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OPPORTUNITY STUDY ON INCREASING THE NUMBER OF PROSUMERS IN ROMANIA

Laura-Alexandra DOROFTEI[1], Petronela-Cristina SIMION[2], Aguriţa Mariana PÎSLARU[3]
[1]SGS Romania
[1]ORCID: 0009-0005-9211-4535
[1]Email: lauradoroftei10@gmail.com
[2]National University of Science and Technology POLITEHNICA Bucharest, Romania
[2]ORCID: 0009-0008-3461-3709
[2]Email: petronela.simion@upb.ro
[3]Privacy Manger, Tupperware Brands, Orlando, USA
[3]ORCID: 0009-0001-5728-9218
[3]Email: agurita.pislaru@gmail.com

Abstract: *The subject of prosumers is a hot topic mainly because of the environmental benefits of renewable electricity generation. At European and national levels, the aim has been to increase the number of prosumers through policies that encourage the practice, but in addition to policies, there are a number of other factors that have a negative or positive influence on the development of the number of prosumers. A number of articles deal with factors such as average income, age, type of housing, and so on in EU countries such as Austria, Poland, UK, but the subject is insufficiently researched, especially in Romania. The research methodology consisted in collecting data available online on the websites of institutions accredited to collect data on the evolution of prosumers and observe the most prosumers and the availability of the national grid in Romanian counties. Subsequently, data on climate, economic, technical and social conditions were collected and studied to see if they influence the increase in the number of prosumers. The results of the research highlighted the fact that the analysed factors have an impact in increasing the number of prosumers. In areas where incomes, living standards and climatic factors were above average, technical factors did not discourage the increase in the number of prosumers, but in those with economic and social conditions below the national average and with the electricity grid already loaded, even if the photovoltaic potential is very high, the growth rate is very low. The main results pursued in this paper are the observation of national conditions that influence the increase in the number of prosumers in Romania in order to be able to develop strategies, establish and adopt policies or measures in the future to support prosumers in disadvantaged areas or in energy poverty, and also to reduce the negative impact of the environment.*

Keywords*: prosumers, conditions, power, strategy, environment*

INTRODUCTION

In a very general definition, a prosumer is a term that defines a citizen (individual or legal person) who consumes but also produces energy from renewable sources, thus being an important resource in the European Union countries' aim to reduce greenhouse gas emissions. In addition to the environmental benefits, the increase in the number of prosumers has social benefits, as a result of improved living conditions due to reduced pollution and economic benefits such as lower energy bills. Thus, both at European and national level, policies and packages ('European Green Deal', 'Fit for 55' or 'REPowerEU') aim to increase the number of prosumers [1].

The number of prosumers can be influenced by various internal factors (e.g. motivation, financial possibilities, knowledge) or external factors (e.g. legislation, climate, accessibility). In order to further increase the number of prosumers, it is important to study what factors have favoured this growth. Thus, the analysis carried out in this article aims to identify which factors support the growth of prosumers in Romanian counties.

Although there are numerous studies in the specialized literature about the factors that encourage the increase in the number of prosumers, a small number of articles study the factors that favour the increase in the number of prosumers in different countries/regions, especially in developing countries such as Romania.

The contribution of this article is to analyse the social, economic, technical and climatic conditions that may encourage or discourage the emergence of new prosumers. By knowing the factors that positively influence the number of prosumers,

national and local governments can develop strategies and enact laws that encourage and favour disadvantaged, energy-poor consumers to become prosumers or help build energy-independent communities. The paper brings a new analysis of issues less addressed in specialized literature, but which have an impact on consumer growth, such as living standards, salary levels, photovoltaic potential and others studied at the county level (administrative-territorial units) in Romania.
The research conducted is qualitative, based on the analysis of national public data available online. The rest of this article is organized as follows: a literature review regarding the factors and initiatives which influence (encourage or discourage) the increase in the number of prosumers. Then, research that has as objectives to discover the counties with the most and least prosumers and how economic, social, technic and climatic factors can affect the increase of prosumers in number. The results and discussion section covers the fulfilment of the objectives assumed to be researched. The article concludes with a discussion of the study's contributions and future research directions.

LITERATURE REVIEW

The photovoltaic panels of the prosumers absorb light energy from the sun and convert it into direct current. With the help of the inverter, the direct current is transformed into alternating current so that the building can be powered, but also delivered to the distribution network. Both for the protection of the equipment in the house and for the protection of the network, it is necessary to install a protection for direct/alternating current. Before being delivered to the national energy system, the energy extracted and delivered to the network is measured and recorded by a smart meter. The data is collected by the distributor who has the legal obligation to send it to the supplier so that he can perform billing and compensation.

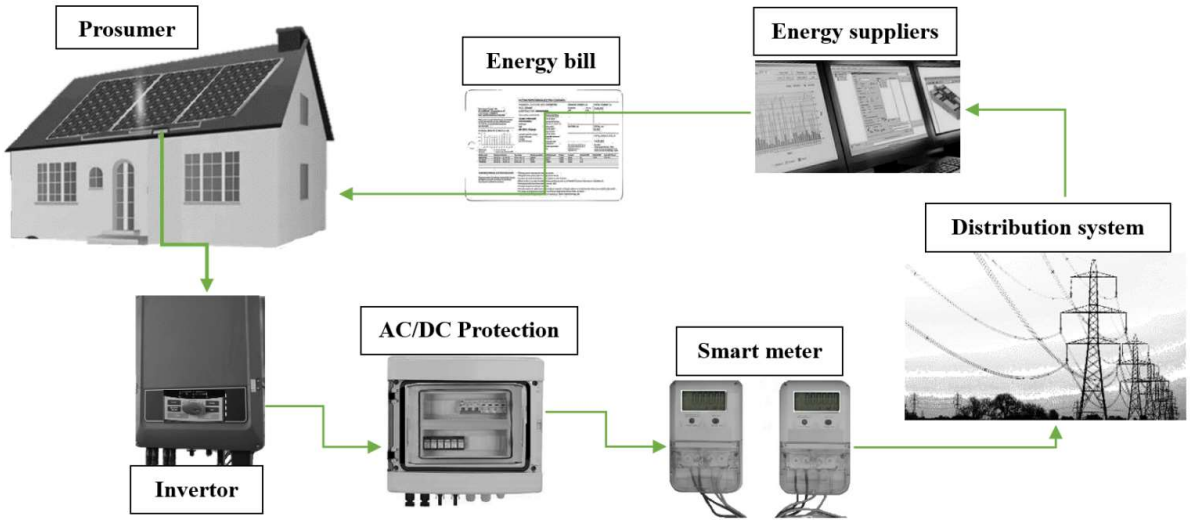

Figure 1: Prosuming system

To increase the number of prosumers, policies should aim at stimulating increased solar power generation in residential solar power plants and encouraging energy storage systems. One such policy could be to provide subsidies for the purchase of energy storage systems to facilitate on-site consumption [2].
An analysis of prosumers in Austria shows that the ability of different groups of households to participate in the electricity market as prosumers varies substantially and depends in particular on household characteristics and household income [3].
In the UK, the effect of policies on the evolution of the number of prosumers has been very visible. The advantage of selling the extra energy produced at a higher price than the market price and relatively low installation costs led to a significant increase in the number of prosumers. However, when the government halved the benefit for selling energy, the number of prosumers stagnated sharply. There are many factors that influence the growth in the number of prosumers, including age, home ownership, financial possibilities or the size of the house or family [4]. The decision to become a prosumer is strongly influenced by financial barriers such as the high cost of the investment, the payback or even the financial benefits it brings and the risk of losing money [5].
In Poland, the regional analysis revealed that the most important factor in the increase in the number of prosumers was the average level of wages per region. It was also found that the number of prosumers is higher in areas where the value of GDP is higher. Higher levels of urbanisation in areas with above-average income and affordable photovoltaic purchase prices for middle-income households also have a positive impact [6]. An analysis carried out in Germany shows a higher number of prosumers among the population with high incomes and high levels of education. Also, the return on investment depends on prices for grid energy supply and consumption and solar radiation and can be tailored to the region [7].

In Romania, among the factors that can influence the growth of prosumers are: energy prices, the electricity grid and the accessibility of connecting prosumers to it, electricity market trends, the implementation of smart meters, smart homes and grids, storage systems and technology costs. A major factor in promoting prosumers is a stable and beneficial support scheme, but also the existence of a market that provides prosumers with expertise, technical solutions, and advice [8].

RESEARCH METHODOLOGY

The main objective of the research is to study the potential national and regional factors driving the growth of prosumers. The main objective was achieved by fulfilling some secondary objectives. The first secondary objective was to analyse the distribution of the number of prosumers and to identify the counties with the highest and lowest number of prosumers. Another objective is to determine the technic, social, economic, and climatic conditions at county level in order to study these conditions in the counties with the highest and lowest number of prosumers respectively. The last objective was to study the availability of the network and the fulfilment of the conditions (exceeding the national average) in the counties with the highest number of prosumers and the non-fulfilment of the conditions in the counties with the lowest number of prosumers of the analysed factors.

The research methodology consisted of researching all documents, reports and information, public resources available online. All the sources used to carry out this research were taken from the online environment, by downloading documents (excel, pdf, word) available on the websites of the authorities holding the required data, taking the data and processing it to obtain the information needed for the research. The criteria for the selection of the sites chosen as data collection sources were availability, credibility, accuracy, and most recent data.

The research steps consisted in collecting and processing data on the evolution of number of prosumers from the websites of the nine distribution network operators. Then, the policies over the last three years from the National Authority for Energy Regulation website was researched to produce Figure 2, which shows the impact of adopted policies on the evolution of prosumers. The next stage consisted of collecting data on the availability of the energy grid to integrate new production capacities from the website of National Energy Transport Company Transelectrica organized in Table 1. Next, the counties with the highest and lowest number of prosumers according to the latest available data (06.2023) were identified and seven counties with the highest number and seven with the lowest number of prosumers were chosen. Step three consisted of collecting the necessary data on average net income per county, GDP per capita, number of individual dwellings, population density and photovoltaic potential for each county. Data on average income per county, data on population density and data on the number of individual dwellings were taken from the website of the National Institute of Statistics, data on GDP per capita were collected from the website of the National Commission for Strategy and Forecasting, data on photovoltaic potential were estimated using the map made by Solargis website. All these data have been aggregated in Table 2, which represents the solutions to the research objectives. The data in the table were analysed and based on them the research conclusions were drawn.

In this paper, the research carried out was limited only to the conditions in Romania, but it can also be carried out for other countries in order to study how different economic, political, social, technic and climatic conditions can influence an increase in the number of prosumers in certain countries/areas.

RESULTS AND DISCUSSION

In this part will be analysed the possible issues influencing the growth in the number of prosumers. As can be seen in Figure 1, the rate of growth in the number of prosumers is strongly influenced by legislative changes. n recent years national and European leadership has sought to create a legislative framework that encourages the growth of prosumers. In 2008, Romania transposed Directive 2009/28/EC in the form of Law 220, which aimed to make renewable energy production more attractive. In 2018, the law was amended by Law No 184/2018, which approved GEO No 24/2017, according to it, prosumers who produce electricity from renewable sources and have an installed electrical power of no more than 27 kW per consumption site can deliver the energy to the grid and sell it to electricity suppliers. In 2020, by Law 155/2020, the threshold of 27 kW was increased to 100 kW per consumption site and in 2021 to 400 kW per consumption site by the adoption of GEO 143/2021.

Figure 2 shows the evolution of the number of prosumers every two months and the growth rate of the number of prosumers (represented in green) from May 2020 to May 2023 and highlights the strong impact that policies and the legislative framework have on the growth of the number of prosumers. From the year 2021, (when the data is available), the prosumers were broken down into natural persons, represented in blue, and legal entities, represented in yellow. The figure shows increases in the monthly growth rates of the number of prosumers as a result of each change or addition to the legislation. The amendment of law 155 of July 24, 2020 brings with it the highest rate of increase in the number of prosumers, an increase that occurs from September 2020 to December 2020, with a maximum rate compared to the previous month of 36.54% recorded in December. The increase of the maximum capacity that can be connected to the network to 400 kW by GEO 143/2021 resulted in a growth rate of 19.12% among individual prosumers. The average monthly rate in the analysed period is 13%.

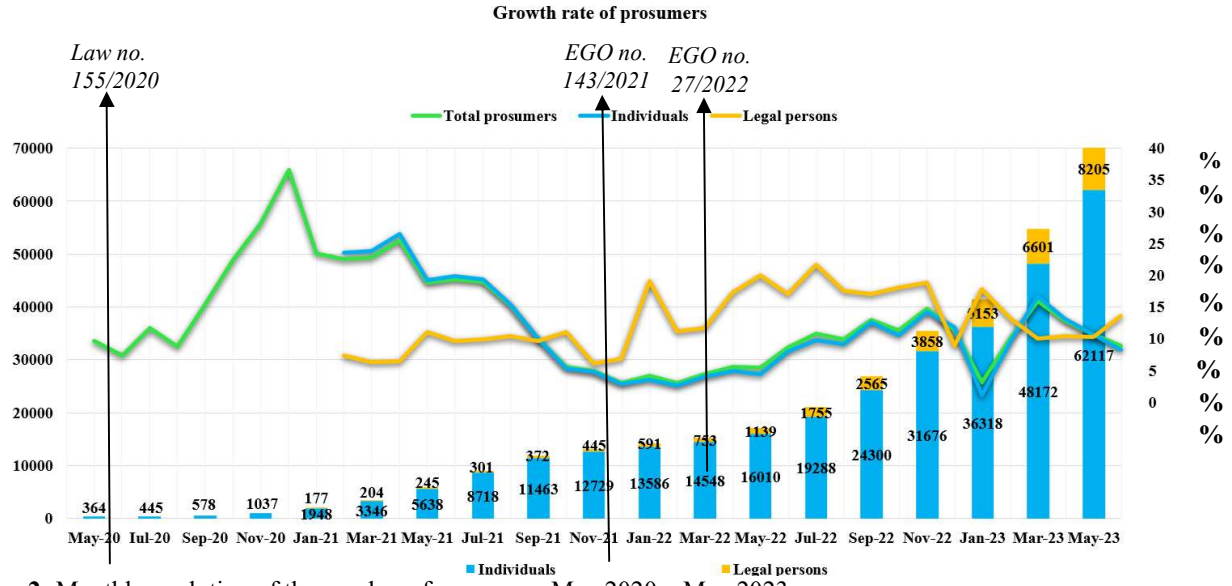

Figure 2: Monthly evolution of the number of prosumers May 2020 – May 2023
Source: The data is taken from the National Energy Regulatory Authority website https://anre.ro/consumatori/energie-electrica/cum-devin-prosumator/ from the reports on monitoring the activity prosumers for 2021-2022, references [9-10]

The data used in Table 1 was taken from the nine network distribution operators websites: Delgaz Grid, E-distribution with its three branches Banat, Dobrogea and Muntenia SDEE with the three branches Transilvania Nord, Transilvania Sud and Muntenia Nord, and Oltenia Energy Distribution and also from the annual reports of prosumers available on ANRE [9] and Transelectrica [11] websites. The retrieved data are from June 2023. The purpose of the table is to highlight the counties with the highest and the lowest number of prosumers and also the impact of the grid availability in installed capacity increase.

Table 1: Number of prosumers in each county in Romania, by June 2023

County	No. prosumers	Installed power		Available grid connection capacity	County	No. prosumers	Installed power		Available grid connection capacity
		2021	June 2023				2021	June 2023	
Bacău	1439	1255	16481.79	Medium	Constanța	2378	2313	27929.96	None
Botoșani	917	817	8878.36	Medium	Ialomița	1219	1463	15596.22	None
Iași	2857	1686	28216.42	Medium	Tulcea	839	974	17313.16	None
Neamț	1594	1897	20355.92	Medium	Brăila	734	619	11047	None
Suceava	2492	1846	29416.55	Medium	Buzău	1082	871	20388.06	Low
Vaslui	1109	1201	11652.9	Medium	Dâmbovița	1458	965	16945.32	Low
Argeș	2954	3612	36687.57	Low	Galați	1068	1024	11798.22	None
Dolj	3223	2190	38685.1	High	Prahova	1777	1719	24002.52	Low
Gorj	1134	979	17815.35	High	Vrancea	1446	1618	20869.9	Medium
Mehedinți	1167	954	10935.3	Very low	Bihor	2414	2551	32084.43	Very high
Olt	2051	2533	19394.35	High	Bistrița-Năsăud	801	362	21267.05	Very high
Teleorman	1058	1168	13124.41	Very high	Cluj	2159	1108	24969.61	Very high
Vâlcea	2066	2307	20638.96	Low	Maramureș	1420	1387	15885.05	Very high
București	2718	5658	32594.27	Very high	Sălaj	718	562	9916.89	Very high
Giurgiu	1137	895	21925.71	Very high	Satu Mare	1630	2018	15675.83	Very high
Ilfov	6530	13921	66505.39	Very high	Alba Iulia	1439	1189	20473.55	Low
Arad	3073	3612	32883.87	Very high	Brașov	2097	1485	26104	Low
Caraș-Severin	604	778	6451.83	None	Covasna	1073	1235	10029	Low
Hunedoara	1555	3174	16940.48	Very high	Harghita	2386	2622	25534	Medium
Timiș	4598	4337	54272.04	None	Mureș	2214	2258	27564.18	Medium
Călărași	939	1185	9219.07	Medium	Sibiu	2075	2020	20660	Low

Source: Adapted using data from the nine distribution operators and from the ANRE [9] and Transelectrica [11] websites then processed in the table.
Table 1 provides information on the number of prosumers registered in June 2023 and their installed capacity. It also includes information on the available connection capacity to the transmission grid by county in 2021 and the installed capacity of prosumers by county at the end of 2021.

As can be seen in Table 1, the counties with the highest number of prosumers connected to the SEN are Ilfov, Timiș, Dolj, Arad, Argeș, Iași and Bucharest. In fact, Ilfov county has 3.6 times more prosumers than the country average, followed by Timiș with 2.5 times more prosumers and then Dolj with 1.8 times more prosumers than the national average. Also, according to the data in the same table, the seven counties with the lowest number of prosumers are Bacău, Bistrita-Năsăud, Botoșani, Călărași, Caraș Severin, Sălaj and Tulcea. Also, from the data collected in Table 1 it can be seen that in areas where the grid had above average available connection capacity, installed capacity increased significantly in 12 of the 25 counties with above average grid absorption capacity. These include the counties with the highest number of prosumers such as Ilfov, Bucharest, Arad, Dolj, Iasi, but also counties with less than 1000 kW in 2021, such as Bistrița-Năsăud or Giurgiu whose number of prosumers is 59 and 24 times higher respectively in June 2023 and where grid availability is very high. Timiș, Constanța and Argeș are examples of counties where even though the grid could not accept much new capacity, the number of prosumers and the quantity delivered continued to grow reaching 13 times the capacity in 2021. Also, 12 counties out of the 17 in which the network has a low to no availability had low prosumer capacity evolution, below the average evolution of the installed capacity per county, the highest installed capacity in such counties being recorded in Vâlcea county, with low capacity, and the lowest in the Caraș-Severin county. The data in the table highlight that the availability of connection to the national electric transmission network can be a deterrent for prosumers. In areas where the network is already loaded, the increase in the number of prosumers is less.

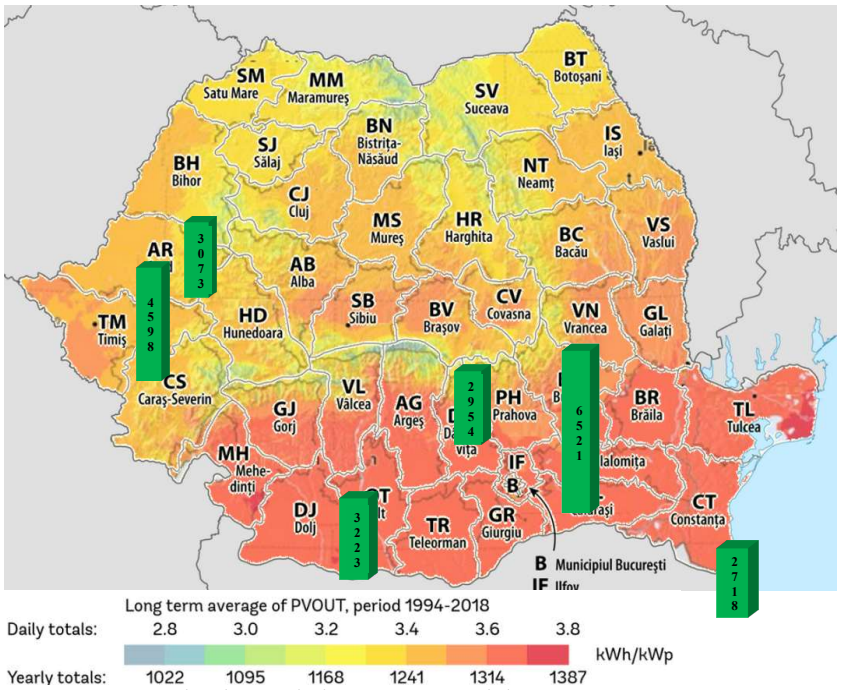

Figure 3: Romania Photovoltaic Power Potential
Source: Adapted from © 2020 The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis, https://solargis.com/maps-and-gis-data/download/romania [12]

Figure 3 was made by adapting the figure prepared by Solargis at the request of the World Bank in which can be seen the photovoltaic potential for each county of Romania and in particular for the 7 counties analysed in this research.
In addition to the policies adopted at the national level, which can encourage or discourage consumers to become prosumers, another aspect that can influence their decision is the financial means at their disposal. Currently, for the installation of a 3 kW capacity, the Romanian state provides financing, but prosumers have to pay a share of 2000 RON [13], an amount that the most vulnerable consumers, those in energy poverty or who cannot pay their electricity bills, can't afford. Also, prosumers who want to install a larger capacity will have to support the extra cost. Also, due to the low financing compared to the demand, the strict rules for receiving funds and the length of time it takes to access them, some prosumers prefer not to use state funds, but rather loans or self-financing. According to the data available on the website of the National Institute of Statistics in Romania, the counties with the highest average net salaries are Bucharest, Cluj, Timis, Sibiu, Ilfov, Iasi, Gorj and Mures, while those with the lowest average salaries are Teleorman, Vrancea, Valcea, Caras Severin and Hunedoara.

Table 2: Analysis of economic, social, and climatic conditions impacting on the number of prosumers

County	Average net salary [lei/ pers.]	country average	GDP /capita	Above country average	Individual homes	Above country average	Photovoltaic Electricity Potential	Population density inhabi/ km^2	Above country average
Alba	3908.5	YES	99.7	YES	801	NO	Low	53.6	NO
Arad	3778.83	NO	98	YES	928	NO	Average	54.9	NO
Argeș	3977.5	YES	91.9	YES	1532	YES	Very Increased	87.7	YES
Bacău	3864.5	YES	64.7	NO	984	NO	Low	91.0	YES
Bihor	3502.67	NO	81.5	NO	1393	YES	Average	75.7	NO
Bistrița-Năsăud	3502.67	NO	70.3	NO	571	NO	Low	52.8	NO
Botoșani	3525.33	NO	51.7	NO	702	NO	Low	79.6	NO
Brăila	3508	NO	77.8	NO	307	NO	Very Increased	64.2	NO
Brașov	4090.17	YES	119.3	YES	2731	YES	Increased	102.8	YES
București	5839.5	YES	256.4	YES	3248	YES	Very Increased	7703.8	YES
Buzău	3582.33	NO	73.9	NO	493	NO	Increased	71.1	NO
Călărași	3582.5	NO	53.5	NO	421	NO	Very Increased	58.4	NO
Caras Severin	3372.83	NO	75.2	NO	117	NO	Low	33.3	NO
Cluj	5482	YES	138.1	YES	5975	YES	Average	105.1	YES
Constanța	3827.17	NO	109.1	YES	4157	YES	Very Increased	96.1	YES
Covasna	3627.5	NO	74.6	NO	212	NO	Low	55.9	NO
Dâmbovița	3608.67	NO	69.4	NO	1213	NO	Very Increased	125.1	YES
Dolj	3856.17	YES	80.3	NO	1857	YES	Very Increased	86.7	YES
Galați	3847.5	YES	66.9	NO	1296	NO	Increased	117.0	YES
Giurgiu	3784	NO	62.9	NO	627	NO	Very Increased	77.8	NO
Gorj	4125.17	YES	104.2	YES	373	NO	Very Increased	59.2	NO
Harghita	3507.83	NO	71.8	NO	405	NO	Low	46.5	NO
Hunedoara	3385.5	NO	80.4	NO	254	NO	Low	56.8	NO
Ialomița	3629	NO	66.8	NO	490	NO	Very Increased	59.7	NO
Iași	4324	YES	80.8	NO	2992	YES	Average	143.8	YES
Ilfov	4546.33	YES	97.4	YES	7644	YES	Very Increased	279.8	YES
Maramureș	3510.17	NO	72.9	NO	813	NO	Low	74.5	NO
Mehedinți	3610.17	NO	65.4	NO	300	NO	Very Increased	51.5	NO
Mureș	4108.83	YES	77.4	NO	621	NO	Average	81.3	NO
Neamț	3490.17	NO	62.2	NO	710	NO	Low	77.6	NO
Olt	3952.33	YES	60.9	NO	388	NO	Very Increased	75.5	NO
Prahova	4077.67	YES	94.6	YES	1028	NO	Increased	157.8	YES
Sălaj	3699.17	NO	76.9	NO	545	NO	Low	56.5	NO
Satu Mare	3569.67	NO	73	NO	671	NO	Low	76.7	NO
Sibiu	4661.5	YES	102.3	YES	2000	YES	Increased	73.7	NO
Suceava	3401.5	NO	57	NO	1710	YES	Low	73.7	NO
Teleorman	3150.5	NO	62	NO	186	NO	Very Increased	61.9	NO
Timiș	4915	YES	123.4	YES	5802	YES	Increased	80.1	NO
Tulcea	3397.67	NO	85.4	YES	176	NO	Very Increased	24.1	NO
Vâlcea	3372.33	NO	82.1	NO	478	NO	Very Increased	62.7	NO
Vaslui	3571.33	NO	45.6	NO	437	NO	Increased	73.0	NO
Vrancea	3239.67	NO	65.4	NO	777	NO	Increased	68.5	NO

Source: The data were taken from the National Institute of Statistics website, the website of the National Strategy and Planning Commission available at references [14-17], the websites of https://solargis.com/maps-and-gis-data/download/romania [12] after which they have been processed in the table

GDP per capita is also a good indicator of the living conditions of Romania's counties. Considering the explanations in the previous paragraph, but also the fact that in order to apply for funds and especially to have access to information, potential prosumers require the technical means (internet, computer) and a minimum level of education, which represent living conditions close to the average level of the country.

The installation of photovoltaic panels requires the existence of a sufficiently large space in which the sun's rays reach throughout the day for them to be truly effective. There are also constructive requirements such as the stability of the construction. Because multi-family housing, such as apartment buildings, requires the consent of all tenants as well as financing, this is not always possible. The vast majority of those who wish to apply for the installation of panels are consumers with their own single-family homes. This applies to individual consumers. For corporate customers, this may be different, as the law allows photovoltaic panels to be installed on leased or jointly owned land.

The number of inhabitants per km^2 can also be a factor that can influence the number of prosumers. In areas with a higher population density, energy communities can be created more easily, but in urban areas that are too crowded, with many inhabitants per km^2, the placement of panels is impossible due to the lack of space, or the shadow caused by the taller buildings around.
Last but not least, a very important aspect is the photovoltaic potential per county. According to Solargis, in Romania, for an installed capacity of 1 kW the amount of energy produced is about 1,300 kWh/year in the counties located in the southern area, Oltenia, Muntenia, Dobrogea and southern Moldova. In the Carpathian and sub-Carpathian regions of Muntenia, Transylvania, the middle and northern part of Moldavia and the whole of Banat, the potential is about 1,200 kWh/year. In the mountain regions, the potential is less than 1,100 kWh/year [12]. All this information is presented in Figure 3.
The data presented in Table 2 were obtained by aggregating several sources of information of public interest and of a general nature available online on the websites of the institutions that collect such data. Also, to make it easier to follow the data in the table, two colours were used, yellow for the counties with the highest number of prosumers and blue for those with the lowest number.
Table 2 shows that out of the 6 selected counties plus the city of Bucharest, six of them have per capita incomes higher than the average for the country, except for Arad County. As for GDP, five of the counties have GDP per capita above the average for the country, except for Dolj and Iași counties, but considering that the average for the country is 83.88, these two counties have GDPs very close to the average for the country. The data about individual houses, six of the counties have the number of dwellings owned (including loans) by individuals above the country average. Regarding solar radiation, it can be seen from both Figure 2 and Table 3 that the photovoltaic potential in the counties with the most prosumers is at least average, i.e. over 1,200 kWh/year. Last but no least, five of the counties analysed have population density expressed in inhabitants/km^2 above the country average.
Summing up the results obtained from the analysis, we can see that in 5 counties (except Arad County) and Bucharest Municipality, at least 3 of the 4 conditions analysed are met. Also, all of them have an above average photovoltaic potential. Analysing also the 7 counties with the lowest number of prosumers, Bacău, Bistrița-Năsăud, Botoșani, Călărași, Caraș Severin, Sălaj and Tulcea, we find that 5 of them have low solar radiation, and in the case of the two counties Tulcea and Călărași, although the photovoltaic power potential is very high, all the other conditions are not met.

CONCLUSION

Prosumers can have a real impact in reducing carbon emissions and protecting the environment. The increase in the number of prosumers and their share in the annual energy production will lead to a considerable decrease in CO_2 emissions and other types of emissions.
The strategies applied on the national level to encourage more consumers to become prosumers have had good results. Legislative changes can influence the evolution of the number of prosumers by adopting national policies encouraging consumers to become prosumers. In addition, there are various funds for which prosumers can apply for investments in photovoltaic systems. As can be seen in Figure 2, the number of prosumers has been continuously evolving, with an average growth rate of 13% and a maximum growth rate of almost 30%. Policies designed to encourage growth in the number of prosumers have served their purpose. Higher growth rates are observed as a result of legislative changes to benefit prosumers. However, the availability of the grid to receive energy and thus to allow new prosumers to be connected has an impact on the growth of prosumers.
In counties where the grid is no longer able to receive new capacity, the growth rates of prosumers are lower. The exception is some counties such as Timis or Arges where an explanation could be found in Table 2. Table 2 contains an analysis of some of the conditions that may encourage or discourage the growth of prosumers. It is clear that in areas where the photovoltaic potential is above average that citizens will be attracted to become prosumers, but in addition to this average income, GDP per capita and type of housing may be factors that hinder the growth of prosumers. Such counties are Tulcea and Caras-Severin counties, where although the photovoltaic potential is very high, the other conditions analysed are not met and the grid cannot receive new capacity.
In the case of counties such as Timis or Arges where the grid is limited in absorbing new energy capacity, the other conditions are met, which may mean that in these areas consumers can afford to purchase more efficient and better performing systems that can be remotely controlled and thus do not disturb the grid. However, this needs to be further investigated as there is not enough data to prove this.
The analysis presented needs to be extended and carried out in more detail, as this article is only an initial analysis of the subject. In addition to the conditions analysed, there may be many other conditions that need to be studied, such as the age, location (rural, urban), the accessibility of grid connection, the number of solar panels suppliers and installers etc. There may also be other factors that are more difficult to quantify, such as public confidence in these energy production systems, the level of information, the attitude of the authorities in the counties in question, and so on.
The research results draw attention to several issues and contain useful information for local and national authorities to consider for policies and strategies to increase the number of prosumers. The analysis also highlights the fact that current programs target the middle-income population, but are not accessible to those who are disadvantaged, living below the national average or in energy poverty.

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Corresponding Author: Laura-Alexandra DOROFTEI
Full address: Str. Gladiolelor, Roșu, București
Email: lauradoroftei10@gmail.com