European Research Studies Journal
Volume XXIII, Issue 4, 2020

pp. 491-511

Financial and Energy Markets - A Sustainable Approach. Perspective of European Countries Belonging to the OECD

Submitted 11/08/20, 1st revision 16/09/20, 2nd revision 18/10/20, accepted 30/10/20

Magdalena Zioło[1], Iwona Bąk[2], Anna Spoz[3],
Beata Zofia Filipiak[4], Jarosław Kozuba[5], Piotr Niedzielski[6]

Abstract:

Purpose: *This paper sets out to explore the relationships between a sustainable energy market and a sustainable financial market and energy market. The specific research objectives were: to explore whether sustainable finance only correlates with a sustainable energy market, or perhaps this relationship also exists with the traditional energy market, to identify the groups of countries for which there are correlations between the study categories.*
Design/Methodology/Approach: *The empirical analysis is based on data from 2008, 2014, and 2018, as related to the energy market, sustainable energy, and sustainable finance for 28 European countries belonging to the OECD. A taxonomic development measure based on the reference method in the positional approach using the Weber median was used.*
Findings: *The results confirmed the existence of a positive correlation between the energy market and the financial market in a sustainable approach. No such relationship was demonstrated for all three categories at the same time, i.e. energy market, sustainable energy market and sustainable finance.*
Practical Implications: *This research is important for the policies of financial institutions and financial markets from the point of view of developing products and services for sustainable financing, so as to change the structure and improve the effects related to social responsibility (ESG risk reduction).*
Originality/value: *This study examines whether relationships exist between a sustainable energy market and sustainable finance and the energy market in the traditional approach.*

Keywords: *Sustainable finance, sustainable energy market, energy market, financial market.*

JEL classification: *Q01, Q43, Q48.*
Paper Type: *Research study.*
Acknowledgement: *Research results presented in this paper are an element of the project is financed within the framework of the program of the Minister of Science and Higher Education under the name "Regional Excellence Initiative" in the years 2019 – 2022; project number 001/RID/2018/19; the amount of financing PLN 10,684,000.00 and an element of research carried out under the project of National Science Centre Poland (NCN) OPUS13 no 2017/25/B/HS4/02172.*

[1]*Faculty of Economics and Management, University of Szczecin, Poland, e-mail: Magdalena.Ziolo@usz.edu.pl;*
[2]*West Pomeranian University of Technology Szczecin, Faculty of Economics, Poland.*
[3]*Institute of Economics and Finance, The John Paul II Catholic University of Lublin, Poland.*
[4]*Faculty of Economics and Management, University of Szczecin, Poland.*
[5]*Faculty of Transport, Silesian University of Technology, Poland.*
[6] *Faculty of Economics and Management, University of Szczecin, Poland*

1. Introduction

The importance of research dedicated to interactions between the energy market and the financial market is growing as the impact of non-financial risk (Environmental, Social, Governance) on the real and financial sphere becomes more pronounced. Ecological sustainability can be a problematic issue when faced with a more traditional view of economic sustainability based on growth. In contrast, it is explained during the research that ecological sustainability is about the pursuit of well-being, social equity and sustainable degrowth (Schneider *et al.,* 2010). The sustainable degrowth should be sustained indefinitely but is rather to be seen as a process of transition/transformation. Green growth may develop through radical degrowth relating to products and processes that negatively impact on long-term living and production conditions, but also on resource-saving technologies (Yolles, 2012). In this context, the concept of sustainable finance, which fits in the three-dimensional perspective referring to the environmental, social, and economic pillars of sustainable development, is growing in significance.

Governments agreed at Rio + 20 to frame the green economy as an important tool for sustainable development. The assumptions of the green economy are combined with the assumptions of sustainable development and are consistent with the provisions of the Brundtland Report and with Sustainable Development Goal 7 dedicated directly to clean energy.

The World Bank (2011) and Cameron (2012) highlight that green growth is best served by a combination of policy instruments, including price-based policies, norms and regulations, public production and direct investment, information creation and dissemination, education and social responsibility. Official studies and research (UNESCAP, 2012; REN21, 2019; Ryszawska, 2015) indicates that policy priorities include reforming the economic incentives framework, including green taxation.

According to the typology of green economy policies, the system of tax incentives and the availability of financing in the form of loans and credits are instruments that practitioners and experts consider to be permitting this transition towards greener economies, and in particular for stimulating actions for green energy as the renewable energy (Cameron, 2012; Cosbey, 2011; Stafford and Faccer, 2014). The literature indicates the need to take in consideration the financial potential of the geographic areas and the possibilities of accessing unconventional energies by local communities (Neacsa *et al.,* 2020).

Financial markets play a key role in providing financing for the renewable energy market (RES), and each of these markets pursues sustainable development policies (Pociovalisteanu *et al.,* 2010; Thalassinos and Thalassinos, 2006). This paper sets out to explore the relationships between the energy market and the financial market from the sustainable approach perspective (based on sustainable development).

The document "Transforming our world: the 2030 Agenda for Sustainable Development" includes a list of 17 Sustainable Development Goals (SDGs). The 7th Goal included in the document concerns access to affordable, reliable, modern, and sustainable energy by environmental taxation plays a special role. The taxation structure is based on the assumptions proposed by A. Pigou (1920) as expressed in the "Polluter Pays Principle" (PPP), which becomes crucial in the policies to ensure that modern economies turn low-carbon and the European Union is in a position to achieve carbon neutrality by 2050. A system of tax reliefs and accessibility of financing in the form of loans and credits are the other factors having influence on carbon neutrality and the sizes of greenhouse gas emissions. In this context, this paper sets out the following specific research objectives:

- to explore whether sustainable finance only correlates with a sustainable energy market, or perhaps this relationship also exists with the traditional energy market,
- to identify the groups of countries for which there are correlations between the study categories,
- to identify the study category that displays the most frequent changes in the ranking positions of countries.

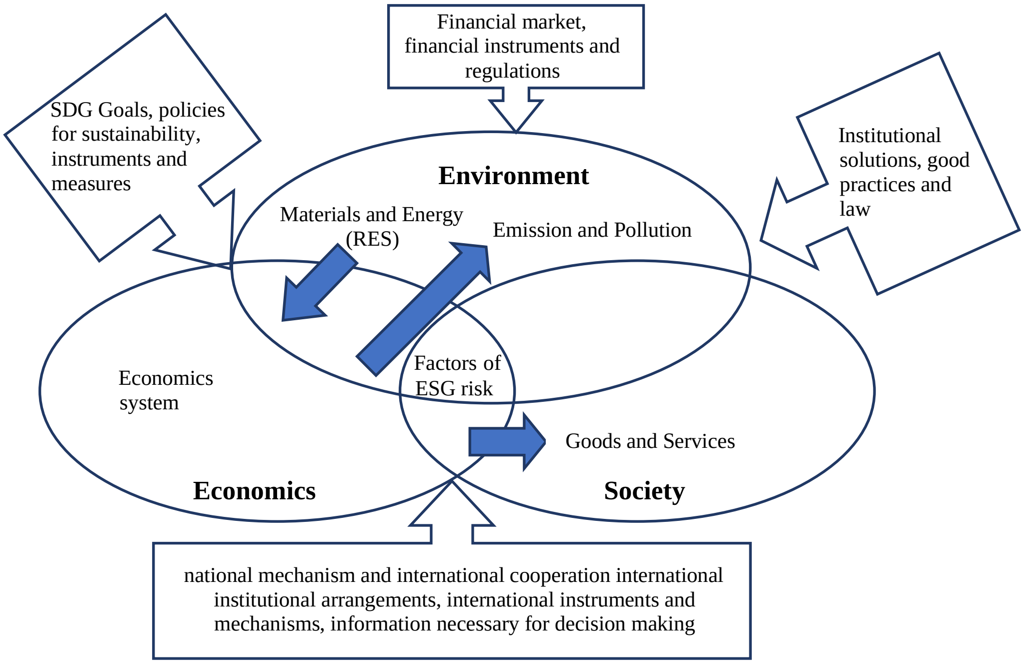
This article contains the following sections: the review of literature, the description of the research methodology, the description of the study results, the discussion of the results, and conclusions pointing to the limitations of the study and the scope of future research.

2. Literature Review

The use of green sources and sustainable development are closely related. Sustainable development is at the crossroads of environment and, therefore, has three dimensions: environmental, social, and economic (Güney, 2019) (Figure 1). Similarly, three dimensions: environmental, social, and economic one refers to ESG risk (Ziolo *et al.*, 2019). The economy uses materials and energy in production by taking them from the environment for the purpose of producing the necessary goods and services for the society; and as a result of these activities, the environment is a subject to emissions and pollutions. The environment that is polluted must be protected from this in order for future generations to be able to use it for their own needs as well.

The increasing costs of environmental degradation indicate the need for long term financing to revitalize degraded areas and change consumers' behaviors towards green consumerism. There is a need to finance innovations that will allow the development of RES and activities to preserve the environment and improve (restore) its quality. Sustainable finance and sustainable financial systems may impact environmental quality (inter alia, green financial products, and environmental taxes) (Schoenmaker, 2017; Curtis *et al.*, 2020).

Figure 1. *Sustainable development concept - linking with ESG risk sources and sustainable energy*

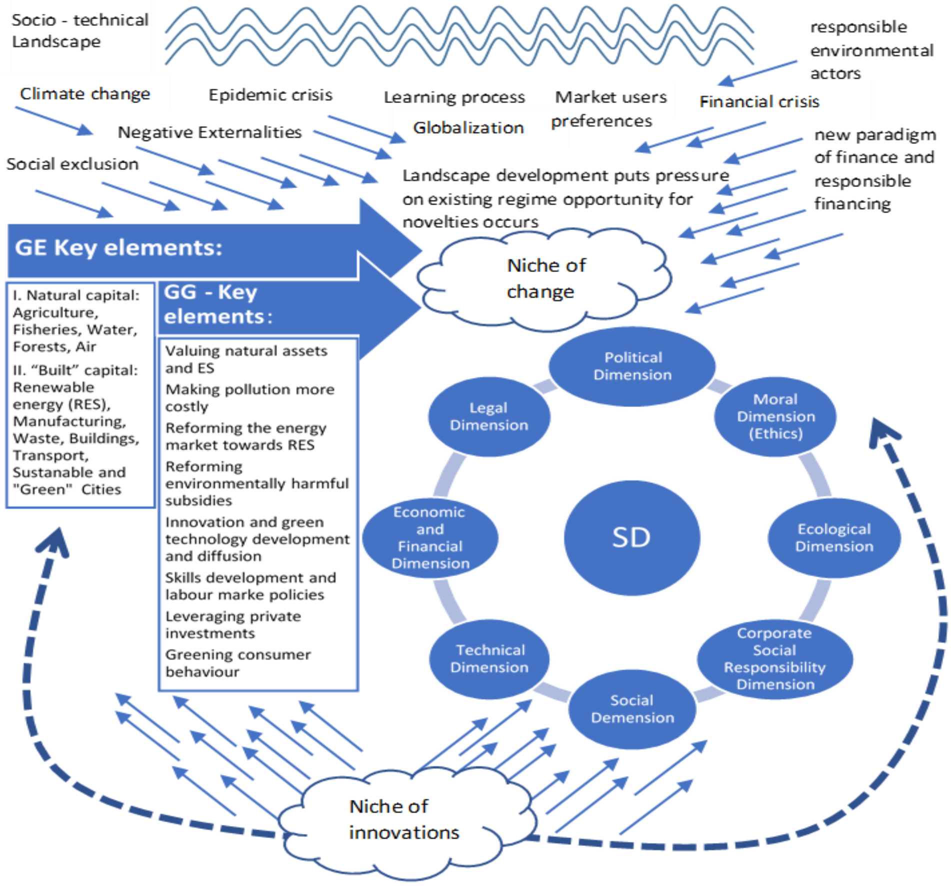


Source: *Own elaboration based on Güney (2019) and Ziolo et al. (2019).*

The SDGs provide guideposts to society as it attempts to respond to an array of pressing challenges. One of these challenges is energy; thus, the SDGs have become paramount for energy policymaking (McCollum *et al.*, 2018). In the recent period, the concept of sustainable development has been linked and it will be the one of accesses to sustainable energy based on RES. The challenge in is that a social and productive development that takes place within the limits set by the "nature" and meets the needs of the present without compromising those of the future generation within a worldwide equitable redistribution of resources (Vezzoli *et al.*, 2018).

The sustainable energy, energy RES market is associated with GG (green growth) and GE (green economy). The literature shows the need for mutual relations between the concept of green economy, green growth and sustainable development looked at from the point of view of mutual feedbacks (Figure 2). Previous approaches to a large extent focused on competitive relationships but there is a need to extend approaches to ESG risk factors. The combination of GG and GE should constitute a practical and flexible approach to achieve specific, measurable progress in two key aspects: economic and environmental. Green growth can provide a solution to economic and ecological problems and create new sources of growth.

Figure 2. *Relations between the concept of green economy, green growth and sustainable development taking into account the impact of ESG risk and financial aspects*



Source: *Own elaboration based on Ziolo et al. (2019), Kasztelan (2017), and Volkery and Rouabhi (2015).*

RES is one of the key elements of GE and an important component of the "built capital" pillar. This pillar is strongly associated with GG and is a key element in building green energy-based economic growth. RES is an important element of sustainability, and thus of SD. It also affects social factors. The innovation gap stimulates technological development. The indicated elements are subject to ESG risk, especially environmental and social.

Effective reduction of CO2 emissions requires innovative investments in GE and taking actions for GG. To force sustainable and adequate investment in RES it is necessary to mobilize capital. Successful financing of innovation in RES requires a better understanding of the relationship between different types of finance and their willingness to invest in RE. However, it should be remembered that financing is based on access to capital of various participant or actors, and it can be driven by financial incentives, a plan to preserve the planet or both may be managed in combination.

A positive relationship between the financial market and the energy market was proved by Nazlioglu *et al.* (2015). The results of research on relationship between the financial market and energy consumption are ambiguous. Rafindadi and Mika'Ilu (2019), Senan *et al.* (2018) and Acaravci and Ozturk (2012) confirmed a positive relationship between the financial market and energy consumption. However, Destek (2018) showed a negative and statistically significant influence of the banking and bond markets development on energy consumption.

Some studies confirm a two-way relationship between the financial market and energy consumption (Thalassinos *et al.*, 2015). Islam *et al.* (2013), showed that financial development measured by domestic credit for the private sector as a share of the GDP leads only to long-term energy consumption, whereas energy consumption causes both long- and short-term financial development.

Anton and Afloarei Nucu (2019) revealed a positive impact of the financial market (in its three dimensions, i.e., the banking sector, bond market, and capital market) on the renewable energy consumption and showed that in the case of the new EU Member States, the capital market development does not influence the consumption of renewable energy. Schwerhoff and Sy (2017) showed that the development of the renewable energy market is conducive to achieving economic, social, and environmental objectives. A sustainable energy market is based on sustainable energy production and consumption (García-Álvarez and Soares, 2018). The role and importance of revenues from environmental taxes for sustainable finance were studied by Diacon *et al*. (2018), Leibus and Mazure (2016). Double benefits from environmental taxes for the environment and for the economy, were discussed by Morley and Abdullah (2010) and Streimikiene (2015).

Integrating funding into climate and energy policies has become a major challenge for governments around the world (Wehrmann, 2020). Green bonds are increasingly used to finance emission reduction, sustainable development, and pro-ecological investment projects (Tolliver *et al.*, 2019). Most likely, the lower cost of financing for bonds than equity investments will support this method of financing and will translate into a growing number of advanced projects in line with the concept of sustainable development and sustainable energy market (Zerbib, 2019). It is difficult to find a reference to research results in the literature which present dependencies in three categories, i.e. the energy market, sustainable energy market, sustainable finance (sustainable financial market). This element determines that our research fills a gap in literature. Usually, relationships between financial development and energy consumption are explored (Shahbaz and Lean, 2012), with a positive correlation between the variables studied. However, there are no studies that would directly indicate the relationship between the energy market, sustainable energy market and sustainable finance.

3. Material and Methods

The empirical analyses presented in this paper based on three groups of indicators (Table 1) related to the energy market (EM – 14 indicators), sustainable energy (SE – 13 indicators) and sustainable finance (SF – 9 indicators)[7]. The study covers three years: 2008, the year of the global economic crisis; 2014, after the end of the 2007-2013 financial perspective of the European Union; and 2018, for which we were able to gather the latest statistical data.

Table 1. *Statistical data*

Symbol	EM
$x_{1.1S}$	Share of renewable energy in gross final energy consumption (%)
$x_{1.2S}$	Energy productivity (Euro per kilogram of oil equivalent (KGOE))
$x_{1.3D}$	Electricity prices by type of user Medium size households (EUR per kWh)
$x_{1.4S}$	Gross available energy by product Total (thousand tonnes of oil equivalent)
$x_{1.5D}$	Final energy consumption by product Total (thousand tonnes of oil equivalent)
$x_{1.6D}$	Final consumption - industry sector - energy use (thousand tonnes of oil equivalent)
$x_{1.7D}$	Final consumption - industry sector - energy use (thousand tonnes of oil equivalent)
$x_{1.8D}$	Final consumption - transport sector - energy use (thousand tonnes of oil equivalent)
$x_{1.9D}$	Final consumption - other sectors - commercial and public services - energy use (thousand tonnes of oil equivalent)
$x_{1.10D}$	Final consumption - other sectors - households - energy use (thousand tonnes of oil equivalent)
$x_{1.11D}$	Final energy consumption in services by type of fuel Solid fossil fuels (thousand tonnes of oil equivalent)
$x_{1.12S}$	Final energy consumption in services by type of fuel Renewables and biofuels (thousand tonnes of oil equivalent)
$x_{1.13D}$	Final energy consumption in industry by type of fuel Solid fossil fuels (thousand tonnes of oil equivalent)
$x_{1.14S}$	Final energy consumption in industry by type of fuel Renewables and biofuels (thousand tonnes of oil equivalent)
Symbol	**SE**
$x_{2.1S}$	Energy productivity (Euro per kilogram of oil equivalent (KGOE)
$x_{2.2S}$	Energy productivity Purchasing power standard (PPS) per kilogram of oil equivalent
$x_{2.3S}$	Share of renewable energy in gross final energy consumption by sector Renewable energy sources (%)
$x_{2.4S}$	Share of renewable energy in gross final energy consumption by sector Renewable energy sources in transport (%)
$x_{2.5S}$	Share of renewable energy in gross final energy consumption by sector Renewable energy sources in electricity (%)

[7] *All indicators were retrieved from: https://ec.europa.eu/eurostat/data/database*

$x_{2.6S}$	Share of renewable energy in gross final energy consumption by sector Renewable energy sources in heating and cooling (%)
$x_{2.7D}$	Energy import dependency by products Total (% of imports in total energy consumption)
$x_{2.8D}$	Energy import dependency by products Solid fossil fuels (% of imports in total energy consumption)
$x_{2.9D}$	Energy import dependency by products Oil and petroleum products (excluding biofuel portion) (% of imports in total energy consumption)
$x_{2.10D}$	Energy import dependency by products Natural gas (% of imports in total energy consumption)
$x_{2.11D}$	Population unable to keep home adequately warm by poverty status Total (% of population)
$x_{2.12D}$	Greenhouse gas emissions in ESD sectors Greenhouse gas emissions in Effort Sharing Decision (ESD) sectors - million tonnes CO2 equivalent (ESD base year=100 / million tonnes CO2 equivalent)
$x_{2.13D}$	Average CO2 emissions per km from new passenger cars (g CO2 per km)
Symbol	**SF**
$x_{3.1S}$	Environmental tax revenues Percentage of total revenues from taxes and social contributions (excluding imputed social contributions) (%)
$x_{3.2S}$	Environmental tax revenues Percentage of gross domestic product (GDP) (%)
$x_{3.3S}$	Energy taxes (million EUR)
$x_{3.4D}$	Consolidated banking leverage, domestic and foreign entities (asset-to-equity multiple)
$x_{3.5S}$	Private sector debt securities by sectors, non-consolidated - % of GDP Non-financial corporations
$x_{3.6S}$	Private sector loans, by sectors, non-consolidated - % of GDP Non-financial corporations
$x_{3.7S}$	Private sector loans, by sectors, non-consolidated - % of GDP Households
$x_{3.8S}$	Private sector loans, by sectors, non-consolidated - % of GDP Non-profit institutions serving households
$x_{3.9S}$	Domestic credit to private sector (% of GDP)

Source: *Own elaboration.*

Each of the analyzed indicators (diagnostic features) were assigned a symbol xi.j, where i means the number of the area which contains a feature, while j means the number of the feature. The impact of each of these features on the analyzed phenomenon was also indicated through its classification among a set of features stimulating growth in an area (symbol S) or de-stimulating this growth (symbol D). Importantly, in the case of EM and SE, most indicators are de-stimulants, i.e., features that have a negative impact on the studied phenomenon. In the area of sustainable finance, on the other hand, stimulants dominate, with only one of the nine features being a de-stimulant.

The studied areas relate to complex phenomena, and possible using multivariate methods, which include taxonomic methods. Synthetic development measures enable the structuring and determination of groups of objects similar in terms of the phenomenon under study. For this purpose, benchmark and non-benchmark measures are used. In non-benchmark methods, a synthetic variable is a function of standardized values of input variables. In contrast, benchmark methods use the concept of a standard object, i.e. a model object with the desired values of input variables. A synthetic measure is construed by measuring the distance between the observed object and the standard object. In this paper, the benchmark approach using the Weber median was used to construe the taxonomic measure of development[8]. First, the diagnostic features were standardized using the following formula:

$$z_{ij} = \frac{x_{ij} - \theta_{0j}}{1{,}4826 \cdot \mathrm{m\tilde{a}d}(X_j)}, \tag{1}$$

where: $\theta_0 = (\theta_{01}, \theta_{02}, \ldots, \theta_{0m})$ is the Weber median for the examined arrangement m of diagnostic features[9], $\mathrm{m\tilde{a}d}(X_j)$ is the median absolute deviation, in which the distance of features in relation to the corresponding coordinates of the Weber vector is tested, i.e. $\mathrm{m\tilde{a}d}(X_j) = \underset{i=1,2,\ldots,n}{\mathrm{med}} \left| x_{ij} - \theta_{0j} \right| \quad (j = 1,2,\ldots m)$. The aggregate measure values were determined according to the following formula:

$$\mu_i = 1 - \frac{d_i}{d_-}, \tag{2}$$

$$d_- = \mathrm{med(d)} + 2.5\mathrm{mad(d)} \tag{3}$$

where: $\mathbf{d} = (d_1, d_2, \ldots, d_n)$ is a vector of distances determined according to the formula: $d_i = \underset{j=1,2,\ldots m}{\mathrm{med}} \left| z_{ij} - \varphi_j \right| \quad \mathrm{i} = 1,2,\ldots,\mathrm{n}$, $\varphi_j = \underset{i=1,2,\ldots,n}{\max} z_{ij}$ – coordinates of the development benchmark vector, which are the maximum values of standardized diagnostic features.

The study covered all the diagnostic features given in Table 1. The authors are aware that some features may be highly correlated, which means duplication of the same information. In the literature on the subject, two alternative solutions are proposed in such cases. The first one recommends using formal-statistical selection, which enables removal of highly correlated features from the set. The other one indicates that where analyses are made, for example, for strategic development policies of countries, for which the established list of monitoring indices is the result of the work of expert teams appointed for this purpose, the use of statistical methods for selection may

[8]*A description of this method can be found, among others, in the following works: Młodak (2006; 2009), Kurzawa et al. (2017).*
[9]*In this paper, the Weber median was calculated in the R-project using the function l1median of the package pcaPP.*

distort the results of the study. In this paper, the latter approach was adopted, hence all the features were qualified in the study.

4. Results

A preliminary analysis of diagnostic features shows that there are large disproportions between the countries studied in terms of the areas studied, i.e. the energy market, sustainable energy, and sustainable finances (Table 2). This is highlighted by high values of the coefficient of variation (Vs) and coefficient of asymmetry (A) for all areas. For EM, regardless of the year studied, variation is higher than 100% for most features (78.6%). Asymmetry measures have also very high values and, which is particularly important, it is always right-side asymmetry, which means that for most EU countries the values of features are below the EU average, which is negative in the case of features that are stimulants with a positive impact on the studied phenomenon, and positive in the case of de-stimulants.

Table 2. *Statistical data*

Symbol	**2008**			**2014**			**2018**		
	average	**Vs**	**A**	**average**	**Vs**	**A**	**average**	**Vs**	**A**
				EM					
$x_{1.1S}$	13.80	75.19	1.15	19.35	59.88	0.94	21.10	54.97	1.13
$x_{1.2S}$	6.03	40.94	0.47	6.86	43.15	0.76	7.39	48.22	1.36
$x_{1.3D}$	0.14	31.45	0.56	0.18	28.95	0.74	0.18	30.17	0.94
$x_{1.4S}$	66715.39	131.75	1.93	59235.22	133.87	2.04	61036.20	129.99	1.95
$x_{1.5D}$	39779.84	130.60	1.93	35921.08	132.35	2.05	37922.71	129.28	1.96
$x_{1.6D}$	39779.84	130.60	1.93	35921.08	132.35	2.05	37922.71	129.28	1.96
$x_{1.7D}$	10517.97	125.47	2.03	9137.77	129.57	2.46	9415.10	127.95	2.50
$x_{1.8D}$	11785.78	130.19	1.69	11034.43	135.28	1.86	11736.02	129.53	1.73
$x_{1.9D}$	5400.73	145.64	2.43	4976.99	145.47	2.33	5415.27	139.39	1.97
$x_{1.10D}$	10931.86	140.97	2.15	9630.07	136.54	2.08	10117.91	135.92	2.05
$x_{1.11D}$	51.16	277.73	4.28	34.58	359.76	5.02	29.85	378.19	5.09
$x_{1.12S}$	127.64	247.79	4.74	173.97	197.42	4.08	353.74	172.51	2.85
$x_{1.13D}$	649.98	140.44	2.14	524.52	166.38	2.54	489.81	163.14	2.73
$x_{1.14S}$	662.69	143.87	2.19	730.24	141.22	2.16	841.31	134.93	2.02
				SE					
$x_{2.1S}$	6.02	41.02	0.46	6.87	43.15	0.75	7.40	48.22	1.36
$x_{2.2S}$	6.55	22.71	0.16	8.04	24.45	0.24	8.87	31.26	1.62
$x_{2.3S}$	13.80	75.19	1.15	19.35	59.88	0.94	21.10	54.97	1.13
$x_{2.4S}$	2.90	82.15	1.35	6.20	79.53	2.41	7.69	63.16	3.50
$x_{2.5S}$	17.74	91.61	1.29	27.21	65.76	0.80	30.78	58.50	0.75
$x_{2.6S}$	19.08	74.82	0.93	25.63	61.39	0.64	28.15	59.49	0.52
$x_{2.7D}$	57.82	46.84	-0.66	54.85	44.93	0.00	56.70	40.60	-0.26
$x_{2.8D}$	74.49	55.60	-0.97	70.77	59.37	-0.78	71.16	54.48	-0.87
$x_{2.9D}$	87.58	37.00	-3.38	88.93	26.28	-3.23	89.73	22.26	-2.78
$x_{2.10D}$	66.44	83.66	-2.10	70.73	69.19	-1.72	77.19	48.67	-1.71
$x_{2.11D}$	11.89	115.16	2.54	11.89	88.73	1.19	8.61	98.22	1.67

$x_{2.12D}$	99.75	130.04	1.72	88.51	131.94	1.80	91.50	129.12	1.73
$x_{2.13D}$	156.01	8.35	-0.68	124.65	7.81	-0.26	120.46	6.69	-0.42
					SF				
$x_{3.1S}$	7.12	21.43	0.55	7.53	23.72	0.16	7.27	23.12	0.05
$x_{3.2S}$	2.51	22.74	0.84	2.68	22.88	0.62	2.62	23.28	0.20
$x_{3.3S}$	7898.80	149.77	2.07	9416.81	151.94	2.00	10505.27	144.36	1.87
$x_{3.4D}$	18.60	40.20	0.57	13.08	34.24	0.70	11.84	27.60	0.14
$x_{3.5S}$	5.85	88.06	0.91	9.57	98.47	1.94	9.01	102.08	1.89
$x_{3.6S}$	97.76	49.84	1.66	101.98	58.62	1.57	94.96	63.52	1.93
$x_{3.7S}$	53.41	49.43	1.19	56.75	53.58	1.01	52.19	51.53	0.92
$x_{3.8S}$	0.47	91.21	1.24	0.61	78.40	0.86	0.50	77.83	1.02
$x_{3.9S}$	98.22	50.42	0.85	90.04	51.66	1.66	78.84	44.27	0.57

Source: *Own elaboration.*

The analysis of descriptive parameters for SE indicates that also in this area there is a high dispersion, although a lower one than in the case of EM. The exception is the feature "Average CO2 emissions per km from new passenger cars", where the coefficient of variation is below 10%. Coefficients of asymmetry are remarkably diverse, but for most features the asymmetry is positive. Two features must be highlighted: $x_{2.9D}$ and $x_{2.10D}$, for which there is a high left-sided asymmetry, meaning that for most EU countries the values of features are above the EU average. All the features in sustainable finance are characterized by a high diversity and a high right-sided asymmetry.

In Tables 3 – 5 there are presented results of the classification of EU countries obtained on the basis of positional measure of development calculated with the inclusion of the features of energy market, sustainable energy and sustainable finance in 2008, 2014 and 2018. In the study of energy market 14 features presented in table 1 were taken into consideration. They were mostly related to renewable energy and final energy consumption in various sectors (industry, transportation, commercial and public services), as well as in households. Majority of the features were de-stimulants, i.e., negatively affected the energy market.

The ranking of EU countries regarding the energy market was presented in Table 3. It should be noted that the situation of the countries in the studied area is quite stable over time. For most of the countries, no significant changes were observed in the positions they occupy in the ranking. Only for two countries, i.e., Hungary and Slovakia, there are differences in three positions, save that in 2018, Hungary moved up by three positions compared to 2008, and Slovakia moved down in the ranking.

The leaders in each of the studied years are invariably Malta, Cyprus, and Estonia, i.e., the countries where energy consumption is below the EU average. The highest energy consumption is observed in Germany, which ranked in the last position.

***Table 3.** Rankings of EU countries in terms of the energy market in the years 2008, 2014 and 2018*

Country	2008 measure	rank	2014 measure	rank	2018 measure	rank
Belgium	0.4281	20	0.3315	21	0.4007	21
Bulgaria	0.8322	9	0.8230	8	0.8230	9
Czechia	0.3792	21	0.4269	20	0.4538	20
Denmark	0.7423	11	0.7391	11	0.7217	11
Germany	-1.1996	28	-1.4310	28	-1.2861	28
Estonia	0.9394	3	0.9399	3	0.9492	3
Ireland	0.7557	10	0.8184	9	0.8197	10
Greece	0.6532	13	0.6382	14	0.6357	14
Spain	-0.0707	24	-0.2532	24	-0.1192	23
France	-0.5375	26	-0.6130	25	-0.5239	27
Croatia	0.8488	8	0.8503	7	0.8685	8
Italy	-0.6451	27	-0.9294	26	-0.4896	26
Cyprus	0.9700	2	0.9768	2	0.9761	2
Latvia	0.9145	4	0.8599	6	0.9211	4
Lithuania	0.9005	7	0.7646	10	0.8785	7
Luxembourg	0.9026	6	0.8936	5	0.9130	5
Hungary	0.6433	15	0.7109	12	0.7078	12
Malta	1.0000	1	1.0000	1	1.0000	1
Netherlands	0.2379	22	0.2065	22	0.2340	22
Austria	0.5933	16	0.5276	18	0.5404	18
Poland	-0.0377	23	-0.1211	23	-0.2036	24
Portugal	0.6662	12	0.6599	13	0.6813	13
Romania	0.5395	17	0.5424	17	0.5607	17
Slovenia	0.9037	5	0.9050	4	0.9070	6
Slovakia	0.5109	19	0.5592	16	0.6058	16
Finland	0.6446	14	0.5833	15	0.6121	15
Sweden	0.5174	18	0.4361	19	0.4836	19
United Kingdom	-0.5132	25	-1.0107	27	-0.4682	25

***Source:** Own elaboration.*

The next field of research was focused on sustainable energy, for the analysis of which 13 diagnostic features were used (Table 1) related mainly to the share of renewable energy in gross final energy consumption by sector and Energy import dependency by products, the first of which had a positive impact on the level of sustainable energy, while the other one impacted the level negatively. The analysis of the positions occupied by each country indicated that in many countries there are differences in the given years (Table 4).

The only country that invariably ranks first is Denmark, which is characterized by a high share of renewable energy, the EU lowest value of the indicator "Energy import dependency by products Oil and petroleum products (excluding biofuel portion) (% of imports in total energy consumption)", and a low "Average CO2 emissions per km from new passenger cars (g CO2 per km)". The most significant change of position in the studied years concerned Ireland, which from 28th place in 2008 advanced by 19 positions ten years later. The situation of Bulgaria and the United Kingdom also changed by 13 positions in the rankings.

Table 4. *Rankings of EU countries in terms of sustainable energy in the years 2008, 2014 and 2018*

Country	2008 measure	2008 rank	2014 measure	2014 rank	2018 measure	2018 rank
Belgium	0.0976	25	0.2400	22	0.1342	27
Bulgaria	0.0826	26	0.3093	16	0.3468	13
Czechia	0.1852	18	0.2460	21	0.2524	21
Denmark	0.7747	1	0.7024	1	0.7751	1
Germany	0.2539	14	0.3283	14	0.2693	20
Estonia	0.2162	17	0.2734	19	0.3508	12
Ireland	0.0362	28	0.3729	10	0.4431	9
Greece	0.1719	19	0.3520	12	0.2985	15
Spain	0.1535	21	0.3542	11	0.1795	25
France	0.2989	10	0.2463	20	0.2715	18
Croatia	0.4012	5	0.4990	4	0.4903	8
Italy	0.2449	16	0.3219	15	0.2941	16
Cyprus	0.1384	22	0.1765	23	0.2196	22
Latvia	0.3547	7	0.5730	2	0.5071	7
Lithuania	0.2767	12	0.3058	17	0.3115	14
Luxembourg	0.0560	27	0.1414	25	0.1946	23
Hungary	0.2492	15	0.1645	24	0.1929	24
Malta	0.1003	23	0.1068	27	0.1066	28
Netherlands	0.2822	11	0.3360	13	0.2701	19
Austria	0.5774	3	0.4904	5	0.5225	4
Poland	0.1674	20	0.1317	26	0.1698	26
Portugal	0.4148	4	0.4510	9	0.5190	5
Romania	0.3868	6	0.4594	8	0.5733	3
Slovenia	0.3167	9	0.4712	7	0.4281	10
Slovakia	0.2701	13	0.0990	28	0.2880	17
Finland	0.3201	8	0.5654	3	0.5106	6
Sweden	0.5861	2	0.4875	6	0.6809	2
United Kingdom	0.0995	24	0.2931	18	0.4259	11

Source: *Own elaboration.*

When constructing the taxonomic measure of sustainable finances, 9 diagnostic features were taken into account (see Table 1), which, apart from the feature $x_{3.4D}$ (Consolidated banking leverage, domestic and foreign entities), turned out to be stimulants, i.e. indicators positively affecting the level of sustainable finance. In all the studied years Cyprus proved to be the leader regarding sustainable finances (Table 5). In contrast, Romania was the worst in this category, where all loan-related ratios ($x_{3.6S}$, $x_{3.7S}$, $x_{3.8S}$, $x_{3.9S}$) reached the lowest values among EU countries. The situation of most countries regarding sustainable finances varied considerably. In the case of countries such as France or Germany it has undergone a systematic improvement. For most countries, however, positions in the ranking were highly unstable. For example, Greece, which ranked 26th in 2004, advanced by 19 places in 2008, and then fell 10 places in 2018. A similar situation concerned Ireland, Italy, Luxembourg, Austria, Slovakia.

Table 5. *Rankings of EU countries in terms of sustainable finance in the years 2008, 2014 and 2018*

Country	**2008**		**2014**		**2018**	
	measure	**rank**	**measure**	**rank**	**measure**	**rank**
Belgium	0.2016	21	0.3041	12	0.3067	13
Bulgaria	0.4003	10	0.1187	22	0.2276	20
Czechia	0.1845	22	0.0746	25	0.0569	23
Denmark	0.5828	3	0.4618	3	0.4611	5
Germany	0.2583	19	0.2591	18	0.3264	10
Estonia	0.4935	6	0.3674	8	0.3004	15
Ireland	0.3764	12	0.4618	4	0.3264	11
Greece	0.0948	26	0.3770	7	0.2590	17
Spain	0.3402	15	0.2981	15	0.2590	18
France	0.1834	23	0.3009	13	0.4899	4
Croatia	0.3882	11	0.1578	20	0.0569	24
Italy	0.3126	18	0.3994	6	0.4072	8
Cyprus	0.6733	1	0.7295	1	0.5611	1
Latvia	0.1077	25	0.0850	24	0.1250	22
Lithuania	-0.0004	27	0.0337	27	0.0569	25
Luxembourg	0.4417	8	0.2796	16	0.3914	9
Hungary	0.3689	13	0.0421	26	-0.0104	27
Malta	0.6045	2	0.2985	14	0.3264	12
Netherlands	0.5817	4	0.3476	9	0.4424	6
Austria	0.2229	20	0.3066	11	0.2225	21
Poland	0.3188	17	0.1388	21	0.2374	19
Portugal	0.5741	5	0.4358	5	0.5050	3
Romania	-0.0303	28	0.0312	28	-0.0104	28
Slovenia	0.4391	9	0.0959	23	0.0569	26
Slovakia	0.1240	24	0.3286	10	0.3012	14
Finland	0.3322	16	0.2709	17	0.4351	7
Sweden	0.3510	14	0.2325	19	0.2823	16
United Kingdom	0.4781	7	0.4652	2	0.5323	2

Source: *Own elaboration.*

Because the country rankings in the examined years are not the same, and in some cases they differ quite significantly, in order to find out the extent of concordance between the orderings of the studied objects, the Kendall tau correlation coefficients were determined (Table 6) along with and the Pearson correlation coefficients (Table 7). The coefficient values show a very good concordance of the linear ordering of countries in terms of the energy market and a good concordance in the area of sustainable energy and sustainable finance, despite the fact that there are discrepancies in the positions occupied by some objects. A check was also made for correlations between different areas and it turned out that only in the areas related to the energy market and sustainable finance there is a moderate correlation (the Kendall tau coefficients are slightly below 0.3).

Table 6. *Kendall tau coefficients*

	EM1	EM2	EM3	SE1	SE2	SE3	SF1	SF2	SF3
EM1	1.0000	0.9206	0.9418	-0.0159	0.0476	0.0847	0.2857	-0.0265	-0.1323
EM2	0.9206	1.0000	0.9471	-0.0423	0.0212	0.0582	0.2910	-0.0212	-0.1376
EM3	0.9418	0.9471	1.0000	-0.0529	0.0212	0.0688	0.2910	-0.0212	-0.1376
SE1	-0.0159	-0.0423	-0.0529	1.0000	0.4603	0.5397	-0.1164	-0.1323	-0.0899
SE2	0.0476	0.0212	0.0212	0.4603	1.0000	0.6243	-0.0423	-0.0159	-0.0794
SE3	0.0847	0.0582	0.0688	0.5397	0.6243	1.0000	-0.0476	0.0529	-0.0423
SF1	0.2857	0.2910	0.2910	-0.1164	-0.0423	-0.0476	1.0000	0.3175	0.3598
SF2	-0.0265	-0.0212	-0.0212	-0.1323	-0.0159	0.0529	0.3175	1.0000	0.6402
SF3	-0.1323	-0.1376	-0.1376	-0.0899	-0.0794	-0.0423	0.3598	0.6402	1.0000

Source: *Own elaboration.*

Table 7. *Pearson correlation coefficients*

	EM1	EM2	EM3	SE1	SE2	SE3	SF1	SF2	SF3
EM1	1.0000	0.9917	0.9947	0.0894	0.1391	0.2027	0.1582	-0.0995	-0.2925
EM2	0.9917	1.0000	0.9868	0.0982	0.1170	0.1823	0.1440	-0.1176	-0.3124
EM3	0.9947	0.9868	1.0000	0.0749	0.1255	0.2019	0.1559	-0.0847	-0.2893
SE1	0.0894	0.0982	0.0749	1.0000	0.7293	0.7895	-0.0349	-0.0736	-0.0691
SE2	0.1391	0.1170	0.1255	0.7293	1.0000	0.8696	-0.0409	-0.0587	-0.0721
SE3	0.2027	0.1823	0.2019	0.7895	0.8696	1.0000	-0.0048	0.0094	-0.0113
SF1	0.1582	0.1440	0.1559	-0.0349	-0.0409	-0.0048	1.0000	0.5691	0.5563
SF2	-0.0995	-0.1176	-0.0847	-0.0736	-0.0587	0.0094	0.5691	1.0000	0.8557
SF3	-0.2925	-0.3124	-0.2893	-0.0691	-0.0721	-0.0113	0.5563	0.8557	1.0000

Source: *Own elaboration.*

5. Discussion

Based on the studies carried out, ranking groups of European countries belonging to the OECD were established for 2008, 2014, 2018 in three categories, i.e. the energy market, sustainable energy market, sustainable finance (sustainable financial market). For the first of the rankings for the energy market (EM), variables such as energy productivity and final energy consumption were key. At the top of the ranking were Malta, Cyprus and Estonia, which are the smallest economies, and therefore have the lowest energy demand and consumption, which corresponds to a sustainable approach that promotes low-carbon economy and energy conservation. Malta and Cyprus, due to their island location, are most dependent on external energy supplies and isolated from European energy infrastructure.

The last ranking places are occupied by Germany, Italy, France, the United Kingdom and Spain, i.e. large and industrialized economies. In the United Kingdom (as in Norway, the Netherlands and Romania) there is a concentration of gas resources. At the same time, the United Kingdom, Germany, and Spain have brown coal resources.

In recent years, there has been a decrease in energy intensity in the Member States of the European Union, which is the result of having energy-saving solutions implemented throughout the economy. This trend can be observed, among others, in the transport sector, i.e. the most energy-intensive sector of the economy, which contributes to the changes in the country rankings in individual years.

The second ranking analyzing individual countries in terms of a sustainable energy market assesses primarily the degree of transformation of the energy market towards RES and the increase in energy efficiency, which has an impact on the size of greenhouse gas emissions. Economies based on RES record significant reductions in greenhouse gas emissions and a positive environmental effect. In the sustainable energy market ranking, the first places are occupied by Denmark, Sweden, Austria, and Latvia. The Nordic countries dominate in terms of the share of energy from renewable sources in total energy consumption. Sweden is the leader in this area (54.5%). Finland (41.0%), Latvia (39.0%), Denmark (35.8%) and Austria (32.6%) follow suit. The lowest share of renewable energy in total energy consumption have Luxembourg (6.4%), Malta (7.2%), Belgium (9.1%), Cyprus (9.9%) and the United Kingdom (10.2%). European Union Member States differ widely in terms of RES energy consumption. In Austria (72.2%), Sweden (65.9%) and Denmark (60.4%), over 60% of all electricity consumed was generated from renewable energy sources (hydropower, solid biofuels). Further, more than half of electricity consumed in Portugal (54.2%) and Latvia (54.4%) came from RES. On the other side, in Cyprus, Hungary, Luxembourg and Malta, the share of electricity produced from RES was less than 10%. The use of renewable energy in transport increased rapidly in Ireland, Luxembourg, Malta, Finland, and Sweden (Energy, transport, and environment statistics, 2019).

As regards sustainable finance, the role of environmental taxes in individual countries was significant, along with the groups of Internal imbalances indicators among the Macroeconomic imbalance indicators, introduced by the EU after the 2008 crisis. Environmental taxes are designed to offset negative environmental impacts and support low-carbon economy, so their role is crucial in the transformation of the energy market towards RES. In turn, the Macroeconomic imbalance indicators (financial perspective) provide information on financial stability and sustainable finance. In the sustainable finance ranking, such countries as Cyprus, Malta, Denmark, Finland, the United Kingdom and Portugal ranked at the top. In each of these countries, the indicator Environmental taxes, % of tax and social contributions is higher than the EU average. Romania, Hungary, Croatia, Lithuania, Latvia, and the Czech Republic came last in the ranking. These are countries with macroeconomic imbalances of different nature.

A comprehensive analysis of all rankings demonstrates links among countries that rank high in the lists for the energy market and the sustainable energy market, and the list for sustainable finance. Low energy intensity economies are also countries with high positions in the ranking of sustainable finance (Cyprus, Malta), just as economies with a high share of renewable energy in total energy consumption are countries ranking high in terms of sustainable finance (Denmark, Finland, Austria). However, it is difficult to unequivocally indicate the same leader countries for all the three rankings.

6. Conclusions

Existing studies confirm the link between the energy market and the financial market. However, research on these matters in the sustainable approach is still in shortage. This paper set out to fill this gap in the literature. In view of the confirmed correlations between the financial market and the energy market, we decided to explore whether similar relationships exist between a sustainable energy market and sustainable finance and the energy market in the traditional approach.

The detailed results of the study demonstrate that sustainable finance is correlated with the energy market only in the case of Cyprus, while such a link was not found for other countries. A link between sustainable finance and a sustainable energy market is evident in more countries, and particularly pronounced in the Nordic countries (Denmark) as well as the United Kingdom and Austria. In terms of the energy market, the ranking positions of countries remain stable over time, which comes from the specific, constant nature of the examined features; this is true, among others, for the structure of energy sources of individual economies, energy consumption by sector, or dependence on energy imports.

In the other two rankings, the changes in individual positions are more visible due to factors such as the transformation towards renewable energy, which is accompanied, among others, by technological change, supporting low carbon and energy efficiency policies. These factors influence ranking positions in terms of the sustainable energy market. Financial factors related to sustainable finance also evolved over the analyzed period. Environmental taxation systems and their role in individual EU countries are developing. After the financial crisis, i.e. since 2008, several mechanisms have been introduced in the European Union with a view to stabilizing the financial market, which has eliminated the practices of excessive leveraging and related financialization. EU Member States are covered by assessment for macroeconomic imbalance indicators, which ensures financial and economic sustainability in these countries over the long term, with an overall positive effect on sustainable finance.

The specific nature of the phenomenon studied, and the importance of the problem causes reflections on the possibilities of using the obtained research results in practice. The authors are aware that the obtained rankings are the result of the indicators adopted by the authors – with different selection of these indicators the results obtained may be different. Therefore, built up recommendations and suggestions are formulated generally based on achieved research results and rankings. Our recommendations and suggestions are as follows:

1. Governments should take necessary steps to raise the public awareness about relationships between a sustainable energy market and sustainable finance.
2. Financial market entities and institutions should review the policies on green financing that is urgent to stimulate the progress of sustainable finance and energy market.
3. Financial instruments should be constantly monitored so that they should ensure finance in different environment friendly projects and investment should be increased for green energy market.
4. Our research could be important for the policies of financial institutions and financial markets from the point of view of developing products and services for sustainable financing, so as to change the structure and improve the effects related to social responsibility (ESG risk reduction).
5. Governments must monitor the financial market institutions about the application of green guidelines to build green products dedicated RES.
6. Governments should analyze their ranking positions of the energy market and change policy to improve the structure of energy sources of individual economies, energy consumption by sector, or dependence on energy imports.
7. National and local government units should analyze the role of environmental taxes. Environmental taxes are designed to offset negative environmental impacts and support low-carbon economy, so their role is crucial in the transformation of the energy market towards RES. This analysis is necessary from the point of view of the role of taxes and the design of tax instruments.
8. Governments should follow macroeconomic imbalance indicators (financial perspective), which provide information on financial stability and sustainable financing. It will allow them to take swift actions to restore balance and change instruments that promote sustainable financing.

Due to the accessibility and comparability of data over time and the specific nature of the studied phenomenon, the study has some limitations. In particular, the selection of variables was problematic. Data on sustainable finance is very limited, and basically from an environmental impact point of view it is limited to information on environmental taxes. Other financial data relates to the economic pillar of sustainable development and refers to sustainability in the context of debt financing. Within future in-depth research, the authors intend to expand the context of the studied financial variables to incorporate data from the commercial sector, related to green loans and green bonds.

References:

Acaravci, A., Ozturk, I. 2012. Electricity consumption and economic growth nexus: A multivariate analysis for Turkey. Amfiteatru Economic, 14, 246-257.

Anton, S.G., Afloarei Nucu, A.E. 2019. The effect of financial development on renewable energy consumption. A panel data approach. Renewable Energy, 147, 330-338.
Cameron, A. 2012. A guidebook to the Green Economy, Issue 3. Exploring green economy policies and international experience with national strategies. Division for Sustainable Development, UNDESA.
Cosbey, A. 2011. Trade, sustainable development and a green economy: Benefits, challenges and risks. In: The Transition to a Green Economy: Benefits, Challenges and Risks from a Sustainable Development Perspective. UNCTAD, New York.
Curtis, P., Hanias, M., Kourtis, E., Kourtis, M. 2020. Data Envelopment Analysis (DEA) and Financial Ratios: A Pro-Stakeholders' View of Performance Measurement for Sustainable Value Creation of the Wind Energy. International Journal of Economics and Business Administration, 8(2), 326-350. DOI: 10.35808/ijeba/465.
Destek, M.A. 2018. Financial development and energy consumption nexus in emerging economies. Energy Sources, 13, 76-81.
Diaconu, A., Balu, O.F., Stancioiu, F. 2018. Environmental Taxes in Europe Union. Quality - Access to Success, Supplement 1, 19, 208-211.
García-Álvarez, M.T., Soares, I. 2018. Empirical assessment of sustainable energy markets in the EU-28. Environment, Development and Sustainability, Supplement 1, 20(1), 83-108.
Güney, T. 2019. Renewable energy, non-renewable energy and sustainable development. International Journal of Sustainable Development & World Ecology, 26(5), 89-397.
Islam, F., Shahbaz, M., Ahmed, A.U., Alam, M.M. 2013. Financial development and energy consumption nexus in Malaysia: A multivariate time series analysis. Economic Modelling, 30, 435-441.
Kasztelan, A. 2017. Green Growth, Green Economy and Sustainable Development: Terminological and Relational Discourse. Prague Economic Papers, 26(4), 87-499.
Kurzawa, I., Łuczak, A., Wysocki, F. 2017. Zastosowanie metod taksonomicznych i ekonometrycznych w wielowymiarowej analizie poziomu życia mieszkańców powiatów w Polsce. Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu 468, 127-137.
Leibus, I., Mazure, G. 2016. Analysis of Environmental Tax Revenues in The Baltic States. International Multidisciplinary Scientific Geo-conference, SGEM, 3, 19-26, Sofia.
McCollum, D., Echeverri, L., Busch, S., Pachauri, S., Parkinson, S. 2018. Connecting the sustainable development goals by their energy inter-linkages. Environmental Research Letters, 13, 033006.
Młodak, A. 2006. Analiza taksonomiczna w statystyce regionalnej. Centrum Doradztwa i Informacji, DIFIN, Warszawa.
Młodak, A. 2009. Historia problemu Webera. Matematyka Stosowana 10/5, 3-21.
Morley, B., Abdullah, S. 2010. Environmental Taxes and Economic Growth: Evidence from Panel Causality Tests. University of Bath, Department of Economics Working Papers.
Nazlioglum, S., Soytas, U., Gupta, R. 2015. Oil prices and financial stress: A volatility spillover analysis. Energy Policy, (82), 278-288.
Neacsa, A., Panait, M., Muresan, J., Voica, M. 2020. Energy Poverty in European Union: Assessment Difficulties, Effects on the Quality of Life, Mitigation Measures. Some Evidence from Romania. Sustainability, 12(10), 4036.
Pigou, A. 1920. Economics of Welfare, 1st edition. Macmillan Publishing, London.
Pociovalisteanu, M.D., Thalassinos, I.E., Tirca, A. and Filho, L.W. 2010. Trends and challenges in the energy sector of Romania in the post-accession to the European

Union. International Journal of Environmental Technology and Management, 12(1), 3-15, DOI: 10.1504/IJETM.2010.029957.

Rafindadi, A.A., Mika'Ilu, A.S. 2019. Sustainable energy consumption and capital formation: Empirical evidence from the developed financial market of the United Kingdom. Sustainable Energy Technologies and Assessments 35, 265-277.

REN21. 2019. Asia and the Pacific Renewable Energy Status Report. Renewable Energy Policy Network for the 21st Century (REN21).

Ryszawska, B. 2015. Green Economy Indicators. In: Towards a green economy. From ideas to practice. Wydawnictwo Uniwersytetu Łódzkiego, Łódź, Poland.

Schneider F., Kallis, G., Martinez-Alier, J. 2010. Crisis or opportunity? Economic degrowth for social equity and ecological sustainability; Introduction to this special issue. Journal of Cleaner Production, 18(6), 511-518.

Schoenmaker, D. 2017. Investing for the Common Good: A Sustainable Finance Framework. Bruegel: Brussels, Bruegel Essay and Lecture Series.

Schwerhoff, G., Sy, M. 2017. Financing renewable energy in Africa –Key challenge of the sustainable development goals. Renewable and Sustainable Energy Reviews, 75, 393-401.

Senan, N.A.M., Mahmood, H., Liaquat, S. 2018. Financial Markets and Electricity Consumption Nexus in Saudi Arabia. International Journal of Energy Economics and Policy, 8(1), 12-16.

Shahbaz, M., Lean, H.H. 2012. Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. Energy Policy, 40, 473-479.

Stafford, W., Faccer, K. 2014. Steering towards a Green Economy. Shutterstock, CSIR.

Streimikiene, D. 2015. Impact of environmental taxes on sustainable energy development in Baltic States. Czech Republic and Slovakia, E+M Ekonomie a Management 18, 4-23.

Thalassinos, I.E., Thalassinos, E.P. 2006. Stock Markets' Integration Analysis. European Research Studies Journal, 9(3-4), 3-14.

Thalassinos, I.E., Pintea, M., Rațiu, I.P. 2015. The Recent Financial Crisis and Its Impact on the Performance Indicators of Selected Countries during the Crisis Period: A Reply. International Journal of Economics and Business Administration, 3(1), 3-20, https://www.um.edu.mt/library/oar//handle/123456789/31257.

Tolliver, C., Keeley, A.R., Managi, S. 2019. Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability. Journal of Cleaner Production, 244(118643).

UNESCAP and KOICA. 2012. Low Carbon Green Growth Roadmap for Asia and the Pacific.

Vezzoli, C., Ceschin, F., Osanjo, L., M'Rithaa, M., Moalosi, R., Nakazibwe, V., Diehl, J. 2018. Energy and Sustainable Development. In: Designing Sustainable Energy for All. Springer Nature, Switzerland AG., 3-22.

Volkery, A., Rouabhi, S. 2015. Green Economy and Sustainable Development. A Historical Account of the Discourse around Sustainable Development and Green Economy. KNOSSOS Policy Briefings: Green Economy, Discussion Paper, UNEP, IEEP, GLOBE-EU.

Wehrmann, B. 2020. Green and sustainable finance in Germany. Available online: https://www.cleanenergywire.org/factsheets/green-and-sustainable-finance-germany.

World Bank. 2011. From Growth to Green Growth: A Fraework. World Bank Group, Washington.

Yolles, M. 2018. Sustainability development: part 3 – the cybernetics of co-evolution through amenity. International Journal of Markets and Business Systems, 3(3), 276-296.

Zerbib, O.D. 2019. The effect of pro-environmental preferences on bond prices: Evidence from green bonds. Journal of Banking and Finance, 98, 39-60.

Ziolo, M., Filipiak, B., Bąk, I., Cheba, K. 2019. How to Design More Sustainable Financial Systems: The Roles of Environmental, social, and Governance Factors in the Decision-Making Process. Sustainability 11, 5604.