Social acceptance of small-scale renewable energy in Lower Silesia in Poland

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Abstract. There have been a large number of studies focusing on reducing the environmental impacts associated with the energy sector. Renewable energy sources (RES), such as solar energy, have been utilized in order to mitigate these environmental impacts. Here we try to answer the question as to why the development of RES among households in Poland is so weak. The survey was conducted in November and December 2015 within a project funded by the National Centre of Science. The main aim of the paper is to identify the factors that influence a household’s willingness to install a renewable energy sources, in particular those factors related to level of education level and profession. An additional aim of the paper is to make a typology of respondents – energy consumers, according to their relation to RES, on the basis of this and previous research. We propose a measure that divides the respondents into different groups according to their level of willingness to adopt RES. The results show that the greatest social acceptance of RES installation appears among: males, people in the age range of 30-49, people with secondary technical education, people living in detached houses, the owners of private companies and farmers. In addition, the results show that economic factors are the most influential in motivating households to install RES, since the respondents indicated the main benefits to be potential savings and potential profits. This study provides useful guidelines for policy makers to further promote the utilization of renewable energy sources among households.

1. Social acceptance

The development of renewable energy in Poland is an important question within the context of the EU’s climate and energy policies, particularly due to the continually low share of renewable energy sources (RES) in Poland (in comparison to the EU as a whole). One important factor in this area is the willingness of individual customers (households) to install RES. As a result of the very slow decrease in the share of coal as an energy source and limited development of RES in comparison to the EU as a whole, the level of emissions of CO₂ into the atmosphere in Poland have a worrying trend. Emissions of CO₂ have been increasing since 2002 and the gap between Poland and the rest of the EU has increased in recent years [1]. The most recent changes in the law regarding support for and the development of RES [2] suggest that the moderate rate of development of the RES sector over recent years will actually visibly become slower. This is likely to have a negative impact on Poland being able to meet the EU guidelines for development of RES by 2020 (a 15% share in total energy production) and achieving the general goals of EU climate policy for the period ending in 2030. The present rate of development of RES in Poland indicates that in 2020 the share of RES in total energy production will be 12.9% [1], whereas the figure projected for the EU as a whole exceeds 20%.
Experience has shown that acceptance of RES is fundamental to ensuring that such systems are installed and the efficiency of converting RES to heat or electrical energy is systematically increased. Hence, it is necessary to consider the level of social acceptance for RES when regional government is defining its policy for sustainable development. Carlman considered the problem regarding social acceptance for wind energy, in particular the social, political and regulatory framework surrounding the placement of wind turbines [3]. The results of her research show that there exist a significant number of barriers to social acceptance. Persuading local communities of the positive impact of such investments, together with obtaining the appropriate legal permission, lasts from 7 to 10 years. This research was developed by e.g. Bosley [4], who defined and analysed problematic issues associated with the implementation of RES. Upham et al. [5] analysed the main factors governing social acceptance for variance types of energy sources in Great Britain. In turn, Stackley [6] investigated social acceptance in Europe for technologies for capturing and storing CO2. The level of social acceptance for solar energy has also been studied in the Chinese region of Shandong [7]. Surveys have also been carried out on e.g. the willingness of households to pay extra for “green” energy [8] and the effect of various factors on the decision to install RES in British households [9]. Such research cannot be directly applied to assessing the readiness to install RES in Poland, since Polish society is characterised by a different mentality, culture, habits and, above all, economic conditions (income, possessions, wealth, savings and living costs). Thus it was necessary to carry out a Polish survey, whose results are presented in this article.

The main aim of this paper is to identify and analyse the factors which influence the willingness to install renewable energy sources among households, in particular those related to level of education and profession. Identification of these factors is key to classifying households as either willing to install RES or uninterested in installing such technology. Hence, an additional aim of this paper is to make a classification of the respondents – energy consumers, according to their attitude towards installing RES, on the basis of this and previous research. This classification was made on the basis of a proposed measure that divided the respondents into different groups according their level of willingness to install RES. We call this measure the coefficient of acceptance of RES or coefficient of willingness to install RES.

2. The research methodology

In order to answer the question as to why the level of development of RES among households in Poland is so low we designed a questionnaire. An initial questionnaire based on a literature review was used in a pilot test. Some minor changes were made as a result of this pilot test. A fuller description of this survey can be found in the following papers: [10], [11]. The questionnaire was divided into 3 parts, with a total of 34 questions. In the first section there were questions enabling us to describe each respondent’s socio-demographic profile: age, sex, number of family members, number of children in the family, level of education, profession, average net income of households, type of building occupied, floor or building area. These data are based on the answers to closed questions.

The second section of the questionnaire included questions regarding the knowledge of respondents about the energy devices in their home (e.g. the type of electrical meter), the tariff applied on electricity bills, their monthly expenditure and the new opportunities arising from the reforms of the energy market (e.g. changing provider, becoming a prosumer). This section included questions about the type of building in which a household lives (e.g. historic, post-war, insulated, energy-efficient, passive), as well as their home: floor area, sources of heating (e.g. district heating, central heating, fireplace, floor heating, storage heater) and hot water, whether RES has been installed and if so what type, whether the respondent is a prosumer or intends to become one. There were also some questions related to various attitudes, e.g. the benefits from installing RES and the willingness to install RES and become a prosumer, as well as on the advantages and disadvantages of being a prosumer. The answers to questions regarding attitudes were chosen from a defined set. Awareness of the energy tariff applied and understanding of the term ‘prosumer’ were assessed using a “yes/no” question.

The third part of the questionnaire was related to various behavioral variables. Data concerning the pro-ecological and energy efficient behavior of households were collected. Regarding pro-ecological
behaviour, there were questions related to the following factors: switching off lights, sorting rubbish, the utilization of electro-rubbish, battery utilization, and unplugging devices that are on standby. In the case of pro-energy efficiency, there were questions related to the household’s attitude to measuring the amount of water to be boiled, washing or ironing at particular times and using eco-options in washing machines, such as low water consumption or low energy consumption. We asked whether households have a one-time zone or two-time zone tariff. In addition to our investigation of energy efficient behaviour, there were questions about household equipment, such as: energy-saving lights, LED light bulbs, A+++ home appliances. The strength of the respondents’ behaviour in reducing their negative impact on the environment was assessed using 5 and 7 point Likert-type scales. Moreover, we used a “yes/no” question to collect data on which respondents had switched providers.

2.1. Data collection

The survey was conducted in November and December 2015. The decision maker in the household completed the questionnaire, which was delivered to 2000 randomly sampled households in the governmental region of Lower Silesia. Thirty districts were included in the study, including the largest cities: Wrocław, Wałbrzych, Legnica and Jelenia Góra. After verification of the answers received, 949 subjects were considered in our sample, since some of the questionnaires did not contain answers to key questions. The sample reflects the distribution of sex and age in the districts of Lower Silesia that were included in the study. The sample was composed of 51.9% females and 48.1% males. The most common age group was comprised of respondents of age between 30 and 49 (341 respondents). The most common household size was 2 people (31.1%), followed by 3 and 4-person households (approximately 20% in both cases).

On the basis of the answers obtained, the respondents were split into three groups. The first group included the households that had already installed RES (45 households– 4.75% of the sample). This group is referred to as “RES installed”. The second group included the households that had not installed RES, but would consider installing them. This group was called “inclined to RES”. This group contained 281 households – 29.6% of the sample. The remaining respondents (623 households – 65.65%), were labelled as „unsupportive of RES”. These respondents were those who had not installed RES and had no intention to do so.

2.2. The coefficient of social acceptance of RES

A simple estimate of the likelihood of a household being supportive of RES only considers the proportion of such households in a particular group (e.g. households where the decision maker is female). Such an indicator can be defined in narrow terms as being the probability of actually having installed RES. The authors decided that it would be more appropriate to define an indicator that would include the households that have not yet installed RES, but wish to do so. This indicator measures the potential that could be achieved in the future. The authors also desired that this indicator reflected the number of households unsupportive of RES in a given group, since the larger the number of such households in a given group, the lower the level of acceptance of RES in that group.

The likelihood of eventually installing RES (\( p_{RES} \)) is defined by Equation (1) as the ratio of the sum of the number of households that have already installed RES (\( L_{RES} \)) and the number of households that are inclined to RES (\( L_{pRES} \)) to the total number of respondents (\( L_k \)).

\[
p_{RES}^i = \frac{L_{RES}^i + L_{pRES}^i}{L_k^i}, \quad \text{where } i = 1, ..., n. \tag{1}
\]

In turn, the coefficient of the willingness of households to install RES (\( S_{RES} \)) in a given group is measured by the product of the number of households that have installed RES and the likelihood of eventually installing RES, as given by Equation (2).
\( S_{RES}^i = l_{RES}^i \cdot p_{RES}^i = l_{RES}^i \cdot \frac{l_{RES}^i + l_{RES}^k}{t_k}, \) where \( i = 1, \ldots, n. \) (2)

In Equations (1) and (2), the index \( i \) denotes the group of respondents for which this coefficient is calculated in turn. For example, on the basis of our age categorization, we can define coefficients for each of the four age groups, i.e. \( i \) takes values from 1 to 4. Intuitively, this coefficient of willingness to install RES is increasing in both the number of households that have already installed RES and the proportion of households who are inclined to RES. On the other hand, this coefficient is decreasing in the proportion of households that are not supportive of RES.

Considering the sample in its entirety, the likelihood of eventually installing RES is 0.34 and the coefficient of willingness to install RES is 15.46. The value of this coefficient will vary according to the group of households considered according to e.g. sex, age, household size, income, expenditure on electrical energy, size of the house/flat, or type of building and that will enable us to highlight groups which are more or less likely to install RES.

In order to compare the values of these coefficients for different subgroups, they were standardized by dividing by the mean value taken over all those subgroups. It should be noted that the coefficient of willingness to install RES depends on the size of a particular group (it not only indicates the likelihood of installation in a group, but the absolute number of households in a group that have already installed RES). Hence, this indicator can be interpreted as a measure of the potential within a group (large groups naturally have more potential). Thus the larger the number of groups considered, the smaller the mean value of this coefficient. If the standardized value for a subgroup is less than 1, this indicates that the potential for installing RES is less than average, while larger values indicate greater potential.

3. Empirical results

Among the most important factors influencing the decisions of households about whether to install RES are the following: sex, age, number of people in a household, monthly average net income, floor area, monthly expenditure on electricity, level of education and profession. The statistical significance of the factors considered are presented in [11].

This article analyses the effect of, in particular, the level of education and profession. However, the other factors that have an influence on a household’s decision cannot be ignored, since they are often clearly associated with the level of education and profession. These factors were described in detail in another paper, but will only be noted here. The values of the standardized coefficient of willingness to install RES are presented in Table 1. Income and expenditure in US dollars were calculated according to the mean exchange rate in the period November-December 2015, which was 3.95 PLN.

3.1. The socio-demographic factors that influence households’ decisions

There is a clear association between the sex of the decision maker and attitude towards RES. The majority of females have not installed an RES nor do they intend to install one. The values of the standardized coefficients indicate that males are more likely to install RES (\( S_{RES} = 1.53 \)) compared to females (\( S_{RES} = 0.6 \)).

With respect to the age of the decision maker, the largest number of households that had already installed an RES had decision makers in the 30-49 age group (48.9% of the households with RES), followed by the 50-65 age group (26.7%). Decision makers of age greater than 65 were the least inclined towards RES, almost 70% of this group had not installed RES nor did they wish to install one. This is confirmed by the standardized statistics, for the 30-49 age group (\( S_{RES} = 2.98 \)), while in the over 65 age group \( S_{RES} = 0.3 \).

With respect to the number of members of a household, households with one or two members are generally uninterested in installing an RES. A large proportion of households that had installed RES had either three or four members (28.9% and 31.1% of households that had installed RES, respectively). Similarly, households with four members were the most favourably inclined to RES (26.8% had installed RES). Both three-person and four-person households are characterized by large values of the
standardized coefficient of willingness to install \((S_{RES} = 1.66\) and \(S_{RES} = 2.52\), respectively). Households composed of five or six members are also characterized by a high value of this measure \((S_{RES} = 1.62)\).

With regard to average monthly expenditure on electricity, households spending in the range 25.33-50.63 USD per month are the most positively inclined to RES and hence characterized by the largest value of the standardized coefficient of willingness \((S_{RES} = 2.62)\). Those spending in the range 50.64-75.95 USD per month are also characterized by a relatively high willingness to install RES \((S_{RES} = 1.7)\). On the other hand, the lowest level of willingness to install was observed among those spending less than 12.66 USD a month \((S_{RES} = 0.08)\).

None of the decision makers in households with less than 40m² of living space are willing to install RES. This is due to the technical impossibility of installing an RES. Only households with a living area of above 80m² have installed an RES. The total proportion of households positively inclined to RES systematically increases as floor space rises, so that 71.5% of households with more than 150 m² of floor space have already installed an RES or are willing to do so. The coefficients of willingness to install are greatest for households with more than 150 m² of floor space \((S_{RES} = 4.26)\), and smallest for households with less than 80 m² of floor space.

The question regarding average monthly income was not answered by 306 respondents (33% of the sample). A large proportion of households with an income of above 5 000zł had already installed RES. The proportion of such households who had not yet installed an RES, but were willing to install RES, was thus relatively low. However, overall the proportion of households willing to install RES was generally increasing in income. The largest coefficient of willingness to install an RES was observed among households with incomes in the range 1 519 – 2 025.32 USD \((S_{RES} = 2.01)\), but households with incomes in the ranges 759.49-1 012.66 USD \((S_{RES} = 1.81)\) and below 759.49 USD \((S_{RES} = 1.63)\) showed a high level of willingness to install RES. The lowest coefficients of willingness to install were observed amongst households with incomes in the ranges 1 012.67 - 1 518.99 USD and above 2 025.33 USD.

| Number of group | 1 | 2 | 3 | 4 | 5 or 6 | 7 and more |
|-----------------|---|---|---|---|--------|----------|
| sex             | female | male |
| age            | 0.6 | 1.53 |
| number of household members | 0.07 | 0.65 | 1.66 | 2.51 | 1.62 | 0.51 |
| average monthly net income (in USD) | < 759.49 | 759.49-1 012.66 | 1 012.67-1265.82 | 1265.83-1518.99 | 1519.00-2025.32 | 2025.33-2531.65 | > 2531.65 |
| monthly expenditure on electricity (in USD) | 1.63 | 1.81 | 0.62 | 0.87 | 2.01 | 0.53 | 0.59 |
| floor space    | < 40 m² | 40-79 m² | 80-149 m² | > 150 m² |
|                | 0 | 0 | 2.67 | 4.26 |

3.2. The educational factors that influence households’ decisions

This section analyses the association between attitude towards RES and level of education. The level of education was categorized into ten groups in the questionnaire. However, for the purposes of analysis, these groups were categorized into six levels, as follows: undefined or below primary (3.2% of respondents), primary or lower secondary (2.6%) and basic vocational (17.9%) were grouped into one level called primary and basic vocational education; post-secondary (1.4%), general bachelor studies (1.2%) and technical bachelor studies (0.3%) were combined into one group called incomplete tertiary
The following categories remained without any changes: general secondary (13.7%), technical secondary (28.3%), general tertiary (18.7%) and technical tertiary (12.8%). The results from the survey and the willingness of households to install RES according to level of education are presented in Table 2.

The greatest willingness to install RES was shown by decision makers with secondary technical ($S_{RES} = 1.81$) and tertiary technical ($S_{RES} = 1.71$) levels of education. The next group in this ranking was composed of those with tertiary general education, where the coefficient of willingness was 1.12. It can thus be seen that decision makers who studied technical educational programmes were more inclined to install RES than those who studied general programmes, particularly among those with a secondary level of education.

| Educational level                  | No. of households with RES installed | No. of households positively inclined to RES | No. of households negatively inclined to RES | No. of households | $S_{RES}$ |
|-----------------------------------|--------------------------------------|---------------------------------------------|---------------------------------------------|-------------------|-----------|
| Primary and basic vocational      | 8                                    | 67                                          | 150                                         | 225               | 1.04      |
| General secondary                 | 3                                    | 34                                          | 93                                          | 130               | 0.33      |
| Technical secondary               | 11                                   | 103                                         | 155                                         | 269               | 1.81      |
| Incomplete tertiary               | 0                                    | 8                                           | 19                                          | 27                | 0         |
| General tertiary                  | 10                                   | 41                                          | 126                                         | 177               | 1.12      |
| Technical tertiary                | 13                                   | 28                                          | 80                                          | 121               | 1.71      |
| Total                             | 45                                   | 281                                         | 623                                         | 949               |           |

The decision maker in the majority of households where RES is already installed has graduated from tertiary education (either general or technical, 51%, - see Fig.1). However, there is little potential to expand in this group, since the proportion of households where the decision maker has graduated from tertiary education and is willing to install RES (however, has not yet installed it) is below 25%. Among households where the decision maker has graduated from secondary technical education, 37% are willing to install RES, but RES is not yet installed. This indicates the potential to expand among this group, which has the technical ability to appreciate RES, but do not possess the technical or financial means to install RES.

Figure 1. Percentages of households according to educational level of the decision maker for the three groups.
Figure 2 indicates that there exists a positive association between having studied a technical educational programme and installing an RES. Grouping all of those households whose decision maker had a technical education (secondary or tertiary) together, it can be seen that they form 38% of households unwilling to install RES, 47% of the households inclined to install RES and 53% of households which have already installed RES.

3.3. Association between the profession of the decision maker and households’ decisions

The profession of the respondent is another factor that may be associated with a household’s attitude to RES. Due to the form of the survey (telephone), the largest group in the survey was composed of people above retirement age (37.2% of the sample). The results of the survey according to profession of the decision maker are presented in Table 3. Among those who have installed RES, the most common professions are: owners of private firms (31.1%), pensioners (24.4%), administrative workers (15.6%) and farmers (13.3%). Among the farmers, 8.7% have installed RES, 60.9% are willing to install RES and only 30.4% are unwilling to install RES. Among the owners of private firms 13.9% have installed RES, 38.6% are willing to install RES, and 47.5% are unwilling to install RES. In three categories (creative artist, director or manager, member of the uniformed services) the quantity of respondent were too small so they were composed as one group called others.

Table 3. Number of households and their social acceptance of RES according to the profession of the decision maker.

| Profession                  | No. of households with RES | No. of households inclined to RES | No. of households disinclined to RES | No. of households | S<sub>RES</sub> |
|----------------------------|---------------------------|----------------------------------|-------------------------------------|------------------|-------------|
| Administration             | 7                         | 22                               | 59                                  | 88               | 1.94        |
| Middle management          | 0                         | 15                               | 23                                  | 38               | 0           |
| Owner of a private firm    | 14                        | 39                               | 48                                  | 101              | 6.18        |
| Independent professional, specialist | 1 | 13                 | 15                                  | 29               | 0.41        |
| Blue-collar worker         | 1                         | 15                               | 29                                  | 45               | 0.30        |
| Service sector, shop         | 0                         | 12                               | 52                                  | 64               | 0           |
| assistant                 |                           |                                  |                                     |                  |             |
| Farmer                     | 6                         | 42                               | 21                                  | 69               | 3.51        |
| Housewife                  | 0                         | 11                               | 22                                  | 33               | 0           |
| Pensioner                  | 11                        | 74                               | 268                                 | 353              | 2.23        |
| Unemployed                 | 3                         | 30                               | 76                                  | 109              | 0.76        |
| Others                     | 2                         | 8                                | 10                                  | 20               |             |
| Total                      | 45                        | 281                              | 623                                 | 949              |             |
Analysing the data from the point of view of willingness to install RES, the highest values of the standardized coefficient were obtained for the following groups: owners of private firms ($S_{RES} = 6.18$) and farmers ($S_{RES} = 3.51$). The following positions are occupied by pensioners ($S_{RES} = 2.23$) and administrative workers ($S_{RES} = 1.94$), who express a similar attitude towards RES.

On the other hand, we can also observe the groups which are the least favourably inclined to RES. The highest percentages of individuals within a professional group who did not wish to install RES were observed in the following groups: service sector workers and shop assistants (81.3%), pensioners (75.9%), unemployed (69.7%), administrative workers (67%), housewives (66.7%) and blue-collar workers (64.4%). These results are presented in Figure 3. Table 4 presents the results for all of the professional groups. Due to the low numbers of individuals in some of these groups, not all of the professional group considered in the survey are included in Figure 3, since these results are likely to be unrepresentative.

![Figure 3. Percentages of households in each of the three groups according to the profession of the decision maker.](image)

A significant proportion of households where the decision maker is a pensioner have installed RES. However, a very high proportion of such households would not consider installing RES. This seeming discrepancy can be explained by the fact that in these households RES had been installed when the decision maker was still working and thus had a greater income. The majority of pensioners cannot afford to install RES, since on average their income is 15% lower than those who are employed.

### 4. Characterization of households most favourably inclined to RES

A characterization of the households that are most inclined to install RES was carried out on the basis of the factors described above. These results are presented in Table 4. This table presents all the subgroups in which the value of the standardized coefficient of willingness to install RES is greater than 1.5. These are segments of society (according to a given socio-demographic trait) whose willingness to install RES is estimated to be at least 50% greater than in Polish society as a whole.
Table 4. Social acceptance for RES according to factors.

| factor                        | groups with the highest level of social acceptance | $S_{RES}$ |
|-------------------------------|--------------------------------------------------|-----------|
| sex                           | male                                             | 1.53      |
| age                           | 30-49 years                                      | 2.98      |
| number of people in household | four-person households                           | 2.51      |
|                               | three-person households                           | 1.66      |
|                               | 5 or 6 person households                          | 1.62      |
| average monthly net income    | 1 519.00-2 025.32 USD                             | 2.01      |
|                               | 759.49-1 012.66 USD                              | 1.81      |
|                               | < 759.49                                         | 1.63      |
| monthly expenditure on electricity | 25.33-50.63 USD                            | 2.62      |
|                               | 50.64-75.95 USD                                  | 1.7       |
| floor space                   | above 150 m²                                     | 4.26      |
|                               | 80-149 m²                                        | 2.67      |
| level of education            | secondary technical                              | 1.81      |
|                               | tertiary technical                               | 1.71      |
| profession                    | firm owner                                        | 6.18      |
|                               | farmer                                            | 3.51      |
|                               | pensioner                                         | 2.23      |
|                               | administrative worker                             | 1.94      |

On the basis of the results presented above, we can propose a characterization of the households which are the most likely to install an RES, as follows:

- sex of decision maker – male,
- age of decision maker – 30-49,
- number of people in household – from 3 to 6,
- average monthly expenditure on electricity – from 25.33 to 75.95 USD,
- floor space is greater than 80 m²;
- type of education – technical education (secondary or higher).

In addition, on the basis of our study, we can describe several segments of households and their statistical attitude to installing RES:

Segment 1 – households where the average monthly net income is less than 1 012.66 USD and the decision maker is an administrative worker. These are often households that are interested in installing RES and possess appropriate knowledge in this realm. However, such individuals do not possess the financial means or, possibly in addition, the technical means to install RES.

Segment 2 – households where the average monthly net income is less than 1 012.66 USD and the decision maker is a farmer. These are households that are willing to install an RES, have the required knowledge and see the benefits to be gained from RES. However, they do not possess sufficient financial funds to install RES.

Segment 3 - households where the average monthly net income is from 1 519.00 to 2 025.32 USD and the decision maker is a firm owner. These are households which can afford to install an RES, but require additional motivation to do so.
5. Conclusions
This article has addressed the question of why such a low proportion of Polish households have installed an RES. Our analysis was carried out on the basis of a survey that took place amongst households in the governmental region of Lower Silesia in November and December 2015. This study was used to describe the most important factors associated with the decision of a household to install an RES. The article has paid particular attention to the educational level and profession of the decision maker in a household. The greatest willingness to install RES was shown by decision makers with secondary technical and tertiary technical levels of education. There exists a positive association between having studied a technical educational programme and installing an RES. The greatest willingness to install RES was obtained for: owners of private firms and farmers. The most important factors are shown in Table 4.

Increasing the number of RES, particularly among households, is fundamentally connected to the level of social acceptance for RES. Therefore, in order to assess social acceptance for small-scale RES among households, the authors have proposed a coefficient of willingness to install RES (a measure of social acceptance) which takes into account the following: the number of households that have installed RES, the number of households that would consider installing RES and the total number of households in a given group. A measure of the likelihood of installing RES has also been defined. The measure of social acceptance was used to find types of household in which the willingness to install RES is highest. On the basis of these traits, the authors have defined educational and promotional activities which are adapted to particular segments of households that might consider installing an RES, but do not have the appropriate knowledge and/or financial means.

In the case of households that fit the first segment, promotion of RES should be based on highlighting the financial benefits of such installations and designing financial mechanisms that would enable such households to invest in an RES. In the case of households that fit the second segment, promotion of RES should be based on the financial and non-financial gains to be obtained from an RES, including the benefits of self-sufficiency within a local energy co-operative. The design of a mechanism to enable investment in such installations is also crucial for such households. In the case of households that fit the third segment, promotion of RES should feature education on the benefits of sustainable development and its effects on future generations, since our study indicates that in this group of households a lack of knowledge is a greater barrier to the spread of RES than a lack of financial means.

Acknowledgments
The paper presents the results from our project called ‘Modelling prosumers’ behaviour on the energy market’, which is funded by the National Centre of Science by grant no. 2013/11/B/HS4/01070.

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