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### **PERSPECTIVE OF APPLICATION OF BEHAVIOURAL ECONOMIC PRINCIPLES FOR CHANGING CONSUMER CHOICE TOWARDS SUSTAINABILITY IN THE ALTERNATIVE ENERGY SECTOR**

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### **MOŻLIWE ZASTOSOWANIA ZASAD EKONOMII BEHAWIORALNEJ JAKO CZYNNIKA WPLYWAJĄCEGO NA ZACHOWANIA KONSUMENCKIE W OBSZARZE ZRÓWNOWAŻONEGO ROZWOJU W DZIEDZINIE ALTERNATYWNYCH ŹRÓDEŁ ENERGII**

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**Summary:** The main aim of the study was to critically overview available data and literature sources on interconnection between applied behavioral economics and consumer choice and to formulate ways of application of behavior principles while implementing sustainable development approaches in alternative energy sector. The models used in behavior economics were explored, similarities and differences were defined and ways for using models in the research were proposed. The analyses show that applied behavior principles can shape and change the consumer choice. The brief sociological survey in selected regions of Ukraine, the Czech Republic and Germany was accomplished and permitted to determine the first insights into behavioral factors and motivation of individuals. Results will be transferred into improvements in economic appraisal of alternative energy and strengthening the new insights in policy evaluation.

**Keywords:** applied behavior studies, alternative energy sector, renewable energy, sociological survey, behavior techniques, EU alternative energy policy.

**Streszczenie:** Analiza na podstawie dostępnych danych i źródeł literatury dotyczących zależności zasad ekonomii behawioralnej a wyborów konsumentów została poddana dokładnej analizie. Udowodniono wpływ zasad ekonomii behawioralnej na zachowania konsumentów w obszarze zrównoważonego rozwoju w sektorze energii alternatywnej. Omówiono główne zasady i modele stosowane w dziedzinie ekonomii behawioralnej, opisano ich podobieństwa i różnice oraz sposoby wykorzystania modeli w badaniach. Kluczowe czynniki wpływające na realizację ustawy dotyczącej

alternatywnych źródeł energii zostały poddane analizie. Podsumowane wyniki analizy przyczynią się do poprawy ekonomicznego poparcia dla opcji alternatywnego sektora energetycznego oraz dostarczenia nowych informacji potrzebnych do oceny ustawy jej dotyczącej.

**Słowa kluczowe:** studia behawioralne, alternatywne źródła energii, odnawialne źródła energii, zachowania konsumenckie, techniki behawioralne, Europejska dyrektywa o odnawialnych źródłach energii.

*The consumer is to the manufacturer, the department stores and the advertising agencies,  
what the green frog is to the physiologist.*

Watson

## 1. Introduction

Theory and practice of sustainable development implies setting equilibrium between economic, social and ecological dimensions for future development [Meadows et al. 2004]. For achieving sustainability goals it is necessary not only concentrate on the political, institutional, educational activities, but change the human behaviour [Sevfung 2009]. This goal is closely connected with theory and applied practices of behavioural economics [Camerer 1999].

The term “behavioural economics” refers to complemented economic approaches and analysis by improving the underlying assumptions about individual behaviour [Wilkinson, Klaes 2016]. The key findings from behavioural economics in accordance with Kahneman [2003] are:

- people display ‘bounded rationality’ and cannot make the complex calculations necessary for “rational” decision making due to the amount of information they must process or the manner in which they compare competing products and services;
- people are inconsistent in their preferences over time, discount heavily in the very short term and make decisions inconsistent with their long-term preferences;
- people exhibit reciprocity and value fairness;
- people may gain satisfaction from the levels of satisfaction and behaviors of others.

The behaviour of consumers for making sustainable choice towards sustainability in energy conservation and alternative energy sector is similar to their behaviour concerning other goods [Snell, Gibbs 1995; Musso 2012; Pidlisnyuk 2012]. One of the main questions is regarding the change of the consumers’ behaviour towards sustainability. Also it is important to understand the differences in accepting the idea of utility as a central driving force in human motivation and behaviour from the economics and psychologists point of views [Ariely, Norton 2008].

According to Europe 2020 program [Europe 2020], one of the most important trends towards sustainability is alternative energy sector [Green Paper 2006] which includes as key issues wind, solar, geothermal and oceanic energy, hydropower, biomass, landfill gas, sewage treatment gas and biogas [White Paper... 1997]. The sector plays an important role in the strategic energy planning process in the EU.

Renewable energy clearly forms an important part in reducing the EU's vulnerability to fossil fuels and for that reason the EU citizens are most in favor of renewable energy sources. According to Eurostat, the number of citizens in the EU-28 will rise to 514 million in 2020, reaching approximately 520 million in 2030 before gradually declining to reach about 515 million in 2050. Due to the long-term effects of decisions in the energy sector and the political visions for 2050, several institutes calculated scenarios with 80/100 percent energy supply by renewables as it is requested by Europe 2020 Strategy. The studies mainly focus on the feasibility of a 100 percent supply based on renewable energies [Pfluger 2014].

Among the main pieces of EU legislations which are focused on promotion of the alternative energy sector and using of alternative energy sources is EU Directive 2001/77/EX [Directive... 2001] promoting the production of electricity from renewable energy sources (RES) and call for increasing production and improving availability. The EU Biomass action plan is focused on the specific role of biomass actions across the region [Biomass Action Plan 2005].

With the advent of the new EU legislation concerning energy efficiency, emissions trading, and wider environmental issues (as well as soaring crude oil prices), there is probably the greatest interest in Europe than anywhere else in renewable energy technologies [Pollit, Shaorshadze 2011]. Barrier removal will increase the uptake of desirable technologies, which is an EU objective.

However, the production of electricity from fossil fuels is still among the main priorities in the EU and efforts should be done towards the promotion of other alternatives. This requires a deeper analysis of human's behavior in terms of selecting policy towards alternatives and defining determinants, which will promote both industry and individuals for making their choice towards alternative energy sources.

The aim of the current study has been to generalize the literature sources and available data focused on the interconnection between applied behavioral economics and consumer choice and to formulate the main directions of application of the behavioral principles related to alternative energy sector in terms of sustainability. For that purpose the general principles and models used in behavior economics were studied, and similarities and differences were defined. The summary of the above made it possible to outline the applied approaches in using behavioral models in research of sustainability in alternative energy sectors, with the support of sociological survey's results.

## **2. Research methodology**

The research methodology used during the study was different. In the theoretical part the comparative analysis of available literature sources was accomplished based at the common approach for generalization of the data in accordance with [Rickinson, May 2009]. In the practical part the social research was field based and cross-

**Table 1.** Questionnaire – attitude of consumers to alternative energy sources

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|--|
| <p>1. Age<br/> a) 16-20, b) 21-30, c) 31-40, d) 41-50, e) 51-60, f)61-70, g) 71+.</p> <p>2. Gender<br/> a) female b) male c) don't want to answer</p> <p>3. Country and place of residence _____</p> <p>4. Are you familiar with sources of alternative energy? <i>(if your answer is b) or c), please skip question 6)</i><br/> a) yes,<br/> b) no,<br/> c) difficult to answer.</p> <p>5. In your opinion, which source of alternative energy is the most promising? <i>(multiple choice)</i><br/> a) solar energy,<br/> b) wind energy,<br/> c) biomass,<br/> d) hydrothermal,<br/> e) others (please specify).</p> <p>6. In your opinion, which source of alternative energy is the most used in your region?<br/> a) solar energy,<br/> b) wind energy,<br/> c) biomass,<br/> d) hydrothermal,<br/> e) others (please specify) _____.</p> <p>7. Please, determine sources of your information on alternative energy <i>(multiple choice)</i>:<br/> a) family members,<br/> b) friends,<br/> c) school,<br/> d) university,<br/> e) TV program and radio,<br/> f) internet,<br/> g) others (please specify) _____.</p> |
| <p>8. Do you use alternative energy at place of residence? <i>(if your answer is b) or c), skip questions 10-11).</i><br/> a) yes,<br/> b) no,<br/> c) difficult to answer.</p> <p>9. Which source of alternative energy do you use at your place of residence?<br/> a) solar energy,<br/> b) wind energy,<br/> c) biomass,<br/> d) hydrothermal,<br/> e) others (please specify) _____.</p> <p>10. What was the motivation to use the alternative energy source at your place of residence? <i>(multiple choice)</i><br/> a) I was economically motivated to saving money,<br/> b) I was encouraged by the company I work in,<br/> c) I want to make a difference in decreasing the impact of climate change,<br/> d) I was motivated by saving natural resources,<br/> e) others (please specify) _____.</p> <p>11. If you have any suggestions or comments, feel free to write them here</p>  |

sectional approach was used in accordance with [Groves et al. 2009]. In this methodology the study was focused on collecting answers from a number of individuals of different ages and backgrounds, that have the same trait or characteristic of interest at a given time. The questionnaire was created in order to evaluate the attitude of individuals involved in the alternative energy, to the sustainability in the sector.

The developed questionnaire is presented in Table 1.

The questionnaire was used for interviewing individuals in Ukraine (Kyiv region and Ternopil region), the Czech Republic (Prague region and Usti nad Labem region) and Germany (Berlin region and Prenzlau region). 121 individuals were interviewed at anonymous base in 2017.

### 3. Results and discussion

Speaking about sustainability in the energy sector and promotion and implementation of alternative energy courses, the changing of consumer behaviour is generally referred to: a) increasing energy conservation, b) intention to use alternative energy, c) purchasing the goods and service which look sustainable. The published researched showed clearly [DiClemente, Hantula 2003] that applied behavioural techniques can definitely change a consumer behaviour, and simultaneously, a consumer can use the same techniques for changing the behaviour of sellers and marketers.

The following three main influencing factors were defined [Guidelines... 2009] while promoting the implementation of alternative energy policy:

(a) motivating factors are individual, internal drivers of behaviour. These factors are awareness, knowledge, social influence, attitude, perceived capabilities and intention. For people to intentionally change their energy behaviour, they must become aware of their energy use, pay notice to it, and be informed about the consequences. At the same time they must be motivated to use the available information and instruments to control their energy use.

(b) enabling factors are the external constraints on behaviour. These factors allow new behaviour to be realized. Factors involve external financial, technical, organisational and judicial resources. The examples of instruments that influence these factors are subsidies, availability of products in shops, and the availability of specific advice. New skills may have to be acquired to realise the desired behaviour.

(c) reinforcing factors are those consequences of actions that give individuals positive or negative feedback for continuing their behaviour. These include information about the impacts of past behaviour (e.g., lower energy bill), feedback of peers, advice, and feedback by powerful actors.

The approaches used for changing the customer behaviours are rather broad, however, they may be generally classified in two main groups: classically conditioning consumer behaviour and operant conditioning consumer behaviour.

### **Classically conditioning consumer behavior**

The methods of applied analysis of consumer behavior is already well established in the literature. However, why it works and how it can develop appeared to be less elaborate. Some factors like entertainment and advertising may increase consumption and reinforce feelings of brand satisfaction. One of the main goals of advertising and marketing is to entice the consumer to purchase the product. While attention to the product and positive affect towards the product have faced validity as dependent variables, the critical outcome is about product selection or purchase. The research [DiClemente, Hantula 2003] showed that these classical conditioning procedures can sometimes change the product selection, however, the overall results are mixed.

Theoretical inquiry from a behavioural perspective led consumer researchers to explore classical conditioning as means of changing attitude and choice. The main techniques used in this approach are the following: (a) money reinforcement, (b) prompting or suggestive selling, (c) rebate system, (d) trial incentive. The research showed [Andner and Loewenstein 2006] that classically conditioning consumer choice looked more difficult and extrapolating from a closed laboratory setting in which one product was paired followed immediately by a choice between a small numbers of similar products to the more open consumer setting may be premature. Overall, the classically conditioned approach has some theoretical importance, but given the well-documented “attitudes” and “behaviour” discrepancies this approach has not had much applied impact.

### **Operant model of consumer behaviour**

According to the literature [Hantula 2013], operant conditioning studies of consumer behaviour were not pursued to the same extent as classical studies. This may be due to operational constraints: classical conditioning studies are often executed in the space of an hour or two with traditional between-subject designs while operational studies require weeks or months of data collection, often using within-subject designs. Bagozzi [2000] argues that it is essential to involve environmental factors and situations surrounding consumption in theory of consumption behaviour while using operant conditioning study.

One of the theoretical models proposed [DiClemente, Hantula 2003] is Behaviour Perspective Model (BPM), which includes three types of consequences of consumer behaviour: hedonic reinforcement, aversive stimuli and informational reinforcement.

Hedonic reinforcement comes from the satisfaction of buying, owning, and consuming economic goods. Aversive consequences come from the costs of consumption such as giving money, waiting in line etc. Information reinforcement is provided by feedback of the consumer’s performance which is seen in particular with social status [Foxall 1994]. The antecedent events happen if the consumer behaviour includes the current behavior setting formed by moods, ability to pay,

deprivation as well as by learning background which is the rewarding and punishing outcomes of the past behaviours. The four classes of consumer's behaviour are defined [Foxall 1994] taking into account patterns of high/low hedonic and informational reinforcement, consequently: (a) maintenance (activities necessary for the consumer's physical survival and welfare such as food, and the fulfilment of societal obligations such as paying taxes); (b) accumulations (behaviour involved in certain kind of saving, collecting, and installment buying); (c) pleasure (consumption of popular entertainment); (d) accomplishment (behaviour showing social and economic achievement, and personal attainment). All four types of behaviour may be applied to the promotion and implementation of alternative energy sector, however, from our point of view, the second type, "accumulation" may be recognized as initiating one and as this covering the biggest part of potential consumers. As the life of the product continues, the other three behaviours will come in force in order of early imitators (pleasure), later imitators (accumulation) and last adopters (maintenance).

Another theoretical operant model proposed is co-called Behavioral Ecology of Consumption (BEC) which overviews the consumer behavior as biobasic action [Hantula 2013]. In this model the behaviours that comprise search, choice, consumption, disposition of goods are seen as selected via evolutionary processes. The consumer behaviour is analyzed in terms of its short and long term adaptive significance to the buyer, as aspects of consumption are overviewed as functionally equivalent to foraging [Stephens, Krebs 1986]. The quantitative models of foraging are proposed to guide experiment and further interpretation of data. From our point of view using this model (BEC) for the research of behaviour consumption of the alternative energy sector may give an idea how the process of implementation is developing. Also using of BEC may permit to do a necessary correction to the alternative energy policy implementation.

The BPM and BEC models share many commonalities and are complementary explanatory systems. An important point of convergence for both proposed models is the General Matching Law (GML), which predicts the fact that organisms will "match" their behaviour to the relative returns from the environment, rather than maximize, or exclusively select option with the highest return rate [Herrnstein 1970]. Matching introduces a departure from the standard economic consumption theories with their maximization of rationality (matching is rather an empirically derived principle). GML provides a formal bridge from behavioural theory to evolutionary biology theory [Rajala, Hantula 2000]. Using this approach apparent anomalies in consumer behaviour can also be predicted: delayed outcomes, extreme preference for immediate outcomes, preference reversals.

Based on these assumptions, the sociological survey was done in 2017 in three countries: Ukraine, the Czech Republic and Germany. Two different regions of each country were covered: one region was a capital and another was a province. The individuals interviewed represented different stakeholders groups connected with the

energy sectors: energy consultants, educators, farmers and engineers from the energy firms and plain users of electricity. Altogether 121 persons were interviewed, from which – 64 were from Ukraine, 26 from the Czech Republic and 22 from Germany. The number of interviewed individuals per regions in each country is presented in Table 2.

**Table 2.** Demographics of the interviewed individuals

| Ukraine   | Czech Republic  | Germany   |
|---|---|---|
| 28 persons – Kyiv city<br>(Capital region)        | 12 persons – Prague city<br>(Capital region)          | 10 persons – Berlin city<br>(Capital region)      |
| 36 persons – Ternopil region<br>(Western Ukraine) | 14 person – Usti nad Labem<br>region (Northern Czech) | 12 persons – Prenzlau region<br>(Eastern Germany) |

Source: own work.

The results of the survey showed that interviewed individuals were from all age groups, the biggest number was from the group of 16–20 years olds (38%) and 31–40 years olds (27%). As far as gender representation, it was almost equal: 54% were females and 46% were males.

Results showed that almost all the interviewed individuals (96%) were familiar with sources of alternative energy, and there were no differences in terms of the countries or regions within one country.

The answer to the question about the most perspective source of the alternative energy varied between countries. Consequently, in Ukraine for Kyiv city individuals mentioned solar energy as the most perspective source of energy, the other sources selected were in the following order: wind energy, biomass and hydrothermal energy. For the provincial Ternopil region again solar energy was pointed out as the most perspective, followed by wind and biomass. The similar picture was received for the Czech Republic: in accordance with results received from Prague citizens, the main selected source of energy was solar energy, followed by wind energy. Only 2 interviewed individuals mentioned the perspective of biomass and no one mentioned the perspective of hydrothermal energy. That order was similar for the Usti nad Labem region. In case of Germany in accordance with the opinion of individuals from Berlin, the wind energy was selected as the most perspective source of alternative energy followed by biomass; for the province Prenzlau region the most perspective source selected was biomass energy followed by wind energy. Three interviewed individuals in Germany pointed out a mixture of the energy sources as the most perspective approach.

The answer to the question about actual use of alternative energy at the habitat regions was the following. For Ukraine biomass was pointed as the most common source followed by wind energy, for the Czech Republic solar energy was mentioned



followed by wind energy, and for Germany only wind energy was selected as a really implemented source of alternative energy. That order was the same for the capital city and province regions for all three researched countries.

When it comes to using the alternative energy at the place of living the answers were summarized for each country. The results obtained from interviewed persons from EU countries were completely different from those received from Ukrainian citizens. In Germany almost all of the interviewed persons from the provincial region (10 from 12 interviewed persons) use solar energy and biomass energy sources at their home places. In the Czech Republic about one third of the interviewed individuals use solar energy at their home. In Ukraine only 5% of the interviewed individuals mentioned that they use any alternative energy source at home, and it was solar energy in all cases.

The answer to the question regarding the motivation of using the alternative energy at the place of the residence was closely connected with behavioural economics. In Ukraine there was only 5% of individuals who use solar energy at home. The motivation of the usage was formulated theoretically and the main reason was decreasing the impact of climate change and the elimination of the usage of natural resources. In all cases of alternative energy usage at home in Germany the main motivation factor was money saving, so, one may see the impact of the applied behaviour economic factors and motivators. Simultaneously, decreasing the impact of climate change as a motivational factor was selected by 4 individuals in Germany.

## 4. Conclusions

The key implication of behavioural economics is that individuals may not display the “rational” behaviour that standard economic preference theory would suggest. The analysis of available literature sources concerning the interconnection between applied behavioural economics and consumer choice showed that behaviour principles applied to the economics can shape and change the consumer choice. Taking account of this more nuanced understanding of behaviour can help improve economic appraisal of alternative energy policy options, develop innovative policy responses, and provide new insights into policy evaluation. Both BPM and BEC theoretical models are proved to be used for research of consumers’ behaviour during promotion and implementation of alternative energy sources. Similarities and differences of the models are analyzed and used for the generalization of the survey results. 121 individuals were interviewed in Germany, the Czech Republic and Ukraine regarding their attitude to alternative energy sources and motivation of using them. It was established that the main reason for using alternative energy sources in EU countries (Germany and Czech Republic) was economical, while in Ukraine only 5% of interviewed individuals use an alternative energy source at home and the motivation reason was ecological: decreasing the impact of climate change.

The next stage of the research has to concentrate on the analysis of attitude of consumers of alternative energy sectors products in terms of exploring how the choice towards sustainability has been achieved. That is planned to be accomplished by continuing the social research and interviewing each selected group of alternative energy consumers based on questionnaire proposed in the current study.

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