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SUSTAINABLE DEVELOPMENT POLICY IN THE FIELD OF RENEWABLE ENERGY SOURCES – THE EUROPEAN PERSPECTIVE

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ABSTRACT: The aim of the article is to review EU policy towards renewable energy sources (RES) and their assessment, taking into account the principles of sustainable development. The presented development is of a theoretical nature. Therefore, the basic research method is the analysis of available sources, such as statistical data, EU legal acquis and reports. Many aspects are touched upon in implementing the principles of sustainable development in energy policy. For this reason, the following have been selected for analysis: the share of RES in the overall energy balance, the energy mix of renewable energy sources and the use of soft instruments supporting RES. As a result of the analysis, it has been found that despite undoubted progress regarding the increase in share of RES in the energy balance, many problems remained unresolved. These include the sustainable use of biomass (especially wood resources) and insufficient use (despite the progress made in this area) of soft instruments.

KEY WORDS: renewable energy sources, sustainable development, bioenergy, soft instruments, European Union policy

Introduction

The sustainability of economic development depends on ensuring constant access to energy sources. Uninterrupted access to such and an unrestrained increase in production and consumption brings about a situation wherein the demand for energy continues to grow. This results in the depletion of some energy resources, as well as the pollution of the environment, and, consequently, climate change. The striving to reduce the negative impact on the environment and to use rationally national resources has, for a good number of years, forced many countries to focus upon developing renewable energy sources and to improve energy efficiency (see: Sathaye et al., 2011; European Commission, 2011; UNECE, 2015; German Energy Agency and UNECE, 2017; European Union and IRENA, 2018; IRENA, 2019). Attributes of renewable energy are the inexhaustibility of resources and the elimination of various types of pollution. However, even the production of energy from renewable sources carries some risks. For example:

- biomass production could contribute to excessive deforestation, losses in ecosystem services and landscape change (see: Firbank, 2008; Evans et al., 2013; Olesen et al., 2016; Costanza et al., 2015; Tarr, Rubino, Costanza, 2016; Costanza et al., 2017). It is worth mentioning that land-use change and subsequent habitat destruction have been the major cause of biodiversity loss in terrestrial ecosystems over the last 50 years (Millenium Ecosystem Assessment, 2005; Secretariat of the Convention on Biological Diversity, 2010; WWF, 2012),
- dams for hydroelectric production cause flooding of huge tracts of space, hence, contributing to social, as well as environmental losses (see: The World Commission on Dams, 2000; Richter et al., 2010),
- the production of wind energy contributes locally to the generation of noise and to social costs (see: Upreti, 2004; Jobert et al., 2007; Wüstenhagen et al., 2007; Wolsink, 2010).

Nevertheless, it is with renewable energy that the world has the greatest hope for sustainable development. The policy of sustainable development in the field of energy should recognize and minimize such threats, taking into account existing social needs. Moreover, it should maintain dialogue with local communities. However, the controversy regarding the use of renewable energy sources mentioned above raises the questions: 'Can all elements and activities in the field of supporting renewable energy sources be considered fully sustainable?' and 'Which activity should be adjusted?'. In this context, the aim of the article is to review the EU policy towards renewable energy sources (RES) and its subsequent assessment, taking into account the princi-

ples of sustainable development. The presented article is, therefore, an attempt to supplement knowledge and opinions in this area. Due to the restrictions on the volume of the article, the analysis concerns selected aspects of EU policy on renewable energy in three dimensions of sustainable development:

1. In the economic dimension – the analysis deals with the basic quantitative data regarding the share of RES in the energy balance. These activities were considered to improve the energy security of the economy. The wider use of renewable energy sources may also contribute to the economies of scale and thus the reduction of costs associated with the use of renewable energy.
2. In the environmental dimension, the analysis appertains to the structure of the sources of energy obtained from RES.
3. In the social dimension – the analysis covered the use of policy instruments aimed at broad social participation and at shaping pro-environmental consumer attitudes.

Research methods

The presented paper is of a theoretical nature. Therefore, the basic research method is the analysis of available sources, such as literature of the subject, statistical data, reports, political guidelines and EU legal acquis in the field of renewable energy sources.

In connection with the stated goal of the article, the adopted research procedure concerned obtaining answers to three main questions:

1. What have been the trends regarding the share of renewable energy in the energy balance in EU countries and what is the state of implementation of EU RES policy targets?
2. What is the structure of energy generation from renewable sources? Can all of these be assessed as sustainable?

The basic sources of data used to answer the above questions were statistical data available in the Eurostat, International Energy Agency (IEA), European Environment Agency (EEA), OECD, Central Statistical Office (GUS) databases. The data mined is for the period 2010-2015 (latest available data at the time of completing the article).

3. What is the scale of soft instruments (social impact tools) use in the EU Member States that influence the shaping of social attitudes towards energy production and consumption?

The answer to this research question was based on the analysis of source data contained in the reports on progress in the promotion and use of energy

from renewable resources from 28 member countries, to the European Commission for 2015. These are the last available data as of when the article was being researched and written.

Basic data on the share of renewable energy in the energy balance

In the EU, an important issue in enacting sustainable development is the pace of solution implementation based on renewable energy sources in individual Member States and the Community as a whole. In total, the European Union countries had, in 2016, a 17% share of renewable energy (an increase from 10.5% in 2007) in their total energy portfolio. At Member State level, the RES shares vary widely, ranging from: 53.8% in Sweden and over 30% of gross final energy consumption in countries such as Finland, Latvia, Denmark and Austria, to about 5% in Luxembourg and 6% in Malta and the Netherlands (Eurostat, 2018). One of the indicators illustrating the progress in developing renewable energy sources is the relationship between the dynamics of Energy consumption and the share of energy from renewable resources (figure 1). This combination is the most desirable from the point of view of fulfilling EU energy policy. The analysis includes both EU and non-EU member states:

An observed general tendency is a moderate rate of decrease in energy consumption. Herein, energy consumption has risen only in the cases of Lithuania, Bulgaria, Malta and Iceland, whereas Hungary is neutral in terms of energy consumption and displays a moderate increase in production from renewable sources. In contrast, Norway and Sweden show a high level of RES use, combined with a moderate downward trend in energy consumption. Still, there was no negative dynamics with regard to the share of energy from renewable resources in any of the examined cases.

The energy and climate package adopted in March 2008 provides a window into EU energy policy intention. This is commonly referred to as "3x20%", and is to be met by Member States by 2020. The package includes a *Renewable Energy Directive* that obliges Member States to achieve in the total energy balance of the European Union, the target of a 20% share that is to be reached through RES. The Directive establishes a general target in overall Energy need that is to come about by utilizing RES for individual countries and a precise way of calculating this, taking as a reference, the share of renewable energy from 2005. Of interest, 3x20% stipulates that 20% of the mandated renewable energy is to be produced jointly by the entire Union, but that each of the Member States has assigned targets. These differ and have been set at

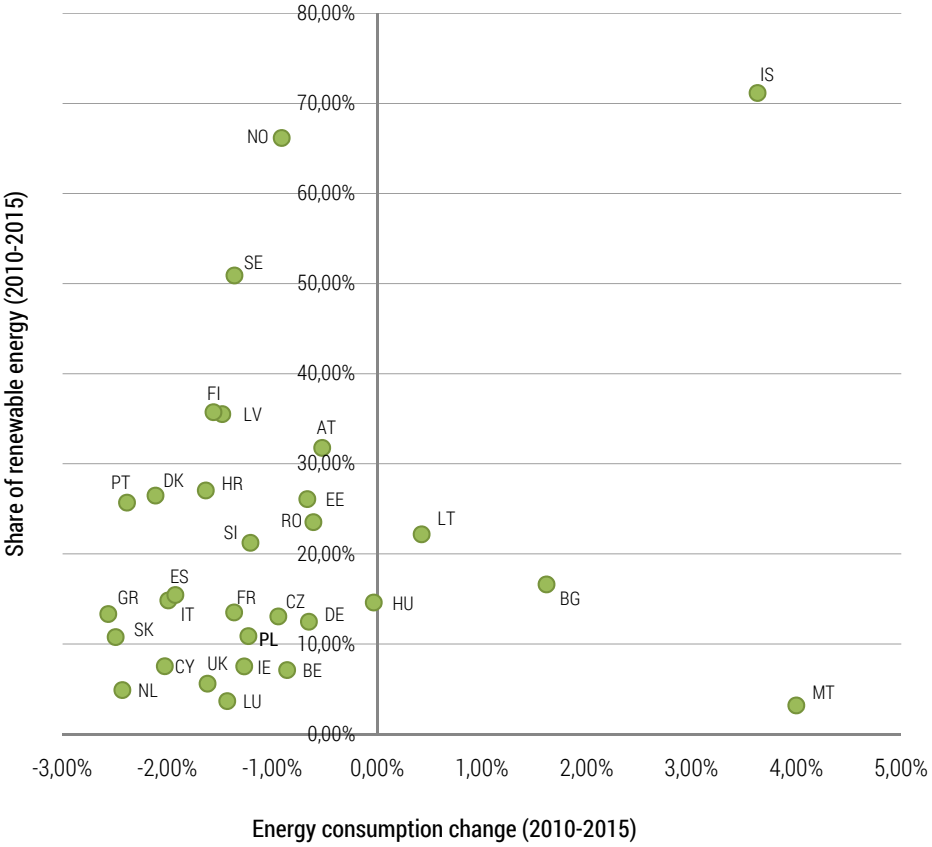

Figure 1. Relationship between the dynamics of Energy consumption and the share of energy from renewable resources in European countries in the years 2010-2015

Source: author's own work based on data from Eurostat, IEA.

levels that, at the same time, ensure motivation to increase the share of renewable energy in a given member country and enable the implementation of the assumed goal. The differentiation is considerable. Herein, Malta is to reach 10%, and Sweden is to attain a level of as much as 49%. Total targets for EU 28 are described below. On 30 November 2016, the Commission published a proposal for a revised *Renewable Energy Directive* that is to make the EU a global leader in renewable energy and which would ensure that a target of at least 27% renewables in EU's final energy consumption is to be met by 2030 (European Commission, 2018).

As previously mentioned, the EU established renewable resource share targets in the block's total energy balance. However, the situation in the Member States regarding the fulfilment of commitments in this area is diversified. In eleven EU countries, renewable energy consumption in 2013 was below what was expected in their National Renewable Energy Action Plans – NREAPs (EEA, 2016), while ten have already exceeded their commitments (Bulgaria, the Czech Republic, Estonia, Croatia, Italy, Lithuania, Romania, Finland, Sweden and Denmark). Moreover, Slovakia, Austria and Hungary are very close to achieving the set goal at a difference of less than 2%, and a large group of countries (Slovenia, Portugal, Poland, Malta, Latvia, Cyprus, Spain, Greece and Germany) are in the range of 2.1 to 5.0%. France still has the most to do in the field of renewable energy (as much as a 7.8% increase is needed to reach the target of 23%). Yet, according to IEA data, France is one of the leading countries when it comes to a low-carbon energy mix. According to 2015 data, only 47% of total energy consumption comes from fossil fuels, because nuclear energy generation made up 46% of the energy mix and 78% of overall electricity generation (the highest share worldwide). France has also witnessed the full decoupling of its energy consumption and carbon dioxide (CO_2) emissions from economic and population growth. In the country, total energy supply and consumption, as well as CO_2 emissions from fuel combustion have declined sharply over the past decade. Indeed, the carbon intensity of the French economy is half the IEA average and has decreased by almost 30% below its level in 2004 (versus an IEA average decline of -20% during the same period) (OECD/IEA, 2017; France, 2016 Review). In contrast, the Netherlands, which we associate with bicycles and common sense and a sustainable approach to the world, has a lot to do in the category of green energy, because they have to catch up by 8.2% as of 2020, although the target for the entire country is only 14%. The remaining countries included in the group that are furthest from achieving the set goals are: Belgium, Luxembourg, Ireland and the United Kingdom.

The energy mix of renewable energy sources

The energy mix of renewable energy sources also sees significant diversity. This is strongly conditioned by the local development potential of individual RES types (see figure 2 and table 1).

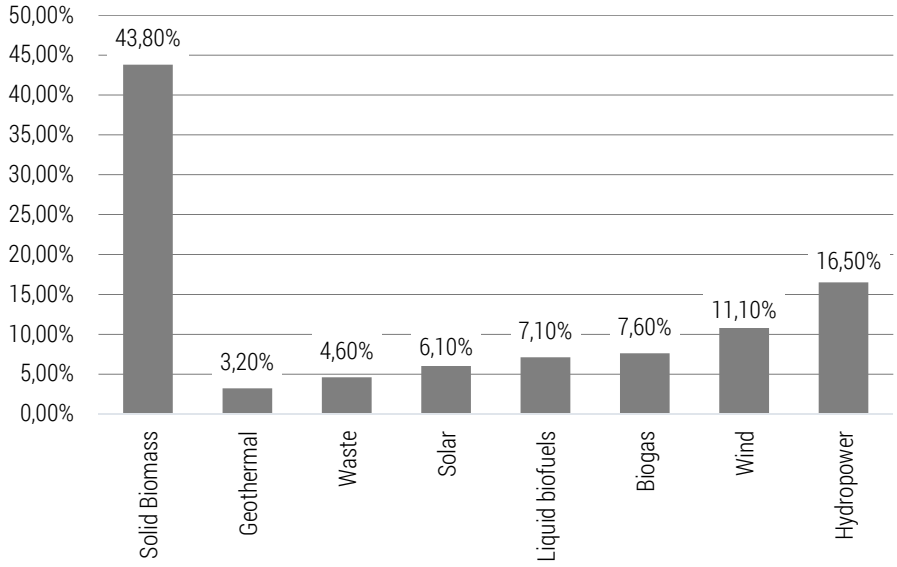

Figure 2. Energy from renewable sources by media in UE-28, in 2014

Source: author's own work based on GUS, 2016.

Table 1. The structure of renewable energy obtainment according to sources in selected EU countries in 2014 [%]

Country	Solid Biomass	Solar	Hydropo wer	Wind	Biogas	Liquid biofuels	Geother mal	Waste
Austria	46,7	2,7	**37,6**	3,5	3,1	4,1	0,3	1,9
Czech Rep.	62,9	**5,4**	4,5	1,1	**16,6**	7,1	-	2,3
Finland	**80,1**	0	11,4	0,9	1,0	4,0	-	2,4
France	43,3	2,9	**25,8**	7,1	2,1	12,2	1,0	5,6
The Netherland s	28,3	2,1	0,2	**10,9**	6,9	**33,4**	0,8	**17,4**
Lithuania	**82,2**	0,5	2,5	4,0	1,5	8,2	0,1	0,8
Germany	31,7	**10,3**	4,7	**13,7**	**20,6**	10,0	0,5	8,4
Poland	**76,6**	0,4	2,3	**8,2**	2,6	9,2	0,3	0,5
Slovakia	52,7	4,0	**25,1**	0	6,7	10,2	0,5	0,8
Italy	27,7	**8,9**	21,3	5,5	8,3	2,6	**22,1**	13,6
Total UE 28	43,8	6,1	16,5	11,1	7,6	7,1	3,2	4,6

Source: author's own work based on GUS, 2016.

The most important sources of renewable energy in the EU are solid biofuels. The basic solid biofuel is wood. A separate group consists of fuels from plantations intended for energy purposes and the organic residues from agriculture and horticulture. Three countries with the highest share of solid biofuels in their renewable energy balance are Finland, Lithuania and Poland. These are the countries in which forest management and the wood industry play an important role. This solution is associated with many doubts related to the use of wood for heating purposes and threats to sustainable forest management (danger of excessive and abusive logging). Meanwhile, forest ecosystems perform a variety of services and their disporpotionate use leads to the loss of important social functions. Currently, many studies attempt to value the forest ecosystem in international, national, regional and local terms (Haefele, Kramer, Holmes, 1992; Krieger, 2001; Pearce, 2001; Slee, 2005; European Commission, 2008; Jellesmark et al., 2014; Figueroa, Pasten, 2015; Binner et al., 2017; Bösch et al., 2018). These developments address the problem of forest economic valuation from the economic appraisal of forest-sourced raw materials, through the assessment of values of individual ecosystem services provided by forested areas, to more detailed analyses related to, e.g. a particular species or to the insurance value associated with the forests.

Thus, in the subject literature, it is possible to find analyses related to the forest value and its function for the society (e.g. research on European forest social values: Lindemann-Matthies et al., 2014; Torkar et al., 2014; Meyer, Schulz, 2017; Getzner, Meyerhoff, Schläpfer, 2018; Gomez, Olschewski, 2008). Admittedly, Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2001/77/EC and 2003/30/EC as revised by Directive 2013/18 contains sustainability criteria for biofuels and bioliquids in that it excludes primary forests, protected areas, and high biodiversity areas from use, but these regulations can be assessed as insufficient. In this context, objections may also be raised by possible import plans for this type of raw material from outside the EU (Russian Federation, Ukraine) (Energy Roadmap, 2050).

Other sources of renewable energy in the EU are hydro and wind energy – 16.5% and 11.1%, respectively, in 2014, yet the source of energy which is worth devoting more attention to due to its high potential, is the energy coming from waste. This is particularly important in the context of global conditions related to waste management (reduction in the volume of import of waste through China from January 2018). Among the EU countries, one of the highest shares of energy from waste incineration is in the Netherlands.

The use of soft instruments in policy supporting RES

Increasingly, discerning the contribution of renewable energy in the structure of production and energy consumption in the EU has become a difficult and very costly task. This because it requires the use of solutions supporting the increase of this share, which at the same time, lead to a reduction in the costs of producing renewable energy, and, as a consequence, improve its competitiveness. Hence, a review and classification of RES support instruments in the EU member states was carried out on the basis of an analysis of 28 reports on progress in the promotion and use of energy from renewable resources, from member countries to the European Commission for 2015. Here, soft instruments that shape the attitudes of energy consumers were particularly emphasized. In this analysis, the member countries were divided into three main groups:

1. Countries that prefer regulatory instruments – for example: the obligation to purchase specific amounts of energy from RES or to provide priority in the provision of electricity transmission services from RES in the national power system, or the issuing of renewable energy certificates and regulation of access to transmission infrastructure.
2. Countries preferring indirect (economic and financial) instruments – for example: energy purchase support systems from RES such as guaranteed price, green certificates and tenders, subsidies, preferential and low interest rates loans, fiscal support.
3. Countries expressing preferences for soft/ behavioural instruments – for example: campaigns raising the level of social awareness, offices, centres, campaigns, portals, etc. providing information on renewable energy sources; trainings and courses; advice services; exhibitions and demonstration projects; good practice guidance.

EU member states that prefer regulatory instruments include Italy, Bulgaria, Poland, Czech Republic, Romania, Spain, Luxembourg, Cyprus, Greece, Portugal, Germany and the Slovak Republic. Of note, Spain and Luxembourg are also characterized by providing a high level of support for soft instruments. Countries that prefer indirect instruments include the Netherlands, Slovenia, Sweden, Ireland, Denmark, Hungary, Latvia, Lithuania, Austria, Belgium, France, Croatia, Finland, the UK and Estonia. The Netherlands, Sweden, Ireland, Denmark, Austria, Belgium, France, Finland and Estonia also apply a high level of soft instruments. Malta is the sole member state that strongly emphasizes soft/behavioural instruments.

Pro-ecological attitudes are an indispensable element for the development and widespread use of renewable energy (GNESD, 2007; Sovacool, 2009; Devine-Wright, 2009; West et al., 2010). The failure to take soft instru-

ments into account in enhancing the acceptance of renewable energy can lead to social tensions and protests. A good example is Poland, where the use of soft instruments was neglected. According to research (Lorek, 2016; Ambiens, 2014; Krzemiński, 2016), currently, the most common reason for environmental protests and conflicts are investments related to renewable energy (biogas plants and wind farms are particularly controversial). In Ambiens's report *"Social conflicts in wind energy"*, easily 90% of all entity-respondents who had invested in wind energy met with the problem of social conflict. The reason for this is that investors and local governments often start talking to the local community about construction only when the protest breaks out. A frequent way of proceeding during such consultations is to idealize such investments and to omit the related risks. This makes such transmission unbelievable. Residents protest because they are afraid of changes that they think will decrease public safety and negatively affect their life-style. Moreover, they lack reliable sources of information.

Conclusions

The policy of support for renewable energy sources in the EU has brought effects in the form of an increase in the level of their use, and thus the diversification of energy sources used in European countries. This situation is beneficial for implementing sustainable development. Nevertheless, there are many challenges to overcome. In some Member States, it is necessary to significantly accelerate efforts to increase the share of energy from renewable sources in the total energy balance. Momentous challenges are also met with in developing new technologies in bringing down costs and enhancing availability to individual economies (for ex. ocean energy and concentrated solar power and secondary generation and biofuels). There is also a need to improve existing green power sources, such as by increasing the size of offshore wind turbines and by improving photovoltaic panels. Storage technologies remain a critical problem. Storage is currently often more expensive than additional transmission capacity, and Europe needs extra investment in this kind of infrastructure. In its development plan ending in the year 2050, the European Commission also attaches great importance to nuclear energy and the use of biomass – both of which may be rated as controversial (Energy roadmap to 2050).

In this regard, it is necessary to introduce an upper limit for the use of biomass to produce energy to a level that will allow its sustainable supply. The restrictions should cover both domestic and imported biomass, to ensure that the carbon footprint of the use of bioenergy in the EU is in line with the

principle of sustainable development. An issue worth rethinking is also the more rational use of limited wood resources and the abandonment of large-scale co-firing in conventional power plants. In order to create a coherent policy of sustainable development in the EU, a necessary action would be to enable better integration of energy policy in the field of bioenergy with other Community policies, e.g. to put in place a strategy for biodiversity protection.

In implementing the principles of sustainable development, it is of key importance to bring about the widest range of social participation and to fully engage local communities. Admittedly, on the basis of the analysis carried out, in recent years, the growing role of soft instruments has been noticed. In general, however, these instruments are still undervalued and should find a wider application. A lack of acceptance and low level of public involvement in the planned solutions means implementation ineffectiveness.

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