

The Effect of Renewable Energy Consumption in Romania

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Please cite this paper as:

Darie, F.C., 2023. The Effect of Renewable Energy Consumption in Romania. In: R. Pamfilie, V. Dinu, C. Vasiliu, D. Pleșea, L. Tăchiciu eds. 2023. *9th BASIQ International Conference on New Trends in Sustainable Business and Consumption*. Constanța, Romania, 8-10 June 2023. Bucharest: ASE, pp. 139-144

DOI: [10.24818/BASIQ/2023/09/008](https://doi.org/10.24818/BASIQ/2023/09/008)

Abstract

The development of a national economy generally takes into account its capability to generate and maintain access to energy resources constantly. Thus, powerful nations are usually associated with considerable energy consumptions. However, this correlation can slowly disappear as soon as nations focus their attention towards renewable energy and intensify its contribution to sustainable growth. Sustainable development can be achieved through conservation of natural resources, sustainable agriculture, education of the labour force and adaptation to modern technologies. The education system must be tailored in accordance with the changing requirements as the perspectives of the society are currently oriented towards a green economy supported by green technologies. The aims of this research paper are to examine the current situation of renewable energy in Romania and to question the ability of household to transition to green energy. In order to reach the objectives of this research paper, the author used secondary quantitative research methodology. Therefore, the author identified and obtained the necessary information through desk research from mainly top scientific journals related to this topic and Eurostat. Significant increase in the energy prices directly impacts both the economic operators and household consumption as the disposable income for households will be reduced drastically due to the inflation being present in many other sectors. From 2018 to 2020, the gross final energy consumption as well as the renewable energy production have increased year by year. However, in 2021, the gross final energy consumption as well as the renewable energy production have slightly decreased due to the inflation affecting energy input and raw materials prices. The originality of this research paper consists in the fact that it provides an up-to-date overview of the Romanian economy and its energy sector, including a viable solution to the energy problem.

Keywords

Renewable resources, green energy, green growth, energy efficiency, fossil energy, inflation, photovoltaics.

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Introduction

The development of a national economy generally takes into account its capability to generate and maintain access to energy resources constantly. Thus, powerful nations are usually associated with considerable energy consumptions. However, this correlation can slowly disappear as soon as nations focus their attention towards renewable energy and intensify its contribution to sustainable growth. Additionally, it is very important to boost the energy sector and its security in order to achieve green growth. According to Reilly (2012), a reduction in the dependency of energy imports can be accomplished by increasing the production of renewable energy that contributes to a faster transition to an independent and greener economy. The current challenge for the European and world economies must consider a substantial rise in the share of renewable energy especially nowadays with energy high prices and environmental concerns.

The renewable energy sector significantly developed in the past few years. It creates major opportunities for new industries in both new technological production and exploration, influencing the economic growth and job creation. The aim of this sector is to efficiently improve the low or unused resource such as inappropriately exploit of biomass, low production of the labour force and most importantly, solar and wind energy production that represents one of the key methodologies used to generate green energy for households. However, it is expensive to produce this form of energy for each household due to its significant investment cost. The topic of energy efficiency became the main challenge of the European Union. According to results of Balitskiy et al. (2016), the consumption of natural gas positively influences the economic growth although the correlation between the consumption of natural gas and economic

development appears to be negative. Their findings suggest that policy makers should consider targeting and increasing energy efficiency and intensity.

The scarcity of the necessary resources can be reduced by enforcing economic policies regarding their protection (recommending the use of green energy technologies) and interventions in the markets (labour market, resources market, etc). Nowadays, economic growth is strongly connected with sustainability. Therefore, the economic system works very well within an ecological structure as both of them complement each other. More specifically, applied economic policies in an ecological system support each other and evolve together. Incomplete or manipulated information negatively impacts the performance evaluation of alternative investments compared to the classical ones (Liou et al. 2016).

On the other hand, the labour force is not yet experienced enough for the renewable technologies as much of Romanian population is aged, especially in the rural areas. Thus, the need to train the younger generation arises. It is very important for the labour force to adapt to new technologies and recognize the need for sustainability development. Creating and using renewable energy stimulates the jobs creation for this sector. The net effect on employment varies according to loss of jobs in other sectors. However, specialists in this field indicate that all non-fossil fuel technologies such as energy efficiency and renewable energy create more jobs per unit energy compared to the natural gas and coal (Wei, Patadia and Kammen, 2010).

Sustainable development can be achieved through conservation of natural resources, sustainable agriculture, education of the labour force and adaptation to the modern technology. The education system must be tailored in accordance with the changing requirements as the perspectives of the society are currently oriented towards a green economy supported by green technologies. Education plays a fundamental role in understanding the value of sustainable objectives and their future benefits (Biswas, 2012). To reach this goal, education must be supported by both governmental agencies and non-governmental organizations. Working together on different policies and projects significantly improves the education system compared to only schools and universities (Kolleck, 2016).

The aims of this research paper are to examine the current situation of renewable energy in Romania and to question the ability of household to transition to green energy. The research methodology was based on quantitative data.

This research paper is organized as follows: the review of the scientific literature is presented in the second section while the research methodology together with results and discussion are presented in the third and fourth section respectively. Finally, this research paper ends with the conclusion section.

1. Review of the scientific literature

Energy is perceived as a strategic commodity and even the slightest doubt related to its supply can affect the performance of the economy especially in emerging economies. At some point, every society depends on certain levels of energy. Therefore, it is essential to secure energy supplies at reasonable prices and develop a sustainable socioeconomic environment with reduced greenhouse gas (GHG) emissions and low environmental impact. According to Sen and Ganguly (2017), conventional fossil fuel consumption signifies 85% of the energy demand which is responsible for 56.6% of anthropogenic greenhouse gas emissions. In the current state, renewable energy technologies heavily support the idea of using renewable energy as much as possible in order to replace the fossil fuel consumption. Favorable promoting policies provided by governments increase the confidence in alternative sources of energy production.

Renewable technologies generate clean energy as they optimally use the necessary resources to reduce the environmental impact while producing minimum secondary wastes. These renewable technologies are sustainable for the current as well as future economics. Sun represents the main source used to produce all energies. The fundamental forms of solar energy are light and heat. Both are beneficial for the environment in various ways. Transformation of the sunlight and heat result in flows of renewable energy such as wind energy and biomass. Renewable energy technology brings forth a significant opportunity to reduce global warming by switching to alternative green energy sources and lowering the greenhouse gas emissions (Panwar, Kaushik and Kothari, 2011). Furthermore, Reikard (2015) argues that in the coastal region the energy produced by waves is becoming extremely popular and might soon replace the leading sources (solar and wind) renewable energy production. Compared to the solar and wind, waves are found to be more predictable and indicate lower reserve costs. Thus, waves could also be an alternative energy producer for Romania in the near future.

Bhattacharya et al. (2016) confirmed the evident of long-term relationship between energy-related contributions and economic growth using panel estimation. The findings of the authors on long-term output

elasticities show a significant positive impact on the economic productivity when consuming renewable energy for 57% of the selected countries. Furthermore, the authors also conducted long-term time-series analysis to confirm their initial results. As a result, they suggest that government, international cooperation agencies, associated bodies and energy planners must act together in a coordinated effort to increase renewable energy investment for low carbon growth.

The consumption of renewable energy provided by the solar and wind sources in the electricity sector is rapidly growing, making it the highest proportion in the European economy. The volatility of photovoltaics and wind power have significantly declined due to the absence of fuel cost and thus, their attractiveness has increased. From 2005 to 2015, the installed wind turbines producing green energy has increased three and a half times to 142 GW while the solar photovoltaics producing green energy has increased 50-fold to reach 95 GW in Europe. Since the Paris Agreement went into force as of 4th November 2016, the pressure of replacing the traditional energy with green energy has considerably intensified. According to Arantegui and Jäger-Waldau (2018), the European Union began deploying wind turbines and photovoltaics together with the policy drivers. Hence, in 2016, approximately 12% of the demand for electricity in the European Union was covered by wind and solar renewable technologies. However, to reach the 2030 goal, a tripling green energy contribution is necessary.

2. Research methodology

In order to reach the objectives of this research paper, the author used secondary quantitative research methodology. Therefore, the author identified and obtained the necessary information through desk research from mainly top scientific journals related to this topic and Eurostat. Afterwards, the author organized and examined the dataset using a comprehensive literature review. Lastly, the author incorporated the results within this research paper.

3. Results and discussion

After reviewing the literature of top scientific journals related to this topic, the author has examined the dataset and recognized the impact of this research paper on the Romanian economy. The production of energy is crucial for accomplishing daily objectives regardless of the beneficiary (households and economic operators). In recent times, growth of its prices in the European Union is likely to reflect eventually the general rise in inflation rates and the dynamics of consumer prices. Furthermore, concerns regarding the sudden price increases in energy supply could have significant medium and long-term effects on the economy. As a result, the uncertainty concerning inflation prospects of economic operators has increased and the economic recovery period will be longer.

The significant increase in energy prices along with the rise of all raw materials prices will be reflected in the GDP of the following years. Among the important transmission channels signaling these shocks are the available real income of households together with the resources available for investment of economic operators considering that energy inputs are very challenging to substitute with other factors of production over short-term and medium-term time spans. The aggregate effects of rising energy costs have a negative impact on the GDP. Hence, their consequences are expected to reveal both the dynamics of potential GDP and the cyclical component (GDP gap) mainly as a result of reduced aggregate domestic demand. Significant increase in the energy prices directly impacts both the economic operators and household consumption as the disposable income for households will be reduced drastically due to the inflation being present in many other sectors. Furthermore, the ability to generate new jobs will also be reduced. (Radulescu et al. 2022).

The severe impact of inflation in most of the key sectors of the economy such as industrial production recorded increasing production costs due to the prices of the energy inputs. In addition, the exports of goods and services continue to be affected by the complications associated with the supply chain. The dynamics of goods and services imports are considered to be influenced by the domestic demand and, respectively, those on exports of goods and services. Nonetheless, imports might still remain the solution due to the domestic increase in the price of energy and better energy-efficient technologies, especially within certain segments of the market.

Table no. 1. Renewable energy Romania

Energy	Type	2018	2019	2020	2021	
Electricity	Hydro	1,432.8	1,416.1	1,377.4	1,390.9	
	Wind	570.9	580.3	582.6	647.3	
	Solar	152.3	152.8	149.0	146.5	
	Solid biofuels	31.6	38.7	42.4	49.9	
	All other renewables	6.0	4.6	4.6	6.3	
	Total numerator	2,193.5	2,192.7	2,156.0	2,240.9	
	Electricity generated from other sources	5,248.5	5,145.2	4,970.8	5,273.9	
	Total denominator	5,248.5	5,145.2	4,970.8	5,273.9	
	Total (%)	41.79%	42.62%	43.37%	42.49%	
Transport	Ren. Electricity in road transport	1.4	1.4	1.5	6.9	
	Ren. Electricity in rail transport	36.7	36.2	36.0	42.2	
	Ren. Electricity in all other transport modes	0.7	0.7	1.5	1.8	
	Compliant biofuels	297.1	412.4	483.3	495.8	
	Total numerator	396.6	510.5	549.2	518.9	
	Fuel used in transport	6,253.7	6,506.5	6,430.5	6,766.3	
	Total denominator	6,253.7	6,506.5	6,430.5	6,766.3	
		Total (%)	6.34%	7.85%	8.54%	7.67%
	Heating and cooling	Final energy consumption	3,403.0	3,419.2	3,363.2	3,565.7
	Derived heat	66.5	76.6	91.5	95.7	
	Total numerator	3,469.5	3,495.9	3,454.6	3,661.5	
	All fuel consumed	13,641.5	13,581.9	13,640.4	14,955.4	
	Total denominator	13,641.5	13,581.9	13,640.4	14,955.4	
		Total (%)	25.43%	25.74%	25.33%	24.48%
Gross final consumption	Electricity	2,154.7	2,154.4	2,117.0	2,190.0	
Note: electricity used in transport is included in transport and not in electricity	Heating and cooling	3,469.5	3,495.9	3,454.6	3,661.5	
	Transport	335.9	450.6	522.3	477.1	
	Total numerator	5,960.1	6,100.9	6,060.8	6,328.6	
	Aviation adjustment	24,964.1	25,117.0	24,760.7	26,820.3	
	Total denominator	24,964.1	25,117.0	24,760.7	26,820.3	
		Total (%)	23.87%	24.29%	24.48%	23.60%

Source: Eurostat shares 2021.

As presented in Table no. 1, the ratio between the total amount of renewable energy (total numerator) divided by the total amount of all energy (total denominator) represents the gross final energy consumption. Thus, from 2018 to 2020, it can be seen that the gross final energy consumption as well as the renewable energy production have increased year by year. However, in 2021, the gross final energy consumption as well as the renewable energy production have slightly decreased due to the inflation affecting energy input and raw materials prices. As a result, key sectors of the economy such as industrial production has also been impacted.

A viable solution to protect households and economic operators is the installation of photovoltaic panels. According to Romanian Energy Regulatory Authority (ANRE), approximately 14.000 prosumers were recorded at the end of 2021. A prosumer is an entity that consumes and also produces energy. It is a massive increase in the number of prosumers compared with the year 2020, where nearly 1700 prosumers were recorded (Economica.net, 2022). Unfortunately, the official statistics for 2022 are yet to be determined. However, the trend is likely to go up as energy prices continue to climb.

Conclusions

The results of this research paper are in line with those of Wei, Patadia and Kammen (2010), Panwar, Kaushik and Kothari (2011), Reilly (2012), Biswas (2012), Reikard (2015), Balitskiy et al. (2016), Bhattacharya et al. (2016), Liou et al. (2016), Kolleck (2016), Sen and Ganguly (2017), Arantegui and Jäger-Waldau (2018), Radulescu et al. (2022).

The development of a national economy generally takes into account its capability to generate and maintain access to energy resources constantly. Thus, powerful nations are usually associated with considerable energy consumptions. However, this correlation can slowly disappear as soon as nations focus their attention towards renewable energy and intensify its contribution to sustainable growth. Additionally, it is very important to boost the energy sector and its security in order to achieve green growth. Sustainable development can be achieved through conservation of natural resources, sustainable agriculture, education of the labour force and adaptation to modern technologies. The education system must be tailored in accordance with the changing requirements as the perspectives of the society are currently oriented towards a green economy supported by green technologies. Education plays a fundamental role in understanding the value of sustainable objectives and their future benefits.

However, a major drawback of photovoltaic panels is represented by their close relationship with the sun. In great weather conditions, the photovoltaic panels increase their production while in worse weather conditions, the photovoltaic panels lower their production. Similar problems extend to other renewable energy sources such as wind and waves. As a results, for the time being, the fossil fuels cannot be completely eliminated.

This research paper will enrich the literature associated with green energy development, improvement of the educational system and the adaptation of labour force to renewable technologies even though the complete substitution of the fossil fuels with renewable energy has not yet been achieved.

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