ISSN 2709-9210
Journal of Service, Innovation and Sustainable Development
Vol. 4 (2023) No. 1, pp. 115-128
DOI:10.33168/SISD.2023.0110

Assessment of the Involvement of the European Union Countries in Sustainable Finance

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Abstract. Sustainable finance and its trends are attracting increasing interest. However, investing in sustainable economic development still raises many questions. Many factors are used to assess sustainable finance and affect the field differently. The problem of this paper is how to evaluate trends in sustainable finance in different countries. This paper examines involvement in sustainable finance in selected European Union countries. The subject of the paper is sustainability in EU countries. The paper provides a theoretical analysis of sustainable finance, an assessment of the sustainability of selected EU countries and a ranking of countries, and a hierarchical clustering. The methods used are analysis of scientific literature, summarisation, analysis of secondary data sources, weighting by the CRITIC method, ranking by the COPRAS method, and hierarchical clustering method. Considering ESG indicators as sustainable finance outcomes, Sweden, of the selected European Union countries, showed the most concern with sustainability.

Keywords: sustainability, sustainable finance, European Union countries, sustainability factors.

1. Introduction

Ecology is a topical issue for many people today. At the same time, there is a great deal of attention being paid to environmental friendliness. Investing in ecology is necessary, and eventually, it will affect almost everyone, so it can be said to be an inevitable factor. Investing in environmental sustainability, which can be defined as investing in technology or human resources to normalize climate change and improve people's social lives. All the inventions that have taken place over the last few hundred years have made people's lives easier while at the same time laying the foundations for future generations to build on those inventions. Research has shown that the inventions of the past centuries were indeed harmful to the environment, but they attracted a great deal of attention and investment at the time. Nowadays, we can see the replacement of polluting cars by electric cars. Therefore, every change opens up new possibilities and is a stimulus for other projects. Recently, the issue of sustainability has also been part of the investment debate – Europe's future is based on a Green Deal. Investing in a sustainable environment can only have one goal: a better quality of life for all. The relevance of the sustainability agenda is also demonstrated by the figures on people's interest in sustainability; according to Google Trends, interest in sustainable finance was about 75 % searches per day in the last 12 months. The problem of this paper is how to compare European Union countries in terms of their engagement with sustainable finance. The aim of the paper is to investigate trends in sustainable finance and to compare different EU countries on sustainable finance. The subject of the paper is sustainability in EU countries.

2. A Theoretical Analysis of Sustainability and Sustainable Finance Trends

Trends in sustainable finance can be diverse but are linked to environmental friendliness – preserving natural and human resources. In other words, sustainable (green) finance is about protecting the environment while minimizing environmental damage (Ronaldo & Suryanto, 2022). It is also important to mention that sustainable finance can put an end to the existence of an industrial sector that is one of the most polluting in the world (Wan et al., 2022). Sustainability aims to consolidate and unite the whole world behind one goal, which is to improve people's quality of life and protect the environment. A brief look at the evolution of sustainability can be taken; first, the light bulb was invented, and with this invention, more and more electricity-using devices began to appear, and due to the scarcity of electricity, power plants began to appear, which nowadays emit endless amounts of harmful substances into the environment in order to generate electricity. Therefore, one of the trends in sustainable finance is to get rid of power stations, which could be replaced by solar energy, wind energy, and hydroelectricity. The natural resources listed above are endless and renewable. Moreover, green finance is a key factor that, through its policies, can create a clean energy present and future (Zhou & Li, 2022).

It is also worth pointing out that small and medium-sized enterprises (SMEs) in countries, which account for almost 70% of the national economy, find it quite difficult to achieve sustainability goals (Small & Medium-Sized Enterprises | National Action Plans on Business and Human Rights, n.d.). The targets are complex because companies that want to implement and achieve the SDGs face financial problems that prevent them from taking out loans, credit, winning tenders, or projects (Soni et al., 2022). Companies also have to meet certain requirements that allow them to create and develop sustainability. In addition, the industry needs to incorporate sustainability and resource conservation into the core of its business culture; otherwise, the industry will not be able to move into the future, as pollution can undermine the further development of businesses. Key sustainability issues include climate change, human health and safety, air quality, waste, human capital, water management, and energy management (Saulick et al., 2023). The remarkable increase in consumer demand for green products suggests that sustainability objectives are increasingly being taken into account (Urbinati et al., 2020). In response to the United Nations Sustainable Development Goals, it can be argued that the goal of sustainability will be mainstreamed into policy-making in all areas (Abdou et al., 2020). Even now, there are advertisements on TV and elsewhere that promote sorting, recycling, and trying to use things until the last second of their life and their shelf life. People and companies who invest in innovative, environmentally friendly items are themselves compensated.

As Spinaci (2021) refers, sustainable finance is an evolution of green finance, as it takes into consideration environmental, social and governance (ESG) issues and risks, with the aim of increasing long-term investments in sustainable economic activities and projects. Companies or people who invest

have recently been paying attention to making sure that the direction of investment is in line with ESG (environmental, social, governance) factors. Environmental factors are defined as those that seek to protect and conserve natural resources (Steuer & Utz, 2022). Social factors are defined as factors that are concerned with human well-being (Bao et al., 2023). Companies are also beginning to understand how their strategies affect the environment, influence the community, and reduce negative impacts (Büyüközkan & Karabulut, 2018). Governance drivers are actions that are executed by higher political or corporate forces (Wang et al., 2022). The main environmental, social and governance factors are further subdivided into sub-factors (see Table 1).

Table 1: Sustainability factors (compiled by the authors)

Environmental factors		
Renewable energy	Renewable energy is cheaper and reduces harmful emissions.	(Abbas et al., 2023); (Steuer & Utz, 2022)
Reducing greenhouse gas emissions	The greenhouse effect can be significantly reduced by using renewable energy.	
Efficient use of energy	Efficient use of energy can replace many conventional technologies and save money.	
Managing climate change risks	Particular attention is paid to the risks of climate change due to the possibility of natural disasters affecting the whole world.	(Reiter et al., 2022)
Water management	Water consumption should be used efficiently and sparingly as the consequences can be critical.	
Waste sorting	Waste reduction and sorting would reduce taxes and help sorting companies.	(Castiglione et al., 2023)
Social factors		
Health	Integrating artificial intelligence (AI) into the health system can help make the right decisions on health issues.	(Suha & Sanam, 2023)
Safety	Integrating new technologies into people's lives can help people to keep safe.	
Working conditions	Ensuring quality of working conditions for employees.	(Dabić et al., 2023)
Human rights	Human rights values are upheld to prevent inequality and injustice.	(Jeffords, 2021)
Impact on local communities	Involving local communities in sustainability objectives to make the most efficient use of natural, human, and financial resources.	(Büyüközkan & Karabulut, 2018)
Governance factors		
Ethical factors	Ethical factors should encourage volunteerism and stubbornness.	(Dey et al., 2022)
Board diversity	Sustainability initiatives are strongly influenced by managers who want to encourage employees to achieve sustainability goals.	
Stakeholder engagement	Sustainability performance can be promoted by incorporating social, economic, and environmental factors.	
Shareholder rights	Increased shareholder engagement to drive sustainable development.	(Lueg & Pesheva, 2021)

However, funding each area together is a rather complex process, as would be the complexity of trying to fund each area separately. Environmental financing is probably one of the easiest and simplest to finance compared to social and governance factors. According to the objectives of the European Green Deal, which reflect environmental sustainability, the environment is the number one objective. The desire is to make the world cleaner and more transparent by 2050 (Abdou et al., 2020). As far as environmental issues are concerned, the feedback on environmental sustainability funding is basically

positive unless a company has a damaged reputation and is unable, or it is simply not feasible for that company to implement projects that promote sustainability. Investing in renewable fuels is viewed positively by banks or other companies that can finance it, as renewable fuels help both the environment and the company itself to save money and manage its finances more smoothly. And the deployment of renewable fuels such as solar or wind is now within reach of almost every company, as the companies responsible for renewable energy are taking their own incentives to get more organizations involved (Kasim, 2007). Investing in less polluting vehicles, such as electric vehicles, can also contribute to reducing pollution. To reduce the greenhouse gas effect, it is possible to move away from current polluting vehicles to less polluting ones or to move away from them altogether, and the same should be done with electricity-generating plants. By moving away from polluting vehicles to new, greener ones, financing is also provided for such products; thus, it can be argued that the number of people or businesses that own electric vehicles can only increase (Johnson et al., 2021).

The next environmental area is energy efficiency. Using energy more efficiently means getting the job done quickly and efficiently at a minimum cost (Jones & Comfort, 2019). Especially nowadays, when electricity prices have risen, we can see which people or companies make efficient use of electricity that should only be used when necessary. If left unchecked, the above areas can exacerbate climate change, which also has its own risk management. However, apart from small-scale installations, the whole process needs to be looked at in a broader way to manage climate change, starting with the closure of the most polluting factories and trying to weigh up alternatives that may seem expensive at the outset, but when invested in a green product, the returns are even higher, as all the world's inhabitants and businesses want to live a more transparent life (Fayet et al., 2022). Investing in water management also has very high returns. And lately, investing in water-efficient equipment is one of the most appreciated because it makes work easier for water treatment companies. Water management is very important for the whole world because the amount of fresh water available for human use is only 0.3% of the total water on Earth. Recently, innovations have made it possible to save water in many ways (Han et al., 2018). However, old equipment is hampered by the use of new, greener equipment, and the whole process of replacement is complex and financially resource-intensive. The next problem, which is major for all people and businesses alike, is waste sorting. Companies and the authorities are looking for solutions to solve this problem because the land is heavily polluted. One way that has already taken root is the emergence of reverse vending machines, which force people to sort and make it easier for recycling companies. Financing the sorting of rubbish could be simple, but for many people, it would require a change from traditional rubbish disposal. With the help of technology, these problems can be solved, but not every company or person is financially ready for this (Gretzel et al., 2020).

Considering the importance of the ESG factors discussed above for the whole society, it is appropriate to evaluate the involvement of different countries in sustainable finance because the investments of private companies and the state respond to the availability of indicators that reflect the factors – indicators that, minimized or maximized, allow to achieve better social, environmental and governance conditions. Therefore, in the empirical study, the indicators corresponding to the mentioned areas will be selected, and the involvement of EU countries in sustainable finance will be evaluated according to them.

3. Methodology for Measuring Countries' Involvement in Sustainable Finance

The research methods used to obtain the results of the study were the CRITIC method, COPRAS, and hierarchical clustering analysis. The CRITIC method allows the identification of specific weights that indicate the percentage importance of criteria and alternatives. In other words, which criterion "weighs" how much? The weights are expressed as percentages, and the weights of all alternatives cannot exceed 100 %. The determination of the weights is essential for the further development of the study. The COPRAS method is used for ranking. Cluster analysis allows for finding similarities between objects and clustering them together. The methodology developed for the study is presented in Figure 1.

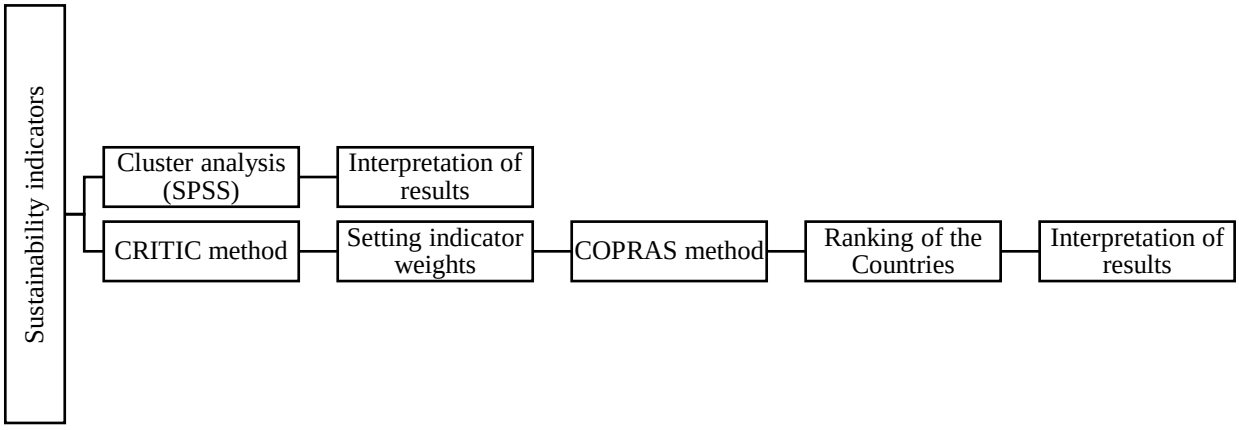

Fig. 1: Research structure (compiled by authors)

CRITIC method. The CRITIC approach helps to determine the weights of the criteria to be investigated. It also aims to determine the relative importance and objective weights in multi-criteria decisions. The weights obtained consist of contrast and conflict intensity, which means that the criteria chosen may be similar or not similar at all. The CRITIC method tries to extract all possible information from the criteria, as this method is characterized by analytical evaluation (De Almeida et al., 2022). The CRITIC method consists of six steps to obtain the objective weights, the last step being the sorting of the criteria according to their weights. The first step involves the normalization of the decision matrix of the sustainability criteria data in the European Union countries, where *m* is the number of alternatives and *n* is the number of criteria (De Almeida et al., 2022), according to formula (1).

$$r_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}}, i \in \{1,2,\dots,m\}, j \in \{1,2,\dots,m\}, \quad (1)$$

After this step, the standard deviation (σ) of each criterion in the normalized matrix is determined (Kumaran, 2022). The next step involves calculating the correlation of each pair of normalized criteria and constructing a symmetric matrix with the r_{ij} elements. Next, the determination of the criterion conflict measure (Kumaran, 2022) according to formula (2) takes place.

$$Conflict = \sum_{j=1}^{n}(1 - R_{ij}) \quad (2)$$

Once the conflict measure has been calculated and determined, it is possible to proceed to the determination of the amount of information *Cj* extracted by the j^{th} criterion (Chisale et al., 2023) according to the following formula (3).

$$C_j = \sigma_j \sum_{j=1}^{n}(1 - R_{ij}) \quad (3)$$

The last step is to determine the objective weight w_j (De Almeida et al., 2022) using formula (4).

$$w_j = \frac{C_j}{SUM\,(C_j)} \quad (4)$$

The resulting objective weights can be used in other methods that do not have their own unique method for determining the weights of criteria. Therefore, we will transfer the resulting criterion weights to the COPRAS method, which does not have its own exclusive weighting method. In addition, the weights determined by the CRITIC method help to more accurately determine the results using the COPRAS method (Yücenur et al., 2020). This method can be used to assess the overall performance of the alternatives, to define sustainability criteria for the European Union countries, to obtain more information on these criteria, and finally to evaluate the criteria by ranking them (Alkan & Albayrak, 2020). Initially, the sizes of the criteria and the matrix of alternatives are normalized (Schitea et al., 2019) using formula (5).

$$\hat{x}_{ij} = x_{ij} / \sum_{i=1}^{m} x_{ij} \quad (5)$$

Next, each of the resulting normalized COPRAS values is multiplied by the criterion weight (formula 6), which was calculated using the CRITIC method, to obtain a new weighted normalized decision matrix, which represents the criterion's corresponding numerical expression (Yücenur et al., 2020).

$$\widetilde{x_{ij}} = \hat{x}_{ij} \cdot w_j \tag{6}$$

Given a normalized weighted decision matrix, in the next phase, each alternative is categorized as maximizing and minimizing index by formulas (7), (8) (Yücenur et al., 2020).

$$S_{+i} = \sum_{j=1}^{n} \tilde{x}_{+ij} \tag{7}$$

$$S_{-i} = \sum_{j=1}^{n} \tilde{x}_{-ij} \tag{8}$$

The relative importance values (*Qi*) of the alternatives are calculated using formula (9) (Alkan & Albayrak, 2020).

$$Q_i = S_{+i} + \frac{S_{-\min} \sum_{i=1}^{m} S_{-i}}{S_{-i} \cdot \sum_{i=1}^{m} \frac{S_{-\min}}{S_{-i}}}, \check{c}ia\ S_{-\min} = \min_i S_{-i} \tag{9}$$

Next, the alternative with the highest relative importance is identified as the best (Q_{max}). The efficiency index is denoted by U_i and is calculated according to formula (10); the alternative with the best relative importance has 100% efficiency. The remaining alternatives are sorted according to the values and ranking of the performance index (Yücenur et al., 2020).

$$U_i = \frac{Q_i}{Q\_\max} \cdot 100\% \tag{10}$$

The resulting U_i performance figures are sorted in order from the highest-performing alternative to the lowest. Finally, the research is completed using the Hierarchical Clustering method that allows the objects of the study to group into specific clusters. The cluster analysis is carried out using the SPSS software based on metric distance measures. A metric is a numerical non-negative function *d*(*X, Y*) of two objects *X* and *Y* that satisfies the conditions described by formulas 9 and 11 (Rozinek & Mareš, 2021):

Symmetry:

$$d(X, Y) = d(Y, X) \tag{9}$$

Triangular inequality:

$$d(X, Y) \leq d(X, Z) + d(Y, Z) \tag{10}$$

Positive definiteness (identity of indiscernible):

$$\text{If } d(X, Y) = 0, \text{ then } X \text{ and } Y \text{ are identical} \tag{11}$$

Hierarchical clustering is carried out by using Ward's method, and the interval is chosen to be Euclidean.

Thus, the methodology developed allows ranking and clustering of the selected objects of the study by evaluating the selected criteria, which is what has been done in the empirical study presented below.

4. Ranking of EU Countries in Sustainable Finance and its Clustering

As the world moves towards sustainability, this has become particularly relevant in the EU following the adoption of the European Green Deal in 2019. This study, therefore, chooses to assess which EU countries are developing sustainability the fastest. The following countries are included in the set of

criteria: Belgium; Denmark; Germany; Spain; France; Croatia; Latvia; Lithuania; Poland; Sweden.

These countries were chosen based on their geographical location and to reflect the different regions of the EU. As the natural environment and domestic policies differ from one country to another, the aim is to assess the sustainability of the selected countries and to identify those that are leading and stand out for their distinctive features. Lithuania is also included in order to compare how it compares with other EU countries.

Sustainability covers all aspects of life, from human well-being to environmental preservation and sustainability. The main alternatives have been selected based on their importance for people and the country itself. Annual data were selected for the study according to the availability of the most recent data. The data were taken from the Eurostat database (Indicators - Sustainable Development Indicators - Eurostat, n.d.).

The 10 indicators selected for the study are described and justified below.

Renewable energy. Renewable energy is the most important factor affecting Europe and Lithuania now. Electricity extracted from fossil fuels is polluting and consumes many natural resources, and judging by these two criteria, it can be said that the result of all of this is also high electricity prices.

Water Exploitation. High water consumption undermines a country's sustainability. With only 3% of the world's total water consumption, water consumption patterns should be monitored intensively and changed to sustainable ones.

Organic farming. It is argued that polluted farming has led to the production of products under harmful conditions; in other words, farming is based on quantity rather than quality.

Income poverty. The quality of people's lives can be used as a proxy for their incomes. Particularly in recent times, many people have complained about low wages and low pensions.

Long-term unemployment. Unemployment is a problem for every country, as each of them is more or less affected by it.

The air emission intensity of the industry. The industry is made up of many components that are often polluting, but the European Union is determined to change this tradition so that industries can integrate environmentally friendly components into their operations.

Reported occurrence of crime. The rate of criminal activity is decreasing over time, but this is an important factor for each country.

Circular economy. The circular economy is the basis of sustainability, as it allows the use, reuse, and recycling of products. When it is discarded, it causes environmental pollution.

Net greenhouse emissions. A country's sustainability performance can be seen through the amount of greenhouse gases in the country, so this indicator shows the extent to which a country has developed sustainability. The data chosen for this study is the greenhouse gas index.

Protected areas. There have been a number of recent scandals involving the destruction of protected natural or historic heritage sites where new projects are to be built.

The second table shows the numerical values of the criteria and the data of the alternatives selected for analysis, the measures of the values (percentage, index), and the types of values (maximizing or minimizing).

Table 2: The research data (compiled by the authors)

Factors	**Environmental**					**Social**			**Governance**	
Country	**Renewable energy**	**Water consumption**	**Using the circular economy**	**Net greenhouse gas emitting particles**	**Protected natural areas**	**Organic farming**	**Poor incomes**	**Long-term unemployment**	**Industrial air emission intensity**	**Emergence of criminality**
Measurement	%	%	%	Index	Index	%	%	%	%	%
	MAX	MIN	MAX	MIN	MAX	MAX	MIN	MIN	MIN	MIN
Belgium	13	7.3	23	75.2	4477	7.2	12.7	2.6	0.06	13.3

Denmark	31.7	1.4	7.7	57.5	6518	11.4	12.3	1	0.01	7.5
Germany	19.3	5.4	13.4	57.1	133021	9.5	15.8	1.2	0.02	13.1
Spain	21.2	23.7	11.2	94.9	141675	9.9	21.7	6.2	0.1	11.6
France	19.1	6.1	22.2	73.2	151506	8.7	14.4	2.3	0.05	14.7
Croatia	31	0.3	5.1	71.8	21332	7.2	19.2	2.8	0.2	2.7
Latvia	40.1	0.2	4.2	81.6	11755	14.7	23.4	2.3	0.84	6.1
Lithuania	26.7	0.3	4.4	35	11033	8	20	2.6	0.04	3.2
Poland	16.1	6.8	9.9	79.9	123523	3.5	14.8	0.9	0.31	4.4
Sweden	60.1	0.6	7.1	20.6	63410	20.3	15.7	1.9	0.06	13

The CRITIC method for determining the weights is used from the outset, and in particular, the values of the alternatives are normalized according to formula (1) (see Table 3).

Table 3: Normalized criteria values (compiled by the authors)

Factors	**Environmental**					**Social**			**Governance**	
Country	**Renewable energy**	**Water consumption**	**Using the circular economy**	**Net greenhouse gas emitting particles**	**Protected natural areas**	**Organic farming**	**Poor incomes**	**Long-term unemployment**	**Industrial air emission intensity**	**Emergence of criminality**
Belgium	0	0.302	1	0.735	0	0.222	0.036	0.321	0.06	0.883
Denmark	0.396	0.054	0.186	0.497	0.014	0.472	0	0.019	0	0.4
Germany	0.134	0.223	0.489	0.491	0.874	0.362	0.315	0.057	0.012	0.867
Spain	0.174	1	0.372	1	0.933	0.385	0.847	1	0.108	0.742
France	0.13	0.252	0.957	0.708	1	0.309	0.189	0.264	0.048	1
Croatia	0.382	0.006	0.048	0.689	0.115	0.22	0.622	0.358	0.229	0
Latvia	0.576	0	0	0.821	0.05	0.671	1	0.264	1	0.283
Lithuania	0.292	0.007	0.011	0.194	0.045	0.267	0.694	0.321	0.036	0.042
Poland	0.066	0.283	0.303	0.798	0.81	0	0.225	0	0.361	0.142
Sweden	1	0.02	0.154	0	0.401	1	0.306	0.189	0.06	0.858

The weights determined by the CRITIC method according to formula (2) are given in Table 4. It can be seen that each alternative has a different weight depending on its importance. The sum of the weights of all the alternatives is 1. For further ranking, the normalized values for the COPRAS method are calculated according to formula (3) and presented in Table 4.

Table 4: Data values normalized by the COPRAS method (compiled by the authors)

Factors	**Environmental**					**Social**			**Governance**	
Country	**Renewable energy**	**Water consumption**	**Using the circular economy**	**Net greenhouse gas emitting particles**	**Protected natural areas**	**Organic farming**	**Poor incomes**	**Long-term unemployment**	**Industrial air emission intensity**	**Emergence of criminality**

Weights	0.108	0.079	0.122	0.089	0.125	0.089	0.103	0.074	0.1	0.112
	MAX	MIN	MAX	MIN	MAX	MAX	MIN	MIN	MIN	MIN
Belgium	0.047	0.139	0.213	0.116	0.007	0.072	0.075	0.109	0.036	0.148
Denmark	0.114	0.028	0.071	0.089	0.01	0.114	0.072	0.042	0.006	0.084
Germany	0.069	0.104	0.124	0.088	0.199	0.095	0.093	0.05	0.012	0.146
Spain	0.076	0.451	0.104	0.147	0.212	0.099	0.128	0.261	0.059	0.129
France	0.069	0.117	0.205	0.113	0.227	0.086	0.085	0.097	0.03	0.164
Croatia	0.111	0.007	0.047	0.111	0.032	0.072	0.113	0.118	0.118	0.03
Latvia	0.144	0.004	0.039	0.126	0.018	0.147	0.138	0.097	0.497	0.068
Lithuania	0.096	0.007	0.041	0.054	0.017	0.079	0.118	0.109	0.024	0.036
Poland	0.058	0.131	0.091	0.124	0.185	0.035	0.087	0.038	0.183	0.049
Sweden	0.216	0.013	0.066	0.032	0.095	0.201	0.092	0.08	0.036	0.145

The values of S calculated in the next step of the study according to formula (4) are presented in Table 5. From the initial results obtained (see Table 5), it can be observed that Sweden has almost no overlapping values, which means that in many areas, it is the leading country in terms of the indicators. The values in Table 5 are needed for further ranking exercises.

Table 5. Calculated values for data and weights (compiled by the authors)

Factors	**Environmental**					**Social**			**Governance**	
Country	**Renewable energy**	**Water consumption**	**Using the circular economy**	**Net greenhouse gas emitting particles**	**Protected natural areas**	**Organic farming**	**Poor incomes**	**Long-term unemployment**	**Industrial air emission intensity**	**Emergence of criminality**
Weights	0.108	0.079	0.122	0.089	0.125	0.089	0.103	0.074	0.1	0.112
	MAX	MIN	MAX	MIN	MAX	MAX	MIN	MIN	MIN	MIN
Belgium	0.005	0.011	0.026	0.01	0.001	0.006	0.008	0.008	0.004	0.017
Denmark	0.012	0.002	0.009	0.008	0.001	0.01	0.007	0.003	0.001	0.009
Germany	0.007	0.008	0.015	0.008	0.025	0.008	0.01	0.004	0.001	0.016
Spain	0.008	0.035	0.013	0.013	0.026	0.009	0.013	0.019	0.006	0.014
France	0.007	0.009	0.025	0.01	0.028	0.008	0.009	0.007	0.003	0.018
Croatia	0.012	0.001	0.006	0.01	0.004	0.006	0.012	0.009	0.012	0.003
Latvia	0.016	0	0.005	0.011	0.002	0.013	0.014	0.007	0.05	0.008
Lithuania	0.01	0.001	0.005	0.005	0.002	0.007	0.012	0.008	0.002	0.004
Poland	0.006	0.01	0.011	0.011	0.023	0.003	0.009	0.003	0.018	0.005
Sweden	0.023	0.001	0.008	0.003	0.012	0.018	0.01	0.006	0.004	0.016

Further calculations are carried out with respect to whether the indicator is maximizing (MAX) or minimizing (MIN), and the results obtained using formulae 5 and 6, respectively, are shown in Table 6.

Table 6: Calculated S_{+i}, S_{-i}, ir $S_{-i\ min}$ / S_{-i} values (compiled by the authors)

Country	S_{+i}	S_{-i}	$S_{-i\ min}/S_{-i}$
Belgium	0.033	0.057	0.536
Denmark	0.020	0.031	1.000

Germany	0.048	0.047	0.654
Spain	0.048	0.101	0.302
France	0.061	0.056	0.543
Croatia	0.016	0.046	0.667
Latvia	0.020	0.090	0.340
Lithuania	0.014	0.032	0.960
Poland	0.037	0.057	0.539
Sweden	0.038	0.039	0.785
	$S_{-i\ min}$	**0.031**	

The relationship between the minimizing and maximizing alternatives (Q_i) is calculated using formula (7). The resulting relationship between the alternatives (Q_i) yields the final required score for ranking U_i calculated using the formula (8). The ranking is carried out on the basis of the U_i values obtained (see Table 7).

Table 7: Calculated Q_i, and U_i, and ranks (compiled by the authors)

Country	Q_i	U_i	**RANK**
Belgium	1.918	4.354	**5**
Denmark	3.371	7.652	**3**
Germany	2.113	4.797	**4**
Spain	0.913	2.073	**9**
France	1.266	2.875	**6**
Croatia	1.259	2.858	**7**
Latvia	0.554	1.258	**10**
Lithuania	0.976	2.216	**8**
Poland	25.390	57.638	**2**
Sweden	44.051	100.000	**1**
MAX	**44.0513**		

The results obtained (Table 7) show that Sweden is in first place and well ahead of Poland, which is the smallest behind it and is in second place. In third place – Denmark. Lithuania ranks eighth and overtakes only Spain and Latvia. Next, a hierarchical cluster analysis is performed, which shows the similarities and differences between the criteria. The SPSS program is used to perform this analysis.

This program would not be able to perform a hierarchical cluster analysis if the data of the selected EU countries did not meet the requirements of symmetry and triangle inequality. When loading data into the program, the program itself shows which criteria the data is correct. In the case of this study, the data for all criteria are correctly selected. The results of the hierarchical cluster analysis can be seen in the dendrogram (see Figure 3).

From Figure 2, in the given dendrogram, 2 large clusters and 4 smaller clusters can be observed. The first cluster includes Latvia, Lithuania, Belgium, Denmark, and Croatia. The states that fall into the first cluster have very similar data, which differ slightly except for water consumption. Water consumption is very different in different states, as the size of the states also varies. Only Sweden is included in the second cluster since the data of this country differs from other countries by all criteria; even the similarities are difficult to discern. The third cluster includes Germany, Spain, and Poland.

These 3 states stand out according to 4 criteria, of which the data of these states are the most similar. Finally, only France falls into the fourth cluster.

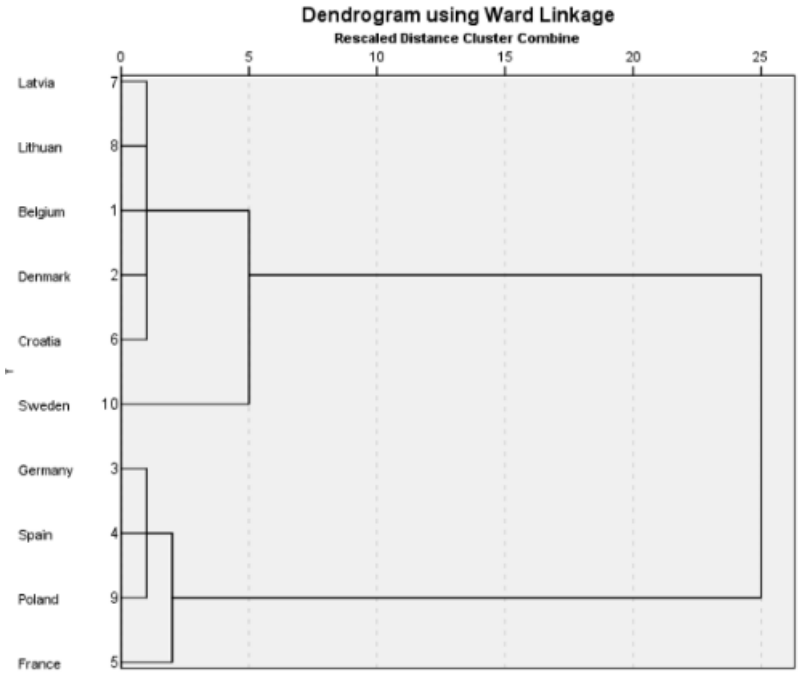

Fig. 2: Results of hierarchical cluster analysis (compiled by the authors)

5. Discussion

When comparing the cluster analysis and ranking performed, there are some differences, but there are also coincidences or minor discrepancies. Lithuania ranked 8th in both the ranking and cluster analysis. The minor discrepancies are such that states have shifted over one position when comparing the COPRAS method and the hierarchical cluster analysis carried out, which can be identified as Denmark, Germany, France, and Croatia. However, it should be distinguished that the ranking is carried out according to the given indicators. From the indicators presented, the countries that are leading in terms of sustainability indicators, in this case, Sweden, are found by ranking. Well, cluster analysis looks for similarities between states; in other words, it looks for the most similar sustainability indicators and connects countries into clusters. In total, 4 clusters are distinguished, 2 clusters contain only 1 state each, in this case, Sweden and France. Taking into account the initial sustainability indicators, Sweden is leading in the following categories: renewable energy, water consumption, and organic farming.

We can conclude that of the EU countries examined, Sweden is the leader in terms of the sustainability criteria chosen to be examined, and we can say that it is the leader in sustainable finance, realizing that every sustainability initiative requires investment.

6. Conclusions

A theoretical analysis of sustainable finance suggests that better ESG indicators are a consequence of sustainable finance. Investing in the environmental sphere ensures environmental friendliness and conservation of nature. Investments in social factors try to ensure the well-being and health of people. Governance factors include the strategies of the companies themselves, be they private or public enterprises, and those who work in them. Investments in governance factors are aimed at ensuring worker safety, better working conditions, and financial usefulness.

The developed methodology for country involvement in sustainability allows to rank countries according to the selected indicators from the most sustainable to the less sustainable (COPRAS method) by giving the weights of the indicators that are not uniform but calculated according to the available data (CRITIC method), and also to cluster countries according to the similarities and differences based on the data of the selected indicators.

The assessment of the sustainable finance of the selected European Union countries showed that

Sweden is most concerned with sustainability and sustainability trends. Latvia was the state that was in the last – tenth place in the ranking. Lithuania took the eighth position. Sweden also distinguished itself according to the results of the hierarchical cluster analysis since this state fell into its own separate smaller cluster. Although France also had its own separate small cluster at the time of the hierarchical cluster analysis, the ranking placed it in 6th place. The rest of the countries were placed in the appropriate places according to sustainability funding, depending on the focus on the sustainable environment and other indicators chosen for the study.

The article has some limitations: data inaccuracy due to data differences in different sources and only a certain number of indicators were examined.

In further research, the number of indicators could be supplemented, more countries could be examined, and the reliability of the obtained results could be based on other methods.

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