

THE IMPORTANCE OF USING RENEWABLE WIND ENERGY FOR THE DEVELOPMENT OF ROMANIAN RURAL AREAS

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Abstract. The problem of rural development and planning is complex because rural areas have a high development potential arising from their diversity and specificity. In this context, Romanian rural communities, therefore, must adapt to identify new opportunities for sustainable economic development, one of them being the renewable energy sources. This article discusses the importance of using wind energy potential in rural areas having as a case study the development of the wind farm/park in Poarta Albă commune, Constanta County. The analysis leads to the conclusion that wind energy which is a form of renewable energy can be the development engine of Romanian rural communities.

Key words: energy sources, wind farm/park, sustainable development, rural planning, Poarta Albă commune.

1. Introduction

The share of rural population and the area occupied, and the importance of the rural life for a country makes the issue of rural development and planning to gain size as well as national and international importance (Oțiman, 2005).

About 45% of Romania's population lives in rural areas, being the state with the highest proportion of rural population in the European Union. The basic economic activity in Romanian

rural areas is agriculture, which is why their development is not sufficient compared to the developed countries in Western Europe, and reported to the reality registered in the ex-socialist Central and Eastern Europe (Davidova *et al.*, 2009).

The rural development policy at the European Union level focuses on improving the quality of life in rural areas and on encouraging diversification of the rural economy. In this context, the Romanian local communities must

therefore adapt to identify new opportunities for sustainable economic development, one of them being the renewable energy sources.

The objective of this paper is to show the importance of developing Romanian rural areas by using renewable wind energy as a development engine to strengthen the rural economy.

1.1. Sustainable Rural Development

The development involves increasing, but what distinguishes it is precisely the change, the switching to a new state, to a higher level, to the complexity (Petrișor, 2008).

One dimension of the development itself is the sustainable development which is *“a model of structural, economic and social transformations that optimize the economic and social benefits available today, without jeopardizing the probably potential benefit likely to recur in the future”* (Goodland and Ledec, 1987). According to the Brundtland Report (1987), the sustainable development is *“the development that meets the needs of the present without compromising the ability of future generations to meet their own needs”* and the control factors are defined by the three pillars - economic, social and environmental (Elliott 2006; Petrișor, 2008). There are also authors who support the concept of sustainable development as a four-dimensional scheme involving the environment, economy, society and the institutions (Shao *et al.*, 2011).

Many authors consider that some of the dimensions of sustainability coincide with the four pillars; a fifth dimension (of equal importance) was considered in order to acknowledge the fact that development takes place in territories

with variable sizes, corresponding to the administrative divisions (Petrișor, 2014, Petrișor and Petrișor, 2014, Pêti, 2012). However, the key to understanding sustainable development is the interconnection of traditional pillars (Ianoș *et al.*, 2011).

The urbanism deals with the development of settlements whose legislative definition places it as an operational, integrative and normative activity aimed at stimulating the complex evolution of settlements through short, medium, and long term strategies of development (Petrișor, 2013) and which has as a result improving the living conditions for all its inhabitants.

According to the *National Statistical Institute* of Romania rural areas cover 87.1% of the country, the commune is *“the basic administrative territorial unit comprising rural population united by the commonality of interests and traditions, made up of one or more villages, according to the economic, social, cultural, geographic and demographic conditions”* (Law no. 351/2001) and the territory to which the rural policy is implemented.

Mainly, rural development is based on its natural available resources, which, if used, are developing (the upside) and can enhance the quality of life and the general welfare of the community. The way the rural development and land settlement took place varies greatly from one geographical area to another, depending on the economic potential of the area, on the cultural environment used for the benefit of habitat, on the protection of settlements and on the local economy (Rusali, 2013).

The term "rural development" derives from the economic concepts applied to

the people and resources in rural areas and can be defined by an improvement in the economic and social welfare of rural residents and the physical and institutional environment in which they live (Brînzan, 2006).

An approach to the current concept of rural development is based on the sustainable development and it has some fundamental features, referring to:

- *Sustainable rural development*, involving equitable and balanced economic development, with a high level of social cohesion and inclusion and accountability for the use of natural resources and environmental protection.
- *Extensive or integrated rural development*, which covers rural development by expanding means of communication and information and by expanding rural activities towards non-agricultural sector and by promoting extensive agriculture whose essential coordinate is information transfer.
- *Multisectoral rural development*, which refers to networking and partnerships between international organizations, national agencies or civil society organizations for the multi-sectoral approach (Bleahu, 2005).

Sustainable rural development is defined „within very precise coordinates: stabilization of the population in rural areas by removing or reducing the rural exodus, eradication (combat) of poverty by stimulating and increasing employment, promoting equal opportunities for all rural residents, increasing quality of life and general welfare by conserving, protecting and enhancing the environment and countryside” (Oțiman, 2005).

In Romania the rural sector carries significant weight, therefore the issue of sustainable rural development policy

should encapsulate the economic and social development of local communities. Currently, rural development in Romania continues to be in a crisis, and the economy is far from being stable and able to support it. The global and national economic crisis requires local communities to adapt, by identifying new activities that provide opportunities for sustainable economic development.

Therefore, the community decisions concerning the development and rural planning proposals must be based on sustainable development principles for raising the socio-economic development of localities.

1.2. Renewable wind energy

Energy is one of the more basic human needs and the trends in energy use are major indicators of the economic growth of a particular country/society (Gavrilăscu, 2008). Thus, the energy indirectly plays a significant role in eradicating poverty, raising living standards and developing economy (Ma, 2011).

According to some authors, renewable energy sources have a large potential to contribute to the sustainable development of specific territories by providing them with a wide variety of socio-economic and environmental benefits (del Rio and Burguillo, 2007, 2009).

Wind energy means transforming wind energy by using wind turbines into electricity. Wind energy is one of the most promising renewable energy technologies an area where there were numerous achievements that have increased power generation efficiency (European Commission, Directorate General for Energy, 2011). Renewable

energy technology is one of the solutions, which produces energy by transforming natural phenomena (or natural resources) into useful energy forms (Chen *et al.*, 2011).

Romania's rural development strategy is part of the reform and development that the European Union proposes by means of Europe 2020 Strategy „An European strategy for smart, sustainable and inclusive growth”. One of its flagship initiatives is „A resource-efficient Europe” to help decouple economic growth from the use of resources, support the shift towards a low carbon economy, increase the use of renewable energy sources, modernize our transport sector and promote energy efficiency.

On the other hand, according to the *Energy Strategy of Romania* for 2007-2020, updated for 2011-2020, in Romania the production of renewable energy must be promoted, so that the share of electricity produced by these sources should be 35% in 2015 and 38% in 2020 from the total gross electricity consumption.

The main energy issues that the European Union is facing today are energy efficiency, energy security and sustainable energy production. Therefore, its purpose is to achieve 20% of energy from renewable sources (wind, solar, hydro-electric and tidal, geothermal and biomass energy) by 2020.

According to the report „*Wind Energy and other renewable energy sources in Romania*”, Romania has been a leader among emerging markets in Europe in 2012, covering 8% of new wind energy sources in the European Union, ranking 5th in the installed capacity of wind power. In 2013 it was still in 5th place in Europe in terms of installed capacity, indicating an

increase of 36.5% of installed wind power capacity over the previous year. In 2014 it was estimated that this percentage will be about 9% of total gross electricity consumption and 10% in 2015, due to the fact that wind farms commissioned in 2014 will operate throughout the year 2015 (TPA Horwath and Schoenherr and SCA Associates, 2014).

The potential for using renewable wind energies is high in Romania (17% of green energy production potential), but different in regions of the country, high in the Black Sea area, Moldova and Dobrogea plateaus and mountains (Management Authority for RDNP, 2013). Therefore, the southeastern counties should try to balance their natural potential (an important biogeographical area) and their high potential for unconventional energy (Petrișor, 2014) as a starting point to stimulate their development.

In Romania, a wind energy park has approximately 50 MW which is a lot over the European average. Operational wind farms are mainly located in the south-east of the country in Dobrogea, on the Black Sea coast, where the average wind speed can reach 7 m/s at an altitude of 100 m. This is possible due to the small density of the population in rural areas of Dobrogea, a flat region, which makes it possible to install a large number of wind turbines, representing the main area used for the wind energy parks of Romania (TPA Horwath and Schoenherr and SCA Associates, 2013, 2014).

2. Methods

Developing rural communities has a high degree of complexity, with the economic and social implications they generate. Therefore, it is normal to have concerns in the local public sector on identifying

solutions and sustainable economic development methods, such as the construction of wind farms/parks.

To accomplish this paper, the research methods used are the systemic analysis of the literature, the general analysis and comparison of studies, reports and papers on sustainable rural development and renewable wind energy as well as the technical project „The Construction of Poarta Albă Wind Park” (ECO TERRA PROIECT SRL, 2012).

3. Case study: Poarta Albă commune, Constanta County

Poarta Albă commune is located in the eastern county of Constanta, at a distance of 23 km from the city and 15 km from Medgidia, with an area of 6553 ha and a population of 5208 inhabitants (Fig. 1).

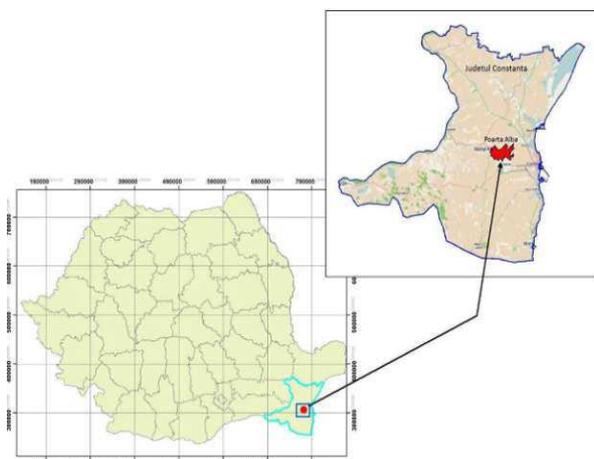


Fig. 1. Location of Poarta Albă commune in Constanta County

The economic profile of the commune is focused on agriculture, animal husbandry/zootecnics (cereals, vines, farming, animal husbandry/zootecnics, services in agriculture) and commerce.

On the other hand, Poarta Albă commune is affiliated to Constanta Metropolitan Area, which is an effective administrative tool to promote joint projects, a facilitator to attract investments (Stan *et al.*, 2014). In

the „Integrated Development Plan for Urban Growth Pole Constanta, Constanta Metropolitan Area” there are priority development programs for the use of renewable energy.

Its geographic location in Dobrogea, along the Danube and the Black Sea Canal, characterized by a steppe relief and a temperate continental climate creates the potential for using renewable wind energy as a solution in sustainable development of the commune.

3.1. Poarta Albă Wind Park

The project analyzed consists in developing a wind farm with 28 Vestas V112-type wind turbine with a rated power of 3 MW, with a total installed capacity of 84 MW, on the administrative territory of Poarta Albă on the western edge of the unincorporated territory of the commune (Fig. 2). The project also includes the realization of a transformer station 30/110 kV, of a 110 kV substations (future module within ENEL connection stations), connecting the electricity networks as well as building and upgrading the communication lines and access (ECO TERRA PROIECT SRL and EPC Consultanță de Mediu SRL, 2012).

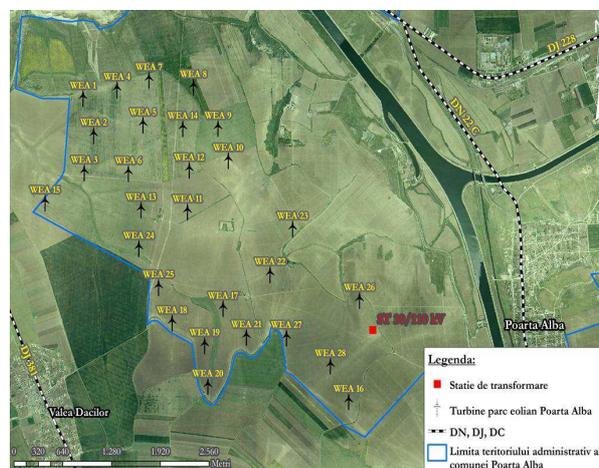


Fig. 2. Location of Poarta Albă Wind Park (Source: EPC Consultanță de Mediu SRL)

The project site examined is located near the Danube-Black Sea Canal and the Poarta Alba-Midia-Navodari Canal, having the appearance of a flat platform. The land on which the investment is to be achieved, on which the roads and platforms will be placed are agricultural lands, outside Poarta Albă and city-owned by individuals. Within the project area there are no natural protected areas (ECO TERRA PROIECT SRL and EPC Consultanță de Mediu SRL, 2012).

The main components of Poarta Albă wind park are (ECO TERRA PROIECT SRL and EPC Consultanță de Mediu SRL, 2012):

1. *Access roads* that will be either the existing exploitation roads (of land) for which complete improvement works will be made and the new roads (access roads within the parcels on which the wind turbines will be installed), with a total length of 24,832.10 m (16370.20 m - rehabilitated exploitation roads; 8461.90 m - new access roads);
2. *Technology platforms* that will be made for each wind turbine, with an area of 1000.00 m² each. On these platforms, the pre-assembly stages of turbines and installation activities will take place using high capacity cranes. The platforms will be used in the operating phase of the wind farm/park to conduct maintenance work and interventions for turbines;
3. *Wind turbines*, including their foundations;
4. *Medium voltage underground electrical grid* (30 kV), which ensures the connection between the turbines and 30/110 kV transformer substation;
5. A 30/110 kV *electric transformer substation* and a 110 kV *electric station*. This will allow the evacuation of power produced by Poarta Albă Wind Park towards the National Energy System. A 30/110 kV transformer substation will

connect through an underground 110 kV electric line (LES) to a 110 kV electric station (which will also belong to PNE Wind Romania) and from here to the 110 kV connection station, input-output type, a connection station which will belong to SC Enel Distribution Dobrogea SA.

In Poarta Albă Wind Park electricity will be produced which will be delivered in the National Energy System. The estimated annual electricity production for the 28 wind turbines is approx. 200 GWh.

The wind turbines use a perpetual energy, renewable, which is never consumed and start at a wind speed of only 3.5 m/s.

Under normal functioning conditions, the wind turbines do not consume water, electricity, heat or fuels. The wind turbines can consume electricity but while the wind speed exceeds 25 m/s and brake actuation is required, or when the wind speed is less than 3 m/s (ECO TERRA PROIECT SRL and EPC Consultanță de Mediu SRL, 2012).

3.2. Results. Discussions

The path to a low carbon economy means developing a local public sector able to identify and support the economic opportunities. In particular, the local public sector can play a strategic role as planning manager and public policy applicant's final (ENER-SUPPLY, 2012).

The local administration is the main agent of local community development, a development which can occur only through a public highly performing management of investment projects.

Thus implementing the project „Construction of Poarta Albă Wind Park” by the local administration aims to:

- Generating direct and indirect economic effects for the socio-economic development of the area and creating new jobs by attracting investors;
- Protecting the environment by reducing emissions;
- Realization a new electricity production capacities by harnessing renewable wind resources;
- Increasing energy efficiency in the context of climate change;
- Increasing productivity of Romanian companies in accordance with the principles of sustainable development and reducing the disparities towards the European Union;
- Reducing dependence on imports of primary energy resources, mainly fossil fuels.

By developing the wind park in Poarta Albă commune, Constanta county, the local authority will become the beneficiary of electricity from renewable sources. This fact shall brings additional revenues to the local authority of the one part, and on the other part, the costs of public lighting and supply of electricity in schools, kindergartens, city hall and other public institutions will be eliminated.

In the report *„Wind Energy and other renewable energy sources in Romania”* states that Romania has the highest potential of Southeast Europe in wind energy and southeastern Dobrogea ranks second on the entire continent (TPA Horwath and Schoenherr and Asociații SCA, 2013). Given these data and although the total potential in the production of green energy in our country is 65% biomass (Management Authority for RDNP, 2013), the local authority chose to exploit at the commune level the wind and voltaic energy potential.

Starting from these considerations, the choice of location of the project was done considering certain socio-economic and technical criteria due to the high cost of the investment. In this regard, the land used on which the wind turbines will be installed is arable land, which will involve the loss of farmland, about 14 ha. Meanwhile, it is known that wind parks located on arable lands have the lowest environmental impact of all energy sources.

The brochure *„The benefits of renewable energy”* presents the arguments that support the use of wind energy (European Commission, Directorate General for Energy, 2011)

- is a source of clean energy without carbon dioxide emissions;
- supplies low-cost indigenous energy;
- is already an important export industry;
- although the landscape changes, unhindered farming/industrial activities can take place;
- can be deployed both onshore and offshore.

The disadvantages of using wind energy sources in rural areas have also been identified, as follows:

- increasing the noise level in some areas – the so-called "noise pollution";
- placing wind turbines generates an unpleasant appearance – "visual pollution";
- affecting the environment and some local ecosystems, but the effect can be limited through careful design;
- high risk damaging due to storms if the wind speed exceeds the permissible limit of design.

Accordingly, wind energy, which is a form of renewable energy is an energy of

the future because it is a completely clean and cheap energy.

Meanwhile, the precarious situation of Romanian the rural sustainable investments argues the need to develop a diversified rural economy that will lead to the general welfare of the community.

From this perspective, the project „*The construction of Poarta Albă Wind Park*” will be given the opportunity to attract local authority sources and resources in order to support community development.

Currently, the wind park is authorized and according to Transelectrica (2015), in Poarta Albă commune, there are connection contracts to the National Energy System regarding a 0.2 MW power grid wind turbine connected to the Tătaru station. On the other hand, the concern of local public administration to attract the structural funds triggered the development of a project concerning the construction of a 0.544 MW photovoltaic park a 110/20 kV connected to Nazarcea station.

The involvement of local public administration in these projects represents an important change towards a smart approach to public management. Thus its ability to adapt to changes will turn it into a resort for the welfare of the village.

Therefore, the local public administration will play a crucial role for the sustainable economic development of the community which inevitably outlines the importance of using renewable wind energy for rural development.

4. Conclusions

The Romanian rural areas have a special importance, economically and socially

speaking, as well as in terms of their size, diversity, natural and human resources that they own.

Currently, many communities in rural areas question themselves on how to tackle unemployment, their social and economic development. Therefore, sustainable economic and social development of rural areas is linked to the creation of a favorable environment for investments.

In this context, the solution to the economic development of Romanian rural communities and to raising living standards would be identifying new opportunities, namely identifying renewable energy sources. Thus, the economic and social life in rural areas will undergo radical changes.

For this, however, it should be changed the way or the approach the policies are made in the community. And as the exponent of the local community development is the local administration, it must be able to support sustainable economic growth. The rural areas should be able to compete effectively in attracting investments, while ensuring and providing adequate living conditions and social services needed by the community. At the moment, this goal can be achieved only by developing sustainable economic, technological and human/social projects, leading to rural areas that no longer have the aspect they have today.

The analysis leads to the conclusion that energy has a fundamental influence on the development and that wind energy which is a form of renewable energy may be the development engine for Romanian rural communities.

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