

Comparison of ESG and SDG Indices: Sustainability and Performance of Companies in the Context of Slovakia and the EU

By Radka Lešková*

This paper assesses the sustainability of companies in Slovakia, emphasizing environmental indexes. We analyze commonly used indexes, with a focus on ESG (Environmental, Social, and Governance) and SDG (Sustainable Development Goals) indexes. The ESG index is a key indicator, evaluating companies' efforts in minimizing environmental impact, including energy efficiency, waste management, greenhouse gas emissions, and biodiversity protection. It provides investors with a tool to assess and compare the environmental sustainability of companies, promoting investments in environmentally responsible firms. The SDG index measures countries' progress towards UN's Agenda 2030 sustainable development goals, enabling comparison of environmental protection performance among countries. By comparing the ESG and SDG index scores for selected EU-27 countries, with Slovakia serving as a case study, we aim to identify their relative positions in terms of sustainability and the performance of individual countries within the EU. This information can be utilized as a guide for decision-making by firms and organizations in Slovakia, enabling them to take concrete measures to support sustainable development and improve their environmental, social, and governance performance. While data source and methodology variations can affect index results, critical analysis is recommended for informed decision-making.

Keywords: Sustainability Assessment, Environmental Indexes, ESG Index, SDG Index, EU-27, Slovakia

Introduction

In recent years, the search for higher efficiency of the production process has become a more relevant problem for thinking about microeconomic foundations, about the relationship between energy, the environment and growth. Private companies and their production technology are slowly moving away from their dependence on fossil energy sources. In addition, the roles of non-governmental organizations and a better institutional framework for environmental resources have become key inputs for achieving the goal of sustainable expansion of prosperity. In order to obtain an energy-efficient combination of inputs in the long term, it is necessary to increase the efficiency and productivity of the company's processes. To be effective and efficient, these profits should come from various sources such as technology, business models, management decisions, institutional directives, and regulatory policies.

*Assistant Professor, Department of Business Economy, Faculty of Business Management, University of Economics in Bratislava, Slovakia.

The current energy crisis, climate change and increasingly serious environmental problems have begun to raise public concerns about environmental issues. Especially in recent decades, rapid economic growth has led to excessive consumption of natural resources and environmental degradation. Green consumption is sustainable consumer behavior characterized by consumption that is compatible with the protection of the environment for the present and for future generations, which has attracted the attention of businesses and consumers in recent years. The purchase and consumption of "green", ecological, environmentally friendly products on a daily basis is beginning to be considered an effective way of solving environmental problems.

We can conclude that consumption is inherently linked to sustainability, because every decision about what to buy, how much to buy, how much to consume and how to dispose of waste has a direct impact on the environment and future generations. The essence lies in the ideas of how human decisions affect the quality of the environment, how human values and institutions shape our demands to improve its quality, and especially, how to design effective public policies to achieve said improvements. Understanding the psychology behind environmental or sustainable behavior is central to a sustainable future and large-scale behavioral change. However, despite this, the obvious importance and substantial impact of research in these areas is relatively low and significantly lagging behind. In the European Union, there is a strong tendency to centrally introduce various kinds of measures restricting currently used technologies and to promote others. There is a constant emphasis on the need for sustainable development, investment in innovative technologies through continuous and increased research and development (R&D) spending.

A growing number of companies in various industries are currently pursuing sustainable development goals in order to improve business efficiency, manage stakeholder expectations or achieve compliance with legislation. This also applies to companies that are under pressure from their stakeholders to manage and improve their sustainability performance. This requires the development of credible tools and measurement systems to capture and monitor sustainability.

The main goal of this professional article is to assess the sustainability of companies operating in Slovakia, with an emphasis on the importance of environmental indices. These indices will be analyzed to determine their role in guiding companies' efforts to reduce their environmental footprint. The findings aim to provide actionable insights for businesses and organizations in Slovakia, helping them to implement effective strategies that enhance their environmental, social, and governance (ESG) performance and promote sustainable development.

Literature Review

Indices of Environmental Economics

In this section, we will overview global environmental indices and their significance in environmental economics, focusing on their use in evaluating the effectiveness of policies and measuring the impact of investment decisions.

In the upcoming section, we will provide a comprehensive overview of key environmental indices, focusing on their *intended applications*, the *number of indicators* and *categories* they encompass, *sustainability dimensions*, *data sources*, *normalization methods*, *category weights*, *aggregation techniques*, and the *interpretation of results*. Additionally, we will examine specific indices utilized in evaluating the state of the environmental economy, as well as some of the most prominent indices that influence the sustainability of companies and organizations.

Assessment of the State of Environmental Economics

The state of the environmental economy is important to evaluate and assess in larger contexts, while it is necessary to consider the sustainability of the systems that are necessary for its existence. The assessment of the state of the environmental economy can be carried out using **environmental indices** and various **models** and **methods** that make it possible to quantitatively evaluate the impact of economic activities on the environment and provide recommendations for policy and decision-making on sustainable development.

Environmental indices are tools used to quantify and compare environmental quality between different countries and regions. These indices include various indicators such as greenhouse gas emissions, air and water quality, waste levels, the amount of renewable energy sources and others (Wendling, et al. 2020).

Unlike environmental indices, we also know *environmental models* and *methods* as versatile tools that contribute to scientific research, policy development, decision-making by simulating the consequences of different management strategies, risk assessment, resource management and public involvement in environmental matters. Their applications go beyond environmental indices and provide valuable insights into the complex interactions between human activities and the natural world. Among the most used models are linear programming, cost-benefit analysis, decision trees and various types of econometric models.

Global Environmental Indices

Global environmental indices are important in the evaluation and assessment of the state of the environment and sustainability, especially in terms of economic activities. They provide measurable indicators that can be used to monitor the impact of human activity on nature and how countries and societies strive to minimize negative impacts and achieve sustainable development. Indices can thus be useful to investment funds, businesses, governments and the public who seek to invest, trade, manage and evaluate their activities and decisions in terms of their environmental impact. In addition, global environmental indices can also be used to compare performance between different countries, sectors and companies and to identify areas where improvement is needed (Esty and Winston, 2009).

Moreover, these indices often drive policy changes by highlighting the most pressing environmental issues that require immediate attention. They can facilitate informed decision-making by providing stakeholders with the necessary data to make strategic choices aligned with sustainability goals. Furthermore, the transparency

and accessibility of these indices can enhance public awareness and engagement, fostering a culture of environmental responsibility. By promoting accountability, they encourage businesses to adopt greener practices and innovate in sustainable technologies.

In the global discourse, sustainability is understood as a broad political concept that is divided into three "dimensions" or "pillars": *environmental*, *economic* and *social* (Purvis, et al., 2019). Each of these three dimensions has its own unique purpose: the **environmental dimension** focuses on the protection of the environment, the renewability of natural systems and the sustainable use of natural resources to ensure their availability for future generations; the **economic dimension** focuses on the sustainability of economic growth and ensuring economic prosperity for current and future generations; the **social dimension** focuses on ensuring social justice and ensuring a dignified life for all people, regardless of their social status or financial means. In practice, this means that all three dimensions need to be considered when deciding how to ensure sustainable development.

Tables 1 and 2, divided into two parts, summarize the most important information about: (1) the main purpose of the index application; (2) the number of indicators and their relationship to the primary dimensions of sustainability; (3) number of categories; (4) dimensions of sustainability; (5) proposed and used data sources for each index; (6) the data normalization method used; (7) structure of indicators and component weights; (8) the method of aggregation of indicators used in the overall assessment; (9) interpretation of index results.

Table 1. Comparison of selected Environmental Indices (Part I)

Index	(1) The purpose of the index application	(2) Number of indicators	(3) Number of categories	(4) Dimensions of sustainability
EPI ¹	Measurement of current environmental capacity	32	11	environmental, social
EFI ²	Measurement of environmental resources	6	-	environmental
ESI ³	Measuring the long-term ability to protect the environment	76/21	5	environmental, social
EVI ⁴	Measuring environmental sensitivity	50	3	environmental, social
DJSI ⁵	Measuring business sustainability	depending on the sector (60 sectors)	3	environmental, social, economic

¹EPI Team. 2018 EPI Report; Yale University: New Haven, CT, USA; Columbia University: NY, USA, 2018.

²Galli, A.; Wackernagel, M.; Iha, K.; Lazarus, E. Ecological Footprint: Implications for Biodiversity. *Biol. Conserv.* 2014, 173, 121–132. <https://doi.org/10.1016/j.biocon.2013.10.019>

³Esty, D.C. et al. 2005. Environmental Sustainability Index: Benchmarking National Environmental Stewardship; Yale Center for Environmental Law & Policy: New Haven, CT, USA, 2005.

⁴Pratt, C.R.; Kaly, U.L.; Mitchell, J. Manual: How to Use the Environmental Vulnerability Index (EVI); SOPAC Technical Report 384; 2004. (accessed on 13 December 2022). URL: <<http://gsd.spc.int/sopac/evi/Files/EVI%202004%20Technical%20Report.pdf>>

⁵Dow Jones Sustainability Indices Methodology. (accessed on 13 December 2022). Available online: <https://www.spglobal.com/spdji/en/documents/methodologies/methodology-dj-sustainability-indices.pdf>

ESG⁶	Measurement of the environmental, social and management practices of the company	depending on the data provider	3	environmental, social, economic
SDG⁷	Measuring countries' efforts to achieve sustainable development goals	247	17	environmental, social, economic

Note: WHO 2010. EPI - Environmental Performance Index; EFI - Ecological Footprint Index; ESI - Environmental Sustainability Index; EVI - Environmental Vulnerability Index ; DJSI - Dow Jones Sustainability Index; ESG - Environmental, Social and Governance Index; SDG Index – Sustainable Development Goals Index.

Table 2. Comparison of selected Environmental Indices (Part II)

Index	(5) Data sources	(6) Normalization	(7) Category weights	(8) Aggregation method	(9) Interpretation of results
EPI	Primary, secondary, expert, forecasts, among others: WB, IEA, IMF, WRI, IHME, WWF, OECD, Eurostat, UNSD	linear transformation	PCA (Principal Component Analysis)/ expert	arithmetic	Ranking of countries; scale 0-100
EFI	Secondary, among others: FAO, IEA, UNSD, UNDP	none	Expert (conversion parameter)	arithmetic	Standardized global hectares (corresponding to average biological productivity); A value > 1 indicates unsustainability
ESI	Primary, secondary, among others: OECD, UNHABITAT, WHO, EEA, WRI, WWF, UNEP, FAO, UNFCCC, UNSD, WB, WEF, WTO, UNICEF, UNDP, DJSG, ITU, UNESCO,	standard score	equivalent at the level of sub-indicators a indicators (expert)	arithmetic (except component level)	Ranking of countries; scale 0–100; The probability that the country will be able to effectively protect the environment in the coming decades

⁶MSCI ESG Indexes and MSCI Analytics (accessed on March 2020). URL: <<https://www.msci.com/our-solutions/indexes/esg-indexes>>

⁷ United Nations, Department of Economic and Social Affairs (2022). ISBN: 978-92-1-101448-8. URL: <<https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf>>

	UNCCD, UNCBD				
EVI	Secondary, among others: WRI, FAO, WB, UNEP, OECD, UNDP, EEA, EPA	none (point scale 1-7)	none	arithmetic (in the absence of data, the indicator is omitted)	Ranking of countries; 0–700 is reflected on a 5- point qualitative scale of susceptibility to environmental problems; Results and availability of data for indicators are reported; Results for the components are also provided
DJSI	Primary	none (point scale 0 - 100)	Expert	arithmetic	0–100 scale for the index and each of the components and indicators; Comparison with median and best score
ESG	Primary, secondary, among others: MSCI, S&P Global, FTSE Russell, Bloomberg, Morningstar	none	Expert	arithmetic (except the importance level of the indicator)	Ranking of countries; scale 0–10; ESG Risk Ratings have a scale of 0- 100
SDG	Primary, secondary, among others: MSCI ESG Research, Sustainalytics, RobecoSAM, FTSE Russell	min-max normalization on a scale from 0 to 100	Expert	arithmetic	Ranking of countries; scale 0–100

Note: DJSI—Dow Jones Sustainability Group Indexes; EEA—European Environment Agency; EPA—Environmental Protection Agency; Eurostat—European Statistical Office; FAO—United Nations Food and Agricultural Organization; IEA—International Energy Agency; IHME—Institute for Health Metrics and Evaluation; IMF—International Monetary Fund; ITU—International Telecommunication Union; OECD—Organisation for Economic Co-operation and Development; UNCBD—United Nations Convention on Biological Diversity; UNCCD—United Nations Convention to Combat Desertification; UNDP—United Nations Development Programme; UNEP—United Nations Environment Programme; UNESCO—United Nations Educational Scientific and Cultural Organization; UNFCCC—United Nations Framework Convention on Climate Change; UNHABITAT—United Nations Human Settlements Programme; UNICEF—United Nations Children’s Fund; UNSD—United Nations Statistics Division; WB—World Bank; WEF—World Economic Forum; WHO—World Health Organization; WRI—World Resources Institute; WTO—World Trade Organization; WWF—World Wildlife Fund.

In addition to the listed indices in the table, we record many global environmental indices that are used in the assessment of the state of the environmental economy. Some of the most famous include:

- **Environmental Performance Index (EPI)** – created by Yale University and Columbia University, evaluates 180 countries based on their performance in 32 environmental indicators (Wolf, et al., 2022).
- **Ecological Footprint Index (EFI)** – measures the impact of human activity on the environment by calculating the necessary space for resource production and waste absorption for a given population (Kitzes, 2009).
- **Environmental Sustainability Index (ESI)** – evaluates the ability of countries to maintain the economy and the environment (Saisana, 2014).
- **Green Growth Index** – measures the sustainability of the economy based on consideration of environmental factors (Acosta, et al., 2019).
- **Happy Planet Index (HPI)** – created by the New Economics Foundation, includes indicators that measure the quality of life and the impact of human activities on the environment (Marks, et al., 2006).
- **Climate Change Performance Index (CCPI)** – evaluates the performance of countries in the field of climate protection, it also includes an assessment of environmental policy and the impact on the health and quality of life of residents (Burck, et al., 2023).
- **Environmental Vulnerability Index (EVI)** – aimed at measuring the vulnerability of countries in relation to environmental impacts and the country's ability to protect its environment (Schepelmann, et al., 2010).

In addition to the global environmental indices mentioned above, which are used to quantify and compare environmental quality between different countries and regions, there are other global environmental indices that companies can use to assess their environmental performance and compare with their competitors. Some of these indices are global and industry-wide, while others are sector-specific.

The most well-known indices affecting the sustainability of companies and organizations are, for example:

- **Carbon Disclosure Project (CDP)** – evaluates companies according to their efforts to reduce greenhouse gas emissions and improve their environmental performance. CDP evaluates this information and publishes it in a score called CDP (Whelan & Fink, 2016).
- **Dow Jones Sustainability Index (DJSI)** – measures the environmental, social and economic performance of companies and includes more than 2,000 companies worldwide. This index is compiled by S&P Dow Jones Indices (Naqvi & Jus, 2019).
- **Global Reporting Initiative (GRI)** – provides a framework for transparent and comprehensive reporting on the environmental, social and economic performance of companies. The GRI defines frameworks and standards for reporting and evaluating environmental factors (GRI, 2023).
- **ESG Index** (Environmental, Social and Governance – ESG) – evaluates environmental, social and administrative factors affecting the sustainability of companies. ESG indices are compiled by various companies and organizations (MSCI, S&P Global, FTSE Russell, RobecoSAM, ISS ESG and Bloomberg) and serve as a tool for investment decision-making (MSCI, 2023).

One of the most well-known indices affecting the sustainability of companies, the ESG index, will be discussed in more detail in the results section, where we will zoom in on the ESG index on individual Slovak representatives of the automotive industry.

Methodology

The research methodology follows the established main goal of evaluating the sustainability of selected companies in Slovakia using environmental, social, and governance (ESG) indices. We apply a combination of quantitative and qualitative research methods to assess both theoretical and practical implications of the ESG indices in the context of imperfectly competitive markets.

Research Design and Selection Criteria

The study focuses on key industries that exhibit characteristics of imperfect competition, such as the automotive, energy, telecommunications, and financial sectors. These industries are represented by companies with significant market shares, limited competition, and an impact on the overall market, such as Volkswagen Slovakia, Slovenské elektrárne, and Orange Slovensko. We chose these companies because they play a pivotal role in Slovakia's economy and are subject to ESG-related reporting obligations.

The primary criterion for company selection is their dominant presence in the Slovak market and their global recognition in ESG reporting. Specifically, the research targets four major automotive companies operating in Slovakia: **Volkswagen AG** (SK: Volkswagen Slovakia, 1991), **Stellantis NV** (SK: Stellantis Slovakia, 2006), **Kia Motors Corporation** (SK: Kia Slovakia, 2006), and **Jaguar Land Rover** (SK: Jaguar Land Rover Slovakia, 2018). These companies were chosen due to their significant contributions to the Slovak economy and their inclusion in global ESG indices.

Data Collection

Given the unavailability of localized ESG index scores for these companies in Slovakia, we sourced global ESG data from the CSRHub ESG database. CSRHub offers comprehensive access to ESG scores, which include evaluations of companies' environmental, social, and governance practices in North America, Europe, and Asia. Data from this platform provides insights into companies' employee relations, environmental policies, community impact, and governance structures, which form the basis of our analysis.

Index Selection

For the automotive industry, we specifically reference the MSCI World Automobiles ESG Leaders Index, which includes globally recognized car

manufacturers such as Toyota, BMW, and General Motors. This index evaluates companies based on environmental performance (e.g., greenhouse gas emissions, resource use), social factors (e.g., labor practices, community relations), and governance (e.g., management structure, shareholder rights).

Analysis Procedures

The analysis includes a comparative review of the ESG scores for each selected automotive company, assessing how well they align with global sustainability standards. Each company's performance is evaluated based on its environmental impact (e.g., emissions, energy use), social responsibility (e.g., employee and community engagement), and governance practices (e.g., transparency, board diversity). The results will be used to draw conclusions about the sustainability efforts of these companies and their contributions to the broader economic and environmental context of Slovakia.

Results

One of the important tools in environmental economics are environmental indices, which play an important role in measuring and evaluating the environmental efficiency of various economic entities, such as enterprises, industries, regions, or countries. These indices provide relevant information on how successfully these entities manage their environmental impact and are able to achieve their environmental goals.

We can consider environmental indices as an important entry into the knowledge of environmental economics, and their importance has been increasing rapidly in recent years due to the increasing awareness of environmental problems and the need to solve them. With the help of indices, we can quantify environmental data and factors such as emissions, waste, resource use and other environmental impacts, and create measurable indicators from them that can be used to assess the environmental impact of economic activity.

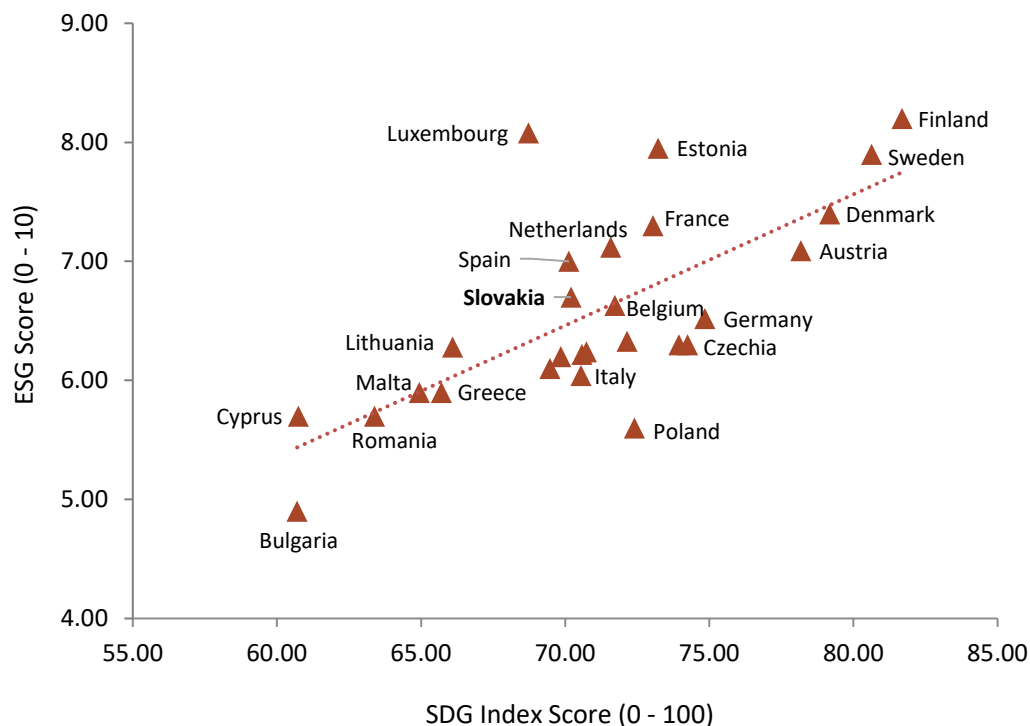
Application of ESG and SDG Environmental Indices to EU-27 Countries

The ESG index is currently one of the important indicators in the field of the environment, which evaluates the environmental, social, and governmental factors of companies and investment products. It focuses on environmental aspects and measures how well companies take care of the environment and try to minimize their negative impact. The ESG index considers various factors such as energy efficiency, waste product management, greenhouse gas emissions and biodiversity protection. It provides investment companies and investors with an important tool for evaluating and comparing companies in terms of their environmental sustainability. This index helps to support and stimulate investments in ecologically responsible companies and contributes to sustainable development and environmental protection.

The SDG index, also used as the "sustainable development goals index", represents an indicator that measures and evaluates the progress of countries in meeting the sustainable development goals set by the United Nations (UN) as part of the 2030 Agenda (Jones, et al., 2017). Using the SDG index, it is possible to compare and evaluate the performance of individual countries in the area environmental protection and contribute to global efforts to achieve sustainable development. We consider it an important tool for monitoring progress and supporting measures to protect the environment and achieve the goals of sustainable development at the global level.

Based on the above-mentioned characteristics of the ESG and SDG indices, we decided to compare their scores for selected EU-27 countries, with the help of which we identify their pan-European position in the area of sustainability and the performance of individual countries. The practical use of this information can serve as a guide for decision-making and taking measures to support sustainable development and improve the environmental, social and government performance of countries within the European Union. However, it is important to keep in mind that the results of these indices may vary depending on the data sources, measurement and evaluation methods, and therefore critical analysis and comparisons are necessary.

Figure 1. Comparison of ESG and SDG Index Score of EU-27 Countries for 2022



Source: Own processing according to MSCI ESG Fundamentals Country Score, and UN (SDG Score), 2022

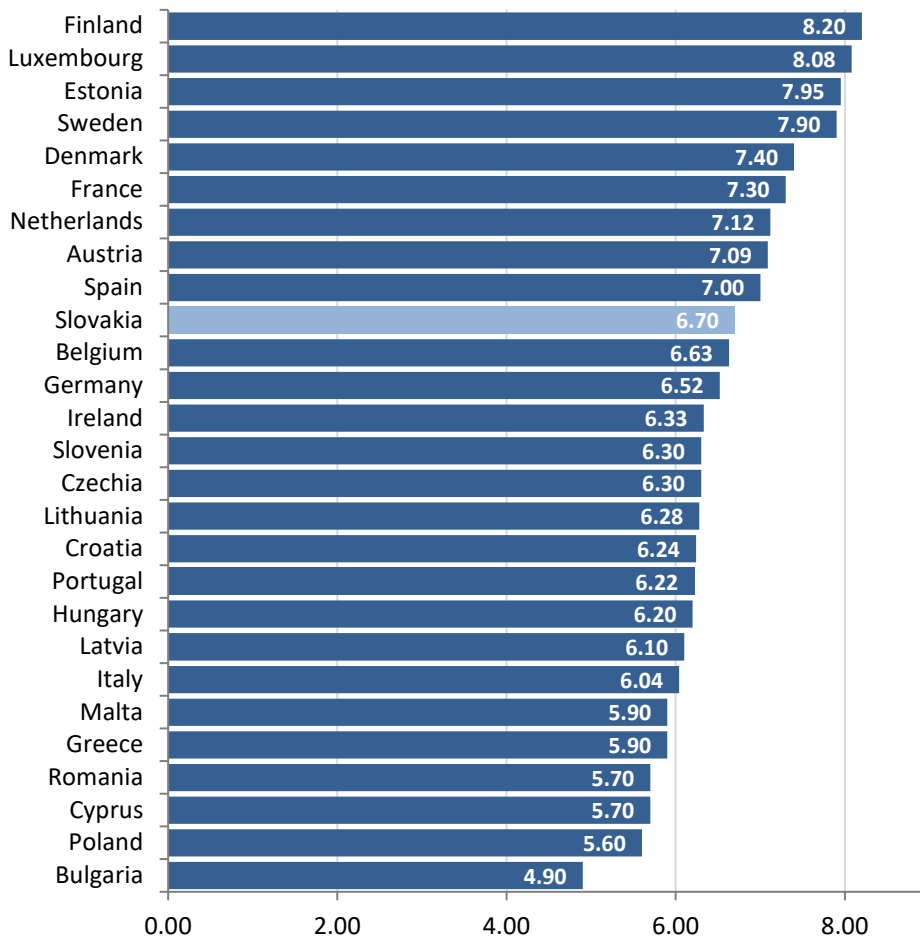
Before we evaluate the results from Figure 1 and 2, it is important to realize how the individual indices or index scores expressed. The ESG score uses a scale from 0 to 10, most commonly within ESG rating agencies such as MSCI. The SDG

index uses a scale from 0 to 100 to evaluate the success of countries in achieving the sustainable development goals set by the United Nations.

Figure 1 shows that by comparing the values of the ESG index and the SDG index, we obtained a group of strong countries with a significant commitment to sustainability and achieve high performance in the areas of environmental, social and governmental factors. **Finland** with the SDG index (81.68) and ESG (8.20), **Sweden** with the SDG index (80.63) and ESG (7.90), **Denmark** with the SDG index (79.17) and ESG (7.40). This means that the selected Scandinavian countries achieve high values due to a strong emphasis on extensive environmental policies and commitments that focus on reducing greenhouse gas emissions, using renewable energy sources, protecting biodiversity and improving air and water quality. Furthermore, they are characterized by high social justice and a high quality of life for their residents, where they have well-developed social programs aimed at healthcare, education, pensions and social security. Their effective legal and regulatory frameworks promote transparency, anti-corruption, and responsible governance, fostering collaboration among businesses, citizens, and government for sustainable development. Investments in renewable energy, resource efficiency, and a socially just economy boost their ESG and SDG results, setting an example for other nations and encouraging global cooperation in sustainability and environmental protection.

Our neighboring country **Austria** is not far behind the mentioned countries with an SDG (78.17) and ESG (7.09) index, followed by **Germany** with an SDG (74.84) and ESG (6.52) index. Within the Visegrad group (V4), we can evaluate the initial position of the **Czechia** with a value of 74.24 and ESG (6.30) according to the SDG index. It is followed by **Poland** with 72.40 and ESG (5.60), **Slovakia** with a score of 70.20 and ESG (6.70) and in last place **Hungary** with a value of 69.85 and ESG (6.20).

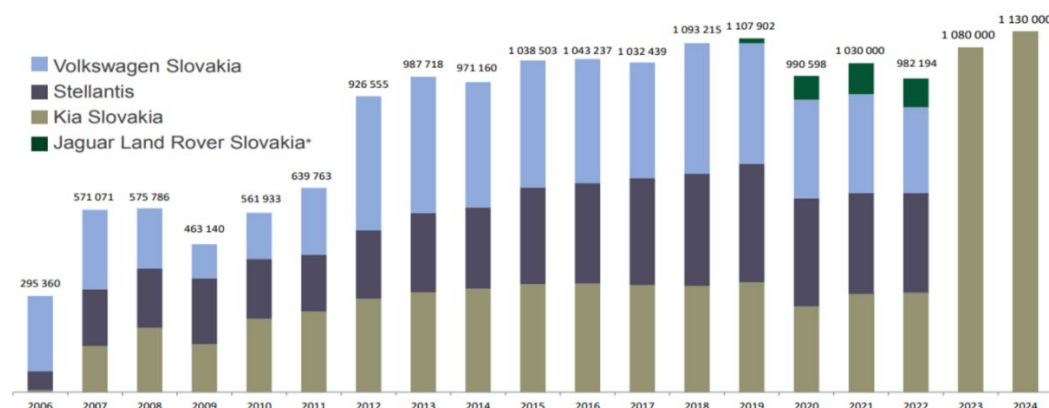
In this case, we could approach several factors that can explain the similar placement of the V4 countries in the assessment of the ESG and SDG indices. One of the reasons is the **significant dependence on fossil fuels** such as coal and gas in their energy mix, which can negatively affect their ESG and SDG results, as these fuels have a significant negative impact on the environment and climate. The economies of these countries are **largely based on industry**, including heavy industry and manufacturing with high greenhouse gas emissions (Jones, et al., 2021). In some cases, these countries may **lag behind in terms of infrastructure** and **investment** in renewable energy sources and environmentally sustainable projects. Lack of sufficient resources and investments may affect their ability to achieve higher values in the ESG and SDG indices. **Regulatory frameworks** and **political will** can also have a significant impact on environmental performance and sustainability efforts.

Figure 2. ESG reporting on Sustainability in EU-27 Countries for 2022

Source: Own processing according to MSCI ESG Fundamentals Country Score, 2022

The Automotive Sector and its Current Situation in Slovakia

Picture no. 3 we reach the position of the Slovak automotive sector and according to current data obtained from the Association of the Automotive Industry of the SR, the production of cars in Slovakia reached slightly more than one million eighty thousand vehicles in 2023, which represents an approximately 4 percent increase compared to the previous year. It is also interesting that in February 2024 this year, the **17,000,000th** vehicle was produced in Slovakia (ZAP, 2024). Car production per capita places Slovakia at the top of the world, **198 passenger motor vehicles** produced per 1,000 inhabitants in 2023. This indicator is followed by the Czechia, Slovenia, Hungary, Germany, Spain and Sweden.

Figure 3. Slovakia - Vehicle Production over the Past Years (2006 – 2024)

Source: Own processing according to ZAP | Automotive Industry Association of Slovakia, 2024

Note: The last years 2023 and 2024 offer only preliminary results of all car manufacturers together, as ZAP worked with incomplete data.

At the beginning of 2021, we could observe a significant increase in car production and sales, and forecasts showed that 2021 will be a strong competitor to the record year 2019. In comparison, this year Slovakia produced 1.11 million cars and sold 101,568 vehicles. However, the semiconductor crisis and the new waves of the COVID-19 pandemic did not help this forecast, but Slovak automakers dealt with it relatively well. Car brands such as *Jaguar Land Rover* and *Volkswagen* focused on producing higher-priced vehicles, which protected them from larger impacts. *KIA Motors Slovakia* had almost no problems with the supply of chips and at the end of the year it started production of the fifth generation Sportage model. Starting from the second quarter, the *Stellantis Slovakia* plant (historical name: until January 2021, Groupe PSA Slovakia) was the most affected, which had to cancel 111 production shifts.

However, despite the worsened situation, the automotive industry in 2022 accounted for 50.3 percent of total industrial production in Slovakia and accounted for more than 42 percent of the country's total exports. The number of employees in this area increased by more than 10,000 employees. Direct employment was at the level of 176,000 workers, while the total number of employees reached 261,000.

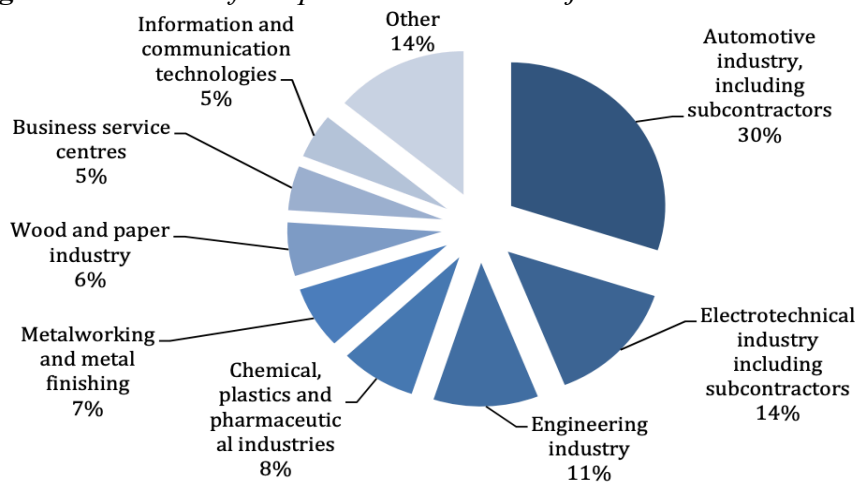
SARIO (Slovak Investment and Trade Development Agency) has been operating in Slovakia since 2003 under the auspices of the Slovak Ministry of Economy, whose task is to support Slovakia's investment, export and innovation potential (SARIO, 2022a). The activity of the SARIO agency includes not only the support of the expansion of established companies and foreign investments with export potential, but also the diversification of sectors, the increase of added value and employment in the least developed regions of Slovakia. During the last twenty years, 609 investment projects were implemented, which created almost 136,000 jobs and brought investments of more than 13.5 billion euros (SARIO, 2022b). In recent years, we can observe the trend of increasing investments with higher added value, such as research and development centers, technology and design centers, as well as an increased number of large investments with multiplier effects on the subcontracting network. In 2021, 29 investment projects with a total value of 464 million euros were completed, creating more than 3,000 new jobs.

From the point of view of the regional distribution of investments, in the last

two years (2020 - 2021) it was found that the position of the Banská Bystrica Region weakened slightly, while the position of the Trnava Region strengthened. The Prešov region still lags behind, not only in terms of the number of completed projects, but also in terms of the number of jobs created. In the structure of completed investment projects by country of origin in the period from 2002 to 2021, Germany is the clear leader (19%), which is in line with Slovakia's foreign trade. The second highest share is South Korea (9%), followed by the USA (7%) and Austria (6%).

Figure no. 4 illustrates the distribution of **completed projects by sector**, with the automotive industry including subcontractors accounting for nearly a third, the electrical engineering industry including subcontractors accounting for approximately one-seventh, and the engineering industry accounting for a ninth. The SARIO agency played a role in the realization of automotive industry investments, including *Jaguar Land Rover* in Nitra (2015), *Stellantis Slovakia* in Trnava (2003), *Kia Slovakia* in Žilina (2004), as well as in the expansion of the *Volkswagen Slovakia* plant in Bratislava (2008, 2020).

Figure 4. Structure of completed Investment Projects in the Period 2002-2021



Source: Based on SARIO data (2022b)

In the coming years, the further development of Slovakia's foreign trade will be largely influenced by the situation in the automotive industry, as it is important for the Slovak economy from various points of view. In addition to making up a third of industrial exports, it represents 13% of Slovakia's total GDP and more than half of industrial production, where it employs nearly 300,000 people. The automotive sector is currently facing a number of challenges, including the impact of the pandemic, which has manifested itself mainly in the disruption of supply chains. The war conflict in Ukraine poses a challenge to Slovakia's foreign trade by reducing trade with Russia and Ukraine.

In addition to global events such as the pandemic and the war conflict in Ukraine, the automotive sector across Europe is also facing a transformation due to decarbonization, which includes the automation and electrification of vehicles. The successful management of this transformation is critical for Slovakia, as it would be reflected in macroeconomic indicators and the development of regions with

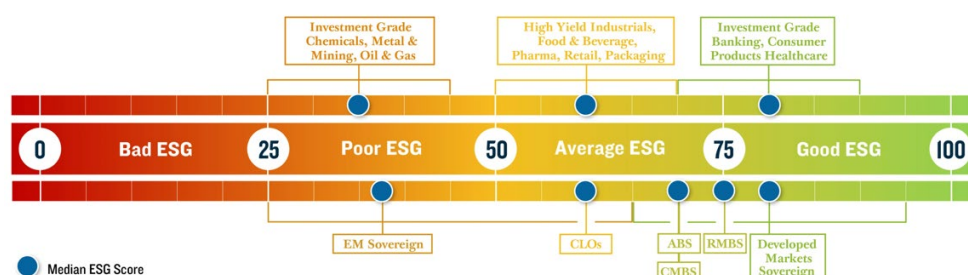
significant automobile production. If Slovakia could successfully transform the automotive sector, it could strengthen its position in electric vehicle production. However, it should be emphasized that the transformation should also include the reduction of individual transport and the support of public transport, which could lead to a decrease in the demand for cars. The impact of the pandemic, the war conflict in Ukraine, the transformation of the automotive sector and Slovakia's ability to face these challenges remain important factors for the future export and overall performance of the Slovak economy in the coming years.

Application of the ESG Index to the Slovak Automotive Sector

ESG indices are used to evaluate environmental, social and government criteria that have an impact on the performance of companies within their industry. In the case of the automotive industry, there are various ESG indices that evaluate these criteria for individual automotive plants. In addition, there are other ESG indices in the automotive industry, such as the S&P Global Clean Energy Index, which focuses on companies producing clean energy and technologies for its use (Egan, 2021). This index also includes automakers that are engaged in the production of electric vehicles or other alternative drives, such as Tesla.

Figure 5 shows the scoring scale of the ESG index score from 0 to 100 percent, according to which we can interpret the obtained results of the analyzed companies.

Figure 5. Scoring Scale of the ESG Index Score (0-100%)



Source: Own processing according to CSRHub ESG

Figures 6, 7, 8 and 9 show us the history of the ESG index rating for all four automotive representatives compared to the industry from April 2021 to January 2023, when we can observe interesting developments by period.

Due to the unavailability of the ESG index scores for Slovak representatives, we decided to conduct a global analysis of selected automotive concerns. We used *CSRHub ESG* (*The first company integrates data from 10 leading Socially Responsible Investing (SRI) analytics firms, alongside over 600 NGOs, government agencies, news outlets, social media groups, and smaller publishers. This tool consolidates more than 510 million data points on sustainability and CSR performance into a cohesive set of ratings.*) as our source database, which provides ratings on employee, environmental, community, and governance performance for large companies in North America, Europe, and Asia (Gidwani, 2021).

Figure 6. ESG index Evaluation History - Stellantis NV

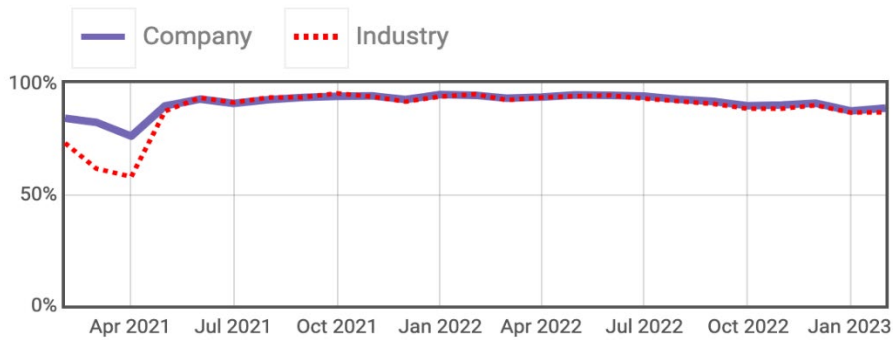
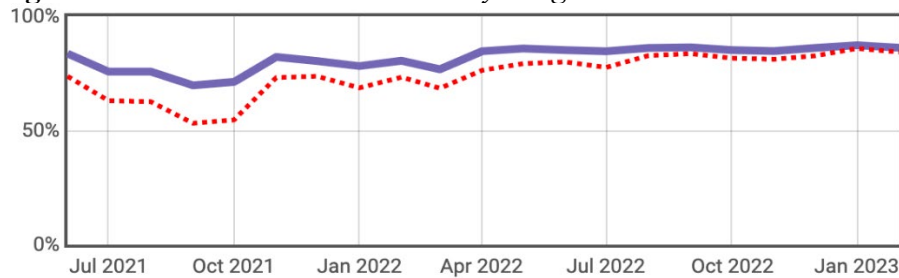


Figure 7. ESG Index Evaluation History - Jaguar Land Rover



Source: Own processing according to CSRHub ESG

Figure 8. ESG index Evaluation History - Kia Motors Corporation

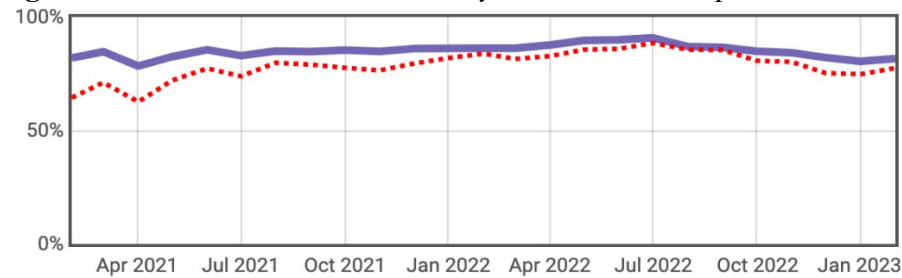
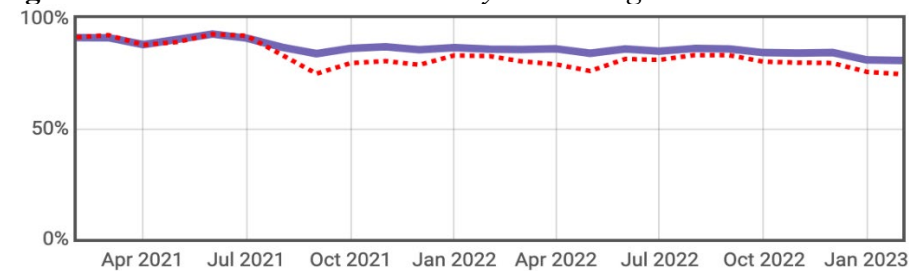


Figure 9. ESG Index Evaluation History - Volkswagen AG



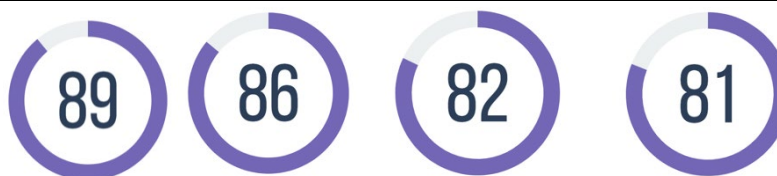
Source: Own processing according to CSRHub ESG

By analyzing the ESG index for four automotive representatives, according to the *CSRHub ESG database*, we obtained the results shown in Table 3, which show **Stellantis NV** (Concern that was created in January 2021 by the merger of the French company *Groupe PSA* with the Italian-American company *Fiat Chrysler Automobiles*).

It is a joint-stock company based in the Netherlands) as the leader with the highest ESG score of 89%. **Jaguar Land Rover** (*Jaguar Land Rover Limited is a British multinational automobile company based in Great Britain, which was founded in 2008. It is a subsidiary of the Indian automobile company Tata Motors*) came in second with an ESG score of 86%. In third place we see **Kia Motors Corporation** (*Kia Motors Corporation is a sister company of the South Korean corporation Hyundai Motor Company, and also a member of the Hyundai Motor Group, which was founded in 1944*) with an ESG score of 82%. Last place was taken by **Volkswagen AG** (*The Volkswagen Group, with its headquarters in Germany, is one of the leading and largest manufacturers of cars and commercial vehicles, which was founded in 1937*) with an ESG score of 81%.

Table 3. Automotive Company ESG Index Rating in 2023

Automotive companies	Stellantis NV	Jaguar Land Rover	Kia Motors Corporation	Volkswagen AG
ESG score	89 %	86 %	82 %	81 %
Order of success	1.	2.	3.	4.



Source: Own processing according to CSRHub ESG

Conclusions

The overall results achieved in the ESG index indicate that the given companies achieve a high level in the field of environmental, social and governance factors. This result indicates that companies are actively concerned with sustainability and responsible management of their business with minimal negative impact on the environment and with respect to employees and society as a whole.

Based on the analysis of rating agencies and investment companies focused on ESG performance of companies, we found that for most Slovak companies this concept is still relatively new. Finding a balance between sustainability and responsible business, with minimal negative impact on the environment and with an emphasis on employees and society, is the key to assessing company performance through ESG criteria. This concept is more often discussed in companies with an international context, especially since 2021, when it began to be talked about the obligation to publish information on sustainability according to the exact standards that are currently being finalized at the European level.

According to analyzes by Mazars, approximately 30 Slovak companies are currently dealing with the issue of sustainability, but only a third of them would meet the stricter criteria for reporting. What is new is that this published information will have to undergo an independent audit and companies will store it in a central

digital system. Under the new rules, companies should start publishing reports on non-financial indicators in 2025 for the year 2024.

ESG indices are becoming an increasingly popular tool for investors who want to invest in companies that consider environmental and social factors as well as the management of their businesses. These indices are often used to measure and compare the performance of companies based on their ESG scores. The higher the company's ESG score, the higher the rating of its environmental, social and governance performance. Investor interest in ESG indices has increased in recent years, as more and more people and companies seek to invest in sustainable development and consider environmental and social factors when making investment decisions.

Acknowledgments

This paper was supported by the Scientific Grant Agency of the Ministry of Education of Slovak Republic and the Slovak Academy of Sciences, VEGA Project No. 1/0462/23 (100 %) „Circular economy in the context of social requirements and market restrictions. “

References

- Acosta LA, et al. (2019) *Green Growth Index: Concepts, Methods and Applications*. GGGI Technical report No. 5, Green Growth Performance Measurement Program, Global Green Growth Institute, Seoul.
- Burck J, et al. (2023) *Results: Monitoring Climate Mitigation Efforts of 59 Countries plus the EU – covering 92% of the GGE*. URL: <<https://www.germanwatch.org/sites/default/files/cc-pi-ksi-2023-kurzfassung.pdf>>
- Dow Jones Sustainability Indices Methodology (2022) URL: <<https://www.spglobal.com/spdji/en/documents/methodologies/methodology-dj-sustainability-indices.pdf>>.
- Egan M (2021) *How the auto industry is embracing ESG*. CNN Business. Retrieved from <https://www.cnn.com/2021/12/03/business/auto-industry-esg/index.html>.
- EPI Team (2018) EPI Report; Yale University: New Haven, CT, USA; Columbia University: NY, USA, 2018.
- Esty DC, et al. (2005) *Environmental Sustainability Index: Benchmarking National Environmental Stewardship*; Yale Center for Environmental Law & Policy: New Haven, CT, USA, 2005.
- Esty DC, Winston AS (2006) *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage*. Yale University Press. ISBN 978-0470393741.
- Galli A, Wackernagel M, Iha K, Lazarus E (2014) *Ecological Footprint: Implications for Biodiversity*. *Biol. Conserv.* 2014, 173, 121–132. URL: <<https://doi.org/10.1016/j.biocon.2013.10.019>>.
- Gidwani B (2021) *NGOs Get Their Say On ESG Performance*. (accessed on 27 October, 2021) URL: <<https://blog.csrhub.com/ngos-get-their-say-on-esg-performance>>
- Global Reporting Initiative URL: <<https://www.globalreporting.org/about-gri/>>.
- Jones P, Comfort D (2021) The sustainable development goals and leading European retailers. *Athens Journal of Business and Economics*, 7(1), 105-122.
- Jones P, Hillier D, Comfort D (2017) The sustainable development goals and the financial services industry. *Athens Journal of Business and Economics*, 3(1), 37-50.

- Kitzes J (2009) *Ecological Footprint Standards 2009*. Oakland: Global Footprint Network. URL: <https://www.footprintnetwork.org/content/uploads/2019/05/Ecological_Footprint_Standards_2009.pdf>.
- Marks N, et al. (2006) *The Happy Planet Index: An Index of Human well-being and environmental Impact*. NEF. URL: <https://neweconomics.org/uploads/files/54928c89090c07a78f_ywm6y59da.pdf>.
- MSCI ESG Indexes and MSCI Analytics (2020). URL: <<https://www.msci.com/our-solutions/indexes/esg-indexes>>.
- MSCI (2023) *30 years of ESG Indexes*. URL: <<https://www.msci.com/our-solutions/indexes/esg-indexes>>.
- Naqvi M, Jus M (2019) *The Benchmark that Changed the World: Celebrating 20 Years of the Dow Jones Sustainability Indices*. ESG Data, Rankings & Benchmarking.
- Pratt CR, Kaly UL, Mitchell J (2022) *Manual: How to Use the Environmental Vulnerability Index (EVI)*; SOPAC Technical Report 384; 2004. (accessed on 13 December 2022). URL: <<http://gsd.spc.int/sopac/evi/Files/EVI%202004%20Technical%20Report.pdf>>.
- Purvis B, Mao Y, Robinson D (2019) "Three pillars of sustainability: in search of conceptual origins". *Sustainability Science*. 14 (3): 681–695. doi:10.1007/s11625-018-0627-5. ISSN 1862-4065
- Saisana M (2014) *Environmental Sustainability Index (ESI)*. In: M. A. C. Encyclopedia of Quality of Life and Well-Being Research. Springer, Dordrecht. URL: <doi.org/10.1007/978-94-007-0753-5_899>.
- Schepelmann P, et al. (2010) *Towards Sustainable Development: Alternatives to GDP for measuring progress*. Wuppertal Institut für Klima, Umwelt, Energie GmbH 2010. 23-38. ISBN 978-3-929944-81-5.
- United Nations, Department of Economic and Social Affairs (2022) ISBN: 978-92-1-101448-8. URL: <<https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf>>.
- Wendling ZA, Emerson JW, Sherbinin A, Etsy DC, et al. (2020) *Environmental Performance Index 2020*. New Haven, CT: Yale Center for Environmental Law and Policy. (accessed on 21 June 2020). URL: <<https://doi.org/10.13140/RG.2.2.21182.51529>>.
- Whelan T, Fink C (2016) *The comprehensive business case for sustainability*. HBR.
- Wolf MJ, et al. (2022) *2022 Environmental Performance Index*. New Haven, CT: Yale Center for Environmental Law & Policy. URL: <epi.yale.edu>