynamic analysis of the sustainable development of the countries for the period 2010-2022 on various indicators that make up the system of ESG projections and correspond to the goals of the sustainable development (SDGs);

– the benchmarking analysis of the sustainable development of the countries for 2022 according to various projections of the sustainable development.

The choice of statistical databases was limited by the availability of the necessary information (a set of indicators - statistical data and time periods). From a number of available databases of statistical services of various international organizations: EC. Europa; United Nations Economic Commission for Europe (UN ECE); statistics from the World Bank, United Nations Department of Economic and Social Affairs; World statistics (World Statistics); Trading Economics selected for analysis are The World Bank, Trading Economics and Enerdata (world energy and climate data).

For the comprehensive study of the sustainable development in different countries, the indicators closest to the list of obligations reflected in the concept of the sustainable development adopted by the UN were selected. The proposed system of indicators satisfies the principles of comparability, necessity and sufficiency, as well as reliability. In order for the system of indicators to reflect the real progress of states in the field of the sustainable development in modern conditions, the balanced approach is used. To do this, the indicators are grouped into three key aspects of the sustainable development: environmental, social and economic. In addition, for the benchmarking analysis, the indicators were selected that allow evaluating effectiveness of ESG transformation both for different countries, regardless of the statistical reporting system used in them. Thus, the proposed methodology allows for cross-country comparisons.

Table 1 shows the indicators reflecting the environmental aspects of the sustainable development.

Table 1. The indicators reflecting the environmental aspects of the sustainable development

№	Indicators	Methodological explanations	Links
1	Terrestrial and marine protected areas, % of the total area of the territory	Reflects the degree of conservation of nature and biodiversity of ecosystems (SDG 7)	https://databank.worldbank.org/
2	Share of renewable energy sources in electricity generation, %	Reflects environmental cleanliness of energy supply (SDG 7)	https://energystats.enerdata.net/
3	Water resource exploitation index (annual fresh water withdrawal, % of domestic resources)	Reflects availability of fresh water (SDG 6)	https://databank.worldbank.org/
4	CO_2 emissions, tons per capita	Reflects the degree of air pollution (SDG 13)	https://databank.worldbank.org/
5	Total rent for natural resources, % of GDP	Reflects contribution of natural resources to sustainable development of the ecosystem (SDG 9)	https://databank.worldbank.org/

The terrestrial and marine protected areas as a percentage of the total territorial area of the country characterizes the level of the sustainable development and environmental safety. According to the Millennium Development Goals established by the UN (clause 3.1.2), in terms of achieving environmental sustainability of the planet, the indicator is indicated - "the ratio of the area of protected natural areas to the total area." The International Union for Conservation of Nature (IUCN) defines a protected area as “a well-defined geographical area that is recognized, designated and managed through legal or the other effective means to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Convention on Biological Diversity, n.d.). Thus, increasing the proportion of land and sea protected areas helps to protect vulnerable plant and animal species and conserve biodiversity.

The share of renewable energy sources in electricity generation is determined by the ratio between electricity generation from renewable energy sources (hydro, wind, geothermal and solar) and total electricity generation. This indicator is applied by the UN in the field of the sustainable development: ensuring access to affordable, reliable, sustainable and modern energy for all.

The index of exploitation of water resources is calculated as the ratio of the total volume of annual abstraction of surface and ground fresh waters to the total volume of renewable fresh water resources (in %) and characterizes the degree of use of fresh water resources. The threshold value of this index is about 20% for territories provided with the necessary and sufficient volume of fresh water and 40% for territories not provided with the necessary and sufficient volume of fresh water (Yakutseni, 2022).

The annual per capita carbon dioxide emissions are emissions from combustion of solid, liquid and gaseous fossil fuels and gas flaring. According to the UN SDGs, by 2030 it is necessary to move towards environmentally friendly industrial technologies and processes [UNECE].

The total natural resource rent is the sum of oil, natural gas, coal, mineral and timber rents. It is calculated as the difference between the price of the product and the average cost of its production. The state, being the owner of the main types of natural resources and extracting most of the natural rent, on the one hand, regulates the resource market, but on the other hand, creates conditions for environmental innovation, thereby contributing to sustainable development of society.

Table 2 shows the indicators reflecting the social aspects of the sustainable development.

Table 2. The indicators reflecting the social aspects of the sustainable development

№	Indicators	Methodological explanations	Links
1	Life expectancy at birth, years	Reflects performance of the country's health system (SDG 3) Characterizes the economic well-being of the population (SDG 8)	https://databank.worldbank.org/
2	Unemployment, % of total labor force	Reflects the degree of employment and provision of the population with decent work (SDG 8)	https://tradingeconomics.com/
3	Gasoline price, USD per liter	Reflects availability of energy resources for the population (SDG 7)	https://tradingeconomics.com/
4	GDP per capita, purchasing power parity, USD	Reflects economic well-being of the population (SDG 8)	https://tradingeconomics.com/
5	Gini index, %	Reflects income and wealth inequality (SDG 8)	https://databank.worldbank.org/

Life expectancy at birth measures how many years a newborn could live if prevailing patterns of mortality at birth remained the same throughout his life (The World Bank, n.d.). Since data on incidence and prevalence of diseases are often not available, this indicator is used to assess effectiveness of the health system.

Unemployment is determined by the share of the unemployed active population in total labor force. According to the methodology of the International Labor Organization (ILO), the unemployed include people of working age who have been unemployed for some period of time, are able to work and are making

efforts to find work, but cannot find it. Unemployment is a key indicator for monitoring countries in terms of achieving the Sustainable Development Goals (The World Bank, n.d.).

The price of gasoline is the price at the gas station of the most widely sold grade of gasoline. The level of the cost of gasoline, as a rule, characterizes the degree of development of the country's economy and reflects availability of energy resources for the population.

GDP per capita at purchasing power parity (PPP) is the indicator of the level of economic activity and the quality of life of the population in individual countries and regions over a certain period. It is used for cross-country assessment of per capita income and reflects the level and dynamics of economic growth and development of the country (The World Bank, n.d.).

The Gini index measures extent to which distribution of income (or, in some cases, consumption expenditure) between individuals or households within economy deviates from perfectly equal distribution. The Gini index varies from 0 to 100%. The greater its value, the more income is concentrated in the hands of certain groups of the population.

Table 3 shows the indicators reflecting the economic aspects of the sustainable development.

The GDP growth rate is the growth rate of the value of all final goods and services produced in the state (The World Bank, n.d.). This indicator allows you to compare the real GDP growth rate of the countries of the world, taking into account inflation, expressed as a percentage and characterizes effectiveness of development of the country's economy.

The inflation, measured by the consumer price index, reflects the annual percentage change in the cost of purchasing a basket of goods and services for the average consumer which can be fixed or change over time (The World Bank, n.d.). Inflation characterizes changes in the general price level and decrease in purchasing power of money against the background of steady increase in the general price level.

Table 3. The indicators reflecting the economic aspects of the sustainable development

№	Indicators	Methodological explanations	Links
1	GDP growth rate, %	Reflects effectiveness of development of the country's economy (SDG 8)	https://tradingeconomics.com/
2	Inflation, %	Reflects purchasing power of money (SDG 1)	https://tradingeconomics.com/
3	Public debt in % of GDP	Reflects country's debt burden (SDG 17)	https://tradingeconomics.com/
4	Production capacity utilization, %	Reflects effectiveness of t use of country's fixed assets (SDG 9)	https://tradingeconomics.com/
5	Expenditure on research and development, % of GDP	Reflects financial provision of R&D by the government and the private sector of economy (SDG 9)	https://databank.worldbank.org/

The public debt as a percentage of GDP is calculated as the ratio of the country's public debt to its gross domestic product (The World Bank, n.d.). It is used to objectively and reliably compare the level of debt burden of various countries of the world, and also allows them to assess the ability of a country to repay its debt. The high ratio means that the country does not have sufficient funds to pay off its debt.

The capacity utilization is the estimate of the maximum or optimal output over a given period (The World Bank, n.d.). It characterizes the actual use of the equipment in comparison with its potential at full load of lines in the production cycle of the enterprise (UNECE).

The expenditures on research and development as a percentage of GDP characterize the activity of scientific research, building up the technological potential of industrial sectors in the country. They include both capital and current spending in four main sectors: entrepreneurship, government, higher education and private nonprofits. This indicator is a key one and characterizes effectiveness of the government and the private sector in creating competitive advantages in the field of science and technology (The World Bank, n.d.).

4. RESULTS AND DISCUSSION

Figures 1-5 show the dynamics of indicators of the environmental component of sustainable development for four countries over the period 2010-2022. (Data for Figure 1 is only available from 2016).

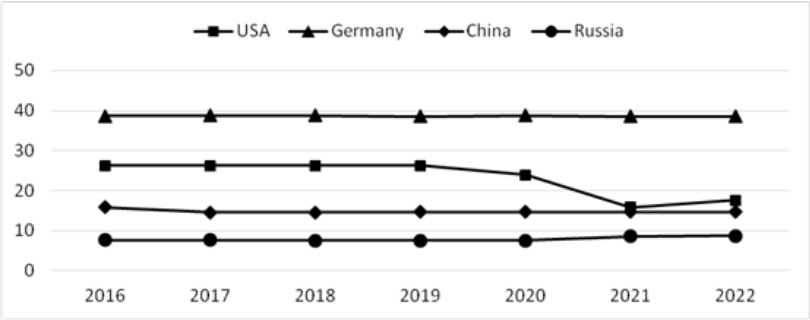

Figure 1. Dynamics of the indicator "Terrestrial and marine protected areas, % of the total area of the territory"

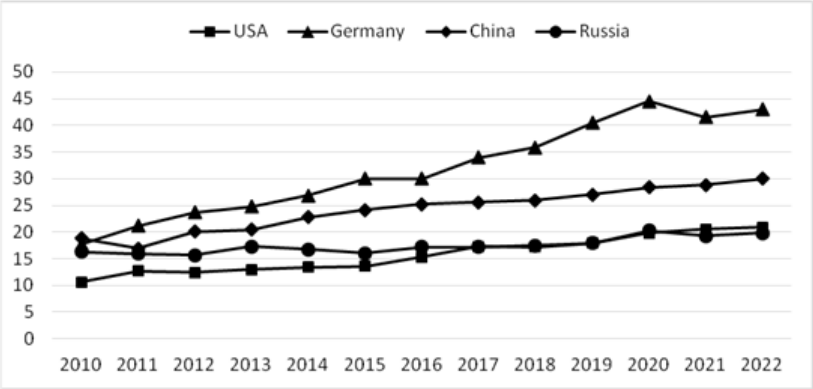

Figure 2. Dynamics of the indicator "Share of renewable energy sources in electricity generation, %"

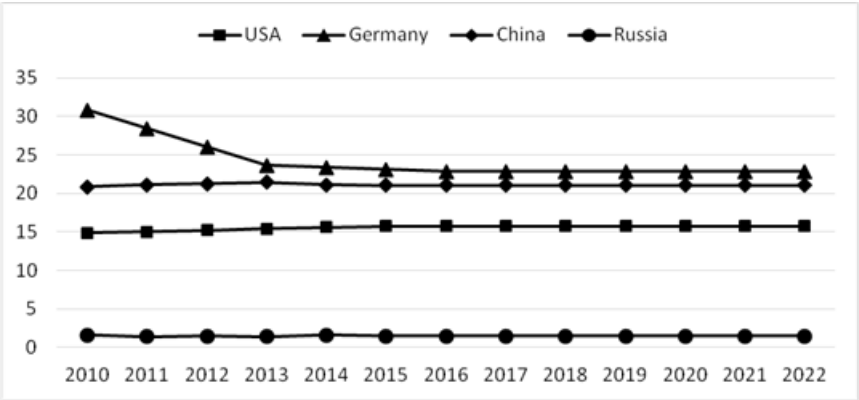

Figure 3. Dynamics of the indicator "Water resource exploitation index (annual fresh water withdrawal, % of domestic resources)"

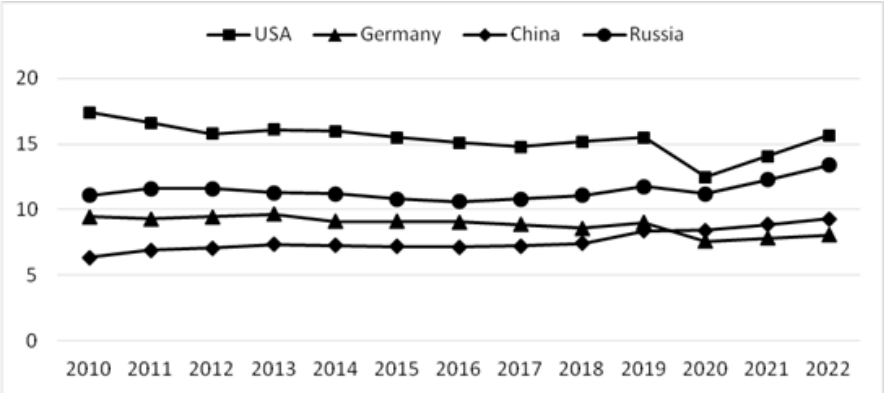

Figure 4. Dynamics of the indicator "CO_2 emissions, tons per capita"

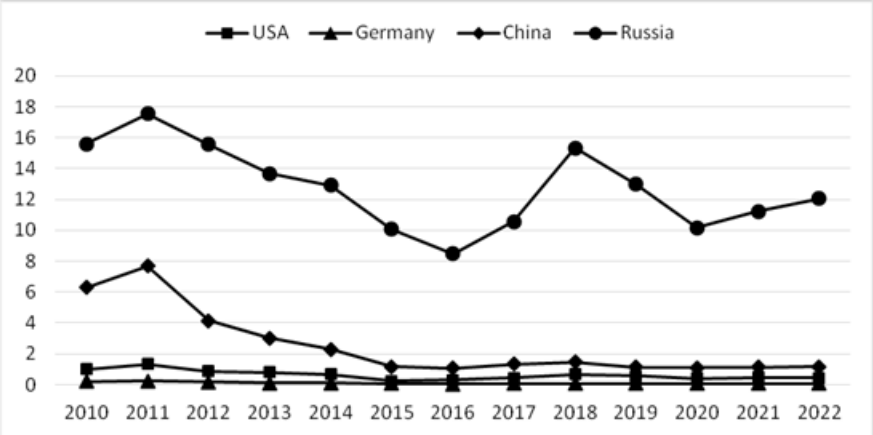

Figure 5. Dynamics of the indicator "Total rent for natural resources, % of GDP"

Figure 1 shows that Germany is the leader among the four countries in this indicator. We should also highlight reduction in protected areas in the United States in 2021. Figure 2 shows that in all the countries there is a smooth increase in the share of renewable energy sources. In this case, the leader is again Germany. Figure 3 shows Russia's leadership in terms of water resource exploitation (the lowest value). The number of carbon dioxide emissions per capita is the smallest in Germany, the largest one is in the USA (Figure 4). The last indicator of the environmental block (rent for natural resources) is the most important in Russia (Figure 5).

Figures 6-10 show the dynamics of indicators of the social component of sustainable development for four countries for the period 2010-2022. Figures 7 and 8 show the indicators on a monthly basis. At the same time, the period of their analysis was 2018-2022.

Life expectancy (Figure 6) tends to increase gradually, with Germany leading the way. The significant rise in US unemployment (Figure 7) was recorded in March 2020 (about 15%), which was associated with the Covid-19 pandemic. The price of gasoline is the highest in Germany and the lowest in Russia (Figure 8). GDP per capita at PPP shows the upward trend in all the studied countries. The leader is Germany, the outsider is China (Figure 9). The maximum level of differentiation of the population by income was recorded in USA. The minimum is in Germany (Figure 10).

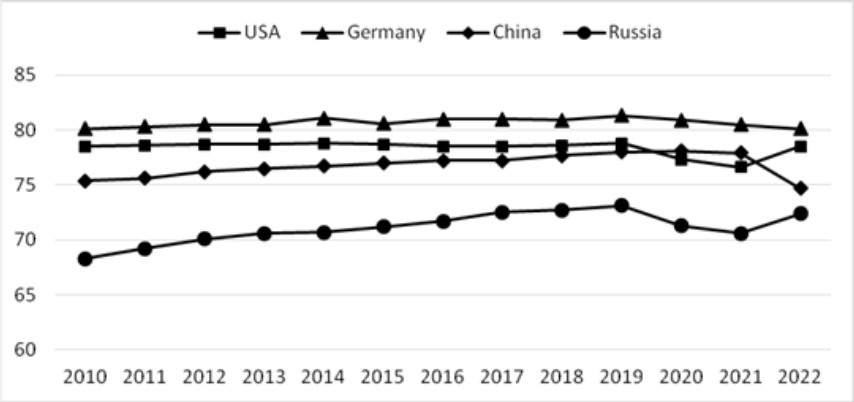

Figure 6. Dynamics of the indicator "Life expectancy at birth, years"

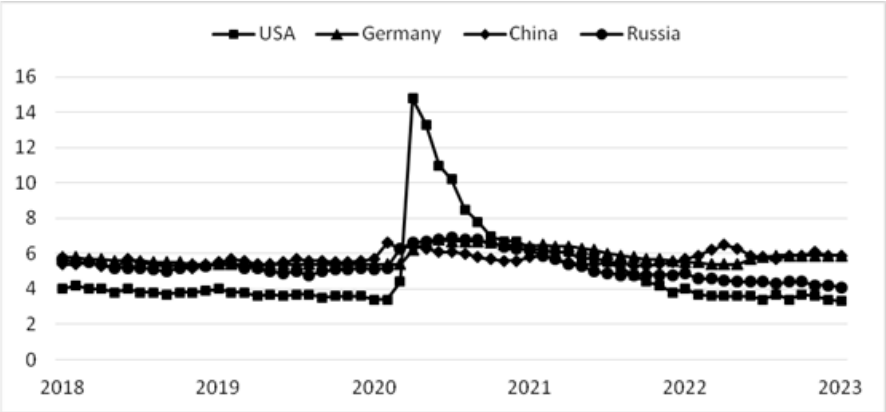

Figure 7. Dynamics of the indicator "Unemployment (% of total labor force)"

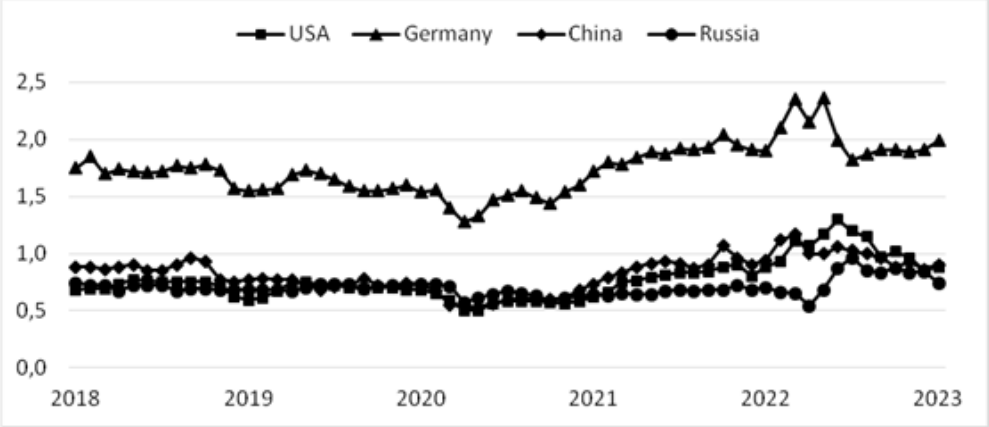

Figure 8. Dynamics of the indicator "Gasoline price, USD per liter"

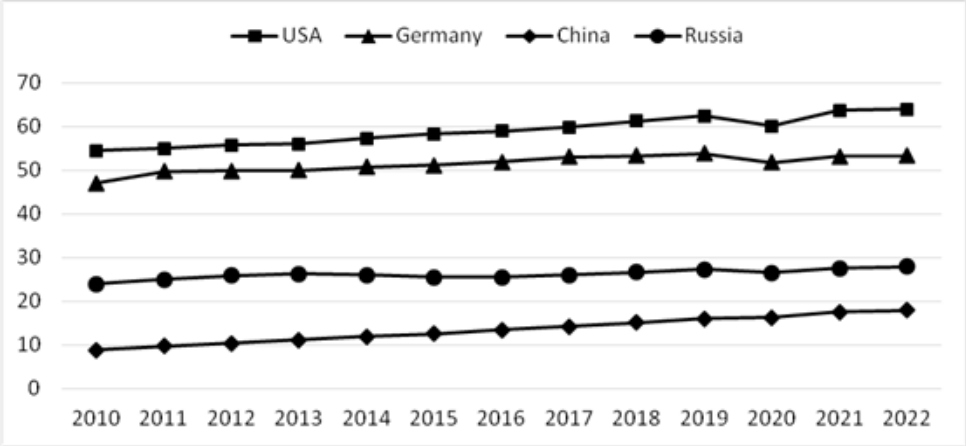

Figure 9. Dynamics of the indicator "GDP per capita, purchasing power parity, USD"

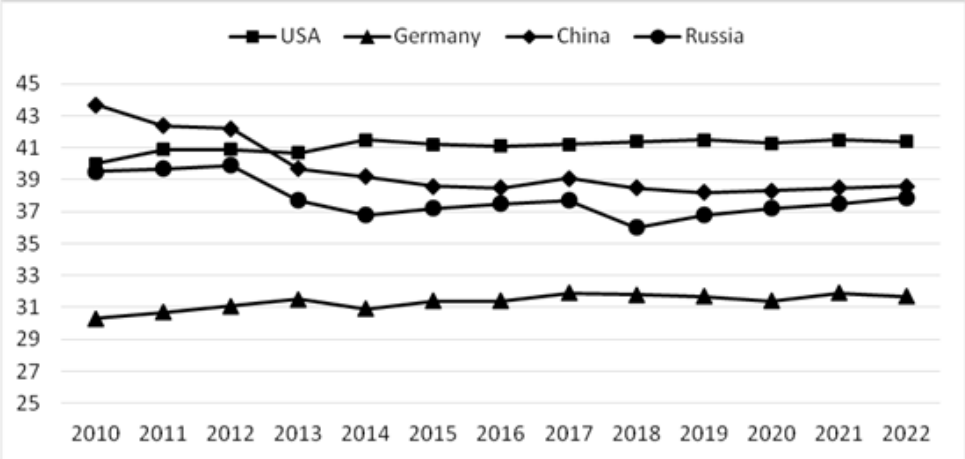

Figure 10. Dynamics of the indicator "Gini Index, %"

Figures 11-15 show the dynamics of indicators of the economic component of sustainable development for four countries for the period 2010-2022. Figures 11, 12 and 14 show the indicators on a monthly or quarterly basis. At the same time, the period of their analysis was 2018-2022.

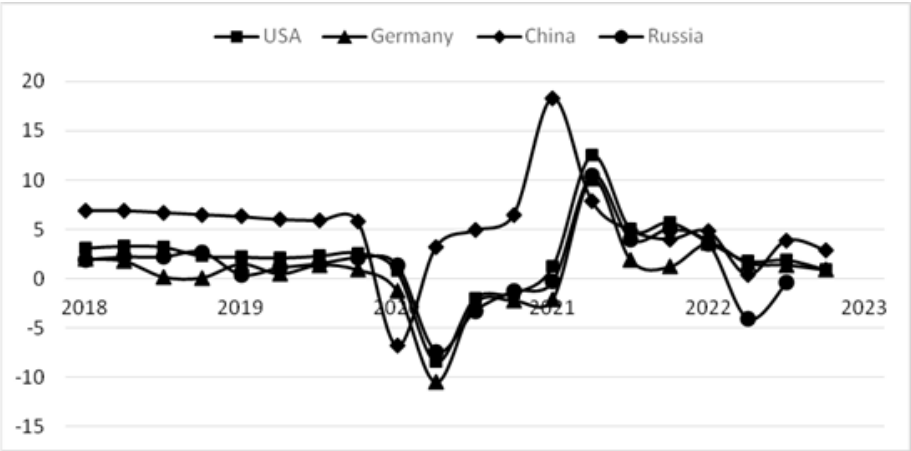

Figure 11. Dynamics of the indicator "GDP growth rate, %"

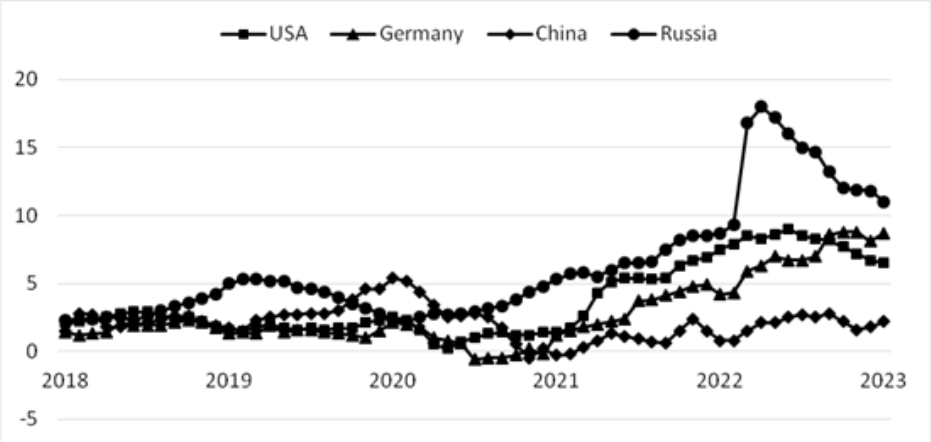

Figure 12. Dynamics of the indicator "Inflation, %"

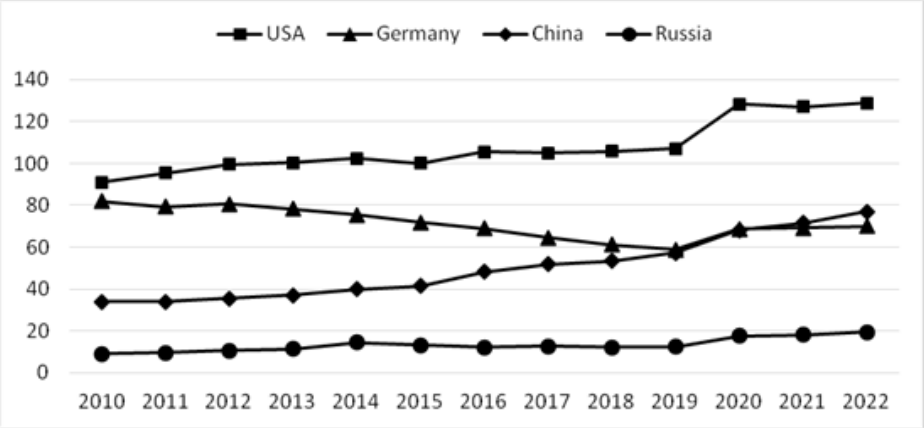

Figure 13. Dynamics of the indicator "Public debt in % of GDP"

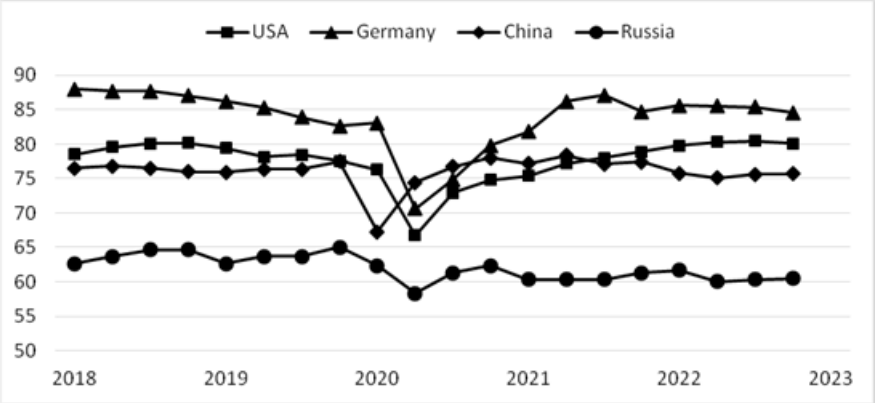

Figure 14. Dynamics of the indicator "Production capacity utilization, %"

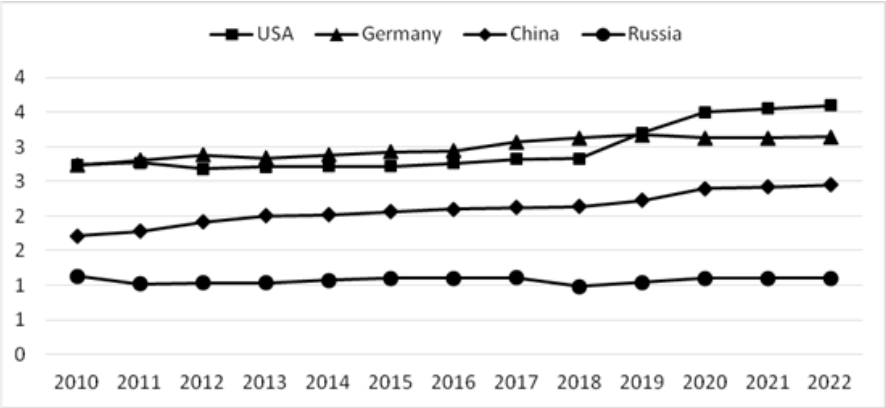

Figure 15. Dynamics of the indicator "Expenditures on research and development (% of GDP)"

Figure 11 clearly shows that the Covid-19 pandemic caused the sharp drop in GDP, first in China in the first quarter of 2020, and then, a quarter later, in the other countries. The economic recovery followed a year later. Inflation (Figure 12) has been growing smoothly in all the countries since mid-2020. In March 2022, there was the sharp spike in inflation in Russia, and then the downward trend was observed. The public debt (Figure 13) is growing smoothly in all the countries. It reached the highest value among the four countries in the United States, and the lowest in Russia. The use of production capacities is the most rational in Germany, the least rational - in Russia (Figure 15).

Figures 16-19 show benchmarking of the indicators of the environmental, social and economic components of sustainable development of the countries in 2022. For each indicator, there was a country index. For "positive" indicators, the growth of which contributes to sustainable development, the positions of countries were lined up, starting from the lowest - "1", ending with the highest - "4". Countries with intermediate positions took the values "2" and "3", respectively. For “negative” indicators, the growth of which reduces the level of sustainable development, reverse positioning was used: for the country with the highest value of the indicator, the value “1” was chosen, then, as the indicator fell, the values “2” and “3” followed. Finally, the leading country with the lowest value of the “negative” indicator took the value 4.

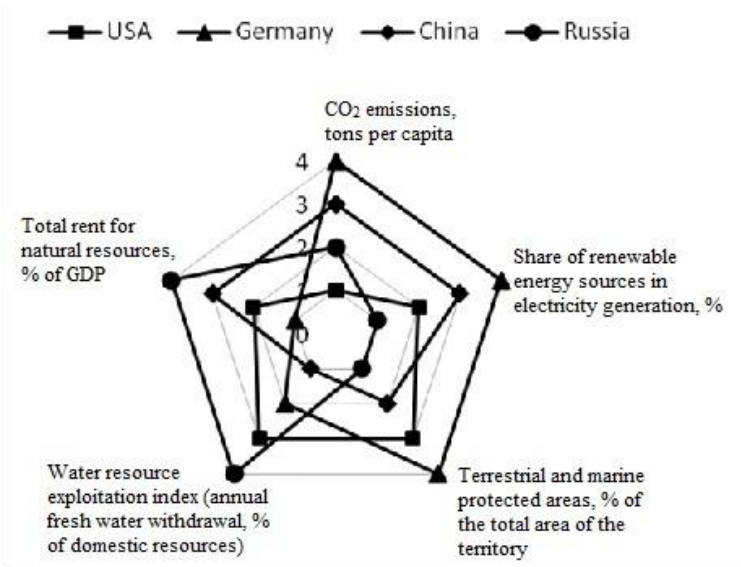

Figure 16. Benchmarking of indicators of the environmental component of sustainable development of the countries in 2022

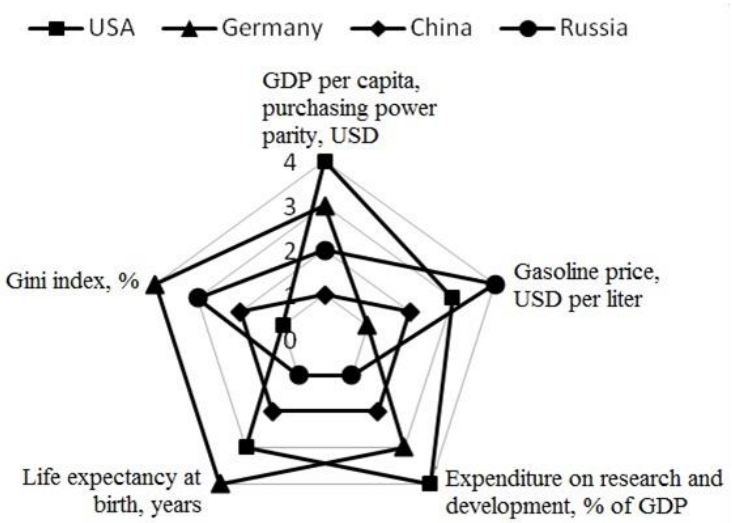

Figure 17. Benchmarking of indicators of the social component of sustainable development of the countries in 2022

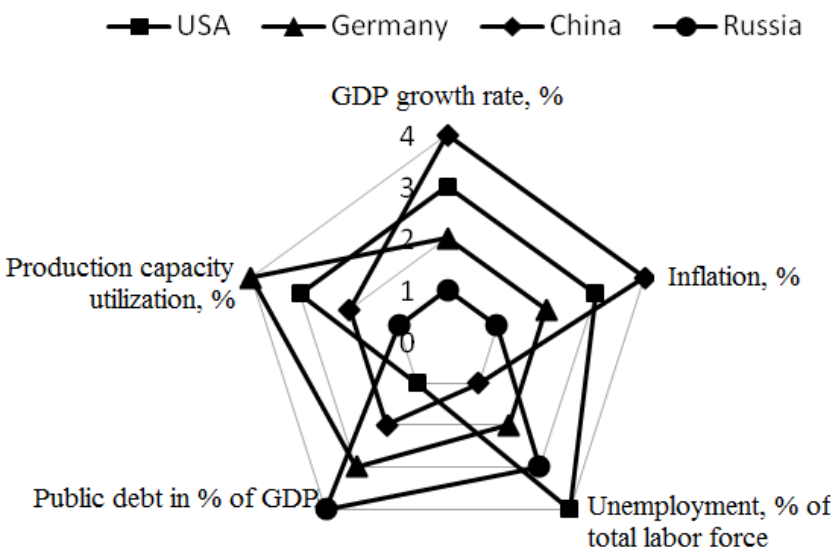

Figure 18. Benchmarking of indicators of the economic component of sustainable development of the countries in 2022

Analyzing figures 16-18, one can find that the countries alternately change their positions. Being a leader in one indicator, they can become an outsider in the other indicator. Such positioning is a very clear tool for positioning the countries in the system of sustainable development indicators.

6. CONCLUSION

The proposed methodology for benchmarking of the sustainable development of the countries can be applied by public authorities in development of strategic documents for implementation of ESG agenda. The list of indicators provided by official international statistical databases provides the opportunity to make effective management decisions, especially in terms of diagnosing effectiveness of ESG transformation at the global level.

The results of comparing indicators for assessing the level of ESG transformation of states make it possible to identify problems and prospects for each state at the intercountry level. The methodology proposed in this article for the comprehensive benchmarking analysis of the sustainable development of the states is based on indicators that are the most consistent with the list of obligations presented in the UN concept of the sustainable development. The system of indicators for the comprehensive comparison of effectiveness of the ESG transformation is balanced and contains 15 indicators that are grouped into three key aspects of the sustainable development: environmental, social and economic.

The system of indicators contains the necessary and sufficient number of indicators, while the numerical values of each correspond to the principles of accessibility, reliability and sufficiency. This makes it possible to compare the level of achievement of the sustainable development goals at the cross-country level, regardless of the statistical reporting system used in the state.

This article demonstrates the dynamics of indicators reflecting the environmental, social and economic components of the sustainable development for four states over the period 2010-2022. The analysis of effectiveness of ESG transformation of the countries under study in 2022 is presented and sustainable development indices are determined.

In conclusion, it should be noted that the proposed system of indicators and the methodology for benchmarking of ESG transformation of socio-economic systems in different countries provides the basis for making effective management decisions that correspond to the real state of the sustainable development of society. In the future, it is possible to create a unified information system of data that reflects the economic, social and environmental aspects of the sustainable development of all the states and, using the unified methodology for assessing ESG transformation, provide information support for global transition of society to sustainable development.

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