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Energy market, quality of life, and Sustainable Development: The EU consumers' perspective

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ABSTRACT:
Energy has become one of the core aspects of the daily life of EU consumers, given the current marketing macroenvironment. The accelerated transition to green energy production and consumption has immediately impacted the quality of their daily lives with direct consequences in terms of the costs and comfort of their living. Increased energy expenditures and decreased home temperatures led to a mix of reactions in the form of migrating between suppliers, switching to green energy sources, or simply saving money by switching off lights and turning off heating. Three years have been enough to observe the emergence of an energy-matter expressed by an imbalance between the macro and microeconomic perspectives regarding the subject, with economic, social, and environmental consequences for all the stakeholders.
The paper presents the results of an investigation conducted using secondary data and from a market-oriented perspective on consumers' behavior regarding energy consumption, aiming to identify a path towards an organic transition balancing traditional and green energy sources to ensure the quality of life and support the sustainable development of the EU countries.

Keywords: energy market, green transition, EU consumers, quality of life, sustainable development

1. Introduction

Recent years have witnessed rapid and significant changes in the European Union energy market as a result of the attempts to stimulate decarbonization of the economy and society through increasing the share of renewable sources employed to generate energy, mostly electricity, used in transport, heating, and household consumption, that have exposed consumers to interesting but costly opportunities (more flexible supply, lower environmental impact), and the possibility to save money balanced by increased prices and vulnerability in relation to suppliers (BEUC, 2019).

Access to energy is essential for satisfying the basic needs of consumers, stimulating economic growth and human development, affecting productivity, health, education, access to clean water sources, and communications (Gaye, 2007). Energy is the element that contributes significantly to increasing the individual quality of life and sustainable economic development of nations (Adedoyin et al., 2023); increased access to energy allowed consumers from European countries to live longer and at superior levels of quality in a cleaner and more comfortably environment, the bonus is represented by the decrease of the energy consumption without affecting the quality of life as a result of implementing energy efficiency and saving policies (Makarova et al., 2020).

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Driving most of the World's economic activity, the employment of energy resources in industry, transportation, residential, and commercial sectors has been and is directly related to the concept of sustainability (Toklu et al., 2010). Conventional energy sources (coal, oil, and natural gas) have provided a solid background for economic progress, but at the same time have affected the environment and human health, generating global problems impacting and influencing the quality of individual life and the overall development of societies (Akella et al., 2009).

Analyzing the primary energy consumption in European countries, Kosowski et al. (2023) pointed out the visible shift from solid fossil fuels to renewable energy sources emphasizing the need for a diversified energy strategy, the implications of dependence on a single energy source, and the importance of diversifying primary energy sources, considering their advantages and disadvantages, to ensure the energy security of countries and designing and putting into practice an efficient energy policy that takes account of economic, environmental and social aspects.

Even the share of renewables in the gross final energy consumption is one of the best indicators to express the greening of the energy sector and decarbonization of the economy (Presno and Landajo, 2021), illustrating the progress in the energy transition (Oleńczuk-Paszel and Sompolska-Rzechuła, 2025), the shift to renewables must also consider the impact of the economic and social factors: positive, due to the effects of the education, life expectancy, and governance, yet also negative, due to the higher related costs (Camacho Ballesta et al., 2022). According to Dirma et al. (2024), the main, particularly environmental, benefits generated (such as the reduced greenhouse gas emissions, improved air quality, and reduced dependence on fossil fuels) are to be balanced with the challenges to be approached (high initial costs, technological limitations, policy barriers, and regional disparities) when adopting renewable sources.

According to Bonsu and Muzindutsi (2017), consumption is one of the determinants of citizens' well-being, the household consumption being generally regarded as the ultimate purpose of economic activity, while the level of consumption per capita describes the productive success of an economy. One of the most relevant indicators describing economic and social well-being, also correlated to the human development index (Palát and Kunc, 2013), is the household consumption expenditures reflecting their spending behavior and purchasing power and providing relevant insights in the analysis of overall macro-economic performances (Madudova and Corejova, 2023).

According to Costanza et al. (2007), the quality of life is either how human needs are satisfied or how individuals or groups perceive satisfaction or dissatisfaction in different domains of life. In this context, access to energy appears as one of the fundamental factors affecting the quality of life, domestic energy consumption being a major segment of the market, and households hold a special position among the energy consumers (Joyeux and Ripple, 2007; Matuszewska-Janica et al., 2021). As a high quality of life tends to be associated with a similarly high consumption of natural resources (Wiesli et al., 2021), energy consumption is a significant driver for both economic development and improving the quality of life of the population (Borja-Patiño et al., 2024).

Marques and Fuinhas (2012) have shown that energy consumption can be seen either as an indicator of development or of efficiency, observing that, on the one hand, a higher energy consumption could stimulate economic growth, but, on the other hand,

could increase the related expenses, thus the overall economic cost. The significant relationships between energy consumption, quality of life, population growth, social inequality, and effectiveness of government policies tend to play a relevant role for future energy demands (Pasten and Santamarina, 2012).

Fanning and O'Neill (2019) have shown the role of a barometer for happiness played by the per capita consumption of energy noticing that when it decreases, the average happiness tends also to decrease, while when it increases, the happiness tends to remain constant but at least does not decrease. Adding sustainability in connection to consumption and happiness, Sameer et al. (2021) have observed that an increased consumption is correspondingly associated with a higher level of happiness, and, consequently, with an improved quality of life, and, also, that a more responsible consumption supports a sustainable growth, concluding that happier, intensively yet responsibly consuming nations can develop sustainably and live a better-quality life.

Correlating human energy needs with the quality of life, Shyu (2024) has identified and described the basic human energy needs at the household level advancing four related levels: needs for a decent quality of life, needs for an adequate quality of life, needs for a comfortable quality of life, and needs for an excessively comfortable of the quality of life. According to his view, after satisfying energy needs for a decent quality of life, in modern society, consumers tend to continuously improve the quality of life to satisfy other human needs, which will lead to higher energy consumption and the increased energy consumption will lead to a higher quality of life.

Piao and Managi (2023) have identified that people are more satisfied and happier with their lives when their energy consumption reaches higher levels, as electricity, natural gas, water, or gasoline are indispensable in everyday life, and a reduction in their consumption or the overall household consumption tends to decrease consumers' satisfaction. The correlation of the observations on consumption (including the specific energy consumption), happiness (as a direct expression of the quality of life), and sustainability (as a feature of economic and social development) suggest an in-depth and organic need for a strategic approach positioning the energy market as a driver and the energy consumer as the main beneficiary of an improved standard of living and sustainable society.

In the context of energy development of the EU market, Jędrzejczak-Gas et al. (2024) have concluded that there is no correlation between sustainable energy and sustainable economic development, despite all the policy considerations according to which the sustainable energy sector will stimulate economic growth and will positively impact economic development, yet identifying three energy-related objectives of sustainable development: keeping energy prices at the lowest possible level, limiting the negative environmental impact of the energy production and consumption, and securing the energy supply provided to the market.

Słupik et al. (2021a) have argued that the socio-economic reality of the European Union countries requires a holistic approach to the people and their needs, emphasizing the well-being and the quality of life of the consumer. The rational and efficient consumption of energy, as a result of both understanding the consumers' way of thinking and considering their needs and preferences, may represent the appropriate way to prevent depletion and waste of the energy resources, preserve ecosystems, and support the

sustainable economic growth (Słupik et al., 2021b).

The consumer remains at the center of the energy market – quality of life – sustainable development triad, and all attempts to redesign the energy market organization, enjoy a quality life, and live in a sustainable context must start with the consumer's needs and behavior. As Cheba et al. (2022) stated, changing consumer attitudes towards accepting green technological solutions and regulations are needed in order to produce the green transformation by integrating economic growth and environmental care, using more efficiently and rationally available resources, minimizing the environmental impact, lowering energy consumption, reducing greenhouse gas emissions, and, last but not least, improving the quality of life.

2. Methodological notes

The scope of this exploratory research approach was to explore the connections between the areas of energy, quality of life, and sustainable development questioning the relationships between the energy market and sustainable development, energy market and quality of life, and quality of life and sustainable development considering that energy represents one of the pillars of sustainable development, also that energy consumption is essential for the quality of life, and, last but not least, that quality of life and sustainable development are significantly associated.

A set of 17 research variables – five describing the energy market, seven sustainable development, and the other five quality of life – has been considered to illustrate and allow the measurements of the relationships between the investigated areas:

- En-FHC: Final energy consumption of the households (in thousand tonnes of oil equivalent, 2023);
- En-%FHC: Share of the households in the final energy consumption (percentage, 2023);
- En-FHCc: Final energy consumption of the households per capita (in thousand tonnes of oil equivalent per capita, 2023);
- En-%RHC: Share of renewables in the final energy consumption of households (percentage, 2023);
- En-RHC: Renewables consumption for producing energy for households' consumption (in thousand tonnes of oil equivalent, 2023);
- SD-GDPc: Gross Domestic Product per capita (at market prices in euro, 2023);
- SD-FExc: Final consumption expenditures per capita (at current prices, in euro, 2023);
- SD-Emp: Total employment rate (percentage in the total population 20-64, 2023);
- SD-Pov: At-risk-of-poverty (percentage in the total population, 2023);
- SD-GHG: Net greenhouse gas emissions (tons per capita, 2022);
- SD-HWs: Households hazardous and non-hazardous waste (kilograms per capita, 2022);
- SD-TWs: Total hazardous and non-hazardous waste (kilograms per capita, 2022);
- QL-Sat: Overall life satisfaction (persons over 16 years old, all ISCED 2011 levels,

2023);

- QL-PBH: Immediate perception of happiness (persons being happy in the last 4 weeks (2023);
- QL-WHs: Happiness Index (average life evaluation scores, 2022);
- QL-HDI: UNDP Human Development Index (average scores of achievements in key dimensions of human development, 2022);
- QL-Pro: Legatum Index of Prosperity (average prosperity scores, 2023).

Secondary data regarding energy consumption, sustainable development, and quality of life at the level of the European Union provided by the European Commission (Eurostat, 2025), Wellbeing Research Centre at the University of Oxford, in partnership with Gallup, the UN Sustainable Development Solutions Network and the World Happiness Report's editorial board (Helliwell et al., 2023), UNDP (2024), and Legatum Institute (2023), have been employed to measure and assess the associations between the considered variables. Pearson correlation coefficients have been calculated using JASP (JASP Team, 2024), the open-source project supported by the University of Amsterdam, and employed to assess the relationships between the selected variables describing energy consumption, sustainable development, and quality of life.

3. Main findings

Only five out of 35 relationships describing the relationship between energy consumption and sustainable development have proven to be statistically significant, while values of the Pearson correlation coefficients higher than 0.400, indicating associations of at least an average intensity, have been measured for only four out of 35 cases, both observations suggesting a rather limited connection between the energy consumption and sustainable development.

Table 1: Energy and sustainable development

Pearson's Correlations

Variable		En-FHC	En-%FHC	En-FHCc	En-%RHC	En-RHC	SD-GDPc	SD-FExc	SD-Emp	SD-Pov	SD-GHG	SD-HWs	SD-TWs
1. En-FHC	Pearson's r	—											
	p-value	—											
2. En-%FHC	Pearson's r	0.174	—										
	p-value	0.386	—										
3. En-FHCc	Pearson's r	0.088	0.402*	—									
	p-value	0.663	0.037	—									
4. En-%RHC	Pearson's r	−0.186	0.502**	0.067	—								
	p-value	0.353	0.008	0.739	—								
5. En-RHC	Pearson's r	0.942***	0.250	0.084	−0.005	—							
	p-value	< .001	0.209	0.675	0.980	—							
6. SD-GDPc	Pearson's r	0.010	−0.391*	0.347	−0.679***	−0.085	—						
	p-value	0.960	0.044	0.076	< .001	0.674	—						
7. SD-FExc	Pearson's r	0.143	−0.359	0.463*	−0.627***	0.044	0.930***	—					
	p-value	0.476	0.066	0.015	< .001	0.828	< .001	—					
8. SD-Emp	Pearson's r	−0.119	0.029	0.233	−0.194	−0.244	0.170	0.163	—				
	p-value	0.554	0.887	0.242	0.333	0.221	0.398	0.416	—				
9. SD-Pov	Pearson's r	−0.108	0.090	−0.270	0.327	−0.064	−0.300	−0.346	−0.422*	—			
	p-value	0.593	0.654	0.173	0.096	0.749	0.129	0.077	0.028	—			
10. SD-GHG	Pearson's r	−0.030	−0.128	0.276	−0.226	−0.087	0.553**	0.444*	0.172	−0.272	—		
	p-value	0.883	0.525	0.164	0.257	0.665	0.003	0.020	0.391	0.169	—		
11. SD-HWs	Pearson's r	0.231	−0.013	−0.044	−0.215	0.210	0.075	0.191	0.183	−0.109	−0.103	—	
	p-value	0.246	0.948	0.829	0.282	0.293	0.710	0.339	0.361	0.589	0.608	—	
12. SD-TWs	Pearson's r	−0.129	−0.085	0.495**	−0.088	−0.132	0.285	0.340	0.201	0.115	0.156	−0.311	—
	p-value	0.521	0.672	0.009	0.662	0.511	0.149	0.083	0.316	0.569	0.436	0.114	—

* p < .05, ** p < .01, *** p < .001

Statistically significant and negative associations have been observed between Gross Domestic Product per capita and two economic-related indicators of sustainable development – share of the renewables in the household energy consumption ($r=-0.679$, $p<0.001$), respectively share of the households in the total final energy consumption ($r=-0.391$, $p<0.05$). A higher GDP per capita is relevantly associated with a lower share of households (and, correspondingly, a higher share of industry) in the final energy consumption, and, more significantly, with a lower share of renewables in the final energy consumption of households. The relevance of industry, both as a main energy consumer and as a GDP generator, suggests that economies with a well-developed manufacturing sector employ significant energy resources, an important part of these being traditional sources (mainly oil and natural gas).

Other statistically significant associations, one negative and the other positive have been observed between final consumption expenditures per capita and share of the renewables in the household energy consumption ($r=-0.627$, $p<0.001$), respectively final household energy consumption per capita ($r=0.463$, $p<0.05$). An increased final energy consumption of households per capita (and a corresponding higher bill) tends to increase the final consumption expenditure per capita. Still, an increased share of renewable energy in the final households' energy consumption is relatively strongly associated with a lower final expenditure per capita meaning, on one hand, that energy bills including a higher ratio of renewables may be lower (particularly when renewable energy is provided from hydro source) but, on the other hand, that in some cases, a higher ratio of renewables (especially when renewable energy is generated from solar or wind) could determine consumers to reduce the overall spending to be able to cover the increased costs.

Just a single environmental-related indicator of sustainable development (the total hazardous and non-hazardous waste) is statistically significantly associated with one of the energy-related indicators – the final households' energy consumption per capita ($r=0.495$, $p<0.01$). An increased energy consumption per capita generates a higher quantity of total waste, drawing attention that besides greening the energy production, similar or even higher attention should be paid to educate consumers towards finding the appropriate ways to consume energy to get more comfort with a minimum amount of waste.

The connections between other environmental-related sustainable development indicators (net greenhouse gas emissions and total household hazardous and non-hazardous waste) did not statistically significantly associate with any of the energy-related indicators. Still, an increase in the share of renewables in the final energy consumption of the households could have positive environmental consequences by lowering, even not to a statistically significant level, both the net greenhouse gas emissions and total household hazardous and non-hazardous waste.

No statistically significant associations have been observed between the social (total employment rate and at-risk-of-poverty) and any of the energy-related indicators of sustainable development. Still, the employment rate tends to increase together with the final household energy consumption per capita (as employment generates incomes that may cover household expenditures, including energy-related ones) but tends to decrease with the usage of renewables to produce energy and the share of renewables in the final households' energy consumption. The exposure to the risk of poverty tends also to decrease with the lowering of the total and per capita final households' energy

consumption but increases with the share of the renewables employed to provide energy for household consumption.

The final household energy consumption and the household renewable energy consumption did not associate statistically significantly with any of the sustainable development indicators, raising a legitimate question about the significance of the household and renewable energy consumption contribution to the economic, social, and environmental dimensions of sustainable growth. The final household energy consumption tends to generate positive consequences diminishing the total hazardous and non-hazardous waste and decreasing the risk of exposure to poverty, compensated by increases in the amount of hazardous and non-hazardous waste of the households and final consumption expenditures per capita. Almost similarly, household renewable energy consumption tends to diminish the total amount of hazardous and non-hazardous waste but increases the waste generated by households. The negative association with the employment rate indicates that a higher rate of employment corresponds to a reduced final consumption and renewable energy consumption of the households. The association with the GDP per capita is rather peripheral and of opposite direction: positive in terms of the final consumption, respectively negative in terms of the renewable energy consumption of the households. Sustainable development involves the consumption of energy, that is not necessarily renewable and comes with a cost including an important energy-related component. Hence the need for an approach that balances the costs (of energy) and the benefits (of sustainable development) and distributes them among the stakeholders on a long-term view.

Seven out of 25 relationships describing the relationships between energy consumption and quality of life have proven to be statistically significant, the same number of values of the Pearson correlation coefficients higher than 0.400, indicating associations of at least an average intensity, have been measured, both observations suggesting a relatively limited connection between the energy consumption and the quality of life.

Table 2: Energy and quality of life

Pearson's Correlations

Variable		En-FHC	En-%FHC	En-FHCc	En-%RHC	En-RHC	QL-Sat	QL-PBH	QL-WHs	QL-HDI	QL-Pro
1. En-FHC	Pearson's r	—									
	p-value	—									
2. En-%FHC	Pearson's r	0.174	—								
	p-value	0.386	—								
3. En-FHCc	Pearson's r	0.088	0.402*	—							
	p-value	0.663	0.037	—							
4. En-%RHC	Pearson's r	−0.186	0.502**	0.067	—						
	p-value	0.353	0.008	0.739	—						
5. En-RHC	Pearson's r	0.942***	0.250	0.084	−0.005	—					
	p-value	< .001	0.209	0.675	0.980	—					
6. QL-Sat	Pearson's r	−0.097	0.017	0.354	−0.174	−0.084	—				
	p-value	0.629	0.932	0.070	0.386	0.677	—				
7. QL-PBH	Pearson's r	0.176	−0.436*	0.134	−0.557**	0.113	0.576**	—			
	p-value	0.379	0.023	0.506	0.003	0.574	0.002	—			
8. QL-WHs	Pearson's r	0.061	−0.044	0.661***	−0.350	0.007	0.670***	0.443*	—		
	p-value	0.761	0.826	< .001	0.074	0.973	< .001	0.021	—		
9. QL-HDI	Pearson's r	0.218	−0.230	0.417*	−0.499**	0.084	0.570**	0.671***	0.759***	—	
	p-value	0.275	0.249	0.030	0.008	0.679	0.002	< .001	< .001	—	
10. QL-Pro	Pearson's r	0.154	−0.228	0.541**	−0.480*	0.034	0.458*	0.544**	0.865***	0.885***	—
	p-value	0.442	0.254	0.004	0.011	0.867	0.016	0.003	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

The final household energy consumption per capita was statistically significantly associated with happiness ($r=0.661$, $p<0.001$), prosperity ($r=0.541$, $p<0.01$), and human development ($r=0.417$, $p<0.05$) scores at the level of selected countries suggesting that a higher household energy consumption per capita contributes to the improvement of the quality of life of the consumers.

Surprisingly, the share of renewables in household energy consumption associated statistically significantly but negatively with the immediate perception of being happy ($r=-0.557$, $p<0.01$), human development ($r=-0.499$, $p<0.01$), and prosperity ($r=-0.480$, $p<0.01$) suggesting that an increased domestic consumption of green energy tend to affect happiness, human development, and prosperity of the EU consumers, with similar noticeable consequences in the cases of overall happiness and life satisfaction, probably mostly due to the higher bills to be paid. This may represent the reason for the statistically significant yet negative association between the immediate perception of being happy and the share of the households in the total energy consumption ($r=-0.436$, $p<0.05$) as an increased share of households means, besides higher expenses for the consumers, a lower Gross Domestic Product per capita, and, consequently, a lower economic development.

No statistically significant connections have been observed between the final household energy consumption and the final household energy consumption from renewable sources and any of the selected indicators to describe the quality of life. Moreover, the associations between the energy-related variables and human development, perception of happiness, prosperity, and overall happiness are of poor and very poor intensity, while with overall life satisfaction is not only very poor in terms of intensity, but also negative. These results are to be viewed in the context of the consistency of the quality-of-life indicators expressed by the direct statistically significant associations between the considered variables.

Table 3: Quality of life and sustainable development

Pearson's Correlations

Variable		QL-Sat	QL-PBH	QL-WHs	QL-HDI	QL-Pro	SD-GDPc	SD-FExc	SD-Emp	SD-Pov	SD-GHG	SD-HWs	SD-TWs
1. QL-Sat	Pearson's r	—											
	p-value	—											
2. QL-PBH	Pearson's r	0.576**	—										
	p-value	0.002	—										
3. QL-WHs	Pearson's r	0.670***	0.443*	—									
	p-value	< .001	0.021	—									
4. QL-HDI	Pearson's r	0.570**	0.671***	0.759***	—								
	p-value	0.002	< .001	< .001	—								
5. QL-Pro	Pearson's r	0.458*	0.544**	0.865***	0.885***	—							
	p-value	0.016	0.003	< .001	< .001	—							
6. SD-GDPc	Pearson's r	0.333	0.554**	0.623***	0.672***	0.738***	—						
	p-value	0.089	0.003	< .001	< .001	< .001	—						
7. SD-FExc	Pearson's r	0.386*	0.622***	0.742***	0.784***	0.853***	0.930***	—					
	p-value	0.047	< .001	< .001	< .001	< .001	< .001	—					
8. SD-Emp	Pearson's r	0.155	0.033	0.341	0.276	0.424*	0.170	0.163	—				
	p-value	0.441	0.870	0.081	0.163	0.027	0.398	0.416	—				
9. SD-Pov	Pearson's r	−0.535**	−0.470*	−0.471*	−0.490**	−0.401*	−0.300	−0.346	−0.422*	—			
	p-value	0.004	0.013	0.013	0.010	0.038	0.129	0.077	0.028	—			
10. SD-GHG	Pearson's r	0.085	0.211	0.186	0.300	0.296	0.553**	0.444*	0.172	−0.272	—		
	p-value	0.673	0.292	0.354	0.129	0.133	0.003	0.020	0.391	0.169	—		
11. SD-HWs	Pearson's r	−0.149	0.206	0.049	0.144	0.236	0.075	0.191	0.183	−0.109	−0.103	—	
	p-value	0.458	0.303	0.809	0.473	0.236	0.710	0.339	0.361	0.589	0.608	—	
12. SD-TWs	Pearson's r	0.025	0.071	0.372	0.111	0.355	0.285	0.340	0.201	0.115	0.156	−0.311	—
	p-value	0.900	0.724	0.056	0.582	0.069	0.149	0.083	0.316	0.569	0.436	0.114	—

* p < .05, ** p < .01, *** p < .001

15 out of 35 relationships describing the association between quality of life and

sustainable development have proven to be statistically significant, with 14 of these registering values of the Pearson correlation coefficients higher than 0.400 and, thus, expressing an association of average intensity.

A higher level of final expenditures per capita is statistically significantly associated with all selected indicators to describe the quality of life. As an old saying states, not the money but its amount brings happiness, translated in this case through a better quality of life, with the EU consumers appearing to have a more prosperous ($r=0.853$, $p<0.001$), humanly developed ($r=0.784$, $p<0.001$), happy ($r=0.742$, $p<0.001$), immediately happily perceived ($r=0.622$, $p<0.001$), and overall satisfactory ($r=0.386$, $p<0.05$) life when they spend more for different goods and services.

Also, lower exposure to the risk of poverty is statistically significantly and negatively associated with a more overall satisfactory ($r=-0.535$, $p<0.01$), humanly developed ($r=-0.490$, $p<0.01$), happy ($r=-0.471$, $p<0.05$), immediately happily perceived ($r=-0.470$, $p<0.05$), and, last but not least, prosperous ($r=-0.401$, $p<0.05$) life. The lower the at-risk-of-poverty risk is, the better the quality of EU consumers' life is.

Four of the indicators used to describe the quality of life have direct and relevant connections with the GDP per capita, suggesting that an overall satisfactory life is relevantly associated with a favorable macroeconomic context. A higher GDP per capita is statistically significantly associated with a more prosperous ($r=0.738$, $p<0.001$), humanly developed ($r=0.672$, $p<0.001$), happy ($r=0.623$, $p<0.001$), and immediately happily perceived ($r=0.554$, $p<0.01$) life, although the connection with the overall life satisfaction appears to be only positive but not statistically significant.

Last but not least, a higher level of prosperity tends to be attained where the employment is also high ($r=0.424$, $p<0.05$), a higher rate of employment being positively, but not statistically significantly associated with improved levels of happiness, human development, and even overall life satisfaction.

Notably, while statistically significant relationships were measured between sustainable development and quality of life variables (nine out of ten connections in the case of economic, and six out of ten in the case of social variables), none of the associations between environmental and quality of life variables proved statistically significant. An improved quality of life tends to be associated with a higher amount of net greenhouse emissions, and total and household hazardous and non-hazardous waste confirming, on one hand, that a higher level of development comes with higher levels of pollution and quantities of waste, and, on the other hand, that paying attention to the environmental dimension complements sustainable development and contributes to a better quality of life.

4. Conclusions, limits, and further directions of the research

The research results revealed statistically significant associations between the investigated variables describing the connections between the energy market, sustainable development, and quality of life. Thus, a higher level of individual prosperity is associated with a higher volume of final consumption expenditure and both a higher per capita household energy consumption and a higher share of renewable energy in household energy consumption. These associations highlight the economic dimension of

development, prosperity also meaning a higher level of income capable of supporting a higher volume of consumption expenditure, including for paying rising bills for energy in general, and green energy in particular. On the other hand, both final consumption expenditure and per capita household energy consumption (including the share of renewable energy in energy consumption) are very good descriptors of prosperity: we are prosperous when we allow ourselves to spend on goods and services that meet our needs, including for energy that includes a growing renewable share.

Similarly, a higher level of human development is associated with a higher volume of final consumption expenditure and both a higher per capita household energy consumption and a higher share of renewable energy in household energy consumption. These associations highlight the social dimension of development, human development meaning consumption expenditure is not necessarily higher but better structured to maximize the satisfaction of consumers' needs through purchased products and/or services, implicitly by prioritizing the payment of energy bills in general, and green energy in particular, the value of which has continuously increased, affecting consumers' budgets. Obviously, achieving a high level of human development is possible when consumers have the necessary resources to support their consumption expenditure and have access to energy, including renewable energy, for their current activities.

The macroeconomic perspective on the relationships between the three areas investigated draws attention to the pivotal role of GDP per capita both in supporting the transition to a more extensive use of renewable energy in ensuring household energy consumption, and in creating greater prosperity and higher human development. Even though there have recently been increasing views that GDP per capita should not be the most used indicator to describe economic development (and here the philosophy of marketing confirms that it is not enough to produce, but it is also necessary to sell what you produce) and also that economic development is not the most important pillar of sustainable development, the reality, described including through the results of this research effort, shows us as concretely as possible that only a strong economy, capable of generating the highest possible GDP per capita, can create prosperity, ensure human development and support the energy transition.

The favorable macroeconomic context significantly impacts the way in which the consumer, as a member of the local, regional, or national community to which he belongs, perceives immediate happiness. Thus, a higher level of GDP per capita is significantly associated with a higher share of both households in energy consumption and renewable energy in household energy consumption. A well-developed economy, even in terms of the ability to generate GDP (with the limits associated with this macroeconomic indicator), with a higher and more renewable energy consumption of households, is one in which the immediate happiness per capita tends to be higher.

The significant impact of a favorable macroeconomic context on the immediate or global happiness of the consumer is also illustrated by the statistically significant associations between final consumption expenditures and final energy consumption of households, respectively the share of renewable energy in final household consumption. Even if the first conclusion that could be drawn would be that energy consumption, including renewable energy, implies higher final consumption expenditures, i.e. higher costs for households, these are statistically significantly associated with immediate

happiness, but also with higher global happiness! This confirms an old Romanian proverb completed by the authors of this paper, which states that "a thin cheek (happy and powered by renewable energy – we would add) is maintained with expense".

The research results show that, obviously, the energy market, sustainable development, and quality of life are intertwined. Energy is absolutely necessary to support the development of all activities, both at the community level and to ensure a better quality of life for the consumer, both ends having obvious economic and social significance. A higher share of renewable energy in household energy consumption generates a positive impact on the natural environment but implies a higher cost, which affects the consumer's budget. If we also bring into discussion the fact that industry continues to be a significant user of fossil fuels (oil and natural gas), then it is obvious that reducing the impact of energy consumption at the household level by increasing the share of renewable energy does not contribute sufficiently to greening the environment and may affect the quality of life, both affecting the sustainable development of communities.

In this context, the solution is represented by adopting a marketing vision that reprioritizes the debate and, especially, the implementation of its conclusions by focusing on the consumer and also on a bottom-up approach. Our main reason to support this conclusion is the ranking of the three investigated areas in terms of importance and relevance as it has derived from the associations between the specific variables: quality of life appears to be the first (due to the interferences with the sustainable development), sustainable development the second (due to the reciprocal interferences with the quality of life), while the energy market the third (due mostly to the interferences with the quality of life). From this perspective, under this vision, an educated and responsible consumer will understand that adopting, for his or her own sake and commitment to live well, a sustainable behavior, will determine a positive impact first on his or her own life, then on the community where he or she lives, and, as a result, on the entire society starting from the local, passing through regional and national, and ending at international level.

As always in marketing and real life, everything, so even our paper, is accompanied by a disclaimer: it is hard to affirm that using only secondary data to measure the associations of the seventeen indicators describing the energy market, quality of life, and sustainable development, at the level of the European Union, for the years 2022-2023, provides the sound conclusions explaining the connections and consequences of their interactions. Therefore, we are aware that primary data regarding the consumers' view over the investigated topics are to be used, the set of indicators is to be revised, the period covered by the future approach will be extended to create a longitudinal dimension of the research, while only the European Union countries (as observation units) will be maintained (the most important reasons for this being the diverse structure of the Member States as well as the availability of the statistical data regarding the investigated topics). Still, our exploratory approach has generated insights that may represent a solid base for future explorations of the subject and may be summarized in a single phrase: sustainable development represents a priority, energy provides the necessary support, and quality of life is the final objective of everything we are doing.

Danish architect Bjarke Ingels introduced the term “hedonistic sustainability”, focusing on designing architectural solutions for fully functional and environmentally friendly buildings (Ingels, 2011). Lelkes (2021) connected hedonism and sustainability,

aiming to mediate the potential conflict between "living well" (the human quest for pleasure and a good life) and "living fair" (the adjustment of personal lifestyles as a result of the external call to reduce resource use). Going further, based on the results of this study, we advance the idea that a good life should also be a fair one by balancing personal and community needs and expectations, giving priority to the personal ones fully aware that a happy and responsible consumer is a proud member of his/her community and a well-developed community is the sum of its happy and responsible members. One may inquire, where is the „State" in this vision? What is the mission of the local, regional, national, or international authorities under a sustainable hedonistic approach? In plain and simple words, the State will have the mission to support the consumers and citizens in their pursuit of happiness by facilitating the creation of an appropriate economic, social, and environmental context.

References

Adedoyin, F.F., Erum, N., Taşkin, D., & Chebab, D. (2023). Energy policy simulation in times of crisis: Revisiting the impact of renewable and non-renewable energy production on environmental quality in Germany. *Energy Reports*, *9*, 4749-4762.

Akella, A.K.; Saini, R.P., & Sharma, M.P. (2009). Social, economical and environmental impacts of renewable energy systems. *Renewable energy*, *34*(2), 390-396.

BEUC (2019). Bureau Européen des Unions de Consommateurs. *The future of energy consumers. Bright or Burdensome?* Retrieved from: https://www.beuc.eu/sites/default/files/publications/beuc-x-2019-055_the_future_of_energy_consumers.pdf.

Bonsu, C.O., & Muzindutsi, P.F. (2017). Macroeconomic determinants of household consumption expenditure in Ghana: A multivariate cointegration approach. *International Journal of Economics and Financial Issues*, *7*(4), 737-745.

Borja-Patiño, J., Robalino-López, A., & Mena-Nieto, A. (2024). Breaking the unsustainable paradigm: exploring the relationship between energy consumption, economic development and carbon dioxide emissions in Ecuador. *Sustainability Science*, *19*(2), 403-421.

Camacho Ballesta, J.A., da Silva Almeida, L., & Rodríguez, M. (2022). An analysis of the main driving factors of renewable energy consumption in the European Union. *Environmental Science and Pollution Research*, *29*(23), 35110-35123.

Cheba, K., Bąk, I., Szopik-Depczyńska, K., & Ioppolo, G. (2022). Directions of green transformation of the European Union countries. *Ecological Indicators*, *136*, 108601.

Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Danigelis, N.L., Dickinson, J., Elliott, C., Farley, J., Gayer, D.E., MacDonald Glenn, L., Hudspeth, T., Mahoney, D., McCahill, L., McIntosh, B., Reed, B., Rizvi, S.A.T., Rizzo, D.M., Simpatico, T., & Snapp, R. (2007). Quality of life: An approach integrating opportunities, human needs, and subjective well-being. *Ecological economics*, *61*(2-3), 267-276.

Dirma, V., Neverauskienė, L.O., Tvaronavičienė, M., Danilevičienė, I., & Tamošiūnienė, R. (2024). The Impact of Renewable Energy Development on Economic Growth. *Energies*, *17*(24), 6328.

Eurostat. Energy statistics – main indicators (t_nrg_indic) (2025). Retrieved from: Statistics | Eurostat.

Eurostat. Sustainable Development indicators Goal 7 – Affordable and clean energy (t_nrg_sdg_07) (2025). Retrieved from: Statistics | Eurostat.

Fanning, A.L., & O'Neill, D.W. (2019). The Wellbeing–Consumption paradox: Happiness, health, income, and carbon emissions in growing versus non-growing economies. *Journal of Cleaner Production*, *212*, 810-821.

Gaye, A. (2007). Access to energy and human development. *Human development report*, *2008*, 2007.

Helliwell, J. F., Layard, R., Sachs, J. D., De Neve, J.-E., Aknin, L. B., & Wang, S. (Eds.). (2023). World Happiness Report 2023. New York: Sustainable Development Solutions Network. Retrieved from: WHR23.pdf.

Ingels, B. (2011). Bjarke Ingels: Hedonistic Sustainability. School of Architecture Lectures Series. 6. Retrieved

from: "Bjarke Ingels: "Hedonistic Sustainability"" by Bjarke Ingels.
JASP Team (2024). JASP (Version 0.19.3)[Computer software].
Jędrzejczak-Gas, J., Wyrwa, J., & Barska, A. (2024). Sustainable energy development and sustainable economic development in EU countries. *Energies*, *17*(7), 1775.
Joyeux, R., & Ripple, R.D. (2007). Household energy consumption versus income and relative standard of living: A panel approach. *Energy Policy*, *35*(1), 50-60.
Kosowski, P., Kosowska, K., & Janiga, D. (2023). Primary energy consumption patterns in selected European countries from 1990 to 2021: a cluster analysis approach. *Energies*, *16*(19), 6941.
Legatum Institute (2023). The 2023 Legatum Prosperity Index™. Sixteenth Edition. A tool for transformation. Retrieved from: 4789.pdf.
Lelkes, O. (2021). 4: Sustainable Hedonism. In Sustainable Hedonism. Bristol, UK: Bristol University Press. Retrieved from: Sustainable Hedonism.
Madudova, E., & Corejova, T. (2023). The issue of measuring household consumption expenditure. *Economies*, *12*(1), 9.
Makarova, O., Kalashnikova, T., & Novak, I. (2020). The impact of energy consumption on quality of life in the world: methodological aspects of evaluation. *Economic Annals-XXI/Ekonomìčnij Časopis-XXI*, *183*.
Marques, A.C., & Fuinhas, J.A. (2012). Is renewable energy effective in promoting growth?. *Energy Policy*, *46*, 434-442.
Matuszewska-Janica, A., Żebrowska-Suchodolska, D., & Mazur-Dudzińska, A. (2021). The situation of households on the energy market in the European Union: Consumption, prices, and renewable energy. *Energies*, *14*(19), 6364.
Oleńczuk-Paszel, A., & Sompolska-Rzechuła, A. (2025). Housing Conditions and the Quality of Life of the Populations of the European Union Countries. *Sustainability*, *17*(4), 1550.
Palát, M., & Kunc, A. (2013). Alternative indicators of living standards and household consumption expenditure in a global perspective. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *61*(2), 437-444.
Pasten, C., & Santamarina, J.C. (2012). Energy and quality of life. *Energy Policy*, *49*, 468-476.
Piao, X., & Managi, S. (2023). Household energy-saving behavior, its consumption, and life satisfaction in 37 countries. *Scientific reports*, *13*(1), 1382.
Presno, M.J., & Landajo, M. (2021). EU-28's progress toward the 2020 renewable energy share: A club convergence analysis. *Environmental Science and Pollution Research*, *28*(47), 66830-66844.
Sameer, Y.M., Elmassah, S., Mertzanis, C., & El-Maghraby, L. (2021). Are happier nations more responsible? Examining the link between happiness and sustainability. *Social Indicators Research*, *158*(1), 267-295.
Shyu, C.W. (2024). A framework of basic human energy needs for decent quality of life at household level: policy implications for enhancing energy justice and meeting SDG7. *Journal of Asian Public Policy*, 1-15.
Słupik, S., Kos-Łabędowicz, J., & Trzęsiok, J. (2021a). An innovative approach to energy consumer segmentation—a behavioural perspective. the case of the eco-bot project. *Energies*, *14*(12), 3556.
Słupik, S., Kos-Łabędowicz, J., & Trzęsiok, J. (2021b). Are you a typical energy consumer? Socioeconomic characteristics of behavioural segmentation representatives of 8 European countries. *Energies*, *14*(19), 6109.
Toklu, E., Güney, M.S., Işık, M., Comaklı, O., & Kaygusuz, K. (2010). Energy production, consumption, policies and recent developments in Turkey. *Renewable and Sustainable Energy Reviews*, *14*(4), 1172-1186.
UNDP (2024). United Nations Development Programme. Human Development Report 2023-24. Breaking the gridlock: Reimagining cooperation in a polarized world. Retrieved from: hdr2023-24reporten.pdf.
Wiesli, T.X., Liebe, U., Hammer, T., & Bär, R. (2021). Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions. *Sustainability 2021*, 13, 9187.