The topic of this research paper starts from objectives that are specific to the protection of the environment which is threatened by phenomena that exert a major impact on the population. Global warming and the increase of CO_2 emissions, corroborated with problems related to the rethinking of the energetic sectors as a result of the exhaustion of fossil resources and the increase of interdependence amongst states have led to attempts of reducing the use of traditional energy sources and, implicitly, to the encouragement of the use of renewable energy sources.

After presenting the functioning mechanisms of the involved markets, this research paper will focus on understanding, explaining and modeling the behavior of the RES consumer. We have used the interview, the questionnaire and the experimental static design based on subsets as the main instruments for data collection. The marketing experiment was considered the best solution for studying the preferences of households due to its predictive function with regard to hypothetical situations. Consumer behavior is modeled and analyzed in relation with the theories and variables identified in the literature in the field.

The originality and novelty of this thesis are given by the very methodology and variables employed for studying the behavior of the RES consumer. The construction, based on consumer knowledge, attitudes and behavior, of a measurement scale of the degree of consciousness with regard to the importance of RES, as a main variable that guides the purchase intention, the methodology employed for the building of orthogonal blocks for an experimental design of the type $2X3^4$ and its application are the main contributions to the thesis. Another novelty in studying the behavior of the RES consumer consists in the filtering of the respondents depending on the degree of manifestation of social desirability.

Although the methodology used and the results obtained are specific to the research conducted as part of a PhD thesis, this work also has significant managerial contributions. At the end of the first stage of the research, we reached the conclusion that Romanian consumers can participate to this new strategy designed to improve the quality of the environment through the use of RES in two ways: the *passive* method, case in which the investments are made by the energy suppliers (E-ON, for instance) that fulfill the compulsory quotas by purchasing green certificates or investing in their own energy parks; or the *active* method, case in which home owners purchase renewable energy microgeneration equipment (sun panels, heat pumps, pellet-based power plants, small-sized wind turbines).

The problems that constitute the object of this research paper concern the following aspects: the degree of development of the RES market in Romania, its functioning mechanisms and the population's low degree of awareness with regard to the importance of the use of RES. The paper has a pyramidal structure, starting from the construction of the general frame of manifestation of the RES market in Romania and ending with a clear focus on the research of the household consumer.

This research *is aimed at* explaining the functioning mechanisms of the market of renewable energy sources in Romania from the perspective of the involved actors. The research focuses on the following objectives:

General objective 1: Estimate of the RES use potential at the level of the national energetic sector of Romania.

Secondary objective 1a: Analysis of the growth potential of the RES market in Romania.

Secondary objective 1b: Building the architecture of the functioning mechanisms of the involved markets.

Secondary objective 1c: Study of the market of suppliers of renewable energy microgeneration equipment as source of identification of the variables for the study of consumer behavior.

General objective 2: Study of the active and passive behavior of the Romanian consumer of green energy.

Secondary objective 2a: Identification of the variables that may influence the households' willingness to use green energy.

Secondary objective 2b: Study of the passive behavior of green energy use by the households in the Iasi area.

Secondary objective 2c: Study of the active behavior of green energy use through the analysis of the willingness of the households in the Iasi area to purchase equipment that uses renewable sources.

Secondary objective 2d: Ranking the preferences of households with regard to the purchase of a heating system.

We have used *active behavior* to refer to a household's decision of investing in microgeneration equipment and *passive behavior* to refer to the household's decision of avoiding any inconvenience involved by the

installation of microgeneration equipment through the payment of a cogeneration quota on the utilities bill.

The thematic structure of the paper is pyramidal: it starts from the building of the general frame of manifestation of the RES market in Romania and it ends with focusing all the efforts of the research on the household consumer. The proposed research work is in line with the current trend which is characterized by the attempt to encourage research in economy and sociology, research that is essential for understanding and facilitating the modification of consumer behaviors (Guardiola et al., 2009; Pellion, 2008; Rundle-Thiele et al., 2008).

Chapter one presents and structures specialized works that have been written so far on three levels: research works conducted at the level of the *macro-environment* (large scale, energy parks), *meso-environment* (region, community or locality) and *micro-environment* (a single building or household).

Chapter two deals with the methodology of the research, presenting research challenges, the purpose and objectives of the research, the proposed hypotheses and model, the research plan, the instruments used and the methodology applied for creating the experimental design. The methodology has been presented for each of the two stages of the research (see table number 1).

Table no. 1. Research stages function of the general objectives that have been proposed

First research stage (general objective 1): Estimate of the RES use potential at the level of the national energetic sector of Romania.	
Stages	***Remarks***
Becoming aware of the problem	Global warming and the increase of CO_2 emissions, exhaustion of fossil sources. Slow dynamics of the Romanian renewable energy microgeneration market
Building the theoretic frame	The study has an exploratory nature. *Secondary sources* of information: *Study and systematization of the literature in the field. *Identification of the main concepts which will take the form of the used variables; *Study of official statistics and publications in the field; *Study of European and national legislation; * Other research works conducted so far by specialized organizations. *Primary sources*: unguided interviews and online questionnaire
Data collection and employed methods	2010-2011: Direct unguided interviews and online questionnaire
Subjects of the proposed study	30 actors directly involved (specialists in the field, investors, staff working for the regulatory authorities, suppliers), 102 companies that supply renewable energy microgeneration equipment
Analysis instrument	Online questionnaire (quantitative study and qualitative analysis of the results) and direct unguided (free) interviews (qualitative interviews)
Sample	Convenience sample
Data analysis	Frequency indicators; correlation, codification and analysis in SPSS, grouping, codification and interpretation of open answers
Findings	Building the functioning mechanisms of the RES market in Romania, identification of the main features of the consumer and of product attributes necessary for constructing the experimental design
Second research stage (general objective 2): Study of the active and passive behavior of the Romanian consumer of green energy.	
Stages	***Remarks***
Becoming aware of the problem	Small degree of awareness of the importance of using green energy at household level
Building the theoretic frame	Study and systematization of the literature in the field concerning consumer behavior and constructing the experimental design based on subsets

Data collection and employed methods	2010, 2011: Pilot survey, face-to-face survey
Subjects of the proposed study	Households at the level of Iasi city which do not have any type of renewable energy microgeneration equipment installed
Analysis instrument	Questionnaire
Sample	Convenience sample
Data analysis	Codification and analysis in SPSS and Excel, testing of the scales (Knowledge, Attitudes, Behavior, Degree of awareness with regard to environment problems and Social Desirability) of the constructed model and interpretation of the results of the experiment by using traditional conjoint analysis and experimental design based on subsets (regression analysis through the transformation of the variables into dummy variables)
Findings	Significance and power of the independent variables (and of social desirability) on the degree of awareness of the importance of using green energy; Ranking the preferences of the households for certain attributes specific to a heating system.

The first stage (2010-2011) is aimed at achieving the first general objective of the research, respectively the *Estimate of the RES use potential at the level of the national energetic sector of Romania.* Due to the fact that it uses primarily mediated techniques of data collection, the research conducted during this stage is of exploratory nature.

During this first stage we have also suggested a direct analysis of reality. For these purposes, we have used the following research instruments:

- *unguided interviews* with specialists in the field, investors and persons working for the regulatory authorities for energy.
- *online questionnaire* applied to the suppliers of renewable energy microgeneration equipment in Romania. We have used a convenience sample comprised of 102 Romanian companies that supply renewable energy microgeneration equipment.

The second stage (2011-2012) is aimed at fulfilling the second general objective of this research paper. For the study of the active and passive behavior of the Romanian consumer of green energy, we have resorted to the following research instruments:

- face-to-face *survey* through the application of a *questionnaire* to the households at the level of Iasi city. The questionnaire is composed of 21 questions which correspond to the variables selected for the analysis.
- *experiment* under the form of a subset-based design. After filling in the questionnaire, the respondents were asked to evaluate and rank 8 product alternatives. These products consisted in heating systems represented by 5 attributes (it uses or it does not use renewable energy sources, monthly average value of the utilities bill, recommendations, disadvantages and cost of purchase). After applying the stages proposed by Gilmour and Trinca (2006), we have obtained the design corresponding to an experiment of the type 2×3^4 (see table number 2).

During our research, we have used an evaluation scale from 1 to 10 (1- would not purchase the product; 10- would purchase the product). The data obtained following the evaluations offered by the respondents were interpreted by applying a linear regression analysis through the transformation of the variables into dummy variables. According to Green et al. (2001), the application of linear regression with the help of the dummy variables represents a viable alternative for the identification of consumer preferences.

Table no. 2. Second-order orthogonal blocks and level codification

Source of energy	Utilities bill	Recom mendation	Dis advantages	Cost of purchase	Source of energy	Utilities bill	Recom mendation	Dis advantages	Cost of purchase
-1	-1	1	-1	-1	1	0	0	-1	-1
-1	-1	1	1	1	-1	0	0	-1	1
-1	1	-1	-1	1	-1	0	0	1	-1
-1	1	-1	1	-1	1	0	0	1	1
1	-1	-1	-1	1	1	-1	-1	0	0
1	-1	-1	1	-1	-1	-1	1	0	0
1	1	1	-1	-1	-1	1	-1	0	0
1	1	1	1	1	1	1	1	0	0
-1	-1	1	-1	1	1	-1	0	0	-1
-1	-1	1	1	-1	-1	-1	0	0	1
-1	1	-1	-1	-1	-1	1	0	0	-1
-1	1	-1	1	1	1	1	0	0	1
1	-1	-1	-1	-1	1	0	-1	-1	0
1	-1	-1	1	1	-1	0	-1	1	0
1	1	1	-1	1	-1	0	1	-1	0
1	1	1	1	-1	1	0	1	1	0
					1	-1	0	-1	0
					-1	-1	0	1	0
					-1	1	0	-1	0
					1	1	0	1	0
					1	0	-1	0	-1
					-1	0	-1	0	1
					-1	0	1	0	-1
					1	0	1	0	1

(a)

Attribute/Level	**-1**	**0**	**1**
Source of energy F1	Does NOT use RES		Uses RES
Average monthly utilities bill F2	150 RON	300 RON	450 RON
Recommended by …F3	a friend	a friend and a specialist	a specialist
Disadvantages of the system F4	requires space	requires space for installation and involves maintenance costs	involves maintenance costs
Cost of purchase F5	5000 RON	12000 RON	20000 RON

(b)

We have used a convenience sample comprised of 184 households. We have selected households from the city of Iasi and its suburbs that do not have any kind of renewable energy microgeneration equipment installed.

During the second research stage we have issued 12 hypotheses and we have built a model in order to study the intensity of the connections between certain features of the households and their members and the degree of awareness with regard to the importance of using renewable energy sources an and the intention to purchase renewable energy microgeneration equipment (see table number 3 and figure number 1 for further details).

Table no. 3. Research hypotheses

	HYPOTHESES
(I)	***INFLUENCE OF THE SOCIAL DESIRABILITY SCALE*** 1.1.The respondents' social desirability does not influence the answers concerning: (A) the willingness to pay extra for green energy, (B) the intention to purchase microgeneration equipment and (C) the degree of awareness with regard to the importance of RES. 1.2. The degree of awareness with regard to the importance of using renewable energy sources is higher in the young than in the elderly. 1.3. The degree of awareness with regard to the importance of using renewable energy sources is higher in men than in women. 1.4. The degree of awareness with regard to the importance of using renewable energy sources is higher in persons with higher education.

	1.5. The degree of awareness with regard to the importance of using renewable energy sources is higher in households with a bigger monthly income than in those with a small monthly income. 1.6. The degree of awareness with regard to the importance of using renewable energy sources is higher in households with children. 1.7. The higher the declared level of knowledge of the households, the more likely they are to show positive attitudes and behaviors towards the use of RES. ***OTHER VARIABLES THAT MAY INFLUENCE*** 1.8 (A) The degree of awareness with regard to the importance of using renewable energy sources is higher in persons that show a higher level of concern in relation to environment problems. (B) The willingness to pay extra on the utilities bill in order to stimulate the use of RES is more accentuated in persons that show a higher level of concern in relation to environment problems. 1.9. Households with Internet access register a higher level of awareness with regard to the importance of RES. 1.10. Households comprised of members who have travelled overseas register a higher level of awareness with regard to the importance of RES.
(II)	***INFLUENCE OF THE DEGREE OF AWARENESS OF THE IMPORTANCE OF RES ON THE INTENTION TO PURCHASE*** 2. The degree of awareness with regard to the importance of RES influences the households' willingness to purchase renewable energy microgeneration equipment.
(III)	***STUDY OF CONSUMER PREFERENCES*** 3. When purchasing equipment for heating and hot water, financial attributes matter most for households.

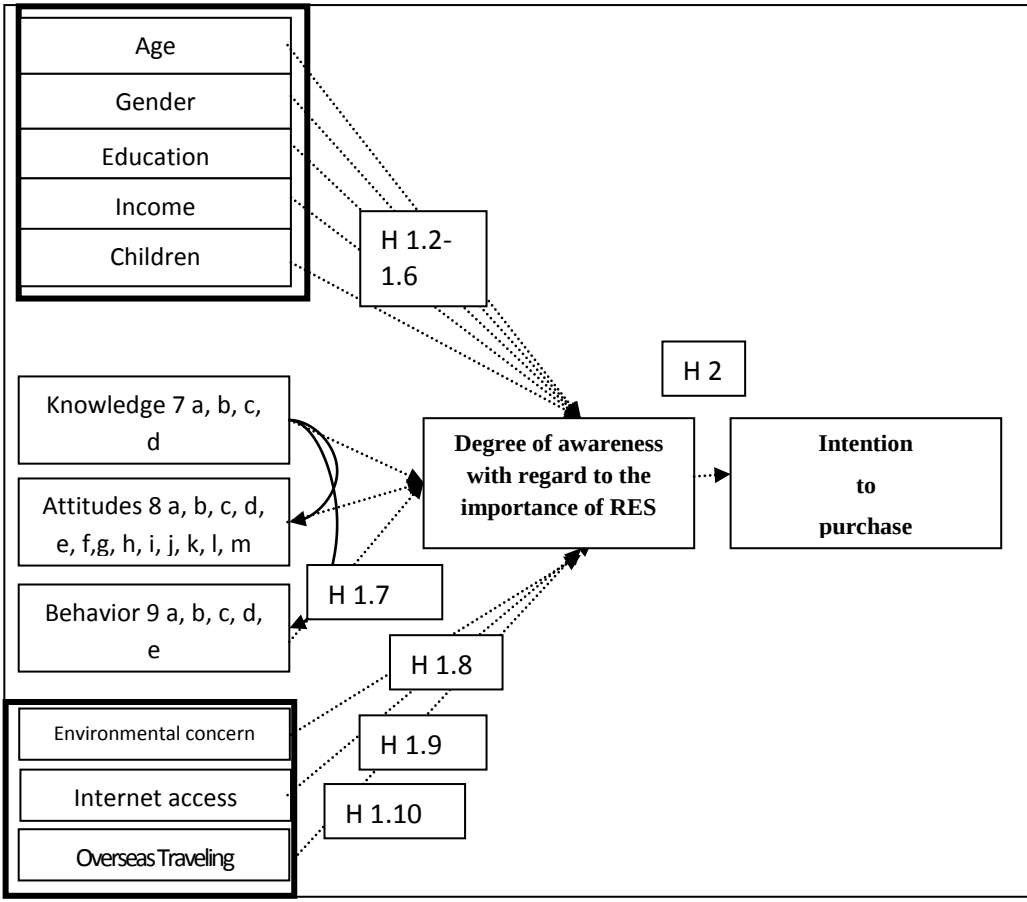

Figure no. 1. Research variables and the connections between them

The model (see figure number 1) is comprised of 5 variables built based on a set of items and 8 simple variables. *Independent variables:* age,

gender, education, household income, civil status of the respondent, Internet access, travelling overseas, level of the utilities bill, environmental concern, *a dependent variable*, the intention to purchase, and a *latent variable*, the degree of awareness with regard to the importance of RES, which acts as a dependent variable in relation to the factors that influence it and as an independent variable in relation to the intention to purchase. The degree of awareness construct is measured based on the following three variables: Knowledge (4 items), Attitudes (13 items) and Behavior (6 items).

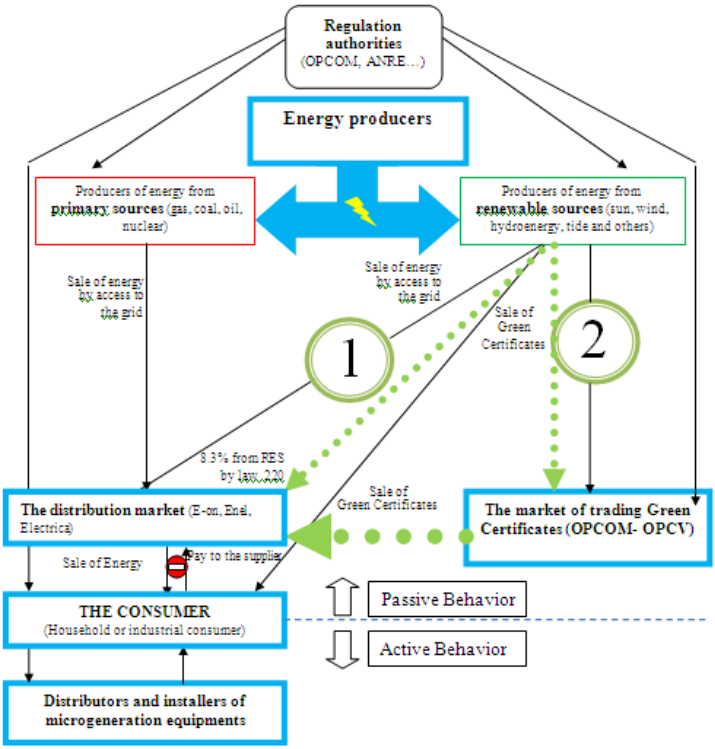

Figure no. 2. Structure of the RES market in Romania

Chapters three and four deal with the interpretation of the data collected during the exploratory research. The findings took the form of a brief presentation of the functioning mechanism of the RES market in Romania (see figure number 2). We have identified the involved markets and the interests of each actor (regulatory authorities, RES investors, suppliers of electricity, and suppliers of renewable energy microgeneration equipment).

Chapter four focuses on the study of microgeneration equipment suppliers. The findings obtained at this level provide information about: the benefits and attributes of the products that generate energy from renewable sources and the profile of the consumer of microgeneration equipment (see figure number 3). The benefits that have been mentioned most frequently are the ones that characterize renewable energy sources, respectively: savings on the utilities bill, participation to the decrease in greenhouse gas emissions and energetic independence.

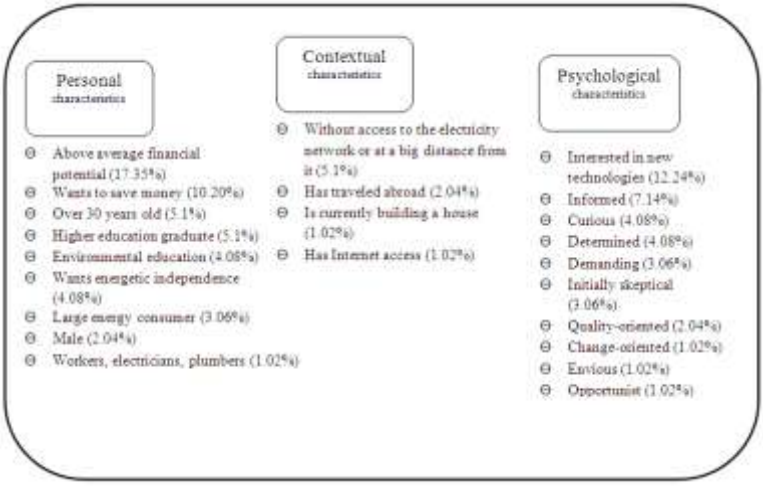

Figure no. 3. Variables which build the consumer profile, as described by suppliers

Chapter five presents the findings of the survey applied to the households at the level of Iasi city and validate or invalidate the formulated hypotheses. The following hypotheses have been validated or invalidated (see table number 3): 1.1. (A)invalidated, (B)invalidated, (C)validated; 1.2. invalidated; 1.3. validated; 1.4. invalidated; 1.5. invalidated; 1.6. invalidated; 1.7. validated; 1.8. (A) validated, (B) invalidated; 1.9. invalidated; 1.10 invalidated; 2. validated.

The passive consumption of green energy of the households is studied by analyzing the willingness to pay extra on the utilities bill, and the active consumption is studied by analyzing the intention to purchase and the preferences for certain attributes of some types of renewable energy microgeneration equipment.

Chapter six presents the conclusions at the level of the *micro*, *meso* and *macro*-environment, the contributions, limits, future directions and managerial implications of this research paper.

The results obtained during the analysis of the passive behavior show an average willingness to pay extra of 18.4 RON (approximately 4.22 EUR) per month at the level of households, value that is very close to the that of the population from Italy (4 EUR) and Great Britain (5 pounds). Although the obtained value may suggest a positive attitude towards the encouragement of investments in renewable energy, there is also a percentage of 23.4 respondents that would not be willing to pay extra and that have been called *spectators* in this research paper.

As concerns active behavior, the research starts from the premise that the high level of awareness with regard to the importance of RES is the main element which guides the household's intent of purchasing renewable energy

microgeneration equipment. The degree of awareness with regard to the importance of RES has been built based on three groups of items: Knowledge with regard to RES, Attitudes towards RES and Behavior. Although the hypotheses were primarily aimed at identifying the factors which influence the degree of awareness, the research also focuses on its direct influence on the intention to purchase.

Table no. 4. Factors which influence the degree of awareness with regard to the importance of RES

TYPE OF CONNECTIONS IDENTIFIED DURING THE RESEARCG	Degree of awareness with regard to the importance of RES	Intention to purchase
Respondent's age	**-**	**(-)**
Respondent's gender	**(+)**	**-**
Respondent's education	**-**	**(+)**
Household income	**-**	**(+)**
Children	**-**	**-**
Overseas traveling	**-**	**-**
Internet access	**-**	**-**
Knowledge	**(+)**	**(+)**
Attitudes	**(+)**	**(+)**
Behavior	**(+)**	**(+)**
Degree of awareness RES	**1**	**(+)**
Environmental concern	**(+)**	**-**
Willingness to pay extra	**-**	**-**

** (+) positive connection; (-) negative connection; - no significant connection*

Men that are worried about the environment have a higher level of awareness with regard to the importance of RES. The intention to purchase is visible in particular in young persons with higher education, with an income above the average and a high level of awareness with regard to the importance of RES.

Our research is in line with most research studies in this field which have reached the conclusion that there is a strong connection between the level of knowledge or environmental concern and the willingness to pay extra for alternative products (Rowlands et al., 2002; Prakash, 2002; Arkesteijn and Oerlemans, 2005). Our findings confirm the fact that being informed and acquiring knowledge consolidate the purchase decision through the development of attitudes or behaviors favorable to the development of the RES market (see table number 4).

The study of active behavior has also involved the analysis of the households' willingness to purchase renewable energy microgeneration equipment compared to other products that use fossil sources. At this level, the research took the form of an experiment during which the respondents were asked to evaluate 8 heating systems characterized by different attributes and their levels (see the chapter entitled *Research methodology* for further details). The respondents were asked to imagine that the heating system in their home broke done and needs replacing for it cannot be repaired.

Following the face-to-face survey and the interpretation of the results of the experiment, we have reached the following conclusions concerning the behavior of household members that need to purchase a heating system:

- the respondents pay very little attention to the attributes related to recommendations and system disadvantages; the latter has been eliminated from the regression model because of the low level of

significance (requires space: $t = 0.689 < +2$, $Sig. = 0.491 > 0.05$; requires maintenance expenses: $t = 0.552 < +2$, $Sig. = 0.581 > 0.05$);

- the obtained regression model is : *Consumer preference = 5.572 + (0.894) * The product uses RES + (1.046) * Bill of 150 RON + (-0.922) * Bill of 450 RON + (-0.668)* recommended by a friend + (-0.347) * recommended by a specialist + (0.760) * cost of purchase 5000 RON + (-0,636) * cost of purchase 20 000 RON.* The respondents grant the highest level of importance to the small value of the utilities bill, which comes first, and to the use of RES by the system, which comes second.

We may thus conclude that the respondents' motivation is of a material nature, that their main concern has to do with financial gains, and that the moral aspects represented by the protection of the environment through the use of renewable energy sources have less weight (thus, hypothesis number 3, When purchasing equipment for heating and hot water, financial attributes matter most for households, is validated).

This doctoral thesis is aimed at explaining the functioning mechanisms of the market of renewable energy sources from Romania starting from the study of the marketing macro-environment and meso-environment and continuing with the analysis of the active and passive consumption of green energy of the households at the level of the Iasi city. The systematic analysis of the literature in the field, the adjustment of the measurement scale to the degree of awareness concerning environmental issues with a view to measuring the degree of awareness concerning the importance of RES, the sorting out of the answers by using a measurement scale of the respondents' social desirability and the application of an experimental design based on subsets with a view to studying the households' preferences with regard to the purchase of a heating system are the main contributions of this doctoral research. The research

activity can be continued through the identification of new attributes or variables which may improve the predictive value of the obtained model and through the study of the potential differences between Romanian regions in relation to the degree of awareness concerning the importance of RES.

For further details, you can access the thesis in .pdf format at: http://bit.ly/O6q75u. Thank you!

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