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Challenges Imposed by Renewable Energy Paradigms of the Romanian Economy from the European Perspective

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Abstract

Promoting renewable energies within the space of the European Union has determined an extensive shift in the energetic paradigm, with multiple effects upon the Member States' economies. On the one hand, the design of this new paradigm is aimed to reduce the specific negative impact of the production and consumption of energy originated from traditional sources; on the other hand, the sustainable development involves the access of the public to sustainable forms of energy, and especially to renewable energies. This paper aims to present a descriptive analysis of the evolutions and changes imposed by promoting the renewable energies at the European Union level, focusing on the realities of Romanian post-transition economy. To understand this change of paradigm, the paper is structured into two distinct levels that are intertwined. The paper also investigates specific aspects on promoting renewable energy and their effects upon national economies .The conclusions argue that, despite the convergence between Romanian and the common European energy policy objectives and promotion of sustainable policies in the field, there are some additional measures that are to be considered in the future

Keywords: *renewables; sustainable development; rural communities; investment; production; consumption*

JEL Classification: *O 13; P18; Q43*

Introduction

One of the characteristics that define the changes of the European space is related to the accelerated development and diversification of the industry. Besides the modern lifestyle requirements, the industrial needs have represented the thrust that contributed to increased energy demand, implying the need to identify new feasible solutions and possibilities for replacement of the traditional energy sources. The energy is the fundamental driving force in promoting and ensuring economic growth and represents a prerequisite in achievement of the current living standards (Popescu et al, 2016; Bucuroiu & Petrescu, 2017; Nica et al, 2017) . Moreover, the literature points out the interrelation between the lack of access to energy and poverty, as a problem faced especially by rural communities. In contemporary societies, the energy began to be considered a strategic commodity and any malfunction in energy supply seriously affects the economic development of the country (Pierce & Paulos,2010; Lazar, 2017; Sen & Ganguly, 2017).

Energy is not a complex research topic but also rises numerous debates in literature both form policy makers, practitioners, social and civil media. For most of the time the energy, including renewables, is related to complementary aspects as the sustainable development policy and its limits (Svizzero & Tisdel, 2016), taxation, evolution of the national economies, environmental and climate policy, and other relevant economic paradigms (Sima, 2014; Sima & Gheorghe, 2014; Constandache et al, 2015; Lockwood, 2015; Panaitescu & Petrescu, 2016; Popescu, 2016; Nica, 2016; Boboc et al, 2017).

Promoting energy production from renewable sources within the European Union represents one of the essential policy elements, considered in order to reduce the dependence from conventional energy sources. During the years the economy of the European Union have become highly energetic dependent, and the need in developing and promoting new sources has dramatically increased, representing a major policy objective. From this perspective, all the measures and instruments used to promote renewable energy are also centered in achieving of some specific economic objectives such as improvement of the economic profitability and minimizing of the costs incurred by the replacement of energy sources and consumption sustainability. Although the technologies used in developing of renewables, are in a continuous progress, there are some limitations in their implementation, regarding the optimality of climate conditions, and by complementary financial measures.

Therefore, the energy may be considered as the veritable "core component of the sustainable development process; and the renewable energy, highly compatible with the environment, represents a viable solution to the problems induced by population growth and by the needs to increase the living standards and boosting of the economic development (UNDP, 2014;Chaurey et al, 2004; Kothary et al, 2010).

As the consumer needs increase and become more diverse, the European strategies and policies promote the renewable energies as the major component of the sustainable model of energy production and consumption. Amid the increased dependence and rising energy consumption in the contemporary economies, the renewable energy represents a viable tool in promoting of the economic growth in rural communities. In Europe, the dispersion and settlement of the population have shaped a unique model that contributes both to the welfare of the residents and the communities, facilitating their sustainable development. However, the development of the European rural communities is significantly affected by the integration and globalization of the markets.

The production of energy from biomass is considered an element with a facilitator role, especially in the development of rural communities. As the agriculture represents the main economic activity in these areas, the promotion of energy crops may generate extra income and added value, expected to be superior to those coming from traditional crops. Moreover, as the extensive usage of energy and the large surfaces of land in the rural areas gain an increasing significance, the energy consumption is expected to increase, with impact on climate change. In addition, the use of renewable energy is safer and brings socio-economic benefits for rural communities such as: the improvement of energy independence at regional level, accelerating of electrification in rural areas, increasing the number of jobs, and improvements in living standards (Tsoutsos et al, 2005; Bergman et al, 2006; Kanasw-Patil et al, 2010; Dusmanescu, 2015).

From this perspective, the involvement of rural communities in the promotion of renewables must be active and long-lasting. Promoting renewable energy raises several important related problems, including governance, economic policy, and the energetic strategy. As Kelly-Richards (Kelly-Richards et al, 2017) points out, the case of small hydropower plants deepens the discussions on strategies to promote the hydropower as viable a tool in achieving of both environmental and renewable energy production objectives. Other studies. (Warren, McFadyen, 2010; Munday et al. 2011) analyze the socio-psychological and economic effects of wind power

development. Some specialists remark the importance of the community-owned wind farms as a potential escape route from a dependency culture but come into notice on the environmental externalities induced by these farms, through the negative impact on landscapes and on local tourism.

The use of renewable sources presupposes additional investments, implied by the upgrade of existing power lines and the setup of new ones in concerned areas. The studies (Warren, McFadyen, 2010; Munday et al. 2011) proved different attitudes among rural communities towards producing of the wind energy, considered through their involvement in the production process. Thereby, the existence of community ownership or energy cooperatives may represent a solution to the controversy on wind farms effects over the landscape in rural areas.

The evolution of energy production from renewable sources in the European Union defines the foundation of a unique energy model, which highlights the unavoidable perspective of reducing energy consumption, irrespective to the implied energy sources or to the consumption efficiency. But, if there is taken into account the availability of renewable energy, it is obviously that the renewables cannot replace the whole consumption of fossil fuels. Promoting of the renewable energy cannot be a long-term solution to satisfy the excessive consumption of energy from community space but may represent a transitional solution, despite the significant side effects involved. For this reason, designing of a renewable or a hybrid energy system, using various articulated components for rural communities, generated numerous studies in the literature, with the aim of both optimization of cost and energy consumption in remote areas (Ashok , 2006, Kanase-Patil, Saini & Sharma, 2010).

Thereby, if the biomass is considered as a renewable energy source, the area susceptible to be used for this type of crops is limited and often generates a change of land destination. The production of biodiesel already has induced significant changes in the paradigm of land use, that is, specific form of competition, which determined changes in regional crops (Andrei et al, 2016; Dusmanescu et al., 2016). This form of competition for fields to be used for food or energy crops, at the global level, generated the so-called "climate changing trilemma" (between food, energy and environment); this trilemma must be but analyzed at regional level (Tilman et al., 2009) considering the experience of three major biofuel production zones: United States, Brazil and Europe (Harvey & Pilgrim, 2011).

Analyzing various researches in this field, Punda et al (2017) concluded that, in southeast Europe, some countries have already significant renewable energy installed capacities, and others are still in the planning stage. Due to crop competition for land and water resources to be used to provide either agricultural products for population, either for biomass production, the use of biomass to produce energy or biofuels can induce increasing in prices of all agricultural commodities (Naylor et al. 2007; De Fraiture, Giordano, Liao, 2008; Greve et al., 2012; Hamelinck, 2013).

Therefore, the impact on food security could be negative (Ene, 2009; Stancu, 2012; Koizumi 2015, Ene, Voica , Panait, 2017). Many interventions aiming to ensure food security at global level, oriented towards vulnerable population, include assistance programs that allow establishing of connections between nutrition and agriculture, concomitant with a favorable impact on energy consumption (Ene, C., Njegovan, N, 2012). For this reason, the national and European public authorities have to initiate measures to increase the coherence between food security and biofuels policies. Moreover, given the interdependencies between the food security and biofuels policies, the national measurements should be developed in order to integrate the country-specific objectives of food and energy security (IFPRI 2008 ; CFS, 2013; HLPE, 2013, Voica, Ene, Panait, 2016).

The sustainable production of energy from bio-sources involves high levels of competitiveness, innovation, new jobs and new skills in order to contribute to generation of significant value chains in Europe. Accentuated pace of change and conversion of renewable energy imposed by

the European regulations, as well as the safety requirements determined by supply and energy consumption, represent joint evolutions that regularly exceeded the possibilities of the economy and society to adapt to the energy realities. Often, some variables considered as given, e.g.: the amortization cycles, the period for gross fixed capital formation, the specific stages of innovation and new technology development, all involve a forced adaptation of society to new contemporary realities.

The use of energy involves certain issues related to the development level of the country: in emerging countries consumers face limited access to modern energy, implying, for rural areas, poverty and a low standard of civilization; in developed countries, often is met the wasteful consumption and environmental pollution. Therefore, solving of the issues of energy consumption requires differentiated strategies tailored according to characteristics of each country.

In this context, the main objective of this paper is to analyze of the evolution of renewable bioenergy production from a double perspective, of both the European Union and, in the case of Romania, trying to highlight the transformations occurred in this sector in terms of changes in paradigm. The paper is structured in two major parts, containing specific analysis dedicated to developments and changes in the European Union (Section 2), without insisting on them, since numerous studies in the field have been realized, and a thorough, more detailed for Romania (Section 3) in order to highlight the transformations occurring in the field.

Renewable Energy in the European Union: Status and Outlook

Removal of the economic model based on fossil fuel consumption results in a significant shift towards renewable energies and defining of a new paradigm in the field. The volatility in prices of energy from conventional sources induces significant implications and contributes to increased need for investments in energetic capacities, harnessing the potentials from multiple perspectives. On the one hand, the satisfying of consumption from conversion of renewables involves an extensive restructuring of the energy sector nationwide, usually implying loss of jobs in the sector; on the other hand, harnessing the potential of renewable energy involves the allocation and reallocation of financial resources. Promoting the production of energy from renewable sources requires new transport infrastructure and interconnection networks that entail costly investments.

The built of the European energy policy is a complex process (Gabriela & Catalin, 2015, Scarlat et al, 2015) and “renewable energy is an important component taking in consideration the challenges of climate change and imperatives of sustainable development. On one hand, there are regulations regarding renewable energy and on the other hand, general regulation regarding energy have been adopted at EU`s level.” The White Paper for a Community Strategy and Action Plan Energy for the future: Renewable sources of energy from 1997 represented the first step in order to create the European Union policy on renewable energy (COM 599/97). Through this paper, the main objective was to increase the share of renewable energy in the EU gross energy consumption from 6% to 12% by 2010, and some specific targets were set up for 2010 regarding the energy production for biomass and installed capacity for different types of renewable energy (wind, photovoltaic, hydro, and geothermal electricity).

The renewable energy policy must cover not only the consumption but also the production component. This is the reason for, through the Renewable Electricity Directive 2001/77/EC, the European authorities established target regarding the share of 21% of Renewable energy in total electricity production for 2010 (Directive 2001/77/EC). The biofuels Directive 2003/30/EC established indicative targets for 2010 regarding the biofuels and other renewable fuels used in transport sector (Directive 2003/30/EC).

The necessity to respect the obligations assumed under the aegis of the Kyoto Protocol, to reduce the emissions of gases with greenhouse effect and to reduce the dependence on imported crude oil, prompted European authorities to adopt the Directive 2009/28/EC, to promote the use of renewable energy. In order to translate this goal into practice, there are necessary actions and incentives in order to ensure the enhancing of technological innovation in the field and creating of the decentralized energy markets, able to ensure the safety of supply and the development of local communities. The European Community objectives in this area were set at: 20% the overall share of energy from renewable sources, and a 10% target for energy from renewable sources in transport (Directive 2009 /28/EC).

Promoting the principles of a green economy, with a high degree of sustainability and achieving the green economic growth in the European Union led to a gradual but irreversible change of the energetic paradigm, including the energy mix, in favor of renewables and clean energy sources. This perspective has imposed the development of a new economic, environmental and social balance.

The recent economic evolution of the European Union has further emphasized the need to diversify the energy sources in order to reduce dependence on imports from outside the Community. From this perspective, the setting of targets for energy production from renewable sources has become a priority both for Member States and for the European Community policymakers.

Due to the different potentials of the member countries and the specific consumption of energy from renewable sources recorded in 2005, the new differentiated targets were set at national level with 2020 deadline. In the Figure 1, it is presented the status for 2005 and targets for 2020.

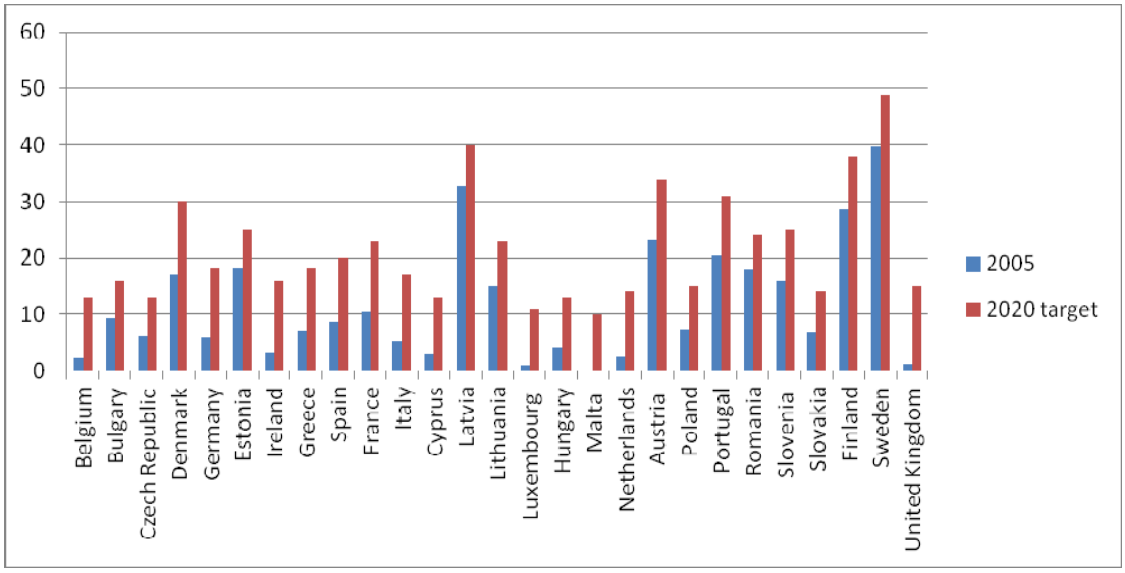

Fig. 1. 2005 and 2020 targets for the share of energy from renewable resources

Source authors, based on Directive 2009 /28/EC

In 2005, the countries with the highest rates of energy consumption from renewable sources were Sweden, Finland and Latvia, whilst at the opposite end are Malta (weighted null), Luxembourg and the United Kingdom. For 2020, the ambitious targets were set for countries with the lowest weights. In Romania, both actual consumption share recorded in the year 2005 and the target set for 2020 are above the European average.

To achieve these objectives, each EU country has developed national policies of renewable energy, national action plans, which include measures designed in order to achieve the objectives and procedures for progress assessment.

The renewable energy transition is a difficult road, which requires concerted efforts from national and European authorities, but also from private companies. The policies adopted by public authorities in the field of renewable energy are critical, as the energy market is closed and lacking in transparency. Through these policies, there has to be pursued the obtaining of certain social benefits, such as: development of rural communities, environmental protection, and elimination of the distortions specific to energy market, dominated for decades by the producers of conventional energy. These policies involve establishing regulations and standards for market functioning, and financial support measures. For the proper functioning of the energy market, there are also essential the dissemination of information, education, and the engagement of stakeholders (Holm, 2005).

In many European Union countries (Denmark, Germany, Spain, Austria, Portugal, Greece, France, Ireland, Czech Republic) is available a pricing system, through the renewable energy is sold to distribution operators at fixed minimum tariffs; these prices are established according to the production costs, location and technology. Thereby, the equal access of all types of investors and the use of all types of renewable energies are guaranteed. In other European countries, like the United Kingdom and Italy, a quota system is used as reverse of pricing system. By using of this system, the public authority establishes a minimum share of energy that must be produced from renewable sources and of those prices are determined through the market forces.

Europe is one of the leading regions in the field of renewable energy. This is mainly due to the European Union efforts towards increase the share of energy from renewable sources to 20% until 2020, according to the 2020 Agenda. This share is not uniform for all European countries and varies from 10% in the case of Malta and 49% in the case of Sweden. As a result, there has been registered an important increase of investments in the period 2009 - 2011.

In Figure 2, it is obviously the ascending trend of the installed capacity for renewable energy and of the new investments in Europe. The production capacity installed in renewable energies grew by 44%, from 301 925 MWe in 2008 to 469 331 MWe in 2014. The annual increase of installed renewable energy capacity ranges from 5% in 2014 to 10% in 2011. The value of investments does not follow a similar pattern, as their value grew from 81.8 billion USD in 2008 to a peak of 122.9 billion USD in 2011, and a fall to 60 billion USD until 2013 and 2014.

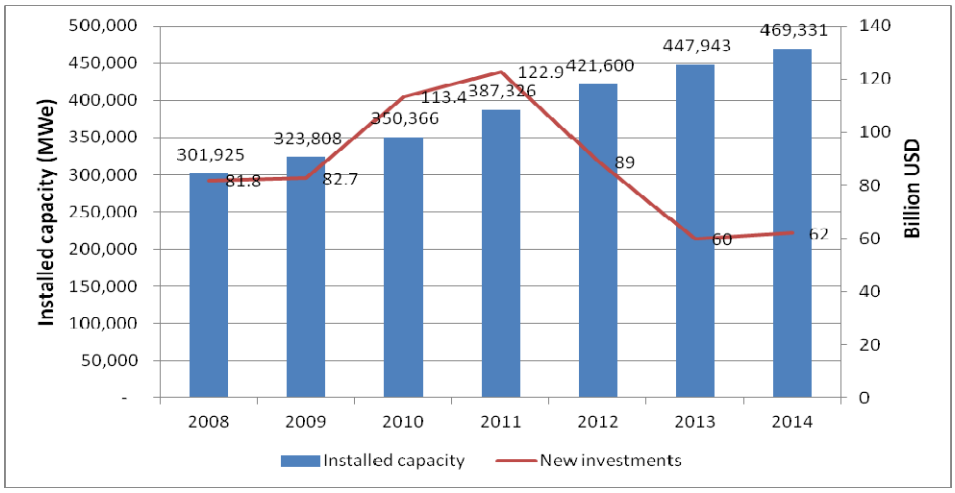

Fig. 2. Installed renewable energy capacity and new investments in European Union

Source: IRENA (2016), UNEP, Bloomberg New Energy Finance

Although the investments in promotion of renewable energy have increased in significance and volume, they continue to present a syncope evolution, representing an accurate picture of the private and state intervention in reducing the energy dependence on imports and of the inland energy production capacities. Along with tax incentives, the investments in renewable energy help to promote green and highly specialized jobs. The evolution of the installed renewable energy capacity and new investments in European Union (Figure 2) reveals a deep change in the Community energy policy, oriented towards growth and expansion of these capacities as a pertinent and sustainable solution to reduce dependence and pressure from conventional sources and increasing the power generation capacity. The dynamic trend described above is a possible effect of the changes in production patterns and of the movements in the frontiers of industrial productivity.

The increase of investments between 2009 and 2011 represent a direct effect of the incentive schemes for renewables, in place in different countries from the European Union, which generated an avalanche of new investments across the continent. The decrease from 2011-2013 may also be explained by two developments. First, many countries reduced their supporting schemes for renewable energy after achieving their required quota in advance. Secondly, the technological breakthroughs in the field of solar photovoltaic panels led to diminutions of the production costs. Also, by analyzing the structure of the renewable energy by technology, it is obviously that the highest increase was on solar with an increase of 8.5 times from 10 430 MWe in 2008 to 88 712 MWe in 2014.

Renewable Energy in Romania, in Comparison with European Union

Promoting of the renewable energies in Romania has represented not only an orientation to the specific objectives in the field and compliance with European energy policy, but also a way to expand, diversify and promote new technologies in the field and to reduce the CO2 emissions. Renewable energies represent a domain with large implications for national economy development, as providers of sustainable energy for both industrial and households' consumption.

According to the 2020 Agenda, Romania, as EU Member State, has a quota of 24% of energy that must be produced from renewable sources. At the start of this analysis, in 2008, this share was 20.5%; in 2014, the share was 24.8%. In order to achieve this result, in 2008 there was passed a Bill (Law no. 220/2008), which established a promotion scheme for renewable energy producers. This scheme grants to producers for each MWh of electricity a number of green certificates (GC) according to the technology used. In 2011, another regulation reduced the number of certificates as it follows: 3 GC/MWh for micro hydropower, 2 GC/MWh until 2017 and 1 GC/MWh starting with 2018 for wind power, 6 GC/MWh for solar power, 2 GC/MWh for geothermal power, 2 GC/MWh for biomass, 2 GC/MWh for biogas and bio liquids and 1 GC/MWh for waste. The availability of this support scheme is 15 years for all technologies, excepting second-hand wind power and micro-hydropower.

Overcompensation is a situation when the internal rate of return resulted from the analysis of users of similar technology is 10% higher than the value considered for the respective technology at the authorization of the promotion system. When such a situation appears, the Regulatory Authority for Energy will propose measures to reduce the number of green certificates. The evolution of installed capacity of renewable energy in Romania proves a specific policy in the field, aiming both to diversify the energy sources and to improve the energetic independence. All four sources of renewable energy have registered massive incensement during the period, as results from Table 1.

Table 1. Installed renewable energy capacity Romania (MW)

Technology		2008	2009	2010	2011	2012	2013	2014
Total renewable energy		383	6466	6883	7502	8446	10190	11244
Hydropower	MW	6362	6450	6474	6483	6548	6610	6613
	%	100%	100%	94%	86%	78%	65%	59%
Wind	MW	5	15	389	988	1822	2773	3244
	%	0%	0%	6%	13%	22%	27%	29%
Solar	MW	0	0	0	1	41	761	1293
	%	0%	0%	0%	0%	0%	7%	11%
Bioenergy	MW	15	0	20	30	35	46	94
	%	0%	0%	0%	0%	0%	0%	1%

Source: Authors, based on IRENA (2016), Renewable Energy Statistics 2016, The International Renewable Energy Agency, Abu Dhabi.

It is noticeable that in 2008 hydropower was the main technology used for renewable energy, but only around 5% of that value represents hydropower plants with a capacity under 10 MWh. The rest is covered by the plants built before 1990, in the form of large hydro projects, which are not considered in the present support scheme because of their environmental influence and of the wildlife displacement. Advancing in time, there may be noticed the significant effect of the supporting scheme on wind farms, as the capacity increased from 5 MWh in 2008 to 988 MWh in 2011, and further on to 3 244 MWh. After 2011, the annual growth rate decelerated from 154% in 2011 to 17% in 2014.

The change in legislation in 2011 promoted the installation of solar power plants of those capacities grew exponentially from only 1MWh in 2011 to 1293MWh in 2014.The change of legislation determined similar effects in the bioenergy sector, which started an ascending trend from 30 MWh in 2011 to 94MWh in 2014.Under this information, the future growth rate is expected to decrease, especially starting with 2018 when the number of GC will diminish from 2 to 1. In case of solar power is expected a rebound, as the cost-efficiency of the technology improves incrementally.

Under renewable energy policy objectives, it may be observed at first the turn of investors towards the wind farm construction as the supporting scheme was, until 2011, one of the most profitable from EU. After 2011 it is noticeable the switch from the wind to photovoltaic technology generated by the change of supporting scheme. If in 2008, the hydro energy accounted for 100% of the entire renewable energy capacity installed, in 2014, this has changed as the hydropower accounts for 59%, wind for 29%, photovoltaic for 11% and bioenergy for 1%.

Conclusions

The energy sector is at a turning point, major changes are needed in order to allow nationals and global economy to face the challenges imposed by the accelerated growth of the population, increasing urbanization and population mobility, which involves fast augmentation in the energy demand, risks arising from climate change and cyber risks, with implications for energy price volatility. As a result, the technical progress requires access to modern energy services, especially for the rural population and the population dependent on the usage of classic fuels (3 billion people use coal, wood charcoal or animal waste for domestic activities like cooking and heating). Worldwide, about 1.3 billion people lack access to electricity, and 84% of them live in rural areas. Therefore, the access to energy is an issue of utmost importance for rural

communities and renewable energy can be a solution to contribute to their economic and social development.

Romania has an important mineral resources potential, that includes fossil fuels like oil and natural gas, including shale gas deposits, lignite and hard coal [53] but also a significant potential of renewable energy, particularly biomass, hydro and wind power. The biomass potential is sizeable, coming mainly from agricultural and forestry waste (60% and 20%, respectively); therefore, it is necessary to put in place a better management of the agricultural sector in order to create the premises for an augmentation in biomass energy production. Therefore, the National Authorities have set clear targets for the production of renewable energy and correlation measures and targets set by the National Action Plan in the Field of Renewable Energy (NREAP), the National Program for Rural Development, and the Master Plan for biomass. The production of renewable energy from biomass involves the expansion of energy crops, through using of the degraded areas and the lands unsuitable for agriculture. Biomass has the advantage of being usable to produce three final energy products: electricity, heat and fuels for transports. Energy from biomass is predictable and measurable, which favors the national energy system. In addition, it may represent a suitable solution for domestic heating and cooking, especially in rural areas.

Romania is a country with a reduced dependence on external energy suppliers (third the least dependent country in the EU) and has a positive energy balance. The development of renewable energy production is expected to lead to positive evolutions of the commercial balance and to the successful integration of the country into the Energy Union.

Multiple constraints generated by the necessity of environmental protection, reduction of energy dependence on foreign markets, increasing social cohesion, imply the promotion of the renewable energy production, as imperative desiderates of European Union. As the renewable energy production requires high investment and production costs, the European countries have decided to implement support systems. Romania opted for using of two interrelated systems: the green certificates incentives and the mandatory quota system.

The energy mix crosses a metamorphosis process by shifting to renewable energy; that results in a decentralization of the production of energy on site, from production in large power plants and transportation that requires nationwide grids and important logistical efforts, to the production in small hydro and micro wind and solar plants. This metamorphosis catalyzes the development of isolated rural communities which will be able to produce energy for the entire community from a renewable source available in the area without the need for transport facilities. Concomitantly, this metamorphosis comprises a beneficial effect in terms of reducing the amount of carbon dioxide emitted into the atmosphere. The two effects above are registered in Sustainable Development Goals that aim to promote sustainable development of the planet.

Another effect of this metamorphosis is the creation of jobs needed to support the construction of the new facilities. Thereby, this metamorphosis is expected to induce a multiplier effect in the economy by involving various manufacturers and service providers in the field. Rural communities will benefit from the emergence of new jobs by increasing purchasing power, which in turn will generate demand for new products and an increase of their living standards.

Switching to energy produced from renewable sources can also imply significant side effects. One of the most important is the removal of large areas of arable land from the food crops, which can affect the market supply and food security.

Another side effect is represented by the changes induced in the environment, wildlife and vegetation, particularly in cases of small hydro, wind and photovoltaic farms with major implications on the environment, and adverse effects upon tourism activities in concerned areas.

The transition to the use of energy from renewable sources is on the way, and the only acceptable decision is to go forward. It might not be the cleanest way to proceed towards a new

energy mix, but it's cleaner than the alternative, the using of fossil fuels. The mankind cannot use 100% renewable energy because of inherent technical and natural limitations (e.g., to produce energy in a wind plant as long as the air flows does not reach a minimum speed, or in photovoltaic plant during the night);it is not possible, yet, to ensure the continuous production throughout the whole day, but the production and the usage of energy are rarely synchronized. Required also by other sectors (especially, the automotive industry), there are expected to be developed new improved technologies for storage of electricity, in order to ensure a cleaner production.

At the EU level, the transition to renewable sources of energy is supported by the 2020 Agenda, which aims for a level of 20% of energy used in the EU to be produced from renewable sources. In these conditions every member state has a national action plan, which contains the roadmap towards achieving of the goal. Because the renewable energy transition is a difficult road, the authors analyzed the efforts made by European authorities in order to set up a legal framework and proper sectoral policies that have certain social benefits, such as: development of rural communities, environmental protection, and elimination of the distortions specific to energy market, dominated for decades by the producers of conventional energy. Romania has an important potential of renewable energy, particularly biomass, hydro and wind power and a reduced dependence on external energy suppliers. In addition, Romania has already achieved its goal regarding the use of renewable sources to produce energy established at EU level.

Although this paper focuses on an actual research topic, and it briefly analyzes in a large section the renewable energy production, consumption and installed capacity for renewable energy from EU members and especially from Romania, it manage to prove that Romania is convergent to the energy policy of European Union in promoting renewable energy production and consumption.

Romania has already achieved its goal regarding the use of renewable sources to produce energy. Forward, there are necessary to further measurements in order to promote the transition to a greener economy, to access the latest and cleanest technologies and to promote investments in R&D activities in the field of renewable sources of energy.

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