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Renewable energy resources in students' opinions

Summary

The article aims to present the research findings regarding the level of knowledge the students of Warsaw University of Life Sciences and the students of Jadwiga Dziubińska Agricultural Education Centre Schools in Golądkowo have about renewable energy resources. The research shows that the university and secondary school students are most knowledgeable about solar energy and wind power. The students whose field of studies is Renewable Energy Technologies demonstrate more knowledge of geothermal energy, biogas or biomass. Most respondents acquire knowledge about renewable energy resources from the Internet and television while the students of Renewable Energy Technologies acquire their knowledge in the course of their studies. The respondents believe that the production of energy from renewable sources is safe for the environment and human health. But most respondents, including the secondary school and university students, think that biogas is harmful for the environment and human health. Almost three fourth of the respondents are most willing to use solar energy. The second most popular source of energy is wind power. According to the respondents, the advantages of the investments are the protection of the environment and reduction of greenhouse gases emission. A big proportion of the students of Renewable Energy Technologies are for becoming independent of the increasing prices of fossil fuels. The research shows that, in the students' opinion, wind power and solar energy development is most prospective in

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Poland. The students of Renewable Energy Technologies believe that there are big opportunities for biomass development in Poland.

Słowa kluczowe: odnawialne źródła energii, uczniowie, studenci, Szkoła Główna Gospodarstwa Wiejskiego w Warszawie, Zespół Szkół Centrum Kształcenia Rolniczego im. Jadwigi Dziubińskiej w Golądkowie.
Key words: renewable energy resources, secondary school students, university students, Warsaw University of Life Sciences, Jadwiga Dziubińska Agricultural Education Centre Schools in Golądkowo

1. Introduction

Renewable energy resources are sources used in the process of generating energy from wind power, sunlight, geothermal energy, sea waves, currents and tides, falling rivers, and energy derived from biomass, landfill biogas as well as biogas coming into being in the process of sewage treatment or plant or animal matter decay (Energia…2014: 1-2). Renewable energy resources constitute an alternative to the traditional primary non-renewable energy carriers. Their resources are replenished in natural processes, which means they can be practically treated as inexhaustible. Moreover, generating energy from these sources is, in comparison to traditional (fossil) fuels, more environmentally friendly.

2. Aim, research methodology and population characteristics

The article aims to present the research findings regarding the level of knowledge the students of the Warsaw University of Life Sciences and Jadwiga Dziubińska Agricultural Education Centre Schools in Golądkowo have about renewable energy resources. In order to thoroughly and objectively examine these factors, the empirical material was collected with the use of a survey and its research technique – a questionnaire. The research was conducted in January and February 2014. The questionnaire was sent to 225 persons, including 111 full-time students of the Faculty of Economic Sciences of the Warsaw University of Life Sciences (24 first year students of

a bachelor programme in Logistics, 47 third year students of a bachelor programme in Logistics and 40 students of a master programme in Management), 66 full-time students of the Faculty of Production Engineering of the Warsaw University of Life Sciences (36 full-time first year students of a master programme in Management and Production Engineering and 30 full-time second year students of an engineer programme in Renewable Energy Technologies) and 48 students of Jadwiga Dziubińska Agricultural Education Centre Schools in Golądkowo (11 first year technical school students of agribusiness, 12 first year technical school students of agriculture mechanisation techniques, 17 second year technical school students of agriculture mechanisation techniques and 8 second year technical school students of veterinary). 106 respondents were women and 119 were men. Most respondents (99) were residents of rural areas, 64 were residents of towns with the population of up to 100,000, 16 were residents of towns with the population of up to 500,000 and the rest of the respondents (46) lived in towns with the population of more than 500,000. Most respondents have completed secondary education (129 persons), 48 persons have finished primary schools, 45 persons have finished university education without a degree diploma and 3 persons had a university degree diploma. All the respondents were divided into three groups, i.e. secondary school students, university students and students of the Department of Renewable Energy Technologies.

3. Energy from renewable resources

Renewable energy resources have been known for long but only at present one can observe how important their use is. These resources include solar energy, nuclear fission power, wind power, hydropower, heat from plant combustion (biomass), geothermal energy (energy of hot deep groundwater), the marine energy of tides and the difference between the temperature of surface and deep water (Fundusze…2009: 2).

In the last years we can notice fast development of techniques of obtaining energy from renewable resources (Józefiok 2008: 8). It is

not only due to our care of the environment and increasing ecological awareness of the society. The main reasons should be traced in the rules of economy. Because of political and economic maelstroms, the prices of traditional fossil fuels are continuously rising. At the same time, devices used to obtain renewable energy are becoming more efficient and cheaper and because of that more and more people can afford them. Political and economic conditions and countries' striving for energetic independence increasingly favour renewable energy resources. Apart from legal changes promoting the use of renewable energy, in many cases one can apply for preferential loans or even investment subsidies (both from domestic and European Union funds) (Materiały…2010: 18).

The use of renewable energy resources is one of the key activities of the development policy of Poland and the European Union within climate protection, energetic safety and the protection of the environment. Because of very high costs of building new power plants and heat and power plants using renewable energy resources, special systems of investors' support are developed in every country. Countries spend enormous funds on these tasks (Paska et all. 2008: 58).

The major aim of renewable energy development is to increase its share in the production of electricity. Investment in renewable energy resources does not only mean energetic safety of future generations but also the reduction of greenhouse gases emission, and thus prevention of climate changes, diversification of energy resources, independence from supply of fossil fuels from abroad and new workplaces (Gorczyca 2011: 515).

Figure 1 shows the share of energy from renewable resources in the total amount of primary energy obtained in Poland and 27 European Union countries in the years 2003-2011.

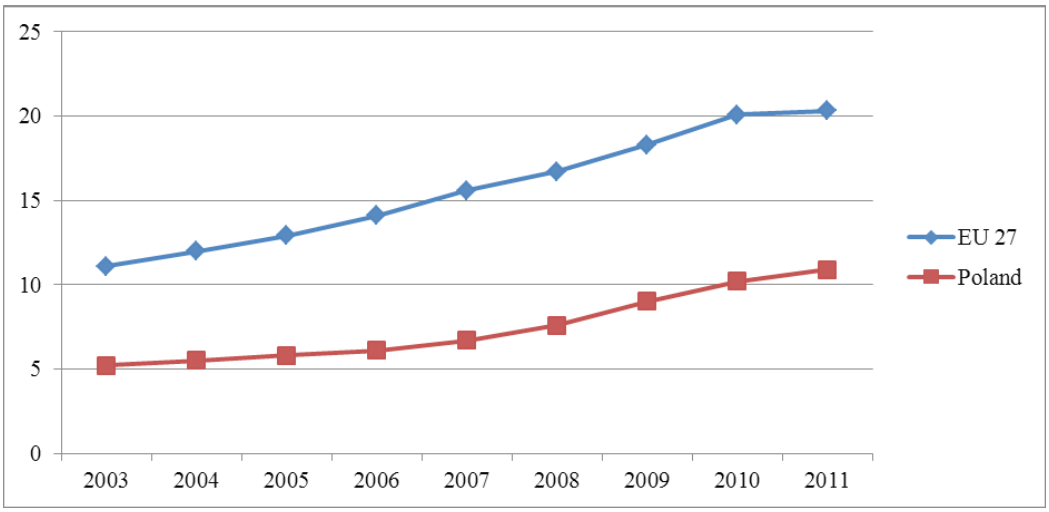

Figure 1. Share of energy from renewable resources in the total amount of primary energy obtained in the European Union and Poland in 2003-2011.
Source: (Energia…2013: 21) and compare (Gorczyca 2005: 17) and (Gorczyca 2008: 36).

In the years 2003-2011, the share of energy from renewable resources in the total amount of primary energy was systematically growing. In 2011 it reached 20.3% in the European Union and was higher than a year before by 0.9%. In Poland, the 2011 rates were 10.9 and 6.4 respectively.

4. Research findings

The research looked for an answer to the question regarding the level of knowledge about renewable energy resources. Information on that issue is presented in Figure 2.

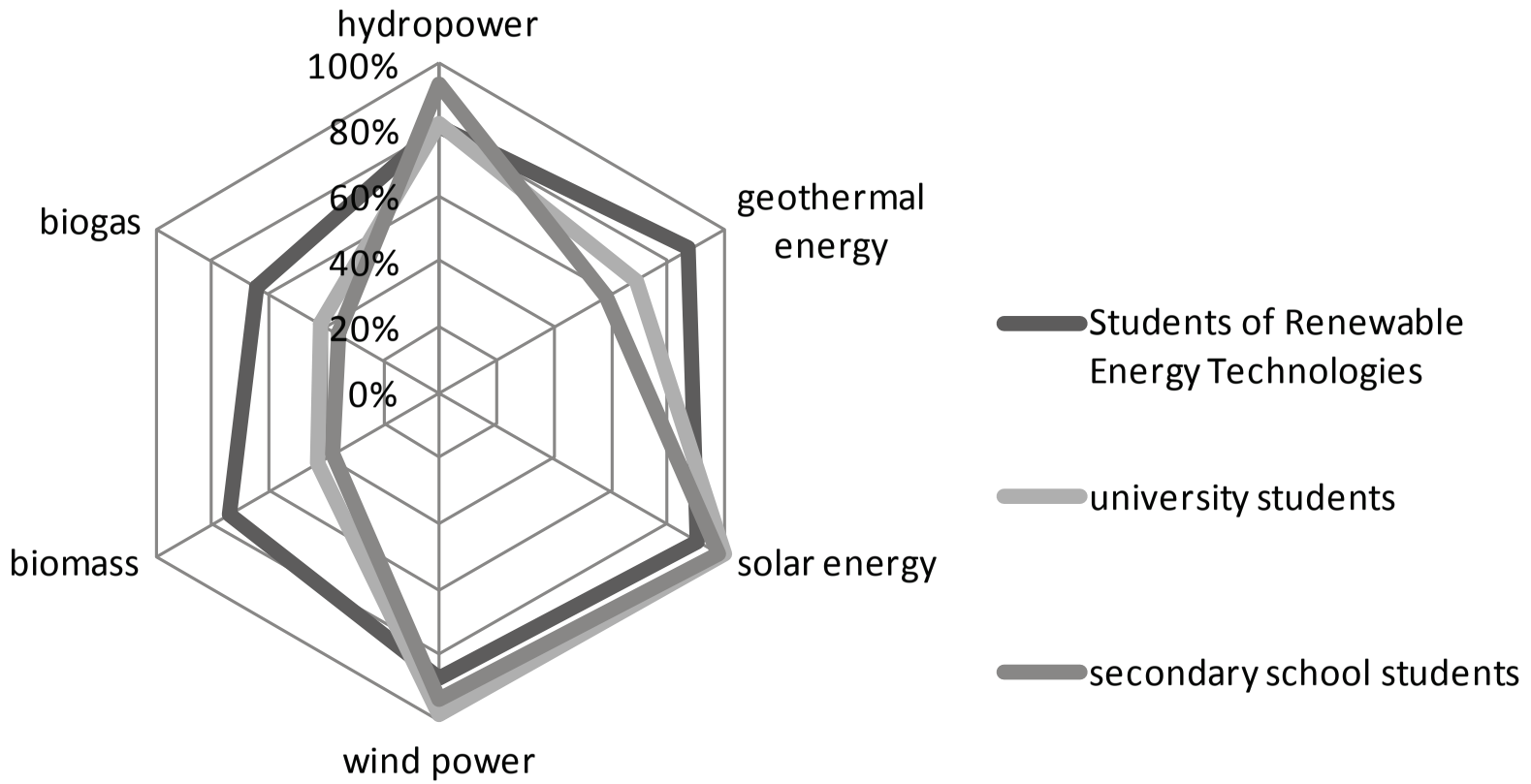

Figure 2. Knowledge of different types of renewable energy resources in the students' opinions [%].
* The respondents could choose more than one answer.
Source: author's own research.

The renewable energy resources that the students know best are solar energy and wind power. The students of the Department of Renewable Energy Technologies demonstrate better knowledge of the issue and have knowledge about geothermal energy, biogas and biomass.

Another issue examined by the research is how knowledge about renewable energy resources is acquired. Detailed data are presented in Figure 3.

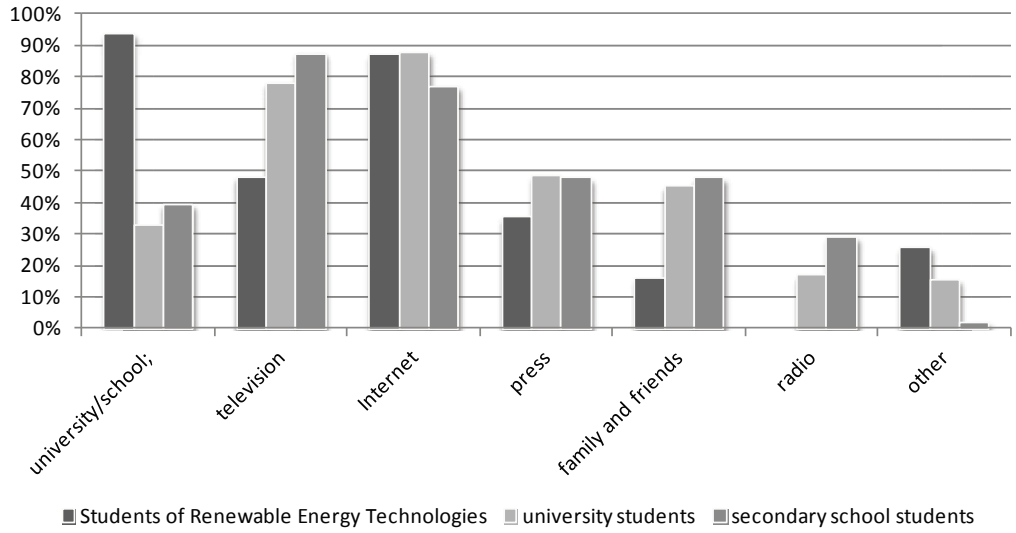

Figure 3. Sources of acquired knowledge about renewable energy resources [%].
*The respondents could choose more than one answer.
Source: author's own research.

As research shows, an absolute majority of students acquire information about renewable energy resources from the Internet and television. Most of the students of the Department of Renewable Energy Technologies acquired their knowledge in the course of their studies. Other sources of information the respondents most often mentioned were press and their family and friends.

The majority of the respondents believe that generating energy from renewable resources is safe for the environment and human health. Detailed data are presented in Figure 4.

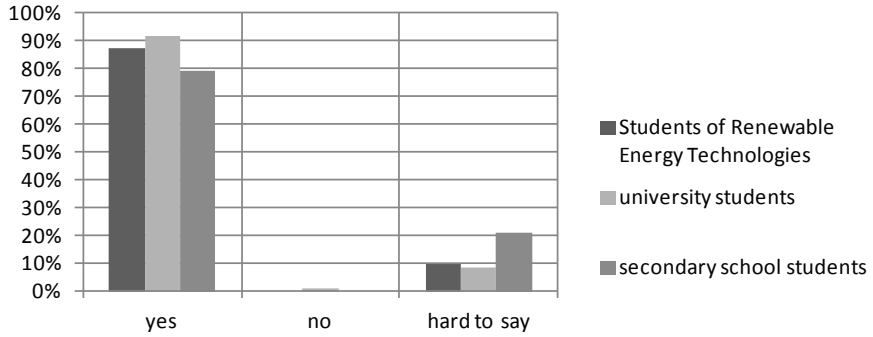

Figure 4. Is generating energy from renewable resources safe for the environment and human health? [%].
Source: author's own research.

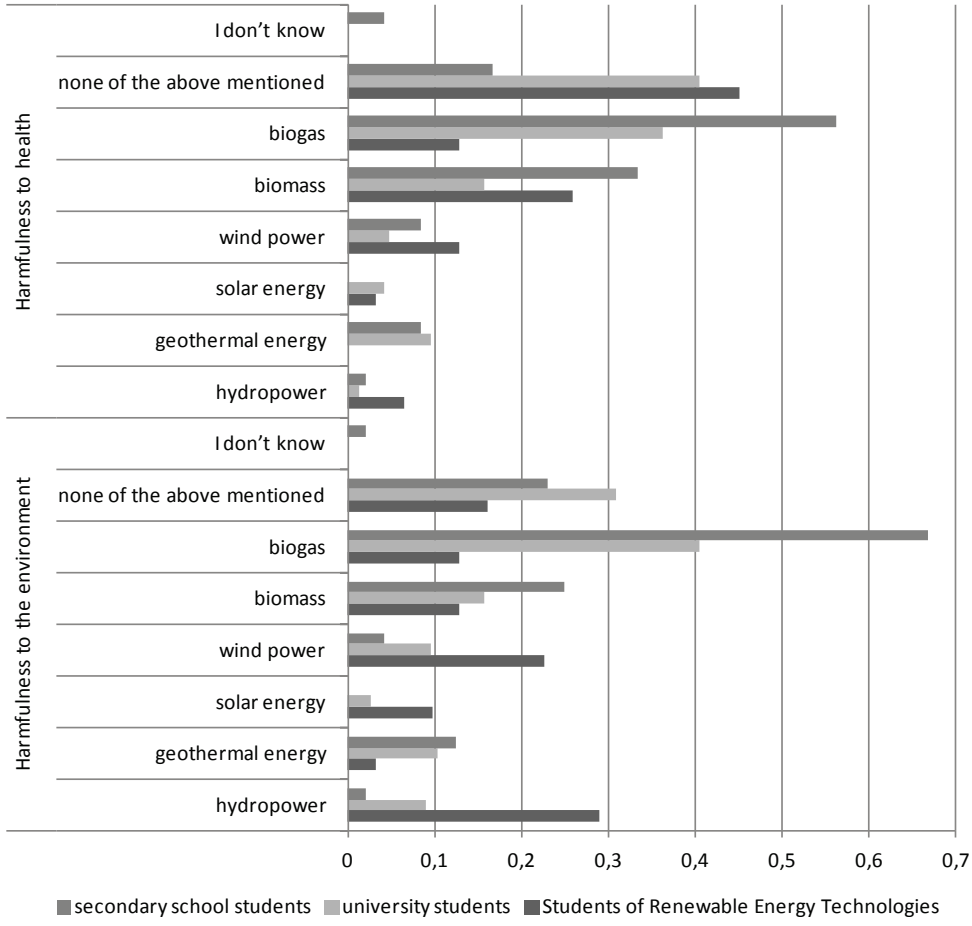

Figure 5. Types of renewable energy and their harmfulness for the environment and human health, according to the respondents [%].
* The respondents could choose more than one answer.
Source: author's own research.

Another issue addressed in the research was also the influence of renewable energy on the environment and human health. The data on this issue are presented in Figure 5.

Most of the respondents, including the secondary school and university students, believe that biogas is harmful to the environment and human health. The conducted research shows that the students of the Department of Renewable Energy Technologies are of the opinion that hydropower and wind power are harmful to the environment.

Figure 6 presents which types of renewable energy the respondents would be willing to use in their households.

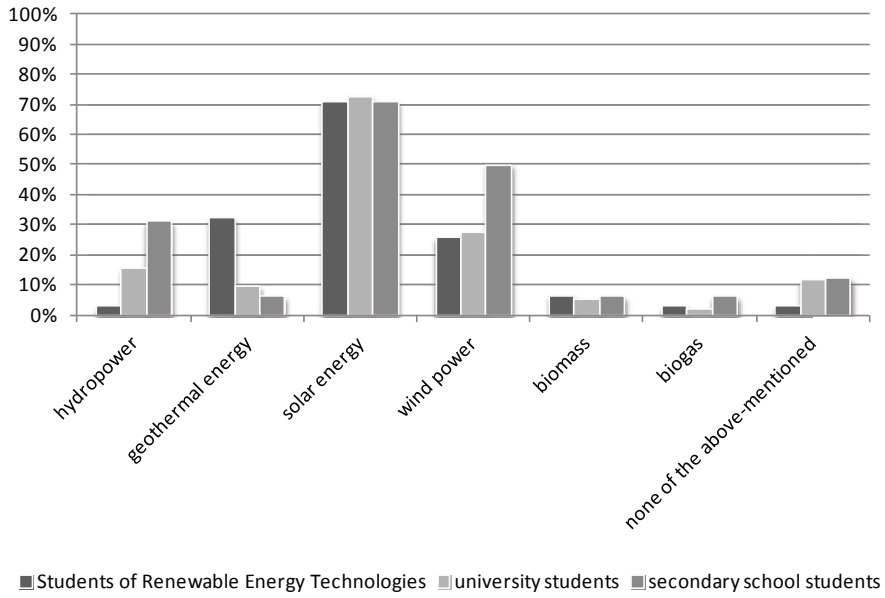

Figure 6. Respondents' preferences regarding the use of given renewable energy resources in their households [%].

* The respondents could choose more than one answer.

Source: author's own research.

Almost three fourth of the respondents would be willing to use solar energy. The second most popular energy source was wind power. Biomass and biogas were the least popular with the respondents. It can be a result of the lack of knowledge about the given resources.

One of the issues covered in the research regarded the advantages of investments in renewable energy resources. These data are presented in Figure 7.

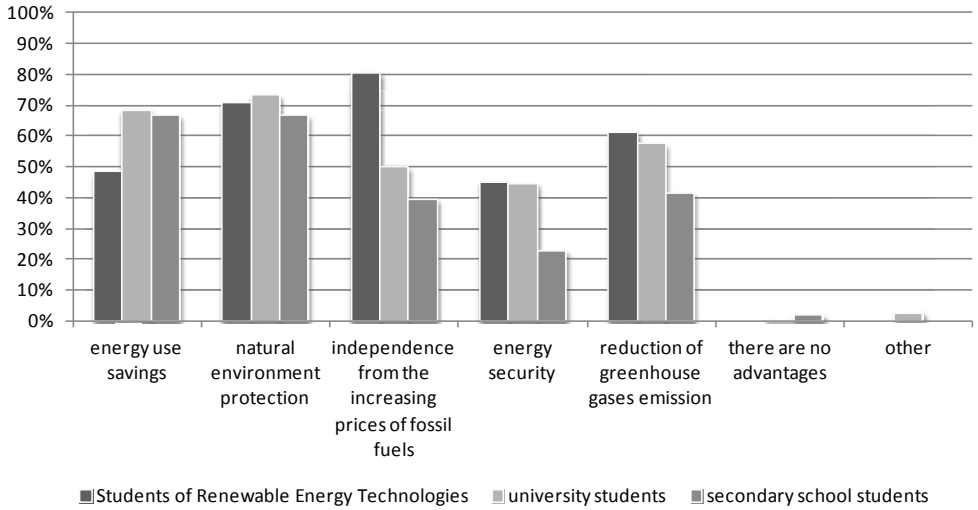

Figure 7. Advantages of investing in renewable energy resources [%].
* The respondents could choose more than one answer.
Source: author's own research.

According to the respondents, the advantages of the given investments are the environment protection and reduction of greenhouse gases emission. A big part of the students of the Department of Renewable Energy Technologies were for independence from the increasing prices of fossil fuels. A very small percentage of the respondents did not see any advantages.

The research also searched for an answer to the question what types of energy resources have most opportunities to develop in Poland (Figure 8).

The data show that, according to the secondary school and university students, wind power and solar energy have the biggest opportunities for development in Poland. The students of the Department of Renewable Energy Technologies believe that biomass is most prospective.

Apart from development prospects, the respondents were asked whether renewable energy resources are sufficiently used in Poland and whether Polish authorities should invest in renewable energy resources.

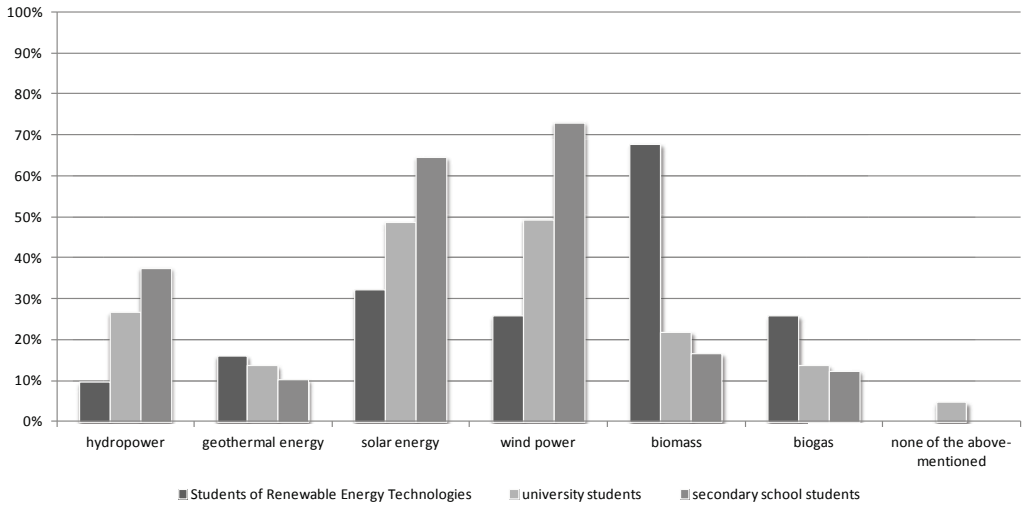

Figure 8. Opportunities to develop renewable energy resources in Poland [%].
* The respondents could choose more than one answer.
Source: author's own research.

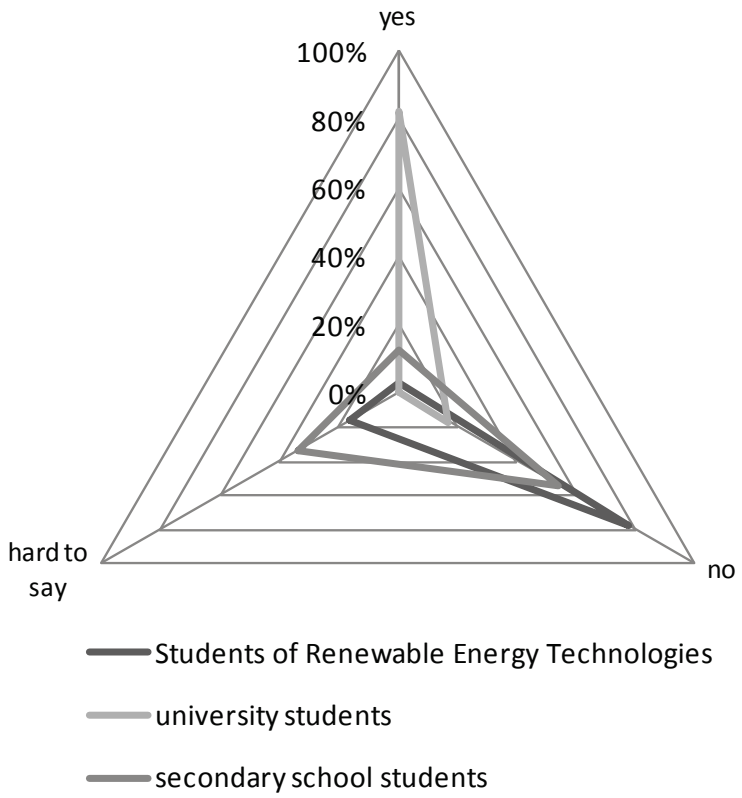

Figure 9. Are renewable energy resources sufficiently used in Poland? [%].
Source: author's own research.

The absolute majority of the students of the Department of Renewable Energy Technologies and secondary school students stated that renewable energy resources were not sufficiently used in Poland and that Polish authorities should invest in this kind of energy. Other students stated that renewable energy resources were sufficiently used in Poland and the authorities should not invest in them. Detailed data on the issue of Polish authorities investments in renewable energy resources are presented in Figure 10.

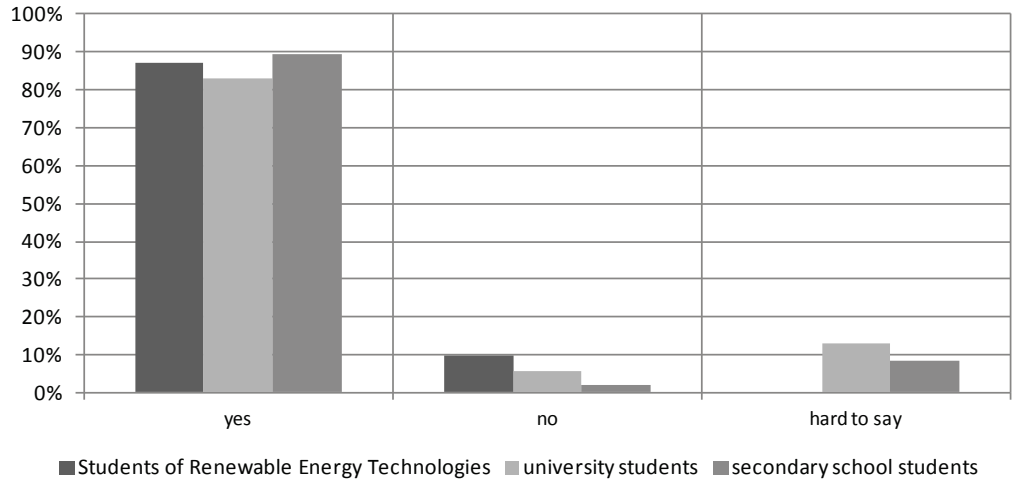

Figure 10. Should Polish authorities invest in the energy from renewable resources at present? [%].
Source: author's own research.

The respondents were also asked whether they would be willing to pay more for energy from renewable resources.

As Figure 11 shows, most respondents would not be able to pay more for energy from renewable resources. The answers suggest that the maximum price rise could be 20%. However, the students of the Department of Renewable Energy Technologies would be willing to pay more for this energy. Other respondents were not decided.

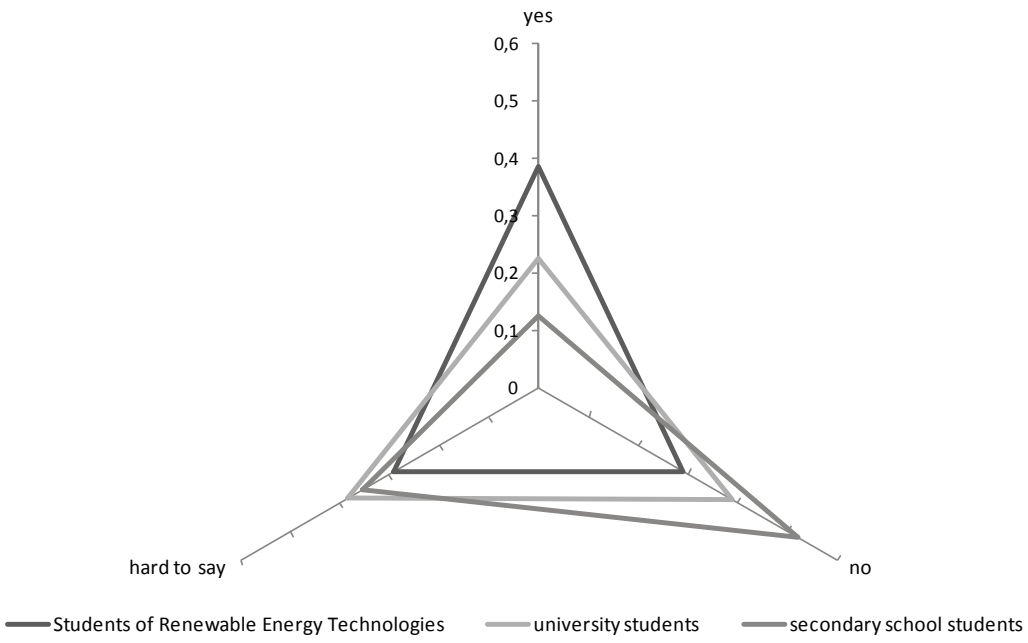

Figure 11. Would you be able to pay more for energy from renewable resources? [%] If yes, how much more? [%].
Source: author's own research.

5. Conclusions

Based on the conducted empirical research and the author's own observations, the following conclusions have been drawn:

1. Renewable energy resources are sources used in the process of converting wind power, solar energy, geothermal energy, sea waves, currents and tides, falling water of rivers and energy obtained from biomass, landfill biogas as well as biogas created in the process of sewage treatment or plant and animal matter decay. Renewable energy resources constitute an alternative to traditional primary non-renewable energy carriers.
2. The best-known renewable energy resources that the secondary school and university students mentioned are solar energy and wind power. The students of the Department of Renewable

Energy Technologies demonstrated better knowledge of geothermal energy, biogas and biomass.

3. As the conducted research shows, most secondary school and university students acquire knowledge about renewable energy resources from the Internet and television. Most of the students of the Department of Renewable Energy Technologies acquire it in the course of their studies.
4. An absolute majority of the respondents believe that obtaining energy from renewable resources is safe for the environment and human health. Most respondents, including most secondary school and university students, think that biogas is harmful to the environment and human health. The research shows that the students of the Department of Renewable Energy Technologies thought that hydropower and wind power were harmful to the environment.
5. Almost three fourth of the respondents would be willing to use solar energy. The second most popular energy was wind power. Biogas and biomass were the least popular with the students. This can be a result of a lack of knowledge about these resources.
6. According to the respondents, the advantages of given investments are the protection of the environment and reduction of greenhouse gases emission. A considerable proportion of the students of the Department of Renewable Energy Technologies are for independence from the increasingly higher prices of fossil fuels. A very small percentage of the respondents did not see any advantages of that.
7. The data show that, according to the secondary school and university students, wind power and solar energy have the biggest opportunities for development in Poland. According to the students of the Department of Renewable Energy Technologies, biomass has big chances to develop.
8. An absolute majority of the students of the Department of Renewable Energy Technologies and of secondary schools stated that renewable energy resources were not sufficiently used in Poland and the authorities should invest in this kind of energy.

The rest stated that this energy was sufficiently used and Polish authorities should not invest in it.

9. A big proportion of the respondents would not be able to pay more for energy from renewable resources. However, some students of the Department of Renewable Energy Technologies would be willing to pay more for this energy.

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