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LOCAL RESOURCES - KEY FACTORS FOR ENERGY EFFICIENCY IN NORTH-EAST REGION OF ROMANIA

BY

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Abstract. In Romania, the policy of energy efficiency follows the system of European principles for strengthening security of energy supply, and a system of positive principles in terms of reducing environmental pollution and, in particular, reducing the greenhouse effect. Energy efficiency is a central target of "Europe 2020" strategy, and, since it is elaborated at EU level generally, its implementation solutions must be adapted to the region's local conditions.

The article presents the specific conditions, the evaluation of natural parameters, and implementation stage of sustainable resources from the Romania's North-East Development Region. The case study presented in the paper is a comprehensive review of the renewable energy resources from the region, and it is focused on the evaluation of the local energy resources, as well as their influence regarding energy efficiency in construction sector. The implementation stage of renewable energy production technologies in the Romania's North-East Development Region has highlighted that there is a clear need for national strategies with an improved understanding of the natural local resources. The conclusions highlight the Romanian government’s policies related to the expected economic inducements for the enlargement of solar and wind energy power fields in order to foster renewable energy development in the North-East Development Region.

Keywords: renewable energy; wind energy; hydro energy; biomass; geothermal energy; solar energy; energy efficiency.

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1. Introduction

Energy efficiency and renewable energy are the main fields in the sustainable energy policy. Energy efficiency has, also a particular importance to national security because applying its principles can be used to reduce the imports of energy and slow the rate at which domestic conventional energy resources are depleted. In this sense, the energy conservation, through reducing energy consumption from conventional energy sources, has an important positive impact on efficient energy use. The energy conservation actions, through implementation of the energy performance programs in different industries, must contribute to the environment improvement, to insurance the national and individual security, and not to affect the human comfort.

Romania has a wide range of the energy conventional resources, fossils and minerals, (crude oil, natural gas, coal and uranium), which are coming from limited sources in quantity and, therefore, are exhaustible. The country has, also, a great potential for producing of renewable energy that can and must be harnessed (Coleşcă & Ciocoiu, 2013; Miron & Preda, 2009; Ciubotă-Rosie *et al*., 2008; Papatulică & Stănculescu, 2007; Maghear, 2011). Statistical analyses consistently show that Romania still has an economy with a high consumption of energy, despite the downward trend from recent years (the decrease of 36.4% in energy consumption between 1999 and 2010 is due to the reduction in industrial activity as a consequence of the delayed transition to a competitive market economy) (www.energie.gov.ro).

According to targets set by the National Reform Programme, Romania intends to achieve a 19% reduction in use of conventional energy, and a greenhouse gas emission reduction with 19% less compared to 1990. The programme also stipulates an increase share of renewable energy sources (unconventional) of 24% in the total energy consumption. Conventional energy production in Romania, based both on the capitalization of reserves of fossil coal and hydrocarbons, as well as on the uranium ore, in the most optimistic situation will have zero growth in the next 2-3 decades. At the same time, it is expected to increase demand for primary energy in Romania (with multiple causes such as economic development, population growth, the improving of population comfort etc.), and this could be solved by renewable energy providing and/or import of conventional energy under the form of the gas, oil, coal, or nuclear fuel imports. In the not too distant horizon, a careful analysis of government strategies shows that Romania remains dependent on imports of conventional energy, if there are no other alternatives. Eliminating the imports entails extensive actions in the national strategy regarding energy intensity (the energy consumption to produce a unit of gross domestic product), with

immediate results in the discovery of new domestic resources exploitable, in the exploitation of renewable energy sources, as well as in the implementation of measures increase energy efficiency.

The evolution of the Romanian economy, which after 2000, is characterized by two distinct periods, respectively 2000-2008 of economic development and 2009-2013 of recession, influences the energy consumption and its structure. This influence does not preserve the proportionality rule, which suggests that disturbances occur because of other factors. In this context, implementation of the principles of energy efficiency becomes more and more important, especially as targets which must to be achieved in the future only relate to energy consumption, CO_2 emissions etc.

In Romania, as in other EU countries, the construction sector is one of the sectors with the highest consumption of the primary energy. A significant share of energy consumption in the building sector is the heat energy (approximately 55%), which influences and it respects, at the same time, energy consumption trends at the country level. Thus, variation chart, for heat consumption between years 2008-2013, presented in Fig. 1 (www.energie.gov.ro), it respects the national variation trend of total energy consumption.

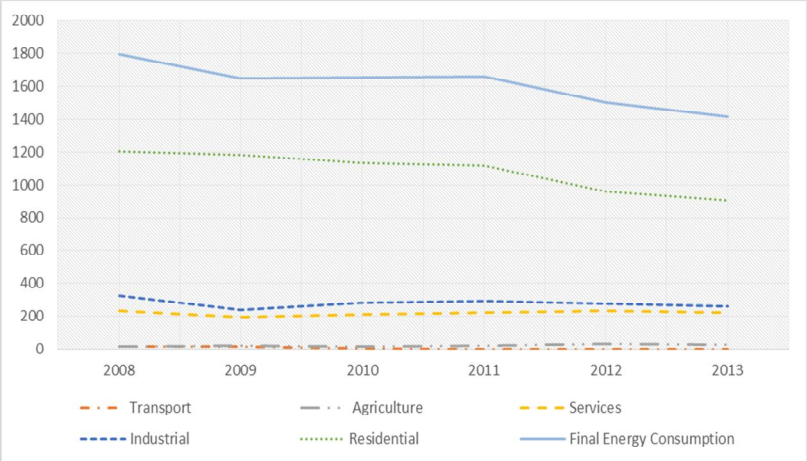


Fig. 1 – The evolution of thermal energy (toe) in the period 2008-2013 in Romania.

The construction sector offers opportunities to reduce energy consumption and CO_2 emissions, with low costs short-term, primarily through improving the energy performance of buildings. The low thermal protection of buildings in Romania leads, approximately, to a double consumption compared

to the energy consumption from EU countries, this having a direct consequence of the high level of CO_2 emissions. The balanced use of energy in buildings will allow reducing the emissions of greenhouse gases at the level of the proposed targets nationally, as well as the level of pollution due to burning fuels. A profound analysis of the statistical data published until now, reveals that emissions of greenhouse in construction sector could be reduced by 90% by 2050. The application of some technological processes of building and by exploitation efficient in terms of use resource and energy consumption, and the intensification of recycling, could significantly reduce emissions.

The paper presents the influence of particularities specific to a geographical area related to the strategies for implementation of national objectives in Romania. Using local energy potential is a target which must be identified in actions to increase energy security and reduce environmental pollution. The case study is developed on to the conditions and sustainable energy resources specific of the development region North - East of Romania. Region North-East is one of the most underdeveloped regions in Romania (Diaconu (Maxim), 2014; National Commission for Prognosis; 2012); INS - National Institute of Statistics, 2012a; INS - National Institute of Statistics, 2012b; INS - National Institute of Statistics, 2011a; INS - National Institute of Statistics, 2011b) but has tremendous potential for development. Identifying and analysing the data collected in this article may be a first step towards region's development, because this analysis presents the indicators that fundament the necessity of future actions, promoted and implemented both the national level and also locally, and which could increase the region's attractiveness to investors.

2. Sustainable Energy Resources
Case Study: A Comprehensive Review of the Sustainable Energy Resources in the North-East Development Region of Romania

Sustainable energy (unconventional energy) is the form of energy obtained from inexhaustible resources, such that the providing these forms of energy serves the needs of the present without compromising the ability of future generations to solve their needs. The technologies which promoting the sustainable energy include renewable energy sources such as hydro, solar, wind, wave, geothermal, bioenergy, tidal energy, and also, technologies designed to improve energy efficiency. Considerable progresses are recorded nowadays in the transition from fossil fuels to systems sustainable and ecological; the studies and research highlighting the possibility of implementing, in certain geographical areas, the concept of "100% renewable", today having available

the technologies required for the production of primary energy from renewable energy.

The implementation of an energy strategy for unlocking the potential of renewable energy sources is part from the requirements of energetic Romania's development in the long term and provides the right framework for making decisions on the energy alternatives.

2.1. Characteristics of the Development Region North-East of Romania

Romania is organized administratively into six regions. The region North-East, Fig. 2 (NDA - National Development Agency, 2012), is the largest region of Romania, having an area of 36,850 km^2 (15.46% of the total area of the country). The region has 6 counties: Bacău, Botoşani, Iaşi, Neamț, Suceava and Vaslui, administrative-territorial units, recognized as statistical territorial units (NUTS) of level 3 (NUTS 3 - EU territorial units under Regulation (EC) 1059/2003). With a population of 3,734,546 inhabitants (17.25% from population the Romania) and a population density of 101.3 inhabitants/km^2, the region North- East ranks second in terms of population density after region Bucharest-Ilfov. The population of region is located mostly in rural areas (56.6%). The region is characterized by a harmonious combination of all forms of relief: 30% mountains, 30% hillside and 40% plateau.

Fig. 2 – Development region North-East of Romania.

2.2. Sustainable Energy Resources In The Development Region North-East Of Romania

2.2.1. Wind Energy

At the end of 2013, wind energy covered 8% of total EU energy demand (Islam *et al*., 2013; Hueging *et al*., 2013). In Romania this indicator was aligned quickly, so that it has increased from 4.4% in 2012 to 8% in 2013.

Table 1
Wind Farms in the Region North-East (on counties)

The region North-East, [MW]							
		Bacău	Botoşani	Iaşi	Neamţ	Suceava	Vaslui
Wind farms	With a technical certificate of connection approval	0	559	218	6	444	132
	With contracts of connection	644	227	814	70	135	709

The increasing is remarkable, given that the end of 2009 only 0.1% of energy needs was covered from wind energy source. The main wind farms are located in the counties Vaslui, Iaşi and Botoşani (TPA Hortwath Schoenherr, 2014). The region North East is second nationally at wind energy produced chapter, the first being the region South East. In Table 1 (TPA Hortwath Schoenherr, 2013), is presented the capacity of production identified on the component counties in the North-East region.

2.2.2. Hydro energy

The hydro energy is the largest source of renewable energy in Romania (in accordance with the identified potential) (Popa *et al*., 2006). According to National Agency for Energy Resources (ANRE), at the end of 2013 there were 77 small hydro power producers, with a total installed power capacity of 530 MW and 51 developers with certificates for power granted for 213 MW (TPA Hortwath Schoenherr, 2014). In the region North East there are counties such as Suceava, Neamt, Botosani, which have the potential to produce hydro energy and in which there are producers, Table 2 (TPA Hortwath Schoenherr, 2014).

Table 2
Hydro Powers in the Region North-East (on counties)

The region North-East, [MW]							
		Bacău	Botoşani	Iaşi	Neamț	Suceava	Vaslui
Hydropower	With a technical certificate of connection approval	0	0	0	0	0	0
	With contracts of connection	0	0.8	0	8.3	2.3	0

2.2.3. Biomass

Biomass represents a renewable source of energy from waste of plant materials and from waste of animal, and it is the oldest source of unconventional energy used by our ancestors (Iluțiu-Varvara *et al*. 2009; Werner *et al*., 2012). The biomass can be regenerated in a relatively short period of time. About 60% of the total biomass used for energy purposes is traditional: firewood (sometimes converted into coal), vegetable scraps and manure. According to ANRE, at the end of 2012 there were 7 producers of energy from biomass with a total installed power of 28 MW and 9 operators with certificates of power granted for 28 MW (TPA Hortwath Schoenherr, 2013). In the development region North-East exist bioenergy producers in the Suceava and Neamt counties, Table 3 (TPA Hortwath Schoenherr, 2013).

Table 3
Biomass producers in the region North-East (on counties)

The region North-East, [MW]							
		Bacău	Botoşani	Iaşi	Neamț	Suceava	Vaslui
Biomass	With a technical certificate of connection approval	0	0	0	3,4	0	0
	With contracts of connection	0	0	0	12,5	14,9	0

2.2.4. Geothermal Energy

Geothermal energy is present in Romania through 66 sources of geothermal water (TPA Hortwath Schoenherr, 2013; Fridleifsson, 2001; Antics & Burkhard, 2007) Fig. 3 (Romanian Geological Institute, 2013), namely:

a) in the Getic Depression: 3 sources with a total flow of 43 l/s in Valcea County;

b) in the Moesian Platform – 14 sources with a total flow of 312 l/s in Ilfov County;

c) in the Pannonian Depression: 12 energy sources with an flow of 90 l/s in Arad county, and 37 energy sources with a total flow of 364 l/s in Timis County.

In the development region Nord-East has not been found any geothermal water source.

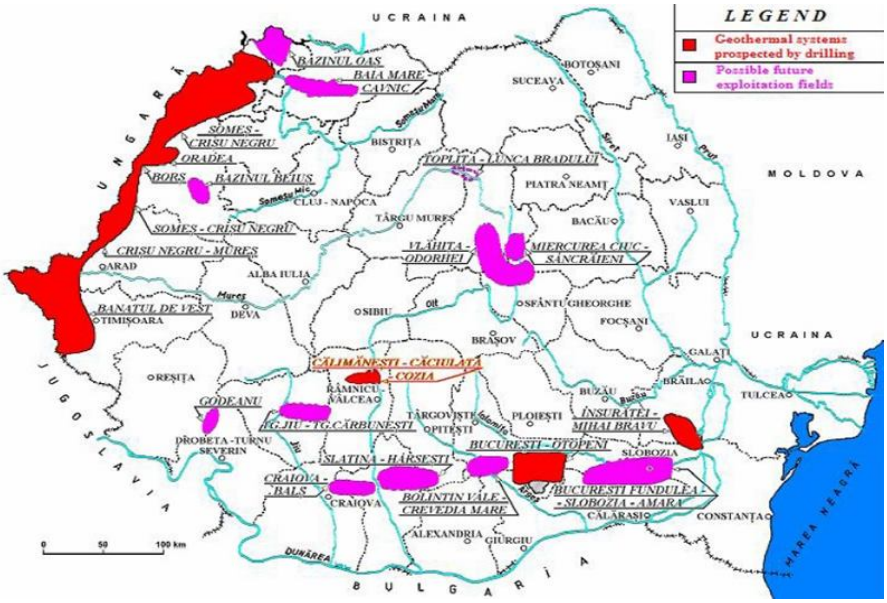


Fig. 3 – Locating the main geothermal water areas in Romania.

2.2.5. Solar Energy

Solar energy is the energy which coming from the sun as solar radiation. For exploiting the solar energy are used photovoltaic panels and solar thermal collectors. Romania is in the European B area from the point of view of sunlight (3.3,...,4.4 kWh/m^2/day) between countries with strong solar energy industry (Beurskens *et al.*, 2011), but with a much lower sunlight (Germany, Sweden, Denmark – 2.4,...,3.4 kWh/m^2/day) and southern European countries with intense sunlight (Portugal, Spain, Italy, Greece – 4.4,...,5.4 kWh/m^2/day), (TPA Hortwath Schoenherr, 2013).

Currently, in the North-East of Romania, are the fewest photovoltaic parks with technical certificate of connection approval and connection contracts, (http://www.bizenergy.ro/wp-content/uploads/2014/06/harta.jpg). The counties Bacau and Vaslui are leaders at this chapter, while the opposite is Suceava County, Table 4 (TPA Hortwath Schoenherr, 2014).

Table 4
Solar parks in the region North-East (on counties)

The region North-East, [MW]							
		Bacău	Botoşani	Iaşi	Neamț	Suceava	Vaslui
Solar parks	With a technical certificate of connection approval	18,3	0,5	0	3	0	6,6
	With contracts of connection	8,5	3,5	7,6	2,4	0	7,6

3. Definitions and Characteristics of nZeb Principles in Romania

Energy efficiency is one of the important pillars of European energy policy and one of the main targets of the Europe 2020 strategy for smart, sustainable and inclusive growth adopted by the European Council in June 2010.

EU support for improving energy efficiency is decisive for competitiveness, security of supply and compliance with commitments under the Kyoto Protocol on climate change. There is significant potential for reducing consumption, especially in energy-intensive sectors, such as construction, manufacturing and transport.

In Europe buildings are responsible for approximately 40% of final energy consumption. Energy consumption in the residential sector is very high in Romania, approximately 36% of total consumption, estimation made in 2010. Investing in improved energy efficiency in buildings can provide substantial energy savings, while supporting economic growth, sustainable development and job creation. Technologies that improve how the energy is used throughout the lifecycle of a building, from construction, then through maintenance and refurbishment, are a priority at this period when a particular emphasis is put on energy efficiency. Besides implementing the requirements of Directive 2010/31/EU, the reduction significantly of energy consumption and associated emissions of carbon dioxide, will have a major impact on supply security with energy, as well as contributing to improved quality of life for citizens.

Based on research results completed in the field, and also, on the developments occurred at EU level, in Romania was elaborate "Plan to increase the number of buildings whose energy consumption is nearly zero" (http://www.mdrap.ro/ userfiles/metodologie_calcul_performanta_energetic), which includes the detailed application, in practice, of the definition of buildings with energy consumption nearly zero – nZEB. This plan includes the indicator of primary energy used from conventional sources as an intermediate target of the year 2015 for achievement of the buildings with low energy consumption from the conventional sources, as well as policies and measures identified for renovation of buildings, in order to achieve buildings with energy consumption nearly zero from conventional sources.

The limits suggested by EU for defining of buildings the nZEB type in Romania, are presented in Table 5 (European Institute for Energy Performance of Buildings (BPIE), 2012). These limits are significantly less ambitious than those set by other countries in Western Europe that are trying to achieve by 2020 new energy-producing buildings „friendly" to the environment and independent of fossil fuels consumption. In the longer term, should ensure the improvement of the building's design to reach the threshold of CO_2 emissions lower than 3 kg CO_2/m^2/year, which represents the minimum value required, in view of the achieve targets of decarbonisation the EU's 2050. The definition of nZEB buildings should be improved gradually, after 2020 and until 2030, so that its requirements for the construction activities will act in line with the environment protection demands.

The benefits of implementing the principles underlying the design and the realization of buildings nZEB, are much broader than saving energy and reducing CO_2 emissions. Renewable energy cannot completely replace the conventional energy, but can play an important role in the energy system in Romania.

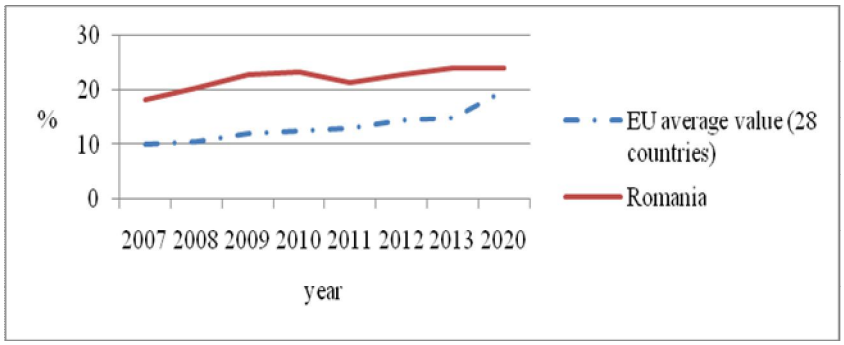


Fig. 4 – The Romania's good route for the share of renewables in total energy consumption.

Table 5
Definitions nZEB Proposed for Romania

Category building	Minimum requirements	Year		
		2016	2019	2020
Individual buildings	Primary energy, [kWh/m²/year]	100		30-50
	Renewable share, [%]	>20		>40
	CO_2 emissions, [kgCO_2/m²/ year]	<10		<3-7
Collective buildings	Primary energy, [kWh/m²/ year]	70		30-50
	Renewable share, [%]	>20		>40
	CO_2 emissions, [kgCO_2/m²/ year]	<10		<3-7
Offices buildings	Primary energy, [kWh/m²/ year]	100		40-60
	Renewable share, [%]	>20		>40
	CO_2 emissions, [kgCO_2/m²/ year]	<13		<5-8
Public administration buildings	Primary energy, [kWh/m²/ year]	100	40-60	
	Renewable share, [%]	>20	>50	
	CO_2 emissions, [kgCO_2/m²/ year]	<13	<5	

Table 6
The Share of Energy from Renewable Sources in Total Consumption of Energy

Country/Year	2007	2008	2009	2010	2011	2012	2013	2020
EU (28 countries)	10	10.5	11.9	12.5	12.9	14.3	15	20
Belgium	3.4	3.8	5.2	5.7	6.1	7.4	7.9	13
Bulgaria	9.2	10.5	12.2	14.1	14.3	16	19	16
Czech Republic	7.4	7.6	8.5	9.5	9.5	11.4	12.4	13
Denmark	17.8	18.6	20	22	23.4	25.6	27.2	30
Germany	9	8.5	9.9	10.4	11.4	12.1	12.4	18
Estonia	17.1	18.9	23	24.6	25.5	25.8	25.6	25
Ireland	3.6	4.1	5.1	5.6	6.6	7.3	7.8	16
Greece	8.2	8	8.5	9.8	10.9	13.4	15	18
Spain	9.7	10.8	13	13.8	13.2	14.3	15.4	20
France	10.3	11.2	12.3	12.8	11.2	13.6	14.2	23
Croatia	12.1	12.1	13.1	14.3	15.4	16.8	18	20
Italy	6.4	7.3	9.1	10.5	12.1	15.4	16.7	17
Cyprus	4	5.1	5.6	6	6	6.8	8.1	13
Latvia	29.6	29.8	34.3	30.4	33.5	35.8	37.1	40
Lithuania	16.7	18	20	19.8	20.2	21.7	23	23
Luxembourg	2.7	2.8	2.9	2.9	2.9	3.1	3.6(e)	11

Table 6
(Continuation)

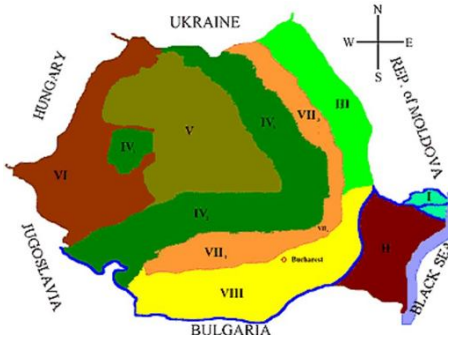
Country/Year	2007	2008	2009	2010	2011	2012	2013	2020
Hungary	5.9	6.5	8	8.6	9.1	9.5	9.8	14.6(d)
Malta	0.2	0.2	0.2	1	1.4	2.7	3.8	10
Netherlands	3.1	3.4	4.1	3.7	4.3	4.5	4.5	14
Austria	27.5	28.4	30.3	30.8	30.9	32.1	32.6	34
Poland	6.9	7.7	8.7	9.2	10.3	10.9	11.3	15
Portugal	21.9	23	24.4	24.2	24.7	25	25.7	31
Romania	**18.3**	**20.5**	**22.7**	**23.4**	**21.4**	**22.8**	**23.9**	**24**
Slovenia	15.6	15	19	19.3	19.4	20.2	21.5	25
Slovakia	7.6	7.7	9.3	9	10.3	10.4	9.8	14
Finland	29.6	31.4	31.5	32.5	32.9	34.5	36.8	38
Sweden	44.1	45.2	48.2	47.2	48.9	51.1	52.1	49
England	1.8	2.4	3	3.3	3.8	4.2	5.1	15
Iceland	:	:	:	:	:	:	:	64
Norway	60.2	61.8	64.8	61.2	64.7	65.9	65.5	67.5
Switzerland	:	:	:	:	:	:	:	:
: = Not estimated, e = estimated, d = defined differently.								

The share of renewables in total energy consumption increased between 2004 and 2013 from 17% to 23.9% (http://epp.eurostat.ec.europa.eu/portal/..., 2015), a good route of national policies, given that Romania's target for 2020 is 24%, Fig. 4. The data used in Figure 4 are taken from Table 6, in which, according to Eurostat data published in 2015 (http://epp.eurostat.ec.europa. eu/portal/..., 2015), it is shown, the estimation for 2020 of energy share from renewable sources in total consumption of energy in mostly of the European Union countries based on the increased results obtained till now.

4. Discussions

In 2013, at level EU 28, Romania was situated on the ninth position, in respect of share of renewable energy in total energy consumption, being ahead of countries like Great Britain, Germany and Bulgaria. Romania has great potential for renewable energy production, being considered the country with the largest wind potential in South East Europe (INS - National Institute of Statistics, 2011b). From the analysis of specialized literature the potential in renewable energy production of Romania can be grouped by regions, Fig. 5 (http://www.bizenergy.ro/wp-content/uploads/2014/06/harta.jpg).

The development region North East has natural features for producing renewable energy. The main renewable energy sources are wind, solar, biomass and hydro. The analysis highlights that in the North-East region, a high potential for renewable energy production is related to solar energy and also for the production of wind and biomass.



Legend:
I - The Danube Delta (solar energy);
II - Dobrogea (solar energy, wind energy);
III - Moldova (solar energy, micro-hydro, wind energy, biomass);
IV - Carpathians (high potential for biomass, micro-hydro and wind);
V - Transylvania Plateau (high potential for micro-hydro and biomass);
VI - West Plain (high potential for geothermal energy and wind);
VII – Sub-Carpathians (high potential for biomass, micro-hydro);
VIII – South Plain (biomass, geothermal energy, solar energy).

Fig. 5 – The territorial regions with renewable resources potential in Romania.

Bio-power has environmental risks and damage ecosystems, produce harmful air pollution, consume large amounts of water, and produce net global warming emissions. Assessing the potential role of bio-power as a climate solution requires a look at its lifecycle carbon emissions, which vary according to the type of feedstock, the manner in which it is developed and harvested, and the scale at which it is used and the technology used to convert biomass into electricity. The lifecycle carbon emissions of bio-power should also be compared to the fossil fuels it's displacing and other zero and low carbon solutions it's competing with. Therefore, the recent studies show little to no economic potential to increase bio-power in the development region North East.

In the North-East region, the hydro energy, which represents the most important source of renewable energy in Romania, is found only at a rate of 0.28% of all renewable energy produced in this region. The main producer county of hydropower is the county Neamt, which is the only county which produces all types of renewable energy, excluding geothermal energy.

Romania has the highest wind potential, almost of 14,000 MW, in South Eastern Europe. A study by Termansen *et al.*, (2009), places Romania as a best place in Europe to construct wind farms due to its large wind potential.

Wind energy is the fastest growing renewable energy source for electricity generation in Romania. The main source for producing of renewable energy, available in all 6 counties analysed in the study case, is the wind, this being responsible for 97.53% of all renewable energy produced in the North-East region. Wind is a clean source of renewable energy that produces no air or water pollution.

Even though the cost of wind power has decreased in the past 10 years, the technology requires a higher initial investment than fossil-fuelled generators. Roughly 80% of the cost is the machinery, with the balance being site preparation and installation. The wind is also variable: if it's not blowing, there's no electricity generated. However, there is a great advantage: the wind is free, therefore the operational costs are nearly zero once a turbine is erected. Some people complain about the noise the machines make, and the rotating blades can also kill birds, but today there are technical solutions to eliminate those criticisms. The major technology developments enabling wind power commercialization have already been made. There will be more refinements and improvements, of course. The high push of technology's deployment will happen when the consequences of climate change will be finally fully recognized and admitted.

The renewable sources of energy represent the most important basis for sustainable development. The main advantages are: the implementation of environment protection requirements, the supply security with energy, economic growth of the regions, and independence from energy based on the fossil fuel resources. Currently, the main administrative unit of renewable energy production from North-East region is Iaşi County, with 1039.6 MW, and at opposite pole, with 105.6 MW, it is Neamț County.

Romania has good potential for energy production from unconventional sources, but the level of its economic development requires a series of measures to create the necessary balance between energy demand and supply from unconventional sources. The main task of those strategies is also represented by the reduction of carbon emissions, as an EU requirement related to energy efficiency and environmental protection.

The construction sector offers opportunities to reduce CO2 emissions with low cost in the short term, primarily through improving the energy performance of buildings. A thorough analysis of the statistical data published to date show that emissions of greenhouse construction sector could be reduced by 90% by 2050. The application of some technological processes of construction and of operating, efficient in terms of the use of resource and of energy consumption and also intensification of recycling, could significantly reduce emissions.

A solution already implemented in some countries, whereby all the actors involved in the construction sector have financial facilities, is the energy

code for building, which ensures a minimum level of energy efficiency for new buildings. In combination with standards for appliances, the energy codes implemented and enforced, will ensure energy savings of 30%,...,40% at the moment of construction, compared with standard practices currently applied in Romania. While new buildings can be designed with energy efficiency at the moment of conception, existing buildings offers most opportunities from touch of the parameters on saving energy and reducing CO_2 emissions. The thermal rehabilitation of existing buildings is also restricted by the age of the building, the building products used originally, and the owner availability in starting the work. In the authors' opinion, in many applications there is a conflict between the principles of human rights in the sovereign decisions on individual property when this is located in a collective property. Legal acts have to balance, at the same time, the right to protection of individual property, and also, to protection of any other properties located in a condominium. Most often these legal issues can block or eliminate the need to achieve a thermal rehabilitation.

5. Conclusions

Renewable energy resources exist over wide geographical areas, in contrast to conventional energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency is resulting in significant energy security, climate change mitigation, and economic benefits. National renewable energy market in Romania is projected to continue to grow strongly in the coming decade and beyond. Many renewable energy projects are suited to the development region North-East, where energy is crucial in human development, because the renewable energy has the ability to lift the poorest population to new levels of prosperity. Local resources can play an important role in the economy of the Development Region North East, and they are decisive factors in the application of energy efficiency principles.

As an EU member, Romania needs to respect the targets for energy efficiency and reduce carbon emissions, and, besides the implementation of power technologies from unconventional resources, it means to reduce the energy losses at the end consumers.

The construction, existing or new, offers the broadest range of action, given the large share that it has in energy consumption and carbon emissions. New design concepts that improve how the energy consumption is reflected throughout the lifecycle of a building, from construction, then through maintenance and refurbishment, are a priority at this period when a particular emphasis is put on energy efficiency and environmental protection. The designers must learn to operate effectively if they want to achieve their design

intentions, creating a flexible technical environment sought by interdisciplinary groups during the design phase, and when selecting suppliers.

The implementation stage of renewable energy production technologies in the Romania's North-East Development Region has highlighted that there is a clear need for national strategies with an improved understanding of the natural local resources.

The Romanian government is expected to develop economic inducements for the enlargement of solar and wind energy power fields in order to foster renewable energy development in the North-East Development Region.

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RESURSELE LOCALE – FACTOR CHEIE PENTRU EFICIENȚA ENERGETICĂ ÎN REGIUNEA NORD-EST A ROMÂNIEI

(Rezumat)

În România, politica eficienței energetice urmează sistemul principiilor europene de consolidare a securității aprovizionării cu energie, precum şi un sistem de principii pozitive în ceea ce priveşte reducerea poluării mediului şi, în special, reducerea efectului de seră. Eficiența energetică reprezintă obiectivul principal al strategiei "Europa 2020", dar acesta fiind elaborat la nivelul UE, soluțiile sale de implementare nu pot fi adaptate la condițiile locale din fiecare regiune.

Articolul prezintă condițiile specifice, evaluarea parametrilor naturali, precum şi stadiul de implementare a resurselor sustenabile din Regiunea Nord-Est a României. Studiul de caz prezentat în lucrare este o revizuire amplă a resurselor regenerabile de energie din regiune, şi este axat pe evaluarea resurselor energetice locale, precum şi influența acestora în ceea ce priveşte eficiența energetică în sectorul construcțiilor. Stadiul de implementare a tehnologiilor de producere a energiei regenerabile în Regiunea Nord-Est a României a scos în evidență faptul că există o nevoie clară de strategii naționale care să înțeleagă mai bine resursele naturale locale. Concluziile evidențiază politicile guvernului român în legătură cu stimulentele economice aşteptate pentru extinderea câmpurilor de energie solară şi de energie eoliană, în scopul de a stimula dezvoltarea energiei din surse regenerabile în Regiunea de Dezvoltare Nord-Est.