
Water Conservation Behaviour as a Sustainable Action of Young Consumers from Selected European Countries

Submitted 19/02/20, 1st revision 10/03/20, 2nd revision 02/04/20, accepted 25/04/20

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Abstract:

Purpose: The aim of the research has been to identify the water conservation consumer behaviour in young Europeans.

Approach/Methodology/Design: A total of 737 people were studied, mostly aged 18-30, from 16 European countries. A hypothesis has been formulated that consumer behaviours related to water saving consumption are intuitive and not conscious. The study involved the CAWI questionnaire to collect data and the classification tree analysis, the Chi-Square test of independence and the factor analysis were used for data analysis.

Findings: The results demonstrate that an informed and responsible water consumption is low. It has been found what characteristics affect the water consumer behavior. It means that even if the consumers apply some practices to save water, the behaviors result from their individual reasons and not from the need of global water saving, namely the sense of social responsibility.

Practical Implications: The study covered selected practices applied to save water in households, or during a direct drinking water consumption. The study covered the demographic characteristics of the respondents, their economic and lifestyle characteristics.

Originality/Value: Over the recent years water saving has been more and more covered by scientific research. Water is one of the critical resources. For that reason, the actions counteracting water wasting require a collective approach, considering the participation of enterprises, the governments and consumers. The role of consumer behaviors is a decisive factor determining a long-term success of the initiatives of balanced production and consumption; however, it remains little investigated.

Keywords: Water conservation behavior, water recycling, sustainable consumption, consumers' responsible behavior, corporate social responsibility, sustainable development.

JEL codes: D12, D91, Q56, Q25.

Paper Type: Research article.

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1. Introduction

In the history of humanity, water plays a key role in sustaining life and building the social structures. The study on water management and conservation becomes an important research problem. It is projected that global water demand will reach 4,350 billion cubic meters in terms of withdrawal by 2040. In the last few decades, the growth in water demand has doubled that of the population growth (Wang, 2019). A vast number of people worldwide still lack access to drinking water sources and improved sanitation services. Striving to provide safe water access to those remaining population groups would likely increase the domestic water demand. As the water resources are becoming scarce, conservation of water has a high priority around the globe, the study of water management and conservation becomes an important research problem (Yang *et al.*, 2017).

There are two main categories of water saving measures to reduce water use: the technical measures include a network improvement, leaks repairs, developing water-efficient appliances; non-technical measures cover information, education, awareness which can change the consumer habits. This article focuses on the non-technical measure and presents the conditions for water saving consumption. Understanding and influencing the behaviors and choices of individuals and households are key for global aspirations embodied in the Paris Agreement on Climate Change and the UN's Sustainable Development Goals (Ostrom, 2012; Goryńska-Goldman, 2019). The consumer behaviors account for directly from a dozen or so to a few dozen percent, depending on the country, for energy consumption, CO₂ emissions, etc. One must add the emissions indirectly resulting from the production of consumer goods and services (Baiocchi *et al.*, 2010). The same dependence applies to household water consumption. Even though the biggest water consumer is agriculture, mostly for crop irrigation, the consumers have their share in water use. Especially when lifestyles change, the household size gets smaller, which results in a deteriorated effectiveness of the use of resources, including water (Richter and Stamminger, 2012). Therefore, it is necessary to take a more environment-friendly approach and to make more environment-friendly lifestyle choices (IPCC).

2. Consumer Behavior Conditions

Over the last decades, various attempts have been made to provide scientific explanations to the environment-friendly behavior of consumers. As a result, a few dozen behavioral theories have emerged (Davis *et al.*, 2015). As for environment-friendly behaviors, they can be grouped into moral, rational or economic models (Turaga *et al.*, 2010). The rational consumer behavior models assume that the behaviors are a result of 'rational choices made to maximize the personal benefits' (Bamberg, 2013). The economic theories assume that the consumer behavior is moderated by incentives or punishments affecting the level of the individual's usefulness (Saphores *et al.*, 2012; Nnorom *et al.*, 2009). The moral concepts include

the value-belief-norms (VBN). It is probably most popular of the moral theories applied to investigate the environment-friendly behaviors (Bronfman *et al.*, 2015).

The theory is based on personal norms and beliefs that the environment-friendly behavior comes from a moral duty (Stern *et al.*, 1999). The VBN theory is often applied in combination with other theories. The earlier theories also often provide the grounds for developing the new ones. For example, often used to account for environment-friendly behaviors (representing the rational theories), the Theory of Planned Behavior (TPB) is an extension of the theory of justified action and it was created by adding the perceived behavioral control decision factors: attitudes and subjective norms (Ajzen, 1991; 2006; Botetzagias *et al.*, 2015). In practice it means that e.g., the consumers positive about the purchase of a selected product or about any consumer behavior, who perceive a support from their environment (a subjective norm) and who believe in their capacity for purchasing that product (perceived behavioral control) should demonstrate a stronger intention of purchasing a selected product or behavior on the market (Klößner, 2013; López-Mosquera, and Sánchez, 2012).

The TPB is used to investigate the consumer behavior in various aspects, e.g., in comparison to organic food consumer behaviors (Aertsens, Verbeke, Mondelears, and Van Huylenbroeck, 2009), to investigate the intentions of consumer e-waste handling behaviors (Wang *et al.*, 2016) and e-waste recycling (Nduneseokwu *et al.*, 2017). Purchasing and consumer behaviors occur in a specific context and their variation is affected by, next to the internal control, the external conditions (Groening, Sarkis, and Zhu, 2018). Quire recently there has emerged the theory accounting for environment-friendly consumer behaviors known as the Alphabet theory (Zepeda and Deal, 2009). It combines the effect of external factors which can support or have a negative effect on consumer behavior, social, financial, physical or legal factors; and internal factors – the socio-psychological attitudes (Guagnano *et al.*, 1995; Stern, Dietz, Abel, Guagnano and Kalof, 1999). For example, the results reported by Alcock *et al.* (2020) show that environment-friendly behaviors can be moderated by a close contact with nature resulting from e.g. the place of living in a close vicinity of the green areas, the seashore, etc.

Other research reports on the complexity of water use while washing the dishes being partly derived from the cultural, behavioral and geographical circumstances (Elizondo *et al.*, 2010). The successive theories added the demographic variables, knowledge, information seeking and habits. For example, information seeking by consumers results in their knowledge development. An extensive knowledge on the topic of interest triggers attitudes to the topic by developing some beliefs and reservations and, at the same point, a comparison of the products and behaviors with values and social norms. Attitudes, on the other hand, trigger further information seeking. A greater knowledge on, e.g., organic production practices results in a higher probability of purchasing organic food (Zepeda and Deal, 2009). Thus, the

knowledge on the need of global water saving can change the water consumption behavior.

Another example of applying the consumer behavior theory in practice are organic product consumers whose eating habits or the way they prepare meals affect the organic food purchases. The values, beliefs and norms of the consumers affect their behaviors (Zepeda and Deal, 2009). Besides, the consumer behavior is indirectly determined by their demographic characteristics as affecting their attitudes. For example, the results of research performed in 500 households showed a greater consumption of water for males while the single-female households use the lowest quantities of water (Karlis *et al.*, 2009). Therefore, it is justifiable to verify what demographic factors and how they affect the attitudes of water consumers.

3. Socially Responsible Consumer

Human actions are threatening the ability of global ecosystems to maintain planetary life-support systems (Steffen *et al.*, 2015). Nowadays consumers pay more attention to the global resources and the community (Walsh, 2016). Most Europeans are aware of various environmental problems related to the consumption model and the importance of an effective use of resources (European Union, 2014). The society faces the technological and economic challenges to be able to implement an optimal system making it possible for all the economic entities, including the consumers, to get fully involved in the rational water resources management. The engagement is reflected in their consumption. Due to the relationship between the water saving behaviors and the consumers' everyday life, all the changes in infrastructure, products, or business models and policies will not succeed without considering consumers' acceptations and adaptations. Water consumers are directly involved in water consumptions by applying various consumer practices, e.g. the purchase of water consuming equipment, and then the use of the equipment, the purchase of products to produce which water has been used, etc.

According to Devinney *et al.* (2006), one of the ways to express socially responsible consumer behavior is a purchasing or a non-purchasing behavior. Other purchase-related behaviors are shopping at local or small businesses, buying green products (Goryńska-Goldmann *et al.*, 2018), reducing one's consumption, buying from CSR companies (Robinot, Ertz and Durif, 2017; Yang and Zhang, 2018).

4. Methodology Assumptions

The aim of this study has been to get to know the water consumption behaviors of the young Europeans. The study covered a total of 737 persons aged 18-30 from 16 European countries (Poland, Turkey, Germany, Italy, Spain, France, Greece, Hungary, Austria, England, Belgium, Ukraine, The Netherlands, Bulgaria, Portugal, Cyprus). The study involved the CAWI (Computer Assisted Web Interviews). The

study covered the water consumer behaviors. The following research questions have been formulated:

Q1. What are the water consumer behaviors?

Q2. How do the external characteristics (context) affect their water consumption behaviors?

2.1. Do the income and water bills affect the water consumption decisions to help saving it?

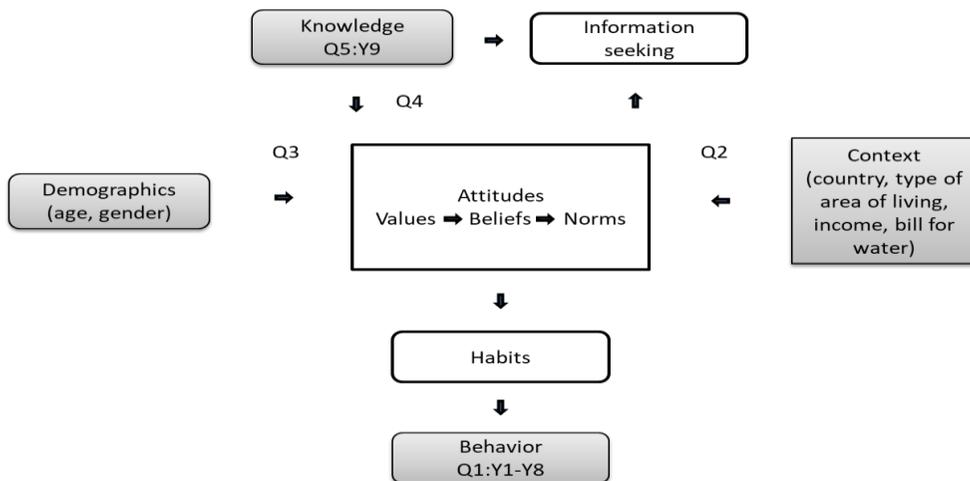
2.2. Is the country of origin or the place of residence a factor determining the water saving consumer behavior?

Q3. How do the demographic characteristics affect the water consumption decisions?

Q4. What is the level of knowledge (water saving awareness) and does it affect the water consumer practices? What water-saving methods do you know?

Q5. Are water consumption behaviors socially responsible?

Figure 1. Research model



Source: Own preparation based on E. Stampa, Ch. Schipmann-Schwarze, U. Hamm, (2020) *Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review*, *Food Quality and Preference*, 82, 2-3, <https://doi.org/10.1016/j.foodqual.2020.103872>.

There has been formulated a hypothesis that the water consumer behaviors are intuitive and not conscious and, as such, they are not oriented on the effects of global water conservation but only on the benefits of an individual and, as such, they cannot be considered fully socially responsible behaviors. The study has facilitated defining the level of consumer awareness in terms of the water saving approach and the factors determining that awareness. Getting to know that awareness will fill in the gap for those managing the society and for the entrepreneurs involved in water

conservation. The decision-makers will be able to, with a greater awareness and understanding, design the system solutions and, in terms of business, to implement new products and services to help the consumers with water saving practices. The analysis started from ordering the set of variables. The dependent variables are presented in Table 1.

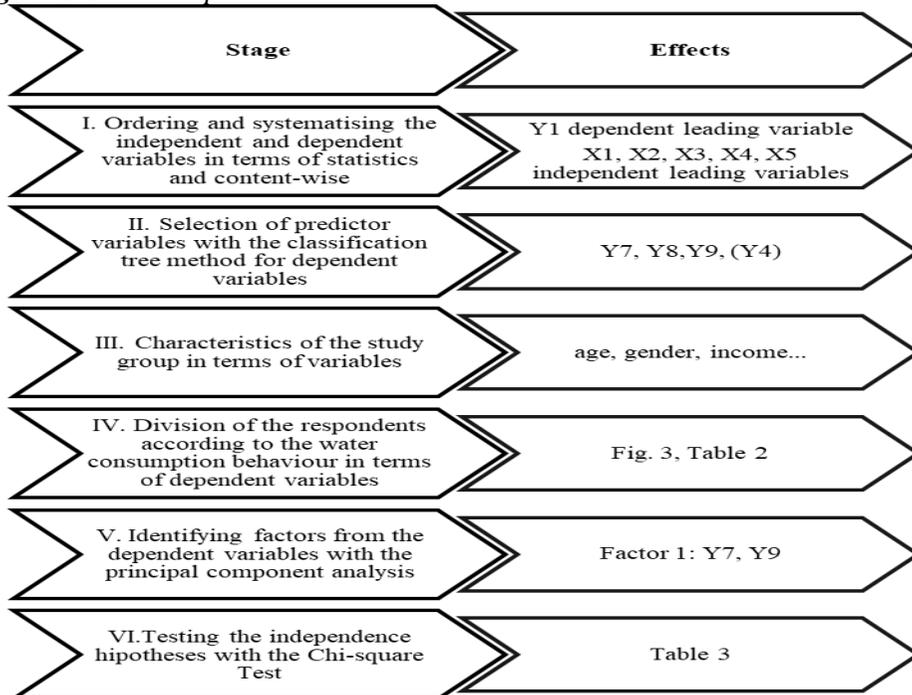
Table 1. *Dependent variables*

Variable symbol	Dependent variables
Y1	Do you use a tap aerator in your house?
Y2	Bath or shower? What do you prefer?
Y3	How many times a week do you do the laundry?
Y4	Do you use a dish washing machine in your home?
Y5	Do you use a water sprinkler system in your garden?
Y6	How many times a week do you water your plants or garden?
Y7	Do you mostly buy drinking water or use a filtration system in your house?
Y8	If you are able to use recycled water instead of sweetened water; will you use it?
Y9	Do you use any other ways to save water at home?

Source: Own research.

Further research procedure is presented in Figure 2.

Figure 2. *Research procedure*



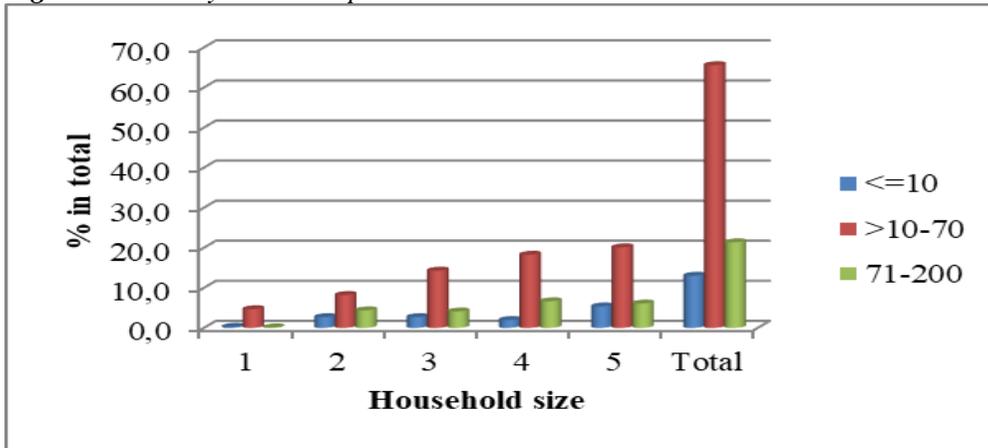
Source: Own research.

5. Research Group Characteristics

The research group has been provided with the following characteristics: age (X1), gender (X2), place of residence (X3), type of residence (X4), country (X5), household size (X6), monthly available income per household (X7), water bills (X8).

Gender has facilitated the division of the group of respondents proportionally: male – 51.4%; female – 49.6%. The respondents mostly resided in rural areas, including 50% of the persons in big cities (over 100 thousand residents), and 31% in towns with less than 100 thousand residents. The rural areas were inhabited by almost 19% of the respondents. The most represented was Poland (37%), followed by Turkey (20%), Germany, (12%) and Italy (10%). The other countries accounted for 6% and less. The most numerous groups was made up by the youngest respondents, the persons aged 18-25 – almost 61%. Almost every fourth respondent fell within the age range of 26 and 30 years. Slightly over 9% of the respondents were 31-40 years old, and almost 5.5% 0 – the respondents above 40 years of age. The persons covered by the study mostly reside in apartment blocks and multi-family houses (53%). The other part of the respondents (47%) live in single- or two-family houses. Most frequently the monthly water bill in the respondents' households ranges from Euro 10 to 70 (65.6%). The highest monthly water bills, as one could expect, are paid by the biggest households (Figure 3).

Figure 3. Monthly water bill per household in Euro



Note: Household size: 1- single household, 2- two-person household, 3- three-person household, 4- four-person household, 5- five- and more-person household.

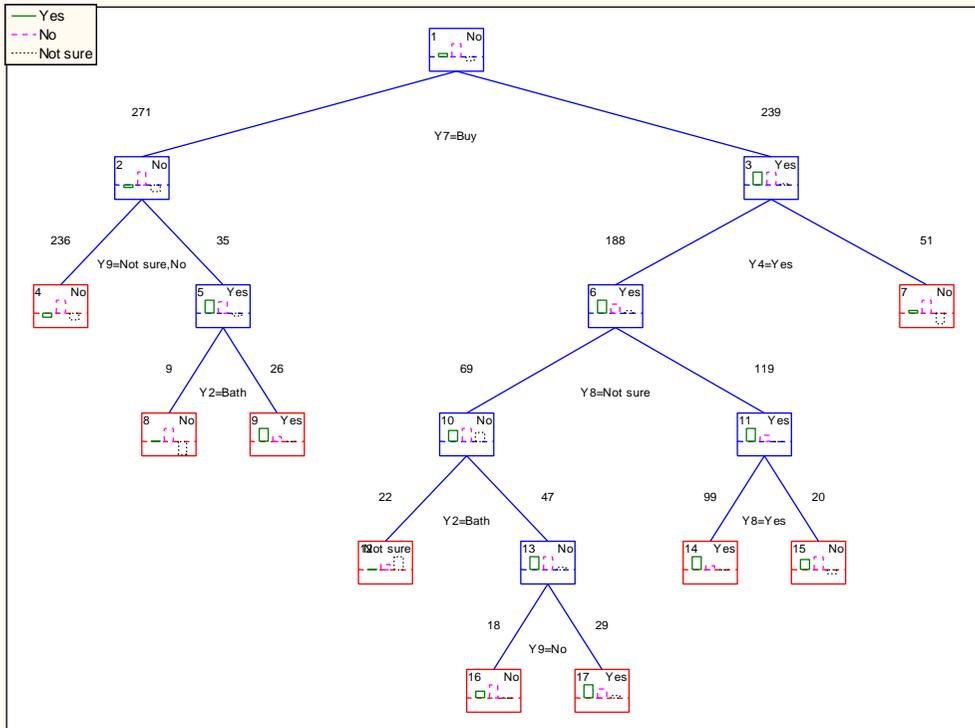
Source: Own research.

6. Socially Responsible Actions of Water Consumers

The classification tree analysis was used to divide the respondents' population in terms of their water consumption characteristics. The dependent variable was made up by the application of the tap aerator in the household (Y1). The other variables

(Y2, Y4, Y5, Y7, Y8 and Y9), once Y3 and Y6 were abandoned, acted as independent variables. The division was made with the C&RT method for an exhaustive search for single-dimension divisions, as the method of retaining the divisions, the FACT type retention, has been assumed, using the retention parameter of 0.05. As a result, a classification tree has been provided; it can differentiate between 8 divisions and 9 end nodes. The ranking of the validity of the predictors indicates that the most important variables are Y7, Y8 and Y9.

Figure 4. Classification of water aerator users/ non-users in terms of other dependent variables



Source: Own research.

The tree analysis (Figure 4) shows that the persons who do not use the aerator in their household – also buy drinking water. Neither do most of them have any idea how to save water. The other group includes the persons who do not use the water aerators in their households either. Neither do they use the dishwasher.

The third group who uses the water aerators in most cases is also positive about using recycled water if possible. The fourth group of the respondents is made up of the persons using the water aerators and a slightly smaller group – not using the water aerators. Those respondents are not sure whether they would use household recycled water. The detailed characteristics of the groups are presented in Table 2.

Table 2. Characteristics of the groups of respondents in terms of the ways of water consumption

Variants	Groups			
Variables	Group 1	Group 2	Group 3	Group 4
Y1	No	No	Yes	Yes, no
Y7	Buying	-	-	
Y8	-		Recycling	No Recycling
Y9	No	-	-	
Y4	-	No	-	

Source: Own research.

The factor analysis has demonstrated that of all the dependent variables, one can identify the factor which is represented by variable Y7 (Y9).

7. Characteristics of Water Consumers and their Water Consumption Behaviors

For the above selected dependent variables and for the independent variables the Chi-Square test of independence was made. The probability of an error has been defined at 0.05. The following hypotheses have been formulated for the variables analyzed:

H0: No dependence between the variables.

H1: A dependence between the variables.

The results of the analysis are presented in Table 3.

Table 3. Results of the Chi-Square Test of Independence

Independent and dependent variables selected at stages: I, II, V	X1	X2	X3	X4	X5
Y1	H1	H1	H1	H0	H1
Y7	H1	H1	H1	H0	H1
Y8	H1	H0	H0	H0	H1
Y9	H1	H0	H0	H0	H1
Y4	H1	H0	H0	H0	H1

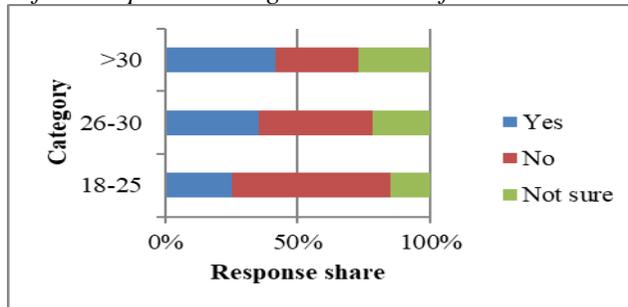
Source: Own research.

Considering the results of testing the dependence between dependent and independent variables, one can note that:

1. The older the respondent, the higher the percentage of the water aerator users in households and the higher the percentage of the persons who are not sure whether they have it in their households (Figure 5).

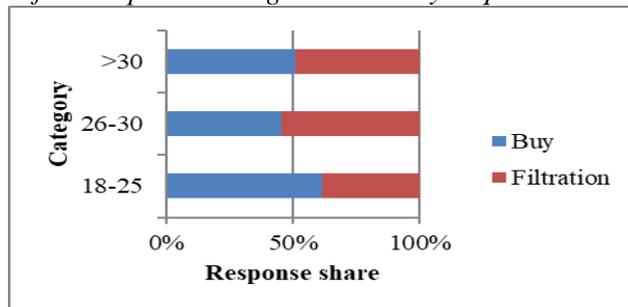
2. Bottled water for direct consumption is purchased more often by the youngest (more than 60%), and then by the oldest respondents (about 55%) (Figure 6).
3. The older the respondents, the higher the share of the respondents who would use water recycling in their household. 60% of the respondents above 30 years of age support water recycling, while the respondents aged 18-25 supporting the idea account for 40% only (Figure 7).

Figure 5. Effect of the respondents' age on the use of the water aerator



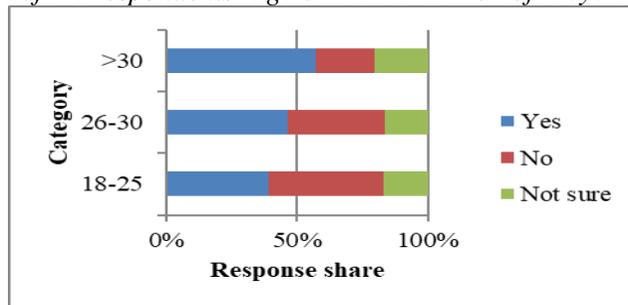
Source: Own research.

Figure 6. Effect of the respondents' age on how they acquire drinking water



Source: Own research.

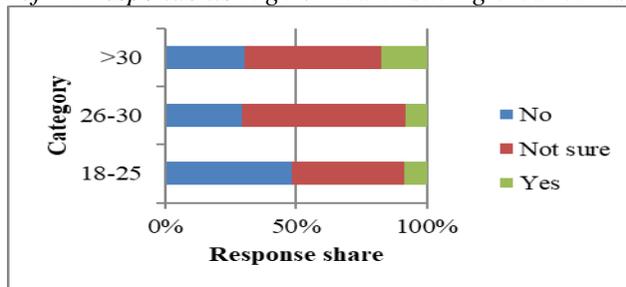
Figure 7. Effect of the respondents' age on their intention of recycled water use



Source: Own research.

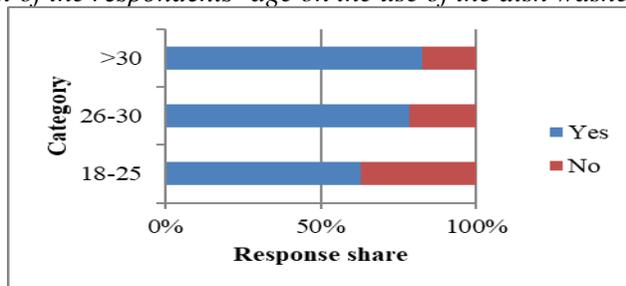
4. The greatest water saving creativity is declared by the persons over 30 years of age; almost 20% (Figure 8).
5. The older the respondents, the greater the share of dish-washer users; the dish washer is used by more than 80% of the respondents over 30 years of age, and only by more than 60% of the youngest respondents (Figure 9).
6. Men more than women declare that their households surely use tap water aerators (about 35%). The women surveyed to much extent (almost 50%) are not sure whether the water aerator is found in the taps in their households, while the male respondents are less uncertain (about 40%) (Figure10).

Figure 8. Effect of the respondents' age on water saving creativeness



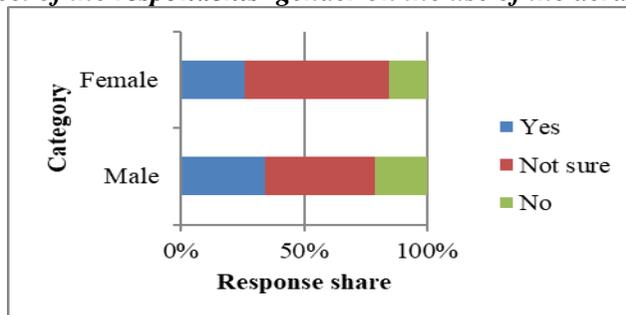
Source: Own research.

Figure 9. Effect of the respondents' age on the use of the dish washer



Source: Own research.

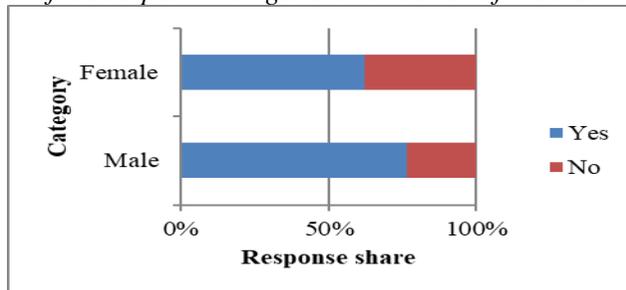
Figure 10. Effect of the respondents' gender on the use of the aerator



Source: Own research.

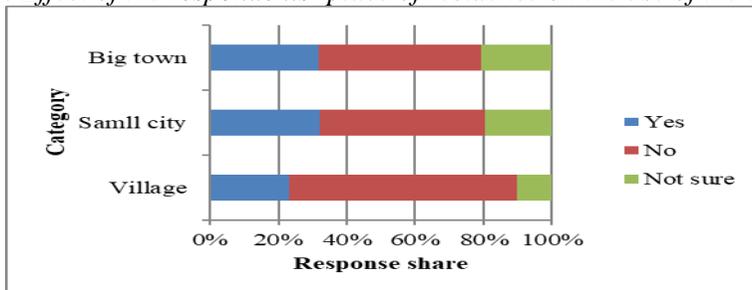
7. The male respondents (almost 70%) use the dish washer in their households more than women (slightly more than 60%) (Figure 11).
8. The use of the water aerator is greater in the cities and towns, irrespective of their size. Only slightly more than 20% of the rural residents claim to be using the water aerator in their households. In the cities and towns such users account for more than 30% (Figure 12).
9. More rural areas residents (more than 60%) buy bottled water than the residents of cities or towns (about 55%) (Figure 13).

Figure 11. Effect of the respondents' gender on the use of the dish washer



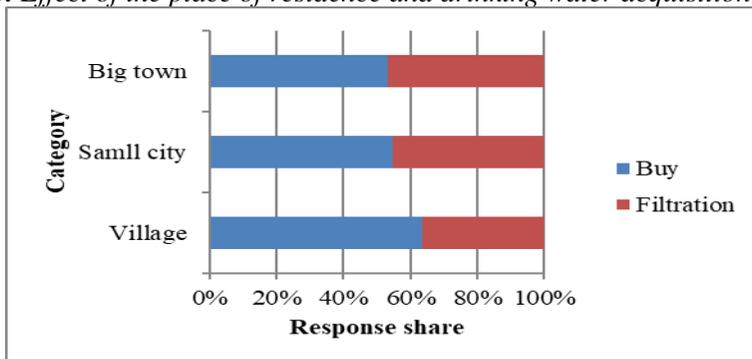
Source: Own research.

Figure 12. Effect of the respondents' place of residence on the use of the tap aerator



Source: Own research.

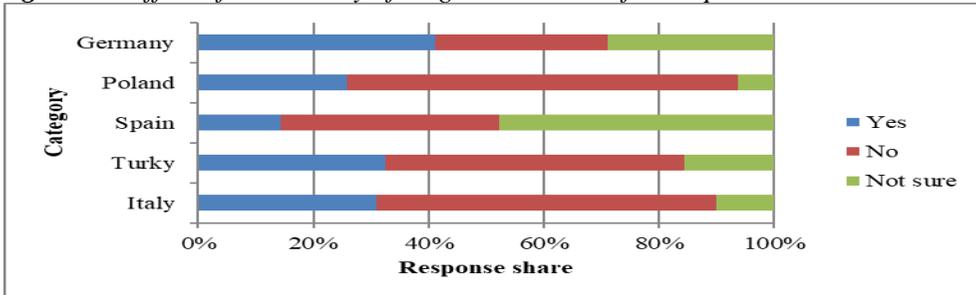
Figure 13. Effect of the place of residence and drinking water acquisition



Source: Own research.

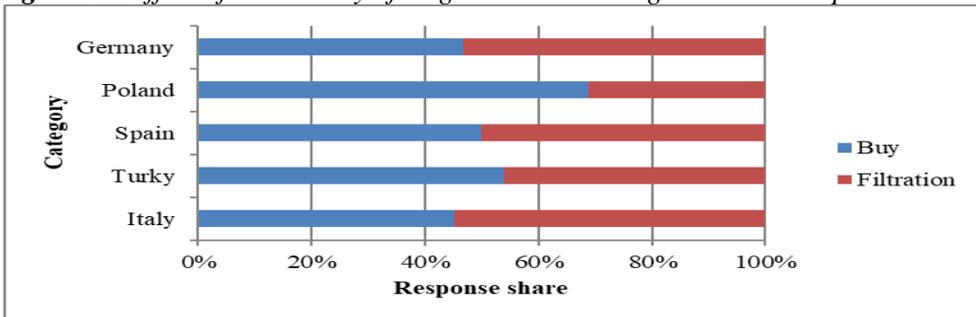
10. Residents of selected European countries use water aerators in the taps. The lowest share (about 15%) of the respondents who declare using the water aerator is found in Spain. More than 40% of the respondents living in Germany claim that water aerators are found in their households and it is the highest result of all the countries studied. The responses of the respondents from Turkey and Italy are similar; about 30% of them use the water aerator. Only every fourth respondent living in Poland claims to use a tap aerator (Figure 14).
11. The method of direct consumption in selected European countries is divided almost proportionally into the consumption of bottled water or home-filtered water. Most people who buy bottled drinking water live in Poland (about 70%). The lowest number of bottled water consumers live in Italy (about 45%) and in Germany (about 47%); in Turkey it is about 55% and in Spain – about 50% of the people (Figure 15).

Figure 14. Effect of the country of origin on the use of the tap aerator



Source: Own research.

Figure 15. Effect of the country of origin on the drinking water consumption method

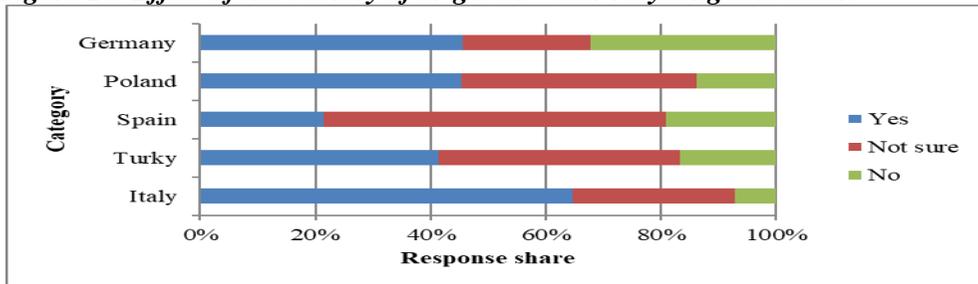


Source: Own research.

12. The highest conviction about household water recycling is found in Italy (about 65%). The least interest in water recycling is found in Spain (about 20%). The opinion of the residents of Poland and Germany is similar; about 45% of the respondents from those countries support the idea of water recycling. Only 40% of the residents of Turkey agree to a recycled water use (Figure 16).

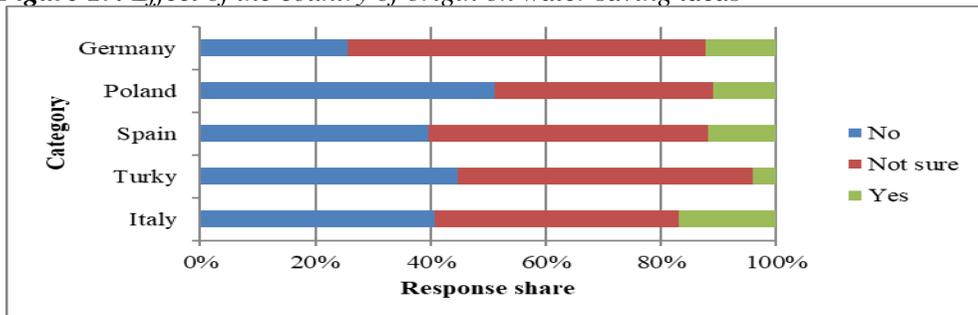
13. The smallest group among the residents of selected European countries and, at the same time, with ideas for household recycled water use is found in Turkey (about 5%). A similar water recycling creativity is found in Germany, Poland and Spain (about 10%). More than 15% of the persons from Italy have an idea how to save water by recycling it (Figure 17).
14. The dish washer is most frequently used by the respondents representing Germany and Spain (almost 90%), followed by Turkey (about 75%) and Italy (more than 70%). The residents of Poland use the dish washer least (more than 50%) (Figure 18).

Figure 16. Effect of the country of origin on water recycling conviction



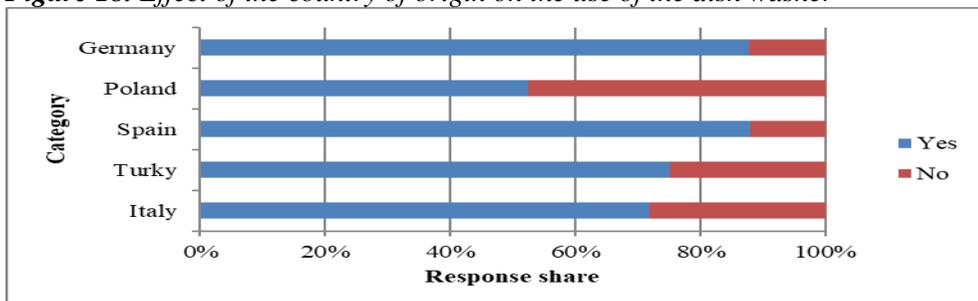
Source: Own research.

Figure 17. Effect of the country of origin on water saving ideas



Source: Own research.

Figure 18. Effect of the country of origin on the use of the dish washer



Source: Own research.

8. Discussion

The protection of the world's natural resources and ecosystems requires consumers to adopt more pro-environmental lifestyles and behaviors (Steffen *et al.*, 2015). Behaviors emerge as a product of personal, environmental, and social factors (Kaaronen and Strelkovski, 2020). The studies by some authors suggest that eco-awareness is the most important predictor of the behavioral intention of environment friendly behavior, e.g., waste selection (Wang *et al.*, 2016), while others demonstrate the importance of the perceived control of behavior (Le *et al.*, 2013), attitude (Kumar, 2019) or social norms (Echegary and Hansstein, 2017). It suggests a share of the external factors in taking up actions for the natural environment.

However, one must remember about a gap between the intentions to act and taking up those actions. The behavioral concepts based on external motivations suggest that attentiveness to the environment is based on the individual norms, beliefs of the effectiveness of the action and the effect itself. They are altruist, more persistent and they can be influenced by information seeking (Stern, 2000). According to other authors, the environmental concern and negative emotions affect the attitudes towards organic foods and purchase intentions (Aertsens, Verbeke, Mondelears, and Van Huylenbroeck, 2009).

9. Conclusion

The household water consumer behavior, as reported by the results of this study, depends on the demographic characteristics age and gender. The variables describing the water consumer behavior decision-making context include the place of residence and the country of origin. The effect of the level of income and the water bill on water consumption has not been found. In general, the respondents have shown little knowledge on how to save water (5-15%), which points to a relatively low water conservation need awareness. It has been observed that some household water use habits are interlinked. Usually the persons who do not apply one of the water-saving practices do not apply another such practice or practices. A group of people who combine environment-friendly water use behaviors is the smallest. One cannot thus confirm that the socially responsible behaviors of the respondents are common and informed.

The barrier to water conservation is a lack of awareness of the importance of water saving as the consumers do not think about the consequences of their water consumption behavior. Some water consumers would be willing to apply water-saving practices, however, to much extent, they are not knowledgeable about how to do it, and for others the barrier is a lack of feasible technical solutions. Those are the barriers which can be overcome, also with the solutions offered by responsible businesses.

References:

- Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Ajzen, I. 2006. Behavioral interventions based on the theory of planned behavior. Retrieved from <http://people.umass.edu/~ajzen/pdf/tpb.intervention.pdf>.
- Aertsens, J., Verbeke, W., Mondeleers, K., Van Huylenbroeck, G. 2009. Personal determinants of organic food consumption: A review. *British Food Journal*, 111, 1140-1167.
- Alcocka, I., Whitea M.P., Pahlb, S., Duarte-Davidsonc, R., Fleminga, L.E. 2020. Associations between pro-environmental behavior and neighborhood nature, nature visit frequency and nature appreciation: Evidence from a nationally representative survey in England. *Environment International*, 136, 105-441. <https://doi.org/10.1016/j.envint.2019.>
- Baiocchi, G., Minx, J., Hubacek, K. 2010. The impact of social factors and consumer behavior on carbon dioxide emissions in the United Kingdom: a regression based on input-output and geodemographic consumer segmentation data. *Journal of Industrial Ecology*, 14, 50-72.
- Bamberg, S. 2013. Changing environmentally harmful behaviors: a stage model of self-regulated behavioral change. *Journal of Environmental Psychology*, 34, 151-159.
- Botetzagias, I., Dima, A.F., Malesios, C. 2015. Extending the Theory of Planned Behavior in the context of recycling: the role of moral norms and of demographic predictors. *Resources Conservation and Recycling*, 95, 58-67.
- Bronfman, N., Cisternas, P., López-Vázquez, E., Maza, C., Oyanedel, J. 2015. Understanding attitudes and pro-environmental behaviors in a Chilean community. *Sustainability* 7, 14133-14152.
- Davis, R., Campbell, R., Hildon, Z., Hobbs, L., Michie, S. 2015. Theories of behavior and behavior change across the social and behavioral sciences: a scoping review. *Health Psychology Review*, 9, 323-344.
- Devinney, T.M., Auger, P., Eckhardt, G., Birtchnell, T. 2006. The other CSR: Consumer social responsibility. *Stanford Social Innovation Review*, 43, 30-37.
- Elizondo, G.M., Lofthouse, V.A. 2010. Patterns of conservation and domestic water use in different cultures: a comparison between Mexico and the UK. In *Proceedings of the 16th Annual International Sustainable Development Research Conference*, 30th May-1st June, Kadoori Institute, Hong Kong, 184-195.
- European Union. 2014. Flash Eurobarometer 388 Attitudes of Europeans Towards Waste Management and Resource Efficiency. http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_388_en.pdf.
- Goryńska-Goldmann, E. 2019. Evolution of local food development in the context of the idea of sustainable consumption. *Journal of Tourism and Regional Development*, 11, 23-35, DOI:10.22630/TIRR.2019.12.17.
- Goryńska-Goldmann, E., Gazdecki, M. 2018. Consumers' awareness of the term sustainable consumption. *International Scientific Days 2018, Towards Productive, Sustainable and Resilient Global Agriculture and Food Systems. Conference Proceedings*, Volter Kulwer, Nitra, 316-329, https://spu.fem.uniag.sk/mvd2018/isd2018/proceedings/isd_conference_proceedings.pdf;
- Groening, C., Sarkis, J., Zhu, Q. 2018. Green marketing consumer-level theory review: A compendium of applied theories and further research directions. *Journal of Cleaner Production*, 172, 18448-21866.

- Guagnano, G.A., Stern, P.C., Dietz, T. 1995. Influences on attitude-behavior relationships. A natural experiment with curbside cycling. *Environment and Behavior*, 275, 699-718.
- IPCC. 2018. Global Warming of 1.5 °C: An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. IPCC, Geneva, Switzerland.
- Kaaronen, O.R., Strelkovskii, N. 2020. Cultural Evolution of Sustainable Behaviors: Pro-environmental Tipping Points in an Agent-Based Model. *One Earth*, 2, 1, 85-97, <https://doi.org/10.1016/j.oneear.2020.01.003>.
- Karlis, D., Vasdekis, V.G.S., Banti, M. 2009. Hetero-sciatic semi-parametric models for domestic water consumption aggregated data. *Environmental and Ecological Statistics*, 16, 355-367.
- Klöckner, C.A. 2013. A comprehensive model of the psychology of environmental behavior: A meta-analysis. *Global Environmental Change*, 23, 1028-1038.
- Kumar, A. 2019. Exploring young adults' e-waste recycling behavior using an extended theory of planned behavior model: a cross-cultural study. *Resources Conservation and Recycling*, 141, 378-389.
- Le, H.L., Yamasue, E., Okumura, H., Ishihara, K.N. 2013. Analysis of Intentions to Recycle Electronic Waste E-Waste Using the Theory of Planned Behavior: A Case Study in Urban Areas of Vietnam. Springer, Japan, Tokyo, 73-79.
- López-Mosquera, N., Sánchez, M. 2012. Theory of planned behavior and the value-belief-norm theory explaining willingness to pay for a suburban park. *Journal of Environmental Management*, 113, 251-262.
- Nduneseokwu, C., Qu, Y., Appolloni, A. 2017. Factors influencing consumers' intentions to participate in a formal E-Waste collection system: a case study of Onitsha, Nigeria. *Sustainability*, 9, 881.
- Nnorom, I.C., Ohakwe, J., Osibanjo, O. 2009. Survey of willingness of residents to participate in electronic waste recycling in Nigeria – a case study of mobile phone recycling. *Journal of Cleaner Production*, 17, 1629-1637.
- Ostrom, E. 2012. Nested externalities and polycentric institutions: must we wait for global solutions to climate change before taking actions at other scales? *Economic Theory*, 49, 353-369.
- Richter, P., Stamminger, R. 2012. Water Consumption in the Kitchen –A Case Study in Four European Countries. *Christian Water Resource Management*, 26, 1639-1649. DOI 10.1007/s11269-012-9976-5.
- Robinot, E., Ertz, M., Durif, F. 2017. Jingle bells or 'green' bells? The impact of socially responsible consumption principles upon consumer behavior at Christmas time. *International Journal of Consumer Studies*, 416, 605-607. <https://doi.org/10.1111/ijcs.12373>.
- Saphores, J.D.M., Ogunseitán, O.A., Shapiro, A.A. 2012. Willingness to engage in a pro-environmental behavior: an analysis of e-waste recycling based on a national survey of U.S. Households. *Resources Conservation and Recycling*, 60, 49-63.
- Stampa, E., Schipmann-Schwarze, Ch., Hamm, U. 2020. Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review. *Food Quality and Preference*, 82, 2-3, <https://doi.org/10.1016/j.foodqual.2020.103872>.
- Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetze, I., Bennett, E.M. 2015. Planetary boundaries: Guiding human development on a changing planet. *Science*, 347, 6223, 1259855.

- Stern, P., Dietz, T., Abel, T., Guagnano, G., Kalof, L. 1999. A Value-Belief-Norm Theory of support for social movements: The case of environmentalism. *Human Ecology Review*, 81-97.
- Turaga, R.M.R., Howarth, R.B., Borsuk, M.E. 2010. Pro-environmental behavior. *Annals of the New York Academy of Sciences*, 1185, 211-224.
- Walsh, S. 2016. Five trends that will change consumer behavior in 2016. *The Globe and Mail*, <http://www.theglobeandmail.com/report-on-business/small-business/sb-growth/five-trends-that-will-change-consumer-behaviour-in-2016/article28019355/>.
- Wang, T. 2019. Global water withdrawal and consumption 2014-2040. <https://www.statista.com/statistics/216527/global-demand-for-water/>.
- Wang, Z., Guo, D., Wang, X. 2016. Determinants of residents' e-waste recycling behavior intentions: Evidence from China. *Journal of Cleaner Production*, 137, 850-860.
- Yang, L., Yang, S., Magiera, E., Froelich, W., Jach, T., Laspidou, Ch. 2017 Domestic water consumption monitoring and behavior intervention by employing the internet of things technologies. *Procedia Computer Science*, 111, 367-375, <https://doi.org/10.1016/j.procs.2017.06.036>.
- Zepeda, L., Deal, D. 2009. Organic and local food consumer behavior: Alphabet theory. *International Journal of Consumer Studies*, 336, 697-705.