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# Challenges and barriers to sustainable energy consumption in the Silesian Voivodeship

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**Abstract:** One of the main factors in achieving the ecological development goals is the change of unsustainable consumption patterns. Households play here a crucial role. The high level of urbanization and industrialization in the Silesian Voivodeship has caused serious environmental degradation, which in its turn has led to deterioration of the living conditions. These conditions mean it is particularly important to use natural resources in a rational and efficient manner and in line with the principles of sustainable development. The purpose of this paper is to characterize the developmental paths and identify the main factors that hinder sustainable energy consumption in the Silesian Voivodeship. Furthermore, the author assessed the awareness level and decisions households make in relation to energy consumption in the region, in the context of sustainable development. Data included in this article comes from surveys concerning development of the ecological goods and services market, which were conveyed in 2013 and 2014.

***Keywords:*** sustainable energy consumption, Silesian Voivodeship, energy efficiency, renewable energy resources
***JEL codes:*** Q43; O13

## 1. Introduction

Ever since the industrial revolution, the social and economic development has been related to the increasing demand for energy and its sources. Even though the use of energy is associated with many social and economic benefits, its production can also have a negative effect on climate and the environment. Apart from the rising prices of gas and petroleum, the electrical energy system in Europe is facing a number of new challenges. The most important ones include the issues of climate change, safe energy distribution and competitive pricing of electrical energy.

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In Poland and other European countries there is a considerable potential for more efficient energy management, which could also be used to stimulate the economic growth through investments in activities that support better energy efficiency. Actions aimed at achieving more efficient energy use should apply to all sectors and areas of operations. They should involve not just more energy efficient production, but also rational energy use in other areas, such as community and lifestyle sectors.

Thus, implementation of the EU and national policies for sustainable development requires so far established production patterns and energy consumption models to be modified gradually, so as to satisfy the reasonable social and economic needs without causing irreversible environmental degradation and particularly the wasteful management of non-renewable natural resources.

The main purpose of this paper is to characterize the developmental paths and identify the main factors that hinder sustainable energy consumption in the Silesian Voivodeship. Furthermore, the author assessed the awareness and decisions made by households in relation to energy consumption in the region in the context of sustainable development. The article presents results of statutory research carried out by the Department of Environmental Protection. That research consisted of a survey questionnaire concerning development of the ecological goods and services market in the Silesian Voivodeship. The survey was addressed to a total of 1000 randomly selected subjects in 2013 and 2014. In 2013, 165 completed questionnaires were returned and in 2014 – 306. Some of the questions asked in the survey concerned behaviours and decisions made by household members with regard to their energy needs and total energy consumption.

## 2. Development of sustainable energy consumption

Over the last few years, the negative impact of global production and consumption on the natural environment has become a matter of interest for governments of highly industrialized countries. It became obvious that to mitigate the ecological crisis it is necessary to change the production processes and the way businesses are run, as well as the attitudes in society. Up to that point, the focus was on profit and meeting the societal demands through mass production, but this approach needs to be replaced by the policy of rational resource management and educating the society on

the immense impact their pro-ecological approach could have on the natural environment. Promotion of campaigns concerning environmental protection accompanied with sufficient support from individual governments could potentially raise the society's ecological awareness. At the same time, an average consumer is increasingly aware of the fact that the key result of economic growth should be better quality of life, which – apart from the level of material consumption – relies on the state of our natural environment, health, education, safety, employment, justice etc. Only then a person can see oneself as happy and satisfied. It explains the growing popularity of the so called sustainable consumption, which draws on the notion of sustainable development.

The most frequently quoted definition of sustainable development is one provided by the *World Commission on Environment and Development* also referred to as the Brundtland Commission. That Commission describes sustainable development as "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs. … It's a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are made consistent with future as well as present needs" (World Commission on Environment and Development, 1987). In a broader sense, sustainable development emphasizes the significance of long-term productivity of available supplies and contributes to a long-term improvement of humans' well-being and wealth by applying a range of different technologies which use available resources, the impact of which on the environment is acceptable.

Traditionally, sustainability has been framed in the three-pillar model: Economy, Ecology and Society are all considered to be interconnected and relevant for sustainability (BMU, 2009). The United Nations General Assembly aims for action to promote the integration of the three components of Sustainable Development - economic development, social development and environmental protection - as interdependent (UN, 2005). However, this model has been criticized for diluting a strong normative concept with vague categorization and replacing the need to protect natural capital with a methodological notion of trans-sectoral integration (Brand and Jochum, 2000). SD can be also oriented along a continuum between the two paradigms of weak sustainability and strong sustainability. Weak sustainability is based on the idea that only the aggregate stock of capital needs to be conserved - natural capital can be substituted with man-made capital without compromising future well-being. As such, it can be interpreted as an

extension of neoclassical welfare economics (Solow, 1974, pp. 29-45). For example, one can argue that non-renewable resources, such as fossil fuels, can be substituted, for instance, by renewable resources and technological progress as induced by market prices (Norgaard, 1994). Weak sustainability also implies that environmental degradation can be compensated for with man-made capital such as more machinery, transport infrastructure, education and information technology. Strong sustainability, on the other hand, starts from an ecological perspective with the intent of proposing guardrails for socioeconomic pathways. Strong sustainability based on the belief that natural capital cannot be substituted, either for production purposes or for environmental provision of regulating, supporting and cultural services (Sathaye, et al., 2011, p. 713).

Sustainable consumption has to be understood as a societal field of action, which could be characterised by three interacting areas of action (Brohmann, et al., 2009:4):

— the individual area of action (divided in two sub-areas): demand-side area, which includes consumption activities in the context of households as well as of professional procurement activities (of both large-scale private-sector companies and the public sector) and the informal area, in which private consumers undertake informal activities (e.g. unpaid household work), which are not market-oriented and are thus not visible on the level of demand;
— the supply-side and structural area of action, which includes the activities of companies and also governmental bodies to provide sustainable products, services and information;
— the socio-political area of action, which includes the activities of governmental bodies but also of organisations and associations to form the general framework for governance in both the individual and supply-side or structural area of action. Furthermore, in this area of action societal factors of consumption behaviour such as visions and moral concepts will be formed.

The notion of sustainable energy development was coined as a result of bringing the sustainable development ideas onto the grounds of energetics. At the core of sustainable energy development lies the efficient use of energy generating, human, economical and natural resources. The need to compare various options of energy generation helps to identify their strengths and weaknesses, notice the progressing degradation of the natural environment and the impending unavoidable

shortage of fossil fuels. It becomes necessary to approach economic development in conjunction with environmental protection as closely interrelated tasks and to stop the economic development from contributing to environmental degradation (Graczyk, 2011, p. 53). A. Voss of the Institute for Energy Economics and the Rational Use of Energy at the University of Stuttgart claims that there is a number of conditions that have to be met before we could talk of sustainable energy development. In the first place, he lists a situation in which the economic potential for energy services provision for future generation is growing, or – in the worst case – is not diminishing. Besides, he also points out that the energetic system can be referred to as sustainable when substance emissions into the environment in connection with energy use do not exceed the natural ability of the environment to assimilate these substance. Another criterion is a situation in which human health risks related to energy generation are lesser than the natural hazards that are avoided due to energy services provision. These services, as per another condition listed by him, must be provided with a minimum possible use of available supplies, including the supplies in form of the environment (Voss, 2006).

Domestic energy consumption represents one area where the links between global environmental problems and individual behaviour are clearly identifiable, even if consumers do not immediately recognize the connection. This means that energy conservation has become one of the first sustainability issues to be addressed through a combination of national and local government policies. As most energy consumption and $CO_2$ emissions are related, directly or indirectly, to household consumption, changes in household consumption patterns and the production patterns that serve them will be required in order to address climate change. Those changes will need to include changes in consumer behaviour, housing construction and maintenance, appliance design, volume and type of goods and services consumed, vehicle design and use, public transportation infrastructure and systems, urban planning, waste management and recycling, electricity generation, and other factors. Some of these changes could, in principle, be undertaken fairly quickly (e.g. lighting), while others will take decades to be effective (housing design, urban planning, transportation infrastructure, and electricity generating systems). The policy question will be not so much which of these to choose, but how much energy conservation and emission reduction can be achieved from each in ways that are technologically, economically and politically feasible (United Nations Department of Economic and Social Affairs, 2007, pp. 6-7).

Energy use in the home is mostly invisible, and our energy consuming behaviour is based on habits and routines. In the energy-related context two groups of behaviour were differentiated (Brohmann, et al., 2009:7):

— Different types of curtailment (saving) behaviour (which include conservation efforts such as turning appliances off – addressing the use phase), and
— Different types of efficiency behaviour (which include buying decisions – addressing the investment phase).

Among others (Curtis, et al., 1984), point out that energy-saving measures may be divided in: a) low-cost or no-cost measures which do not involve capital investment but rather behavioural change (e.g. switching off lights, substituting compact fluorescent lamps for incandescent light bulbs) and b) measures which require capital investment and involve technical changes in the house (thermal insulation of built environment, windows with double- or triple-glazing). Although purchasing a new appliance usually does not require technical changes in the house, purchasing expenditures may be high (Brohmann, et al., 2009:8).

Households are generally aware of their direct energy consumption as they pay for household electricity and gas and fuel for vehicles, but they are generally not aware of their indirect energy consumption. While the cost of energy embodied in goods and services is generally reflected in the price, it cannot easily be separated from other elements. Some economists (Axelrod and Lehman, 1993; Uutela, 1994) have suggested that the link between pro-environmental attitudes and concern about energy-related environmental issues and conservation behaviour is a weak one. However, (Seligman, et al., 1979) has found that 50 per cent of variance in energy use could be explained by attitudes towards energy conservation. Other economists (Verhallen and van Raaij, 1981; Uusitalo, 1989) have all argued that people's perceptions of their own contribution to energy problems is predictive of household energy conservation and that information designed to promote energy consciousness should emphasize such values. As for the impact of income, results from most studies imply that higher income is positively related with energy-saving activities/expenditures. Thus, richer households are less likely to face income or credit constraints for investments in energy efficiency.

Consequently the problem is that household residents currently lack a good understanding or awareness of the link between their home energy use and their monetary or environmental

consequences. This lack of understanding is a significant contributor to over-consumption and inefficient energy use. Changing consumption behaviour is a psychologically, socially and culturally complex problem, requiring drastic changes in how people think about and use energy. Thus, though creating energy-efficient technology is the first necessary and important step towards sustainable living, it is only a partial solution. The next step should focus on changing peoples' energy consumption behaviours immediately, durably, and for the long-term.

Energy consumption patterns and the way the total energy use gets established become a real challenge for EU member states with regard to energy policy making. From the perspective of sustainable development, the most efficient economy is one characterized by a low energy consumption rate and a low energy intensity index. The main challenge, however, is to meet the energy needs and secure safe energy provision. Yet another key factor in aiming for sustainable energy consumption seems to be a reduced primary energy demand achieved through increased efficiency of energy consuming appliances and more efficient energy use. Crucial here is the responsible energy management or, in a broader context, responsible management of limited supplies. Thus, the efficiency of energy system increases together with a drop in the amount of supplies, also ones in form of the environment, used when providing energy services. However, the majority of the European Union countries increase the amount of energy they use alongside the increased efficiency of that usage. Consequently, the improving quality of life in highly industrialized societies is associated with the soaring ecological costs of energy consumption.

For the last several years, the European Union has been actively supporting the more rational energy use, consistently meeting the goals included in the climate and energy package published in January 2008, according to which all member states are obligated to:

- reduce CO2 emissions by 20% in 2020 compared to 1990;
- increase the renewable energy consumption in the EU to reach 20% by 2020; for Poland the target was set at 15%;
- increase energy efficiency by 20% in 2020 compared with 2005.

The attainment of the first two goals listed above needs, above all, a considerable financial expense related to the implementation of energy efficient technologies. The third objective depends mainly on taking, sometimes technically and technologically simple, actions to support energy saving.

Due to fears concerning the European Union's failure to meet the energy efficiency targets included in the climate and energy package, on 25 October 2012 the European Commission accepted the Directive 2012/27/UE of the European Parliament and the Council on energy efficiency (2012) amending and then repealing directives 2004/8/WE and 2006/32/W. It listed measures which would help create the right conditions for improved energy efficiency and laid down rules according to which the energy market should function, so as to eliminate any barriers that impede efficient energy distribution. Provisions included in that document imposed many binding measures on EU countries, including the following obligations:

— to establish approximate energy efficiency targets at a national level based on each country's primary or final energy use , primary or final energy saving, or energy intensity;
— to establish a long term strategy of supporting investment in the renovation of each country's residential and commercial building stock for both public and private buildings;
— to ensure that, as from 1 January 2014, 3% of the total area of heated and/or cooled central government buildings is renovated to meet at least the minimum standards set for new buildings in accordance with the idea that public authorities' buildings should set an example for others;
— to establish an energy efficiency obligation scheme, which would ensure that energy distributors and/or retail energy sales companies are obligated to achieve a total energy saving target of 1.5% of their annual energy sales to final customers;
— to create conditions allowing all final customers of energy access to high quality energy audits and to purchases of competitively priced meters accurately reflecting their energy consumption and providing information on the actual time of energy use.

The new directive on energy efficiency is supposed to lead to a 20% increase in the efficiency of energy consumption in the European Union by 2020. It introduces "national binding targets" in this area, as well as very high requirements in respect of building stock energy saving (80% by 2050) and points to the need for raising the buildings renovation index – 2.5% of the area of public authorities' buildings every year as of 2014, as the existing building stock represents the biggest potential sector for energy savings.

Currently, the European Council is drafting a new EU strategy for next 5 years, which is largely devoted to energy issues, including renewable energy and energy efficiency. The new

European Union strategy calls for a framework of a so called energy union meant to increase energy safety and independence of the EU countries – e.g. by diversification of energy sources and its transportation, further development of trans-border energy infrastructure and increased energy efficiency. The measures that are supposed to increase the EU energy safety mentioned in the new strategy include, among others, the need to develop renewable energy resources. On 22 January 2014, the European Commission presented a long-expected climate and energy package for 2030. It proposed two goals – a 40% reduction in greenhouse gases emission and increasing the share of renewable energy by 27%, without providing exact goals for individual countries. If such a strategy was to be accepted, it would mean – from the perspective of the renewable energy sector – a dissolution of the Union's renewable energy development strategy (Gawlikowska-Fryk, 2014, pp. 1-2).

Poland, as European Union member, actively partakes in developing common energy policy and laws concerning energy efficiency, implements them on a state level considering the end-users' best interest, owned energy resources and technological conditions of energy generation and transmission. The Polish Energy Efficiency Act of 15 April 2011 (2011) prescribes the national target for energy efficiency increase, which is to reach a final energy saving level of at least 9% of average national annual energy consumption until 2016. The average figure for the period of 2001-2005 is used as baseline. At the same time, the Act provides for increased production performance, reduced transmission and distribution losses, and lower energy consumption. It introduces supporting mechanisms to achieve those goals in a form of white certificates as evidence of actions taken to increase the amount of energy saved. Companies that sell electricity, natural gas and heat will be obligated to acquire a certain number of certificates, depending on the volume of energy sold. The Act also provides for creation of a pro-saving investments catalogue; it will allow entrepreneurs to acquire a given number of certificates through a call for tenders announced by the President of the Energy Regulatory Office. Companies will also be able to purchase certificates on commodities exchange markets or controlled markets. The white certificates system provides a stimulus to develop the energy services market. Alongside the generating of a demand for energy services and provision of energy saving measures, there is also the expectation that – due to benefits of scale and specialization – the energy services costs will go down.

The white certificates scheme applies in three different areas, so called categories of measures for improving energy efficiency (The Polish Energy Efficiency Act of 15 April 2011, 2011):

- increased energy savings by end-users,
- increased energy savings by devices used for own needs (e.g. a motor of a conveyor belt feeding coal to a mill in an electric plant)
- reduced losses of energy, heat or natural gas during transmission or
- distribution (this category includes also modernization of energy transmitting networks and relevant objects that accompany such processes).

Furthermore, the Energy Efficiency Act of 15 April 2011 imposes a number of duties on the Minister of Economy and the Minister of Transport, Development and Marine Economy with regard to the promotion of use of these measures to improve energy efficiency, including the introduction of innovative technologies, and providing relevant information, education and training.

## 3. Pro-environmental behaviours of households in the process of energy consumption in the Silesian Voivodeship

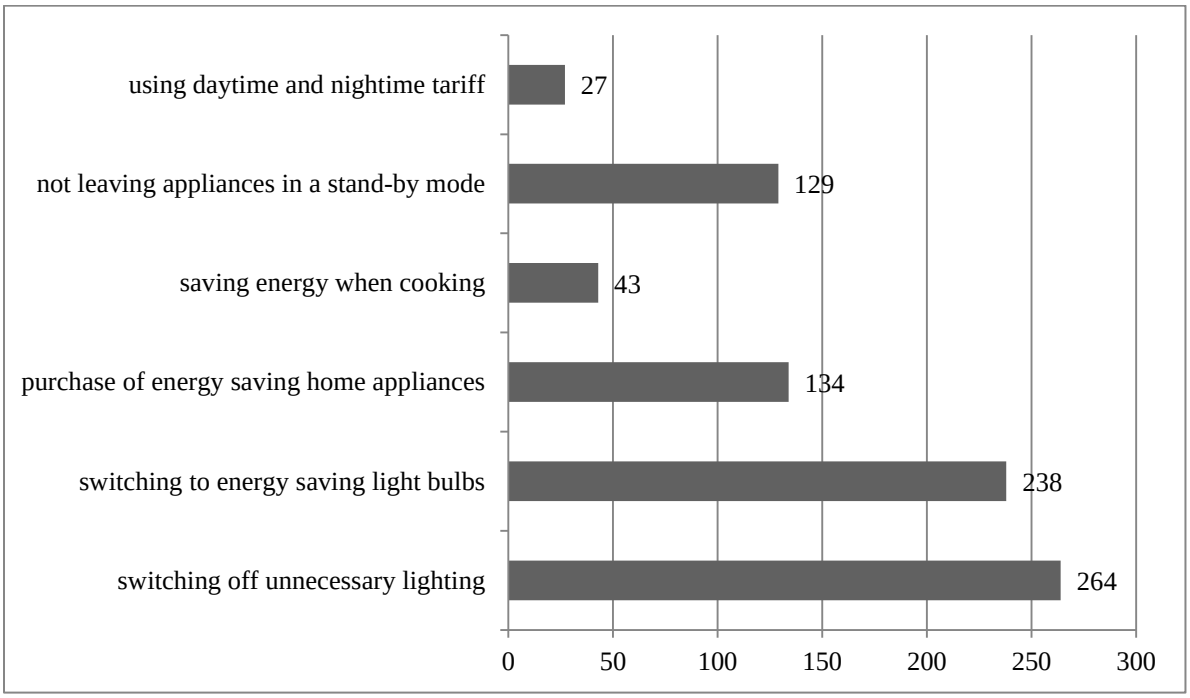
Departure from unsustainable consumption patterns is one of the main factors of achieving eco-development goals. In this case households play a crucial role. Aware consumers adjust their habits and increasingly often choose eco-friendly products. The choices they make affect manufacturers and in a way force them to make production more environmentally friendly. They also raise awareness of the ecological aspects at every stage of the product lifespan. The basic knowledge of contemporary energetics enables customers to purchase the least energy consuming energy media, products and appliances and to support energy savings in many different ways (Poskrobko, 2007, p. 61).

A study conducted by RWE as part of the 7th edition of the "Conscious Energy" Programme (RWE, 2013) showed that people living in the Silesian Voivodeship remember to switch off the lights in unused rooms within their households (40% of respondents). When it comes to investing in energy saving lighting, the Silesian Voivodeship takes the third place (27%

of respondents) among the voivodeships of the Southern Poland. 66% of Voivodeship's population chooses to buy appliances with the highest energy efficiency rating, while 47% of the respondents remember to switch off their computers after finishing work or to turn off the screen (not leaving it in the stand-by mode).

Statutory research carried out in the years 2013 and 2014 confirmed the rising energy saving awareness in the Voivodeship. 85% of the respondents claimed they consciously try to save electrical energy. The remaining respondents may have provided negative answers to the energy savings question, but in the following question they indicated energy saving measures they apply in their own households, such as replacing traditional light bulbs with energy saving ones, or buying energy saving household appliances. Such a dichotomy of answers may stem from the respondents not viewing the saving of energy as a way of reducing the demand, but as an act of surrendering, in a more or less conscious manner, to the pro-environmental trends, current fashion or perceiving these actions merely as a way of saving money. The distribution of survey responses provided with regard to the ways of saving electric energy in households is shown in Figure 1. It is noteworthy that nearly all the respondents indicated at least two energy saving measures.

**Figure 1. Energy-saving measures used by the population of the Silesian Voivodeship in 2013 and 2014 [number of measures indicated by respondents]***




* The respondents could provide more than one answer.

Source: Author's own analysis

Furthermore, the results of the statutory research showed that the Voivodeship population prefer to equip their households with installations and appliances that increase energy efficiency. 91% of the study participants claimed that they equipped their households with energy saving electrical devices (light bulbs, home appliances), whereas 73% of Voivodeship population owned meters that help to achieve optimal energy use (i.e. hot water meters, heat meters); 44% of the respondents use devices that optimize energy use, such as thermoregulators, recuperators etc., and nearly 32% claimed that they owned devices for obtaining energy from renewable sources, such as heat pumps or solar panels. Survey respondents living in the Silesian Voivodeship also estimated their expenses related to acquisition of equipment directly linked with protection of the environment. The largest group of the respondents (74%) spent up to PLN 300,00 a year on such equipment.

For the sake of comparison, according to a PBS report (Badanie świadomości i zachowań ekologicznych mieszkańców Polski, 2013) "The Analysis of Ecological Consciousness and

Behaviours of Polish Citizens" prepared for the Minister of Environment, 86% of Poles save energy at home. The declared means of energy saving could be divided into two categories:

- - activities that do not require any effort or expenditure (64% of the respondents mentioned switching off the lights in unused rooms; 32% turn the heating down when airing the house, and 29% avoid leaving their home appliances in a stand-by mode);
- - and activities that involve some extra effort or costs (this group was dominated by energy saving light bulbs use – 47% of all answers; window sealing – 38%, and thermal modernization of buildings – only 17% of the total. In addition, 6% of the respondents have installed systems for obtaining energy from renewable sources).

At the same time, the study showed a worrying tendency, as – compared to previous years – the share of people who do not partake in energy saving more than doubled. It is difficult to objectively explain this trend, but it may result from Polish people's unwillingness to make extra effort in order to protect the environment.

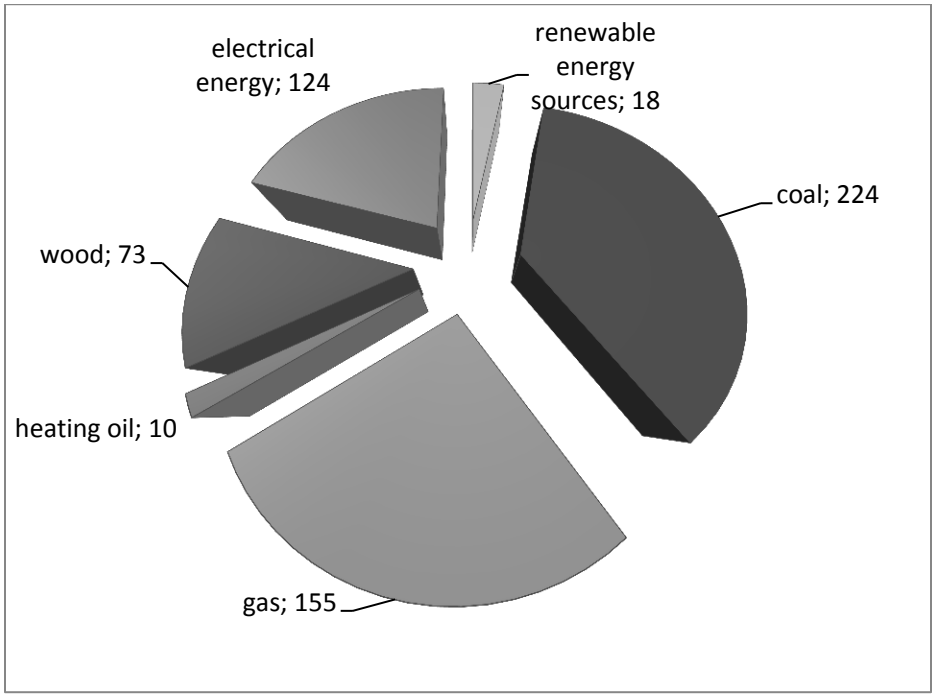
## 4. Barriers to sustainable energy consumption in the Silesian Voivodeship

The Silesian Voivodeship has a long tradition of using coal as the main fuel for generating energy. A high degree of urbanization and industrialization of this region has caused a serious environmental degradation, which in its turn led to deterioration of the living conditions. The main air pollutants in the region come from emissions related to industrial activities, general living and emissions from commuting sources. Emission from area sources is linked to the presence of main industries in Silesia, such as: mining; steel, zinc and lead industry; as well as electrical energy production. The level of air pollution in the Voivodeship of Silesia is determined primarily by surface emission, mainly due to local boiler rooms, small and medium enterprises that burn coal for heating and technological purposes, as well as coal stoves used in households. The main cause of dust and benzo(a)pyrene concentrations in the air is the burning of waste in households. The major source of linear (roadway) emission is transportation and related main commuting arterials with high traffic density, especially transit routes. The cities of Silesia are at the biggest risk, as all the main national and regional roads run through city centres, thus

causing a considerable decline in air quality. The air quality in the Silesian Voivodeship is also determined by pollutants from sources located outside the region.

Despite the increasing ecological awareness of the region's population, the environmentally harmful way of generating energy still prevails. According to the participants of the statutory research, coal was the main source of heat energy in the households of the Voivodeship in the years 2013 and 2014 (47.5% of the respondents indicated that source), with gas being the second biggest source (33%) (see Figure 2). The respondents also mentioned electrical energy as yet another important source of household heating in the Voivodeship. 26.3% of all households actually listed electrical energy as their main source of energy. Other sources included heating oil, wood and renewable energy resources.

**Figure 2. Heat energy sources in Silesian households in 2013 and 2014 [number of sources indicated by respondents]***




* The respondents could provide more than one answer.

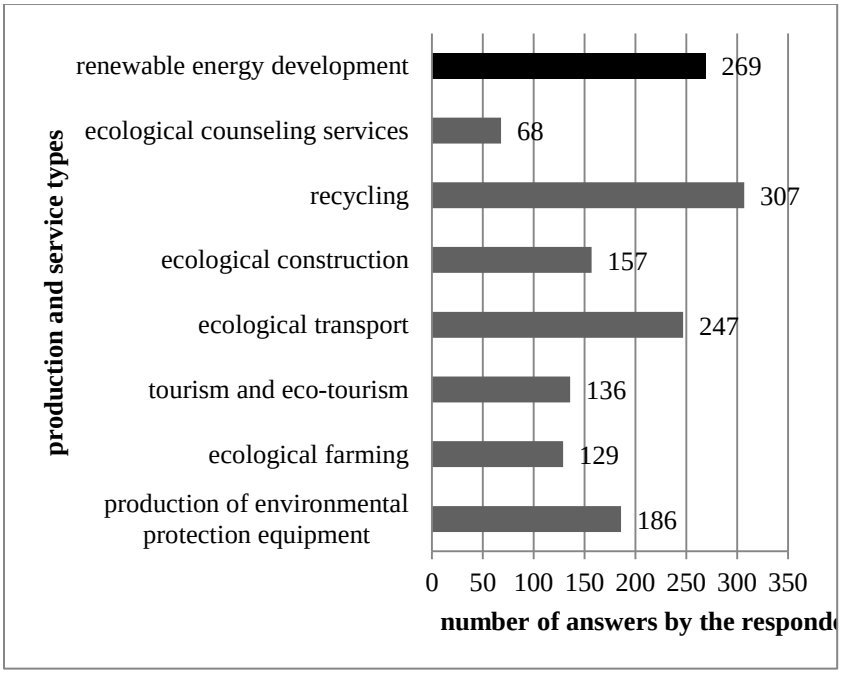
Source: Author's own analysis

At the same time, over 70% of the respondents declared their interest in receiving grants for purposes related to environmental protection, including a change in heating system, or building

insulation. Only 9.5% of the respondents said they were not interested in such grants, and nearly 5% declared they had already taken some steps to obtain such grants.

Currently, there is a new trend in the development of the Silesian Voivodeship, in the form of actions supporting the development of sustainable energetics and wider use of energy sources other than coal. In the context of needs and problems faced by smaller administrative units, such as municipalities and districts, and in the general social awareness there is a need to make investments that make use of renewable energy resources and improve energy efficiency, and to limit the amount of pollutants released into the atmosphere. The people of this region consider the increasing share of renewable energy resources in the whole structure of energy consumption to be a positive phenomenon. It was supported by the results obtained in the statutory research, in which 58% of the respondents supported the development of alternative energy sources in the Voivodeship. The development of renewable energy resources is the second, after the recycling, most frequently selected answer to the question: which type of production and services listed below should be preferred in the Silesian Voivodeship (Figure 3).

**Figure 3. Types of production and services which the respondents indicated as the preferred development areas for the Silesian Voivodeship***




* The respondents could provide more than one answer.

Source: Author's own analysis

Important, and very difficult to establish, is the actual level of renewable energy resources use in the region. Available data is incomplete and inconsistent, which reflects the shortcomings of the Voivodeship's statistics. Scattered data and decentralized gathering of information on renewable energy resources show that any interest in those activities is relatively new and is not yet fully monitored by local and regional authorities.

Financial problems are mentioned as the most common obstacle for development schemes concerning the use of renewable energy resources in the Silesian Voivodeship. The main reason for this state of affairs is the high investment cost. The shortage of funds often means that activities supporting the renewable energy resources development and increasing energy efficiency are often abandoned, in spite of the actual benefits they entail. Another factor considerably hindering the development of renewable energy resources in Silesia is the poor condition of the energy transmitting infrastructure (problems with inclusion and transmission of energy from renewable sources). Energy transmission infrastructure, both for heat and electricity, in the Silesian Voivodeship is one of the most complex ones in the country. The biggest investments in the grid development took place in the 1960's and 1970's. A research carried out by Poland's General Mining Institute (GIG) on "The efficient use of natural resources in the Silesian Voivodeship towards sustainable development" estimated the extent of recapitalisation of the local infrastructure for energy transmission and distribution based on interviews with representatives of local government divisions. In over 76% of surveyed divisions the grid recapitalisation was rated as medium, which means that most transmission networks within the Voivodeship have been functioning for 30-40 years, whereas 14% of networks have been functioning for over 40 years and only 10% – for up to 30 years. In spite of the high network density with regard to Silesia's energy distribution lines, a vast part of the infrastructure will soon be outdated and in need of some renovation and modernization. Development of renewable energy resources also increases the importance of investments in Smart Grid solutions (intelligent electrical networks) and development thereof. Smart Grid systems enable communication between all the energy market participants and their aim is to provide power services in a more cost-effective and efficient manner, while integrating dispersed energy sources, including renewable energy resources (GIG, 2011, pp. 84-85).

When it comes to initiatives concerning renewable energy resources, the social approval is particularly important. Most answers provided by the respondents with regard to practicality

and necessity of renewable energy resources development were positive, reflecting a perceivable social approval of developing new installations generating green energy and connecting them to existing transmission networks. A study conducted by the Public Opinion Research Center (CBOS) (2009) shows that over two fifths (41.3%) of the respondents think that – due to the soaring prices of traditional raw materials – renewable energy resources would result in saving money in a long run. A quarter of the people surveyed (26.2%) are of an opinion that using such sources as sun, wind or water could be particularly important in less wealthy countries and see it as an investment for the future. In general, however, Polish people, knowing how renewable energy resources affect the climate, are moderate enthusiasts of introducing alternative energy technologies on a larger scale, perhaps due to concerns related to potentially disruptive changes. The obtained results indicate also that the respondents are more supportive of solutions which would result in some cost savings, even if these were to be postponed in time.

The attitudes towards renewable energy resources in Silesia are similar to those found across Poland. The results of a survey concerning the ecological awareness and identifying actions taken by the citizens in support of the environment within the Silesian Voivodeship, which was carried out as part of the already mentioned research conducted by the General Mining Institute, show that over 60% of the respondents consider renewable energy resources to have a positive effect on the environment. Besides, over 30% of answers provided by the respondents indicated that renewable energy resources need to be developed, as it would reduce the cost of energy. Negative answers constituted less than 10%, which reflects the positive attitude of the population of Silesia to renewable energy resources development and a high level of ecological awareness in this population (GIG, 2011, p. 104).

Results of studies carried out as part of the statutory research confirmed those obtained by GIG in 2011 with regard to the respondents' conviction that it is necessary to support actions related to the development of renewable energy resources. However, as part of the study the respondents were asked about their willingness to pay more for energy originating from renewable resources. Only 14% of the respondents declared they would be prepared to pay more for energy from such sources, and generally they would only be willing to pay less than 10% more for such energy compared to current prices. Also worthy of mention is the fact that only 3% of the surveyed respondents declared they spend over PLN 1,000 a year on products and appliances which are directly connected with environmental protection.

Based on the outcome of the conducted research one could draw a conclusion that environmental criteria of product selection are at the very end of the list of motives consumers consider when making their market choices. There is also a significant discrepancy between people's declared and actual actions and behaviours. One possible reason for this is the aversion to lifestyle changes and unwillingness to reduce consumption. The analysis of the obtained data shows that one of the main causes of behaviour opposed to the principles of sustainable consumption is the lack of ecological awareness among a considerable part of society, often accompanied by cultural shortcomings in this area, which translate into indifference, recklessness and no sense of responsibility for the condition of the environment.

The GIG research quoted above shows that the population of Silesia has little knowledge of the condition of the natural environment, with a considerable discrepancy between the declared and actual level of knowledge. The low awareness level is caused mainly by the non-involvement of regional and local authorities in popularizing actions supporting protection of the environment. The lack of communications from authorities is also reflected by the very little part the society takes in making decisions concerning the environment. As many as 75% of the respondents did not participate in public consultations, and nearly 11% expressed an opinion that participation in public consultations has no actual effect on decisions authorities make with regard to the environmental protection issues. Only 14% of the surveyed citizens of the Silesian Voivodeship have taken part in public consultations.

## 5. Conclusion

An important issue, with regard to actions supporting the more efficient energy use, seems to be the emphasis on raising the social awareness with a view to save energy. Unfortunately, energy consumers – due to the rate and scale of changes affecting energy market and resulting from the general progress – lack both economic and technical knowledge. Therefore, a crucial element of the society ecologization is the ecological education at a household level.

The biggest challenge to sustainable energy consumption in the Silesian Voivodeship is the lack of knowledge concerning costs and accessibility of modern technological solutions. Energy customers need to know the consequences of their behaviour and they have to be able to access information which would allow them to change their consumption pattern. Besides, the

uncertain economic situation and the need to save money mean that the population of Silesia turns away from ecological solutions. More popular ways of saving energy are ones that do not require any extra effort, like for example building modernization, which involves high cost and a considerable amount of work.

It is also worth to mention that barriers and limitations that impede development of renewable energy resources in the Voivodeship include also the lack of coherent legal and financial solutions and the long turnaround period for obtaining decisions on location and building provisions for any such investments. In addition, the structure and location of individual renewable energy installations is also determined to a high extent by natural factors, including protected areas. Another important limitation is the lack of a systematic approach that would facilitate finding information on financial support available with regard to carrying out investments using renewable energy resources. Furthermore, there is no consistent and current database of scientific projects or research and development projects carried out in this area, which would help to select solutions that combine a high level of ecological efficiency with high innovative potential.

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## *Wyzwania i bariery zrównoważonej konsumpcji energii w województwie śląskim*

### *Streszczenie*

Zmiana niezrównoważonych wzorców konsumpcji jest jednym z podstawowych czynników osiągania celów ekorozwoju. Kluczową rolę mają tu do odegrania gospodarstwa domowe. Wysoki stopień zurbanizowania i uprzemysłowienia województwa śląskiego prowadzi do głębokiej degradacji środowiska, co skutkuje pogorszeniem warunków życia. W tych warunkach szczególnego znaczenia nabiera racjonalne i efektywne korzystanie z zasobów naturalnych z uwzględnieniem zasad zrównoważonego rozwoju. Celem artykułu jest charakterystyka kierunków rozwoju oraz identyfikacja głównych barier zrównoważonej konsumpcji energii w województwie śląskim. Ponadto w artykule dokonano oceny poziomu świadomości i podejmowanych decyzji gospodarstw domowych związanych z konsumpcją energii w regionie w kontekście zrównoważonego rozwoju. W artykule zaprezentowano wyniki badań ankietowych dotyczących rozwoju rynku dóbr i usług ekologicznych przeprowadzonych w 2013 i 2014 r.

***Słowa kluczowe:*** zrównoważona konsumpcja energii, województwo śląskie, efektywność energetyczna, OZE.