# CHARLES UNIVERSITY

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Institute of Sociological Studies

Sociology in European Context


## Master thesis


**2021** **Çağatay Boyacı**

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# An Examination of Household Energy Conservation Behavior in the Framework of Theory of Planned Behavior and Norm Activation Model: Prague Case

*Master thesis*


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## Abstract

This M.A. thesis aims at investigating the socio-psychological motivations and demographic factors related to how individuals perform energy conservation behavior in the household domain. For this reason, two approaches to this sociological issue, the Theory of Planned Behavior and Norm Activation Model, were comprehensively examined to be adequately combined into one experimental model that would determine and help to explain the motivations on the energy conservation behaviors in households. In total, 303 respondents were surveyed who have a residency in Prague by sharing an online-based questionnaire in various Facebook groups between April 28, 2021, and July 3, 2021. In order to test the created hypotheses according to the developed model of the research study, structural equation modeling and ANOVA analysis were employed. As a result, the findings show that combining the Theory of Planned Behavior and the Norm Activation Model gives promising results in explaining the socio-psychological motivations of household energy conservation behaviors. The author of the thesis concludes that social norms have a positive influence on personal norms, and further the personal norms have a positive impact on intentions, and therefore the intentions directly impact the household energy conservation behavior. In addition, a decrease is being observed in energy conservation behavior when the individuals have higher income and larger household size, whereas individuals with a high level of education tend to perform energy conservation more than individuals with a lower level of education.

## Keywords

Energy Consumption, Household Energy Conservation, Pro-Environmental Behavior, Theory of Planned Behavior, Norm Activation Model, Structural Equation Modeling

# Abstrakt

Cílem této magisterské práce je prozkoumat socio-psychologické motivace a demografické faktory související s tím, jak lidé provádějí chování orientované na úsporu energie v oblasti domácnosti. Z tohoto důvodu byly komplexně prozkoumány dva přístupy k této sociologické problematice, a to teorie plánovaného chování a model aktivace norem, aby mohly být adekvátně zkombinovány do jednoho experimentálního modelu, který by určil a pomohl vysvětlit motivaci k energeticky úsporného chování v domácnostech. Celkem bylo dotazáno 303 respondentů, kteří mají bydliště v Praze, a to sdílením online dotazníku v různých facebookových skupinách mezi 28. dubnem 2021 a 3. červencem 2021. Pro testování vytvořených hypotéz podle vyvinutého modelu výzkumné studie bylo použito modelování strukturálních rovnic a analýza ANOVA. Ve výsledku zjištění ukazují, že kombinace teorie plánovaného chování a modelu aktivace norem poskytuje slibné výsledky při vysvětlování socio-psychologických motivací chování orientovaného na úsporu energie v domácnostech. Autor práce dospěl k závěru, že sociální normy mají pozitivní vliv na osobní normy a dále osobní normy mají pozitivní dopad na intence, a proto dané intence přímo ovlivňují energeticky úsporné chování v domácnostech. Kromě toho je pozorován pokles v úrovni energeticky úsporného chování u jednotlivců s vyššími příjmy a větší velikostí domácnosti, zatímco jedinci s vysokou úrovní vzdělání mají tendenci provádět úsporu energie více než jednotlivci s nižší úrovní vzdělání.



# Klíčová slova

spotřeba energie, úspora energie v domácnosti, pro-environmentální chování, teorie plánovaného chování, model aktivace norem, modelování strukturálních rovnic


**Length of the thesis:** 133 pages, 43023 words

## Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

In Prague on the 26th of July 2021 Çağatay Boyacı

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# Institute of Sociological Studies
# Master thesis proposal

The main target of my thesis project is to develop an experimental model to investigate household energy conservation behavior by revealing the extent to how the socio-psychological factors, as well as demographic characteristics, are effective on the individuals' household energy conservation behaviors. Basically, I planned to integrate the Norm-Activation model (NAM) into the Theory of Planned Behavior (TPB), and then I developed a model towards the prediction of the impacts of socio-psychological factors on individuals to perform household energy conservation behavior. Both models have been used to explain pro-environmental behavior, but they are slightly different from each other. The TPB explains the behavior through intentions whereas the NAM explains the behavior through personal norms. Briefly, the TPB asserts that behavioral intention determines an individual's actual behavior, and behavioral intention is determined by three variables; subjective norms, attitude toward behavior, and perceived behavioral control. In this model, an individual's behavior is a logical consequence of his/her personal costs and interests to perform the behavior in question. On the other hand, NAM proposes that an individual's behavior is determined by his/her personal norms, and personal norms are influenced by two variables, namely awareness of consequences and ascription of responsibility. According to NAM, the behavior is derived from the individual's motivation to assist the sake of the collective interests of a particular group or community. The developed model contains the interrelationships between main components of both models (ascription of responsibility, awareness of consequences, personal norm, social norm, perceived behavioral control, attitude, and intention) besides socio-demographic variables such as income per month, household size, and the level of education. I assume that providing such an experimental model might provide a wide framework in explaining household energy conservation behavior. Furthermore, I expect that the differences in individuals' income, education level, and household size factors would influence the participants' household energy conservation behavior differently. Consequently, I would like to test both models separately, and together (based upon the developed model) to reveal the impacts of psychological and socio-demographical factors that influence household energy conservation behavior.

# Contents

# INTRODUCTION

Since the beginning of the industrial revolution, there have been some serious progressive changes in many fields such as science, medicine, technology, agriculture, and manufacturing. Accordingly, people's demands to consume and process natural resources to meet the needs of daily routine have gradually increased in the course of time. In this sense, new technological or industrial production and consumption methods have been required to use and process the commodities that exist in nature more than in the past. Nevertheless, it is a well-known fact that the natural resources on this planet are not unlimited to afford the increased demands of people. In this context, some environmental problems related to increased consumption and production activities have emerged as a result of changing needs in societies. Therefore, as societies have developed industrially, the relationship between people and the environment has inevitably gained importance as well.

Since the 1960s, environmental issues caused by anthropogenic actions have been a crucial topic of discussion in the social sciences, and considerable attention has been paid by various disciplines such as sociology, psychology, economy, and international affairs to the relationship between environmental problems and societies. Considering the environmental consequences of consumption and production ways of natural resources is on the agenda of many governments and various international and civil organizations. The bulk of empirical findings suggest that environmental disasters such as global warming and climate crisis directly or indirectly threaten almost every life on earth. Following this, many scholars have addressed the issue that anthropogenic actions significantly contribute to an increase in greenhouse gas emissions (GHG), and catastrophic impacts of global warming problems are more visible than ever. In fact, recent environmental problems such as Australia bushfires in 2020, Jakobshavn Isbrae melting in Greenland, or the Cape Town water crisis in 2017 have proven that the extinction threat of many species and some vital problems for human beings are stemmed from global warming.

There are many human-based actions that might cause an increase in greenhouse gas emissions, but energy consumption has a very special place amongst such actions. A large part of the pollutants and over released greenhouse gases to the atmosphere originates in the energy sector, namely energy production, consumption, or its cycle (Kadıoğlu & Tellioğlu, 1996). When energy consumption is considered on a sectoral

basis, it is concluded that larger portions of energy consumption are made in households, transportation, and industrial areas in the EU (Eurostat, 2021). On the global scale, household sector is almost responsible for approximately 72% of GHG emissions (Niamir et al., 2020). Therefore, household energy consumption has become one of the most discussed topics because a significant portion of the final energy consumption is covered by the household sector in the EU and global scale. Furthermore, the industrial and transportation sector can likely be controlled to some extent by the provisions, regulations, taxations, incentives, measures, and sanctions of governments and international agreements, yet household energy consumption is an issue that ought to be considered as an individual responsibility. Taken together, one might suggest that household energy conservation is a considerable topic because the given individual effort to conserve energy at the household domain can play an essential role to cope with the risen GHG emissions that cause global warming and related environmental problems.

In the examination of individuals' household activities related to energy consumption, it is important to crystalize the meanings of household energy conservation and household energy consumption terms. Basically, energy consumption can be explained by the socio-demographic characteristics of individuals whereas energy conservation is generally affected by personal motivations (Abrahamse & Steg, 2009). To that extent, demographic factors of the individuals such as education level, household size, income per month, or geographical location can be effective in explaining the amount of household energy consumption. On the other hand, socio-psychological factors such as the sense of responsibility towards environmental problems, the expectation of approval from the social surrounding, moral norms, or behavioral intentions can be effective to explain household energy conservation motivations of individuals.

In the literature, many behavioral studies have been concerned to understand the motivations of individuals in performing a certain behavior. In this sense, some behavioral models such as “Value Belief Norm” (Stern et al., 1999), and “Motivation Opportunity Ability” (Ölander & Thøgersen, 1995) have been developed to predict what kind of socio-psychological factors might drive individuals to perform a specific behavior. Nevertheless, although there are various theoretical perspectives in the literature to explain pro-environmental behaviors, it is hard to claim that researchers have built a consensus on a single conceptual framework or model that covers almost

everything related to energy consumption and conservation behavior (Frederiks, Stenner, & Hobman, 2015, p. 576). Yet, amongst various socio-psychological models and theories, Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991) and Norm Activation Model (NAM) (Schwartz, 1977) stand out as the most popular models in the literature because they have been widely accepted and empirically supported in many pro-environmental behavior studies. TPB and NAM provide different theoretical frameworks to predict pro-environmental behavior (Liu et al., 2017). According to TPB, an individual's personal cost-benefit analysis towards a particular behavior is efficient whether or not to perform a behavior. On the other hand, NAM asserts that an individual's pro-environmental behavior is considered as altruistic behavior and the individual decides to perform the behavior for the benefit of "others", or collective interests (Abrahamse & Steg, 2009).

TPB model proposes that the behavior is determined by intention variable, and the intention variable consists of three predictor variables; these are attitude towards behavior, subjective norms, and perceived behavioral control. In addition, sometimes the individual's perceived behavioral control can directly influence the actual behavior regardless of the mediator impact of behavioral intention. Briefly, behavioral intention refers to the individual's willingness whether or not to perform a specific behavior, subjective norm refers to the individual's perceived social pressure, attitude towards behavior refers to the individual's evaluative judgment to particular object or situation, and perceived behavioral control refers to the individual's control ability to perform a behavior. In the household energy conservation behavior context, various researchers have addressed TPB variables in order to examine the main motivations of individuals whether or not to perform a particular energy conservation behavior (e.g., Abrahamse & Steg, 2011; Macovei, 2015; Liu et al., 2020).

On the other hand, NAM proposes that behavior is exposed by the influence of personal norms. However, there are two different approaches toward the determinant factors of personal norms; namely "mediator" and "moderator" interpretations of NAM. The mediator model suggests that the ascription of responsibility variable has a mediator role between awareness of consequences and personal norms variables whereas the moderator model suggests that both awareness of consequences and ascription of responsibility variables directly influence personal norms variable (De Groot & Steg, 2009). Briefly, personal norm variable refers to the individual's moral obligations whether or not to perform a specific behavior, awareness of consequences

variable refers to the individual's awareness about a specific behavior's possible consequences, and ascription of responsibility variable refers to the individual's perceived responsibility about whether or not to perform a behavior. In the household energy conservation behavior context, several researchers have employed NAM variables to explain the main socio-psychological factors of individuals in performing energy-efficient behaviors (e.g., Black, Stern & Elworth, 1985; Van der Werff & Steg, 2015; Song, Zhao & Zhang, 2019).

Although generally TPB and NAM have been used separately to predict various pro-environmental behaviors, some researchers (e.g., Bamberg, Hunecke, & Blöbaum, 2007; Bamberg & Möser, 2007; Macovei, 2015b) have argued that combining these two models might provide more accurate results in understanding pro-environmental intentions and behaviors (Onwzen, Antonides and Bartels, 2013). Taken together, the main target of this thesis study is to examine to what extent the household energy conservation behaviors can be explained by using the socio-psychological components of TPB and NAM models separately as well as combined. In this context, this thesis study aims to consolidate the components (variables) of TPB and NAM models into one model by providing a comprehensive theoretical framework on the examination of the socio-psychological dimensions of energy conservation behaviors in the household domain. Another focus of this thesis study is to investigate whether or not there is a significant statistical relationship between individuals' socio-demographic factors such as monthly income level, educational background and household size (number of occupants) of individuals, and their energy conservation behaviors.

In the first chapter of this thesis study, the relationship between the environment and society, and the environmental significance of household energy consumption and conservation behaviors are considered. In this context, firstly, it is aimed to explain the environmental impacts of anthropogenic-based environmental problems, and the relationship between environmental problems and society through some sociological perspectives such as on the basis of Giddens's (2009) "the Giddens's Paradox", Inglehart's (1977) "Post-materialism" theory, and Beck's (1992) "Risk Society" theory. Secondly, the impacts of energy consumption on carbon emissions are examined, and specifically, the environmental significance of household energy consumption and conservation behaviors are considered in line with the main concern of this thesis study.

In the second chapter, the literature review of Theory of Planned Behavior and Norm Activation Model is comprehensively examined. Following this, both behavior

and pro-environmental behavior terms are also discussed, and then some behavioral models are mentioned. Next, the energy consumption and conservation behavior studies in the literature are given within the theoretical framework of TPB and NAM models. In order to examine the socio-psychological and demographic factors that influence the household energy conservation behaviors of individuals, a theoretical model is developed by integrating the model components of TPB and NAM into one model. In this context, 11 hypotheses are given to investigate the interrelationship between TPB and NAM variables as well as to examine TPB and NAM models separately. The prepared hypotheses for the developed theoretical model aim to focus on to what extent NAM and TPB model variables affect each other. Thus, this section's target is to examine the factors that might influence the decision-making process of individuals in the context of household energy conservation behavior by considering the relationships between the variables included in the model. On the other hand, 3 hypotheses are given in socio-demographic part of the chapter in order to examine whether or not the participants' household energy conservation behavior varies across some demographical characteristics such as income per month, education level and household size.

In the third chapter, it is indicated that the content of the prepared questionnaire, sampling method as well as how the obtained data was collected. Then, it is mentioned that several statistical methods such as reliability analysis (Cronbach's Alpha) and construct validity analysis (Confirmatory Factor Analysis), Structural Equation Modeling, and ANOVA, and how these statistical methods were employed to test the hypotheses of the study model. In this context, the obtained results by the statistical methods are examined in the next chapter. In the last two chapters, the general scope of this thesis study is evaluated as well as the contributions of the obtained results by statistical methods to the literature are discussed.

# 1. ENVIRONMENT AND SOCIETY

The environment term is mostly defined as the physical, geographical, biological, social, economic, and cultural sphere in which living and non-living things maintain their relationships and interact with each other throughout their existence. However, many scholars have not built a consensus on determining a general framework of the environment term due to each individual might perceive their own environment differently (Jack, 2017). Adak (2010, p. 373) argues that each society has a unique production style, way of life, or thoughts, and these differences are closely related to various social factors such as cultural values, the forms of relations, and the sharing of surplus-value. This might suggest that, then, as societies change, the environmental conceptualization of societies changes as well. In this sense, social factors can be considered as crucial factors in the relationship between societies and the environment (Adak, 2010).

Since the beginning of the industrial revolution, the social and economic development of societies has been largely dependent on the use of natural resources, more specifically, energy resources in nature. The interaction between societies and the environment such as people's purposes and ways of using natural resources have had considerable attention from many social scientists. In today's world, the vast majority of societies still need natural resources to maintain their life. Accordingly, new technologies in industrial and agricultural sectors are constantly developed, and these developments have some inevitable impacts on the environment (Andersson, Bennekou & Schroll, 1992). Generally speaking, the main purpose of many technological or industrial developments is to make life easier or more desirable. Yet, some emerged environmental problems as a result of these developments have led to the acceleration of the processes that affect human and public sake adversely. Thereby, although the consumption of natural resources is among the indispensables of modern life, it has become a significant phenomenon through its both economic and social impacts on society.

## 1.1. Environmental Problems

Undoubtedly, many different reasons can play significant roles in the existence of environmental problems. Earthquakes, hurricanes, or volcanoes are out of humanity's control and there is nothing to prevent the occurrence of such natural disasters. Nevertheless, the bulk of current environmental problems regardless of natural disasters are the outcome of anthropogenic activities on the biological and physical environment.

Although some environmental problems seem to be locally effective in relation to socio-economic and vital issues, they can lead to a global impact. In today's world, environmental problems such as climate change, biodiversity loss, deforestation, air, water, and soil pollution, toxic contamination, sea, and ocean pollution endanger the sustainability of every life regardless of the country border. To give an illustration, global warming is the biggest environmental issue that all living things face up nowadays. Basically, the over-release of greenhouse gases (GHG) into the atmosphere contributes to global warming. Precisely, the earth's surface is heated by the sun's rays and the earth reflects these rays back to the atmosphere, but some rays are trapped by a natural covering formed by water vapor, carbon dioxide, and methane gas. Accordingly, the risen gas emissions trigger more trapped rays in the atmosphere, and this process causes an increase in temperature on the earth's surface. As a result of that, the risen temperature causes many massive problems for both human beings and other living things such as loss of biodiversity, bushfires, environmental migration, and even changes in the production of food supply.

According to Shahzad (2015), 97% of climate scientists and scholars have agreed that anthropogenic actions have changed the composition of atmosphere over the past two centuries. The accumulation of gases such as carbon dioxide, methane, and carbon monoxide in the atmosphere is considered as a result of anthropogenic actions such as the burning of fossil fuels, rapidly spreading deforestation, and risen energy consumption rates in accordance with the increased population. Eventually, such anthropogenic-based actions contribute to global warming. To support that, IPCC's (2018, p. 4) report explain the current situation as follows; "…human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate". According to Mohajan (2011, p. 24), the impacts of global warming can be summarized as follows;

| |
|---|
| “The increase of temperature on the surface of the earth, as a result plants are flowering earlier and animals are shifting their ranges due to shortage of food and water.” |
| “The loss of Arctic ice, Antarctic ice, Greenland ice, Himalayan ice etc.” |
| “The increase of hurricane intensity, the earth quake and tsunami in recent years.” |
| “Melting of glaciers at an accelerated rate and related glacial lake outburst flows.” |
| “Heat waves in the oceans and rises in sea level which caused costal flooding.” |
| “Destruction of habitats and extinction of widespread species, and an increasing number of plants and animals species will be at risk of extinction.” |
| “Increase of acid rains destruct forests, insects and create various diseases in the living organisms and ocean will continue to acidify which will harming coralforming organisms. Due to acidity of the oceans fishes, coral reefs and other living organisms are dying.” |
| “The loss of snowpacks in various parts of the world, as a result ice-bond water supplies will decrease or run off before the usual time.” |
| “Harms of public health such as increased heat-related illness and the irregular smog increased respiratory related diseases.” |

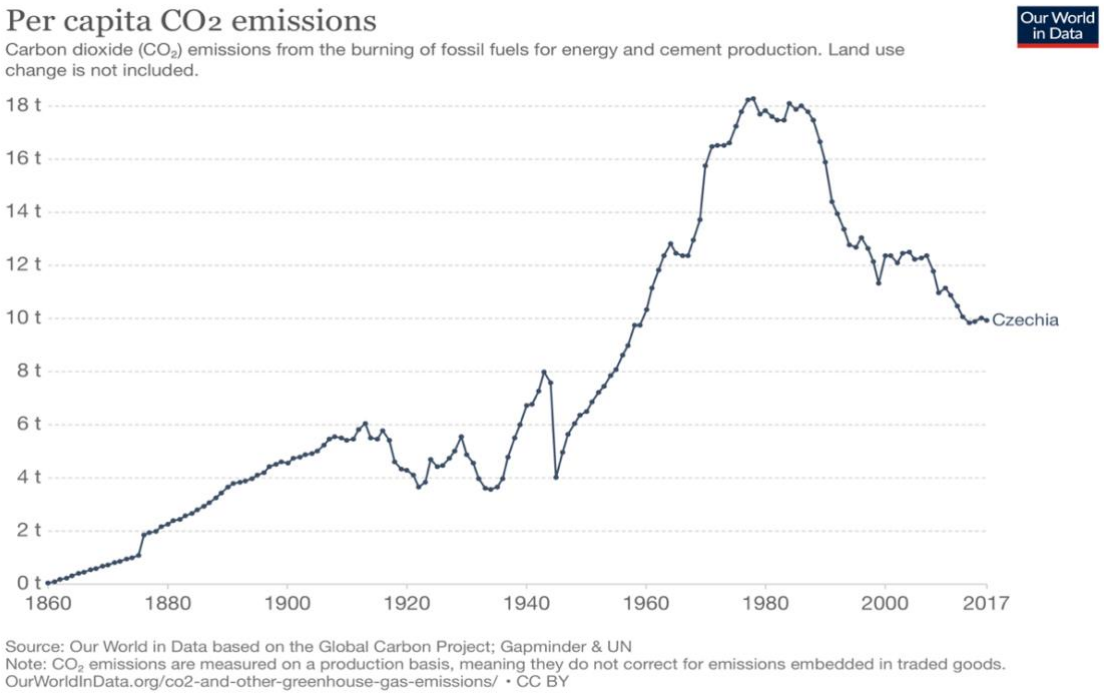
(Citated from Mohajan, 2011, p. 24)

It is a well-known fact that global warming affects not only humans, but also all the lives on the planet, and this is why environmental protection is a crucial action that should be taken into consideration for the sake of nature. In fact, environmental protection has an important place in the international agenda. Because cooperation between the public and private sectors, international and civil organizations is necessary to develop new solutions for environmental problems, and eventually global warming. Thus, many international organizations such as the United Nations (UN), the European Union (EU), the Organization for Economic Cooperation and Development (OECD), the Organization for Security and Cooperation in Europe (OSCE), and many non-governmental organizations such as Nature Conservancy, Nature Friends International, Greenpeace, Global Footprint Work, and Earth Justice address the significance of various environmental problems and develop new action plans for the possible solutions toward the environmental issues. Various multilateral environmental agreements (see **Appendix 1**) have been issued by international organizations in order to prevent and mitigate the catastrophic impacts of environmentally related problems for all lives on the planet.

As mentioned earlier, an anthropogenic action can be a significant contributor to many environmental problems, and this might cause catastrophic outcomes for nature. Almost every single human being has a direct relationship with the environment in the everyday life. However, the contribution of individuals to environmental problems may differ across to their place of residence, level of education, socio-economic status, or even cultural background. Thereby, each individual has a unique carbon footprint in the line with his/her lifestyle or living conditions. Basically, the carbon footprint can be considered as the individual's impacts on the environment. Wiedmann and Minx (2008, p. 4) define the carbon footprint as follows; "The carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product.". The main components of carbon footprint can be summed as daily actions at home, waste, agricultural GHG emissions, industrialization and energy consumption. Moreover, it is also possible to examine the carbon footprint on the country scale.

The evolution of carbon dioxide emissions proposes that almost every state needs to have an action plan for providing a more sustainable energy (Radu, Scrieciu & Caracota, 2013). Actually, the EU countries have already started to take actual steps towards a more economical and sustainable lifestyle in order to reduce the negative effects of carbon emissions on nature and future generations (Radu, Scrieciu & Caracota, 2013, p. 362). For instance, the data indicator of ourworldindata.com shows that Czech Republic has taken important steps in terms of reducing carbon emissions per capita in the burning of fossil fuels. Considering the last decade of the country, while the amount of carbon emissions per capita was 12.65 t in 1997, this amount decreased to 9.93 t in 2017 (see **Figure 1**).

**Figure 1**. Czech Republic CO2 Emissions (1860-2017)




Furthermore, when the GHG emissions by sector are considered, the report findings also indicate that electricity and heat (59.2 million t) are the major contributors of GHG emissions in Czech Republic in 2016 (see **Figure 2**). Yet, this amount is approximately 12.1 million t less than 1996 electricity and heat levels (71.3 million t) (see **Figure 3**).

**Figure 2.** Czech Republic 2016 Greenhouse Gas Emissions by Sector

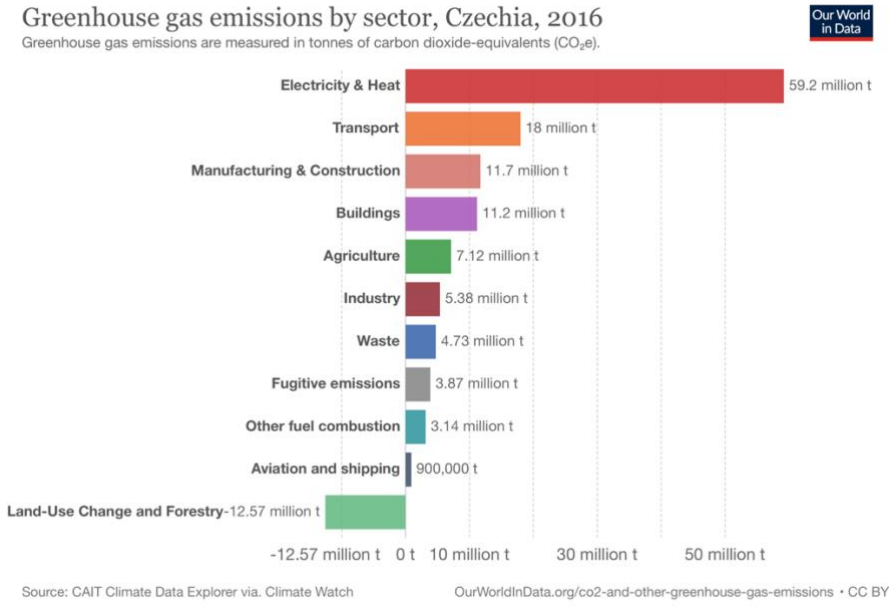
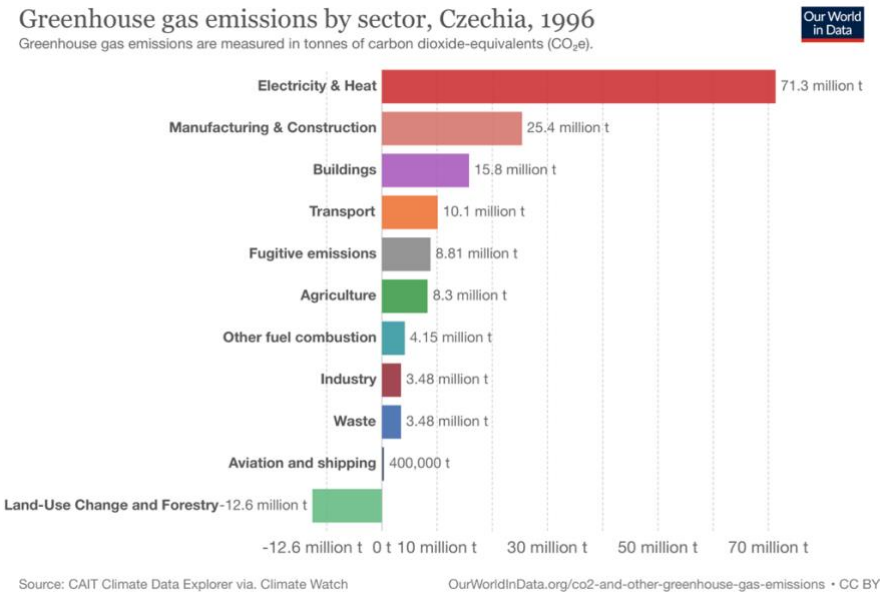


**Figure 3.** Czech Republic 1996 Greenhouse Gas Emissions by Sector




## 1.2. Sociological Perspectives on Environmental Problems

Although human-centered paradigms that ignore environmental problems have been dominant in industrial societies, the increasing environmental problems in such societies have also created alternative sociological conceptualizations of the environment in response to development and development-centered modernization theories (Adak, 2010). In fact, environmental concerns gained considerable attention from many social scientists in the 1960s (Pretty et al., 2007). Since then, some social scientists have issued the significance of environmental problems due to many different reasons such as environmental consequences of modernization, industrialization, over-consumption, or value changes in societies. The article titled "Environmental Sociology: A New Paradigm" published by Catton and Dunlap in 1978 is considered as one of the most important works in the establishment process of Environmental Sociology, and the main subject of this new discipline is the study of environment-society interaction (Eryılmaz, 2017, p. 161). Catton and Dunlop (1978) developed the “New Ecological Paradigm” as a criticism of the social sciences’ anthropocentric approach, specifically to the human exceptionalism paradigm. The human exceptionalism paradigm perspective proposes that nature can be used by humans for profit and economic growth because nature is a commodity to be dominated and exploited (Kara, 2018, p. 17-18). On the contrary, in the New Ecological Paradigm, human beings are in a constant relationship

with nature, and this relationship is not used for human interests because the quality of life increases as long as people eager to maintain natural life (Kara, 2018). Even though New Ecological Paradigm is considered a milestone in the literature, many scholars have also been interested in different approaches to emphasize the society-environment relationship towards environmental problems (Jack, 2017). In this context, this section aims to focus on three different sociological perspectives about the interaction of the society and environment in order to expand the perspective towards the relationship between human beings and nature towards environmental problems.

### *1.2.1. Risk Society*

Since the beginning of the industrial revolution, environmental issues such as environmental pollution, biodiversity loss, and global warming have emerged due to the irresponsible consumption of natural resources, increased greenhouse gas emissions, and industrial pollutions by overproducing. Beck (1986, 1992, 2010) discusses such environmental problems within the framework of "risk society" theory. According to Beck (1992), industrial modernization has created the exponential growth of the productive forces, and thus this has caused irreversible threats for all living species on the planet. In the past, it was possible to explain the dangers due to technological inadequacy in the health or hygiene field. However, industrial overproduction is at the center of today's dangers. Therefore, today's risks differ from those in the Middle Ages because today’s dangers and threats are "the manufactured" risks of modernization (Beck, 1992).

Destroyed forests, toxic wastes, polluted groundwater, and contamination in seas can be considered as the visible effects of industrial risks. Even though those risks are sometimes seen likely as local, they are spreading all over the world and becoming global. In the end, the impacts of industrial dangers no longer stay in industrial facilities, and they keep to endanger future generations as well (Beck, 2010). Modern industrialization often aims to better respond to individuals' material needs in turn to keep the industrial wealth. As a result of that, industrial societies face with such ecological risks that it produces within themselves due to the financial interests (Beck, 2011). Therefore, the risk society is considered as an advanced stage of the industrial society, and the majority of the environmental risks are attributed to industrial progress.

Considering the social consequences, risk and wealth distribution varies across social classes. In this sense, Beck (1992) takes a critical stance against modernity

because of unequal sharing of wealth and risks. While the people in poverty in the society are more exposed to risks, the wealthy people away from the risk. Furthermore, rich societies take advantage of the risks that they generate by producing and selling new technologies that help prevent the emergence of risks and overcome their destructive effects. As a result, the risks of modernization also affect those who profit from them. In other words, the risks create a boomerang effect that spoils the class model (Beck, 1992). For example, ecological disasters and radioactive fallouts do not recognize country borders (e.g., Chernobyl disaster, 1986). After all, the rich and powerful ones are not safe as a result of industrial environmental disasters. These dangers threaten not only health but also legitimacy, property, and profit. Ecological devaluations and dispossessions, which frequently and systematically contradict the profits and property interests that accelerate the industrialization process, are linked to the recognition of the risks of modernization (Beck, 1992).

### *1.2.2. Post Materialism*

With the gradual decline of the effects of World War II in Europe after the 1960s, intergenerational value differentiation has become an important topic of discussion in social sciences. In the 1970s, Ronald Inglehart introduced "post-materialist theory" in his well-known presentation "The Silent Revolution of Europe" (1971). Inglehart (1990) proposes that the wave of new or less popular social movements (e.g., environmental movement) has become more visible through the rise of the post-materialist perspective in society. Basically, Inglehart's (1977) post-materialism theory argues that individuals who achieved economic wealth and physical security in industrialized societies that have greater education opportunities and technological development tend to concern with post-material issues such as quality of life or environmental quality.

The older generation who already experienced the impacts of the second world war more closely concerned about some basic needs to survive such as having a safe shelter, food, or monetary (material) products. The main reason for this situation is that the older generation lived in an environment of famine and insecurity, thus material values were of primary importance for them. According to the materialist view, there is no problem in using the scarce resources in the world as long as the use of the world's scarce resources leads to economic growth and employment opportunities (see Davis, 2000) (Ahonen, 2017). Thus, this point of view can actually be associated with an

anthropocentric mindset. The younger generation, on the other hand, focused a new life sphere and a different value system from what the older generation constructed. The younger generation grew up in welfare and security conditions and had more opportunities to access education than the previous generation. The younger generation gives more priority to post-materialistic values such as personal autonomy, freedom of expression, adaptation to innovative ideas, cross-border consensus, and cosmopolitanism because the material needs were already somewhat met by the older generation. Thus, the younger generation was more concerned with environmental problems and political issues, and placed more emphasis on post-materialistic concepts such as quality of life or environmental quality than the previous generation.

To sum up, several studies have also revealed that individuals who have post-materialistic values tend to concern about environmental issues such as protecting the environment or preventing environmentally related problems, and thus they contribute to supporting environmentalism across societies (Abramson, 1997). However, Inglehart (1990) also proposes that the increasing environmental concern among the society can be derived from the environmental conditions are worse than ever before, and the environmental concern might not be directly related to the value shifting.

### *1.2.3. The Giddens's Paradox*

Giddens's Paradox is a concept that Sir Anthony Giddens claims in his book "The Politics of Climate Change" (2009) towards the relationship between individuals and climate change. According to Giddens (2009), no matter how climate change or related environmental problems come up to today's agenda, it is not easy for individuals to face up these problems due to various reasons. Because of global warming impacts might not seem as real to many individuals, sacrificing the accustomed lifestyle and comfort zone in order to cope with climate change might be quite difficult for many individuals. Giddens's Paradox basically states that even if individuals accept a problem that may have devastating effects such as climate change, they do not give up their comfort zones for the solution of these problems, since they see such problems as "distant" problems due to they have not experienced yet the climate change's destructive effects physically in the daily life. Although the abundance and robustness of the scientific data on the occurrence of global warming are indisputable, its effects are not yet visible in daily life at a serious level for many individuals. This might

suggest that individuals might have more expectations from global warming such as a high level of physical impacts in order to start taking necessary actions.

As Giddens (2009, p. 2) states, some attitude surveys indicated that even though the vast majority of the public accepts that global warming is a massive threat, only a few individuals are willing to significantly change their lives to cope with global warming. To give an illustration, the impact of energy consumption to greenhouse gas emissions is invisibly embedded in daily actions such as cooking, washing, or space heating (Isaksson & Ellegård, 2015), and thus the importance of energy consumption's contribution to environmental problems may not be sufficiently perceived by some individuals. Accordingly, Giddens (2009, p. 2-3) argues that the "future's discounting" and Giddens's Paradox can be associated at some point. Accordingly, most people have difficulty in attaching the present reality to a future reality, and this is why a small reward obtained in the present may be preferable to a greater one in the future. To be more explanatory, Giddens gives an example of this situation; although it is written on the cigarette packs that "smoking kills", many young people still continue to smoke because they might have not yet encountered the vital risks of smoking or they have not imagined the health risks of being over 40 years old. Thus, individuals' environmental attitudes and behaviors can be considered in the same way. At some point, the most important factor that keeps many individuals inactive to reduce their contribution to global warming is derived from that global warming is a future-oriented (or distant) and a theoretical disaster. Nevertheless, when the inevitable climate disaster strikes, it will be too late to take the necessary measures (Giddens, 2009).

# 2. ENVIRONMENTAL CONSEQUENCES OF HOUSEHOLD ENERGY USAGE

In Europe, the human population grew up significantly with the end of World War II and this caused an increase in energy consumption demands too (Salari & Javid, 2017). Especially, the energy crisis that broke out in the 1970s caused the mismatch between energy supply and demand to become even more pronounced (Ma, Wang & Li, 2020), and energy consumption behavior became one of the crucial topics amongst many scholars (Karatasou, Laskari & Santamouris, 2013). In today's world, energy consumption is still an important topic for many researchers (Salari & Javid, 2017; Özcan, Gülay & Üçdoğruk, 2013), but mostly due to its impact on the environment.

Because the energy consumption represents a large source of emissions among various anthropogenic actions that contribute GHG (Akpan & Akpan, 2012). According to Loureiro and Lima (2019), energy consumption is considered as one of the main reasons for the challenges faced by humanity, such as climate change and related environmental problems.

International institutions such as the International Energy Agency (IEA), and the European Environment Agency (EEA) systematically collect energy consumption statistics to address current energy issues. According to United Nations' Emission Gap Report in 2020 (UNEP, 2020), global GHG emissions continued to grow, and reaching a record high of 52.4 GtCO2e (range: ±5.2) in 2019 (Ma, Wang & Li, 2019, p. 1). According to statement of IEA's Global Energy Review (2021, p. 13), "CO2 emissions are likely to rebound less in the European Union, as the economic outlook is dimmer than in other parts of the world. The expected increase of 80 Mt CO2 in 2021 will reverse only one-third of 2020's drop. EU emissions in 2021 should stand at 2.4 Gt. Most of the 90 Mt CO2 drop in power sector emissions in 2020 will endure through 2021, with a slight anticipated increase in coal and gas-fired generation in 2021 reversing only 10% of the 2020 drop. The share of coal in electricity generation in the European Union has declined almost three-percentage points from 2019 to 2021, to less than 14%.". As part of 2019 European Green Deal, the EU commission has already set an energy efficiency target to 2030 in order to help to protect the environment, mitigate climate change impacts, and also reduce the EU's dependence on external oil and gas suppliers (2030 Climate and Energy Framework, 2020). According to the action plan, the key targets are stated as follows;

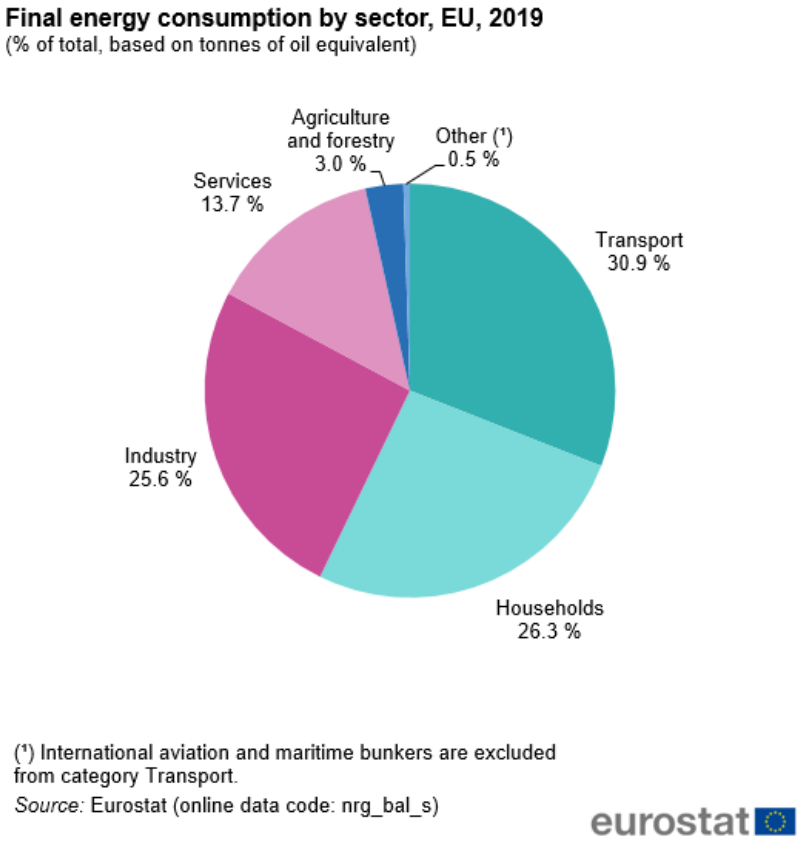
- "At least 40% cuts in greenhouse gas emissions (from 1990 levels)"
- "At least 32% share for renewable energy"
- "At least 32.5% improvement in energy efficiency"

## 2.1. Household Energy Consumption

During the daily life routine, we face series of lifestyle choices that might be carbon-intensive. Accordingly, the household sector is one of the major contributors to GHG emissions, and consequently to global warming (Abrahamse et al., 2005, Zhou & Yang, 2016). Therefore, the direct usage of household energy consumption has been an important topic among the international community and organizations (Liu et al., 2020).

Vasseur, Marique and Udalov (2019) mention that residential energy consumption accounts for approximately 30% of total energy consumption and 16% of total CO2 emissions in Europe. Based on UNFCC Anex-1 historical emissions report, Climate Watch data indicator tool shows that energy consumption is the biggest source of GHG emissions, and responsible for 83% of aggregate GHG emissions in EU-27 countries in 2018. Eurostat's recent findings (*accessed in June 2021*) on the final energy consumption in the EU has indicated that transport (30.9%), households (26.3%), and industry (25.6%) are three dominant categories in total energy consumption in 2019 (**see Figure 4**). International Energy Agency's (IEA, 2019) research findings have revealed that households are responsible for more than 20% of the final energy consumption of OECD countries. To sum up, the household energy consumption topic has taken a significant place in the EU agenda because the amount of energy consumed in households triggers the increase in the amount of GHG emissions (Druckman & Jackson, 2016), and this leads to catastrophic environmental problems that many largest economies face (Brozyna et al., 2020, p. 4).

**Figure 4.** Final energy consumption by sector in 2019



According to the data compiled by Eurostat (*accessed in June 2021*), households' energy consumption constituted 26.1% of final energy consumption in the EU countries. Following this, total household energy consumption is covered by the usage of natural gas (32.1%), electricity (24.7%), renewable resources (19.5%), petroleum products (11.6%), derived heat (8.7%), and coal products (3.4%) (see **Figure 5**). The report's findings (see **Figure 6**) have indicated that heating at the home is the main energy use of households by 63.6%. Electricity use for lighting and electronic appliances (except powering main heating, cooling, and cooking systems) represent 14.1% whereas the use of water heating represents 14.8%. Cooking devices use has 6.1% proportion, space cooling 0.4%, and other "end-uses" represent 1.0%. Space heating, and water represent 78.4% of the total energy consumption of households.

**Figure 7** shows the final energy consumption by the main products in the EU households needs. Electricity consumption of the EU households cover 100% of the energy needs for lighting and space cooling, as well as 83.4% of other end-uses and 49.2% for cooking. Gas consumption of EU households covers %38.0 of the energy needs for space heating, %40.6 for water heating, and 31.0% for cooking. The consumption of renewable energy sources in the EU households covers 27.0% for space heating, 12.6% for water heating, and 5.6% for cooking. Derived heat consumption of the EU household covers 13.8% of the energy needs for water heating, and 10.6% for space heating, but oil products also cover 14.1% of space heating, 13.5% of cooking and 11.3% of water heating. Consequently, Eurostat's (2021) data results have shown that households have represented 26.1% of final energy consumption and 16.6% of gross inland energy consumption in the EU in 2018. On the other hand, it should be also noted that the energy consumption and related CO2 emissions per capita might vary in different regions and countries because of various external factors may influence household energy demands (Rahmani et al., 2020). To give an illustration, the lowest proportions of energy used for space heating have been observed in the EU-27 countries as Malta (20.4 %), Portugal (28.2 %), and the highest in Luxembourg (78.7 %), Belgium (73.5 %), Estonia (72.7 %), Hungary (71.7 %), Lithuania (70.3 %) Austria (69.0%) and Czechia (68.5%) (see **Table 1.**). Accordingly, the results can suggest that the northern counties relatively demand more space heating than countries on the southern side of Europe. Additionally, Ivanova et al. (2017) mention that drivers of carbon footprint and GHG emissions can differ across variables such as household size, rural and urban areas, level of education, and countries with greater income inequality.

**Figure 5.** Final energy consumption in the residential sector by fuel in 2018 (Eurostat)

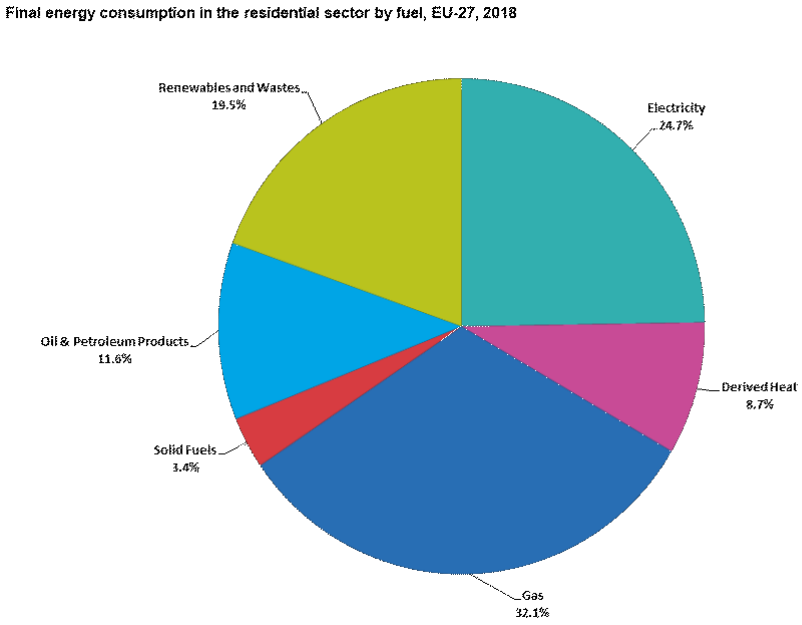



**Figure 6.** Energy consumption in the residential sector by use in 2018 (Eurostat)

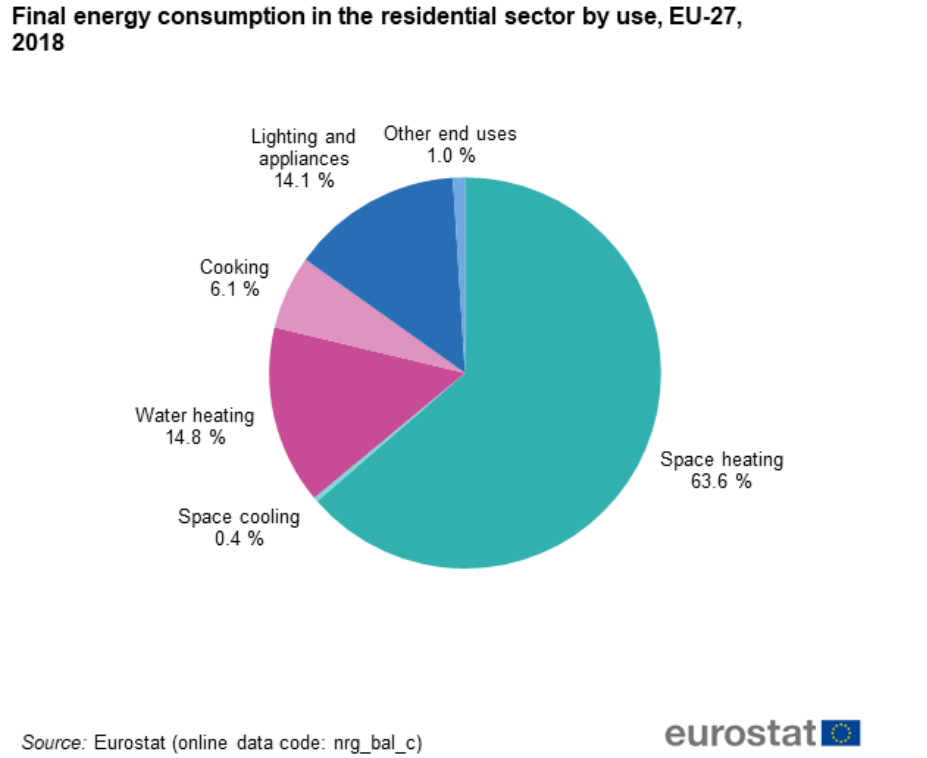


**Figure 7.** Main energy products in the final consumption for each type of end-use in residential sector in 2018 (Eurostat)

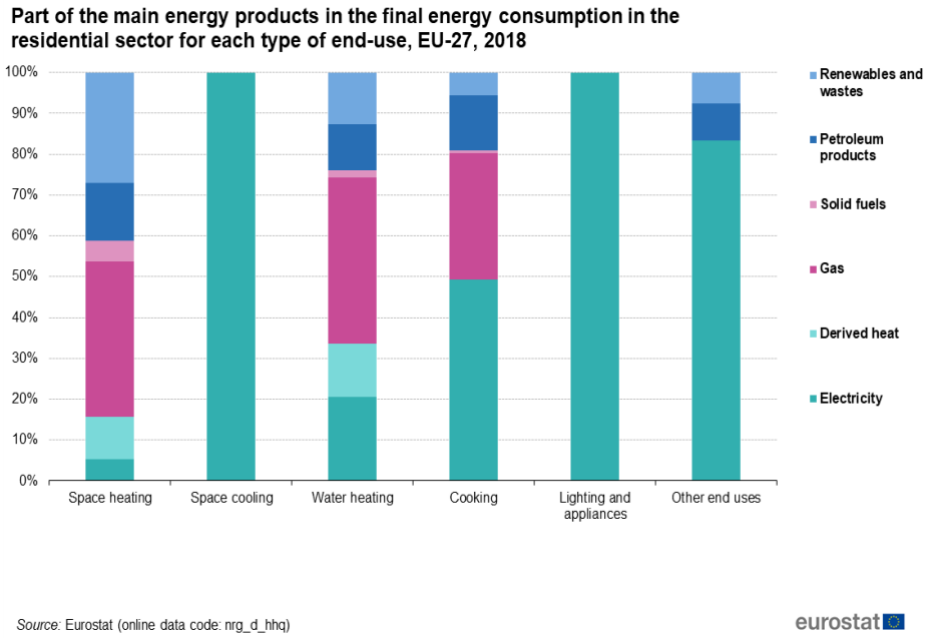



**Table 1.** Share of final energy consumption in the residential sector by the type of end-use in 2018 (Eurostat)

**Share of final energy consumption in the residential sector by type of end-use, 2018**
(%)

| | Space heating | Space cooling | Water heating | Cooking | Lighting and appliances | Other end uses |
|---|---|---|---|---|---|---|
| **EU - 27** | **63.6** | **0.4** | **14.8** | **6.1** | **14.1** | **1.0** |
| **EU - 28** | **63.6** | **0.3** | **15.0** | **5.7** | **14.6** | **0.9** |
| Belgium | 73.5 | 0.1 | 11.9 | 1.7 | 12.5 | 0.4 |
| Bulgaria | 52.8 | 0.4 | 18.0 | 8.5 | 20.2 | 0.0 |
| Czechia | 68.5 | 0.1 | 17.0 | 6.2 | 6.6 | 1.6 |
| Denmark | 62.5 | 0.0 | 21.3 | 1.6 | 14.0 | 0.6 |
| Germany | 66.0 | 0.2 | 16.9 | 6.5 | 9.4 | 0.9 |
| Estonia | 72.7 | 0.0 | 11.8 | 4.9 | 10.6 | 0.0 |
| Ireland | 60.5 | 0.0 | 19.1 | 2.3 | 17.2 | 0.9 |
| Greece | 54.5 | 3.6 | 15.2 | 6.2 | 20.5 | 0.0 |
| Spain | 43.1 | 1.0 | 17.0 | 7.4 | 31.4 | 0.0 |
| France | 64.9 | 0.2 | 11.3 | 5.5 | 18.0 | 0.0 |
| Croatia | 68.3 | 1.9 | 10.0 | 6.5 | 13.2 | 0.0 |
| Italy | 66.6 | 0.7 | 12.4 | 6.6 | 12.5 | 1.4 |
| Cyprus | 35.4 | 11.4 | 23.9 | 7.3 | 21.8 | 0.1 |
| Latvia | 66.0 | 0.0 | 18.5 | 7.1 | 7.9 | 0.6 |
| Lithuania | 70.3 | 0.0 | 8.9 | 6.4 | 14.4 | 0.0 |
| Luxembourg | 78.7 | 0.3 | 7.6 | 2.6 | 10.9 | 0.0 |
| Hungary | 71.7 | 0.1 | 12.8 | 4.9 | 10.4 | 0.0 |
| Malta | 20.4 | 12.3 | 25.4 | 14.4 | 25.7 | 1.9 |
| Netherlands | 63.4 | 0.2 | 16.7 | 2.1 | 17.5 | 0.1 |
| Austria | 69.0 | 0.0 | 14.8 | 2.7 | 10.3 | 3.1 |
| Poland | 65.3 | 0.0 | 16.4 | 8.3 | 10.0 | 0.0 |
| Portugal | 28.2 | 0.6 | 17.4 | 35.6 | 18.1 | 0.0 |
| Romania | 62.9 | 0.3 | 13.5 | 9.8 | 13.4 | 0.0 |
| Slovenia | 61.2 | 0.5 | 16.8 | 4.3 | 17.2 | 0.0 |
| Slovakia | 67.1 | 0.2 | 14.0 | 5.7 | 13.1 | 0.0 |
| Finland | 66.9 | 0.1 | 15.1 | 1.0 | 11.5 | 5.5 |
| Sweden | 54.8 | 0.0 | 14.1 | 1.5 | 19.2 | 10.3 |
| United Kingdom | 63.5 | 0.0 | 16.4 | 2.8 | 17.3 | 0.0 |
| Norway | 66.4 | 0.1 | 12.9 | 1.5 | 18.2 | 0.8 |
| North Macedonia | 60.4 | 2.1 | 12.5 | 9.8 | 15.2 | 0.0 |
| Albania | 31.4 | 5.7 | 21.3 | 29.5 | 12.1 | 0.0 |
| Serbia | 61.1 | 0.5 | 14.0 | 7.2 | 17.2 | 0.0 |
| Bosnia and Herzegovina | 73.1 | 0.6 | 9.6 | 5.0 | 11.8 | 0.0 |
| Kosovo* | 70.3 | 3.6 | 6.7 | 7.4 | 9.7 | 2.3 |
| Moldova | 70.5 | 0.1 | 9.9 | 11.7 | 7.8 | 0.0 |
| Ukraine | 54.8 | 0.4 | 13.3 | 17.5 | 14.0 | 0.0 |

(*)This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

*Source:* Eurostat (online data code: nrg_d_hhq)

eurostat

## 2.2. Household Energy Conservation

Energy conservation in household domain is a necessary action in order to achieve both the international and national commitments for reducing carbon emissions (Vasseur, Marique & Udalov, 2019). Anthropogenic based issues that contribute to GHG emissions have been one of the main reasons for many researchers to study on individuals' energy conservation behaviors (Abrahamse et al., 2005; Gardner & Stern, 2002). Basically, energy conservation behavior can be defined as the decision and practice to use less energy such as turning off the light when leaving the room, turning off the heater when leaving the house, choosing public transportation, or cycling instead of driving a car if feasible. Several researchers have agreed that energy conservation can be achieved with technical measures on the one hand, and on the other hand, by reducing total energy consumption of social organizations and individuals (Erten, 2006). Costanzo et al. (1986) argue that although the development of "energy-saving" technologies is necessary to reduce energy consumption, sometimes this attempt may be an insufficient step. According to Shi, Wang and Wang (2019, p. 150), some studies have proven that the individual's behavior is a significant factor to determine the impacts of energy conservation and environmental protection (see Gardner & Stern, 2002). Therefore, it is crucial to understand how the environmental problems that are stemmed from energy consumption can be solved through the main determinant factors of the individual's energy conservation behavior.

The individual (i.e., occupant, or consumer) is considered as "the most basic energy consumer" (Yue et al., 2019, p. 1). In a broad view, the main idea of conserving energy is "to use energy more efficiently" (Curtis, Simpson-Housley & Drever, 1984, p. 452). To that extent, household energy conservation behavior can be considered as reducing the use of heat, gas, water, and electricity at home in order to minimize the impacts of household energy consumption on the environment (Peattie, 2010). As a result, households have been an important group when addressing energy conservation behavior (Rahmani et al., 2020). Some earlier studies such as "behavioral model of residential energy use" (Van Raaij & Verhallen, 1983), "socio-psychological model of energy conservation behavior" (Costanzo et al., 1986), and "causal model of resource use" (Stern & Oskamp, 1987) have been influential approaches to explain the individuals' energy conservation behaviors (Frederiks, Stenner & Hobman, 2015). On the other hand, several socio-psychological models have been developed to explain the

individuals' pro-environmental behaviors, and some researchers have successfully employed particular models such as Norm Activation Model (Schwartz, 1977), and Theory of Planned Behavior (Ajzen, 1985) in order to explain household energy conservation behaviors (see Abrahamse & Steg, 2009; Wang et al., 2011). In conclusion, household energy conservation behavior is one of the most important pro-environmental behaviors that should be taken into account because of its strength to reduce GHG emissions as well as mitigating the impacts of climate change.

# 3. LITERATURE REVIEW

In this section, it is aimed to focus on the theoretical framework of this study by providing comprehensive definitions of both Theory of Planned Behavior (TPB) and Norm Activation Model (NAM). Basically, TPB (Ajzen, 1985; 1991) emphasizes that the individual's intention of whether or not to perform a pro-environmental behavior is as a result of the personal benefit-cost evaluation in turn for himself/herself (Ajzen, 1991). On the other hand, NAM (Schwartz, 1977) argues that the individual decides whether or not to perform the pro-environmental (or altruistic) behavior in line with his/her personal (moral) norms. Accordingly, the individual likely to perform pro-environmental behavior if he/she feels a moral obligation to act for the benefit of others or the environment itself (Schwartz, 1977).

Both NAM and TPB theories were examined in the context of pro-environmental behaviors, and more specifically energy conservation behavior in the household domain. Eventually, 14 hypotheses have been created towards the relationship between NAM and TPB, and the impacts of socio-demographical factors on household energy conservation behavior.

## 3.1. Theory of Planned Behavior

Some earlier studies showed that the correlation between attitudes and behavior is not statistically strong (LaPierre, 1934; Wicker, 1969; Maloney & Ward, 1973). Several researchers have argued that although attitude can be considered as one of the key predictors of behavior, it is insufficient to determine the behavior only by itself (Dockery & Bedeian 1989; Bamberg, 1996; Doğan, Şen & Yılmaz, 2015). Eagly and Chaiken's (1993) state that the reason of the weak correlation between attitude and behavior relationship may be derived from insufficient statistical techniques, and not-

well organized measurement scales. Fishbein and Ajzen (1975) influenced by studies on attitude and social cognition (Hagger, 2019), and they developed the Theory of Reasoned Action (TRA) model (Ajzen & Fishbein, 1980; Fishbein, 1963, 1967, 1980; Fishbein & Ajzen, 1975) in order to improve the insufficient measurement techniques on attitude and behavior relationships in previous studies. Erten (2002) proposes that the inconsistency between attitude and behavior relationship was attempted to solve through "*The Principle of Compatibility*" that proposed in TRA model (Fisbein & Ajzen, 1975; Ajzen & Fishbein, 1977). According to Ajzen (2005), it is required that measures of attitude and behavior must involve exactly the same elements of "*target*, *action*, *context*, and *time*" (TACT). In other words, to eliminate the inconsistency between attitude and behavior, the attitude must be specifically oriented towards the kind and the purpose of the behavior as well as when and where the behavior will take place. For instance, on the example of a consumer's vehicle purchasing intention, "The Principle of Compatibility" can be defined as follows; the purchasing intention must include an action (to purchase), a target toward the action (to purchase a diesel vehicle or etc.), a context of the target (to purchase a diesel vehicle from a specific auto gallery), and a time frame (in two weeks, next year or etc.).

Ajzen and Fishbein (1977) state that the structure of TRA model consists of "subjective norms", "attitude towards behavior", "intention", and "actual behavior". The intention is the key determinant of both the direction and intensity of the behavior (Bentler & Speckart, 1979). According to Ajzen (1991), an individual's intention is the degree of desire of whether or not to perform a specific behavior. A strong intention to perform a certain behavior also increases the likelihood of performing the behavior. In addition, when there is a high correlation between intention and behavior, a single performing can be predictable from the attitude towards the act (Ajzen & Fishbein, 1977 p. 888). Furthermore, it is also crucial to mention that intentions can be changed by the time, and they can predict "an individual's attempt to perform a behavior, not necessarily its actual performance" (Ajzen, 1985, p. 29).

According to TRA model, an individual's intention to perform a specific behavior is influenced by the factors of both attitude towards behavior, and subjective norms. Attitude towards behavior is a personal evaluation that consists of behavioral beliefs to perform a certain behavior. In other words, "…the degree to which an individual has favorable or unfavorable appraisal" influences the intention of that individual to perform actual behavior (Ajzen, 1991, p. 188). Subjective norm is

considered as perceived social pressures whether or not to perform a specific behavior. An individual's normative beliefs construct the individual's subjective norms. In other words, an individual's tendency to perform a specific behavior depends on the approval or disapproval of the individual's social surroundings (i.e., family members, close friends, colleagues, and/or neighbors) towards the behavior in question. In consequence, when an individual evaluates a certain behavior as positive, and if his/her social surrounding also approves that behavior, the individual likely intends to perform the behavior in question (Ajzen, 1985).

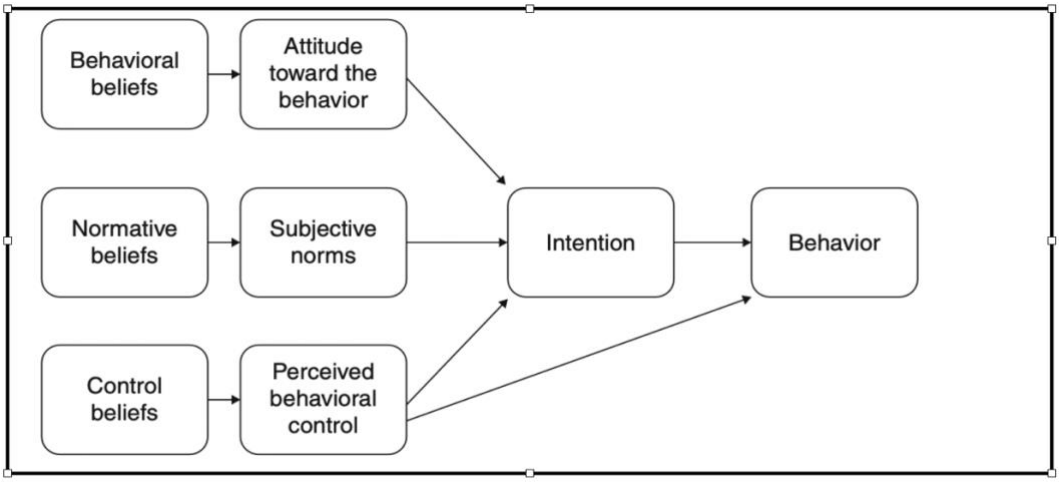
In the social psychology literature, TRA model was one of the most extensive and influential research models on behavior studies (Trafimow, 2009). A serious limitation with TRA model, however, is that TRA model is based on the assumption that the individual performs a behavior in a sensible manner that is under full volitional control (Madden, Ellen, & Ajzen, 1992, p. 3). Hence, if the individual is out of opportunity, resources, or skills in adopting the behavior, then TRA model would be insufficient to predict the behavior because sometimes behavior can be also influenced by non-volitional factors and not to be controlled by the individual (Liska, 1984). Thereby, Ajzen (1985) introduces the "perceived behavior control" factor as an exogenous variable that has motivational implications for behavioral intentions, and/or a direct indicator of the actual behavior. Eventually, Theory of Planned Behavior (TPB) model (Ajzen, 1985, 1988, 1991) was developed as an extension of TRA model to provide a better prediction toward the behavior under both volitional and non-volitional situations thanks to perceived behavioral control variable. As in TRA model, TPB model also stresses that the intention refers to the motivational factors that influence the behavior, and indicates how much an individual is willing to perform the behavior in question (Ajzen, 1991). In TPB model, the intention towards one specific behavior is a function of attitude towards behavior, subjective norms, and perceived behavioral control (Liu et al., 2020).

Briefly, the perceived behavioral control can refer to the individual's perception of whether or not to perform a behavior is hard or easy. Furthermore, the perceived behavioral control can also represent an individual's past experience towards a specific behavior and the individual can decide whether or not to perform the behavior in question according to his/her past experiences. Perceived behavioral control, which is effective together with a strong attitude towards behavior and subjective norms, has a

positive effect on intention (Ajzen, 2002). Overall, TPB covers non-volitional behavior to predict the intention and actual behavior.

According to Ajzen (1985, 1991) the beliefs have a crucial impact in the rational decision process whether or not to perform a certain behavior. An individual obtains the beliefs about institutions, people and about himself/herself, and eventually, the obtained beliefs influence the individual's attitude, subjective norms, intention and behavior (Bilim, 2015). As a matter of fact, an individual might have many different beliefs towards one single behavior, but only salient and accessible beliefs are cognitively considered to be prevailing determinants in the process of performing the behavior (Kocagöz, 2010). In this context, Ajzen (1991) proposes three types of salient beliefs that are considered to be prevailing determinants of the individual's intentions and behavior. These beliefs are "behavioral beliefs" as the influencer of attitude towards behavior, "normative beliefs" as the determinant of subjective norms, and "control beliefs" as the basis for perceived behavioral control (see **Figure 8**).

**Figure 8.** Schematic model of variables in Ajzen's (1991) Theory of Planned Behavior




(Citated from LaCaille, 2013, p. 1965)

### *3.1.1. Attitude Towards Behavior*

In social psychology literature, attitudes are mostly considered as evaluative judgments toward people, subjects, objects, institutions and/or situations through the construction of a negative, positive, or neutral point of view (see Eagly & Chaiken, 1993; Fabrigar & Wegener, 2010; Petty, Briñol, & DeMarree, 2007; Briñol, Petty & Guyer, 2019). Allport (1935, p. 810) describes attitude as "a mental and neural state of

readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related". According to Eagly and Chaiken (1993, p. 1), attitude is "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor". In other words, Ajzen, (2001, p. 28) defines attitude as "a summary evaluation of a psychological object captured in such attribute dimensions as good-bad, harmful-beneficial, pleasant-unpleasant, and likable-dislikable". Attitudes are latent constructs which mentally attached to concrete or abstract objects (Gifford & Sussman, 2012). Ajzen (1993) suggests that attitudes can be measured through the indivdual's reactions or responses towards the attitude object even though they are latent and inaccessible (Abun et al., 2019).

The attitude is considered as a multidimensional construct and it consists of three components; these are "cognitive", "affective" and "conative" (Breckler, 1984). The cognitive component refers to the individual's thoughts and beliefs towards a particular object, subject, person, or institution. In this component, the individual's belief and thoughts do not necessarily need to represent a reality or rightfulness about the attitude object because the cognitive component is all about his/her perception, experience, and information towards the attitude object. The affective component refers to the individual's emotional response about the attitude object. The individual evaluates an attitude object positively or negatively and his/her emotions emerge according to this evaluation. On the other hand, the individual's emotions might also derive from positive or negative evaluation towards the attitude object. The conative component refers to the individual's behavioral tendency in a certain way towards an attitude object. The individual's short or long-term plans or commitments can be included in the conative component. The individual with positive cognitive and affective components tends to behave positively towards the attitude object. For instance, if the individual believes that having regular jogging in the daily routine helps to reduce heart-attack risk (cognitive), and if he/she likes to have jogging (affective), he/she tends likely to have jogging.

In TPB model, attitude is the positive or negative evaluation of the individual towards performing a behavior, and this is so-called as "attitude towards behavior" (Ajzen, 1991). Ajzen (1985) stresses that attitude towards a specific behavior is one of the direct determinants of intention to perform the behavior in question. According to the TPB model, the individual might have a positive attitude towards a particular behavior when he/she believes that performing the behavior in question provides a

positive outcome for him/her. In this context, the individual's cost-benefits evaluation for himself/herself is one of the determinant factors of the intention to perform the behavior.

Clement, Henning and Osbaldiston (2014, p. 48) mention that attitude towards behavior is derived from "beliefs about the likelihood and degree of particular outcomes, as well as from the evaluation of these outcomes". TPB assumes that behavior is a function of salient information or beliefs, and salient beliefs are considered as "prevailing determinants of the person's intentions and behaviors" (Ajzen, 1991, p. 189). In this sense, Ajzen (1991) proposes that behavioral beliefs can be associated with attitude towards behavior. Behavioral beliefs can be described as the individual's belief about possible consequences of the behavior to be performed. Therefore, the individual can decide whether or not to perform a specific behavior according to his/her belief towards the outcome of the behavior in question.

For example, an individual might believe that purchasing an eco-friendly vehicle will help to produce fewer emissions, and mitigate climate change impacts rather than purchasing conventional vehicles which have diesel or petrol engine vehicles. On the other hand, the individual might also believe that purchasing an eco-friendly vehicle would cost higher than conventional vehicles, and it will lead to a financial problem for his/her daily life. In this situation, the main behavior is to purchase an eco-friendly vehicle and the expected outcomes (beliefs) of this behavior are to reduce global warming impacts and/or to have a financial problem because of the vehicle's cost. Thereby, the individual will determine his/her purchasing behavior according to the significance level of these beliefs for him/her toward the expected outcomes. In consequence, TPB postulates that the basis of the cost-benefits evaluation in an individual's attitude towards behavior can be rooted in his/her behavioral belief about the outcome of the behavior.

### *3.1.2. Subjective Norms*

In TPB model, subjective norms are related to the individual's perceived social pressures of whether or not to perform a behavior in a certain manner (Ajzen, 1991). In this sense, the intention to perform a particular behavior can be associated with the given importance to the people in the social surrounding. According to Passafaro, Livi and Kosic (2019, p. 2), the impacts of "specific social groups or categories relevant to a behavior in a specific context" can be accounted with the construct of the subjective

norms. Basically, the individual evaluates the behavior with its social costs and benefits in turn for his/her self-interest. Following this, the individual's intention to perform a behavior in question is influenced in accordance with the approval or disapproval of friends, family members, colleagues, neighbors, and or a specific community around him/her.

A positive attitude towards a specific behavior from the people who are important in the individual's social surroundings can influence his/her intention positively to perform the behavior in question. For instance, Stern (1992, p. 1229) states that "the personal opinions and actions of one's friends may have a more powerful influence over household energy choices than expert advice, even if the latter is better informed". In this context, the crucial point of the subjective norm is about to what extent the degree of given importance by the individual to social groups or individuals around him/her.

Ajzen (1991; 2005; 2006) posits that the normative beliefs constitute the determinants of subjective norms. Normative beliefs refer to the individual's beliefs towards how his/her social surrounding would evaluate his/her behavior. Thereby, an approval or disapproval from the social surrounding can influence the individual's belief about performing the behavior. For example, an individual might believe that if he/she buys a seal fur coat, this would be approved by his/her colleagues in the workplace because of the coat's fancy look. On the other hand, that individual might also believe that if he/she buys a seal fur coat, his/her environmentalist school friends would be against this behavior due to he/she would support the industry of seal hunting. In this case, the individual would decide whether to buy the seal fur coat according to which one of those beliefs that based on his/her social surrounding reaction is more important for him/her. To sum up, subjective norms, as one of the determinants of intentions, are considered to be a function of the individual's beliefs on perceived approvals and/or disapprovals that arise from social judgments on whether or not to perform a specific behavior (Ajzen, 2005b, p. 124).

### *3.1.3. Perceived Behavioral Control*

Perceived behavioral control (PBC) is the most prominent variable that distinguishes TPB from TRA, and it forms the basis of TPB as well. Ajzen (1991) mentions that PBC grew out of Bandura's (1977, 1982) "Self-Efficiency" theory. Self-efficacy refers to the individual's expectation or confidence that his/her ability to

perform a behavior (Bandura, 1982). In detail, Bandura (1977, p. 191) explains the structure of self-efficiency as follows, “expectations of personal efficacy determine whether coping behavior will be initiated, how much effort will be expended, and how long it will be sustained in the face of obstacles and aversive experience”. Accordingly, TPB processes PBC as similar to self-efficiency theory, but “…within a more general framework of the relations among beliefs, attitudes, intentions, and behavior” (Ajzen, 1991, p. 184). Ajzen (1985) introduces PBC as an “exogenous variable” that has motivational implication for behavioral intentions, and/or a direct indicator of the actual behavior in some situations. PBC was added into the TPB in order to “attempt to deal with situations in which people may lack complete volitional control over the behavior of interest” (Ajzen, 2002, p. 666).

In general, Ajzen (1991) suggests that PBC is the individual’s perception of his/her ability to perform a behavior. In other words, PBC is a perceived degree of ease or difficulty toward performing the behavior in question. Wang, Zhang and Li (2014) stress that the possible restrictions to perform a behavior such as convenience, time, duration, and economic condition can affect the strength of PBC. In this sense, PBC depends on both internal and external control factors that facilitate or inhibit to perform the behavior in question. Internal control factors include “information, personal deficiencies, skills abilities and emotions” whereas external factors include “opportunities, dependence on others, and barriers” (Conner, 1993, p. 29).

According to Ajzen (1991), PBC and behavioral intention can be used together directly to predict the final behavior. Following this, PBC can affect the behavior either directly, or as mediated by behavioral intention. The degree of the individual's control perception over the behavior determines his/her behavioral intention of whether or not to perform the behavior. Once the individual has sufficient resources and opportunities towards performing a particular behavior, then he/she would be strongly intended to perform the behavior of interest. However, even though the individual is intended to perform the behavior, he/she might not believe that he/she cannot afford to perform the behavior in question. For example, an individual might want to recycle his/her household wastes, but he/she might also think that he/she has not enough time to perform recycling during in his/her daily routine. As a result, given the insufficient effort to recycle household wastes is derived from the individual’s low control perception over the recycling behavior.

On the other hand, PBC represents the actual behavior in some situations. In this sense, PBC can directly affect the actual behavior when the individual has no control over performing the behavior (Ajzen, 2005b). In other words, if the individual does not have sufficient knowledge, and resources or some opportunities are not available to perform the behavior of interest, then the individual cannot perform the behavior due to those reasons that are out of his/her control. For example, an individual might intend to recycle his/her household wastes to reduce environmental pollution, but he/she cannot not perform the recycling behavior unless there are no recycling containers near to his/her house or hood. In this case, an external factor that is not depend on the individual's intention or effort can directly affect the ability of the individual's performing toward the behavior in question.

Ajzen (1991) proposes control beliefs as the basis for the perceptions of behavioral control. Accordingly, control beliefs can be affected by "some parts of past experiences", "second-hand information", "the experiences of acquaintances", and/or some other factors that increase or reduce the perceived difficulty to perform a specific behavior. (Ajzen, 1991, p. 196). For example, once the individual feels so tired about walking to reach a supermarket that is far from home, he/she might not prefer to walk again to that supermarket in the future. In this sense, the individual might believe that if he/she walks to that supermarket again, the expected consequence might be the same as in the past experience that he/she had before. As another example, when the individual is told a bad experience about having a vacation in a particular country by his/her close friend, the individual might not prefer to visit that country in the future due to his/her close friend's experience. Consequently, the individual might refrain from getting the same bad experiences as his/her close friend had before.

### *3.1.4. Intention*

As in TRA model, the intention is the central factor of TPB as well. Ajzen (1985) suggests that behavior is determined by the intention to perform (or not to perform) a particular behavior. The intention is considered as a strong predictor of the behavior under volitional control (Ajzen, 1991, p. 181). Several studies have shown that an individual's intention is the last step before whether or not he/she performs a particular behavior (Bagozzi & Warshaw, 1992; Valle et al., 2005; Macovei, 2015). Basically, a behavioral intention indicates that how hard the individual is willing to try, and how much effort he/she plans to exert towards performing a certain behavior

(Ajzen, 1991). According to Conner and Armitage's (1998, p. 1430) definition of behavioral intention; "intentions represent a person's motivation in the sense of her or his conscious plan or decision to exert effort to enact the behavior". Thereby, if the individual's intention is strong to engage in a particular behavior, he/she likely to perform the behavior in question (Ajzen, 1991).

In both TRA and TPB models, the intention is considered as a mediating function between the actual behavior and socio-psychological variables that explain the actual behavior (Fishbein & Ajzen, 1975). Nevertheless, the significant difference between the TRA and the TPB model is that TRA does not include the perceived behavioral control factor whereas TPB indicates it as an important influencer of the individual's intention and action. In this context, TPB postulates that behavioral intention is determined by three variables; perceived behavioral control, subjective norms, and attitudes toward behavior (Ajzen, 1985, 1991).

## 3.2. Norm Activation Model

The Norm Activation Model (NAM), the main development purpose of which is to explain altruistic and pro-social behavior (Schwartz, 1977), has been one of the most used theories in predicting pro-environmental behaviors (Schwartz, 1977; Schwartz & Howard, 1981; De Groot & Steg, 2009; Onwezen, Antonides & Bartels, 2013; van der Werff & Steg, 2015). NAM asserts that an individual who performs an altruistic behavior considers his/her self-interest worth to sacrifice for the collective benefits of others (Fang et al., 2019). In other words, altruistic behavior stems from an intrinsic drive to help others in need (Zor, & Dervişoğlu, 2017). Furthermore, Schwartz (1977) labels altruistic behavior as "helping" and "pro-social" behavior.

Schwartz (1977) proposes that behavior is a reflection of an individual's intrinsic value system, and the individual exhibits certain behavior when only convenient situations arise for the activation of norms and values. Schwartz (1977, p. 241) explains the structure of altruistic behavior as follows "…a process moving from the initial perception of need through the activation of the normative structure and the generation of feelings of moral obligation to the eventual overt response", and additionally, he also argues that both situational and individual variables can influence this process. Blamey (1998, p. 678) mentions that the activation of "helping" norms exposes when an individual is aware of the others are in need (personal norms), when the individual feels responsible to act (ascription of responsibility*)*, and when the individual feels that

his/her behavior might lead to positive consequences for the others (awareness of consequences). In sum, Schwartz's (1977) NAM proposes that the interrelationship of three variables influences altruistic behavior, and these variables are namely; personal norms, awareness of consequences, and the ascription of responsibility.

NAM considers personal norms as a determinant construct of a certain behavior or intention. Schwartz (1977) defines personal norms as the feeling of the moral obligations of whether or not to perform a behavior in a specific manner. Thøgersen (2006, p. 248), defines personal norms as "the self-expectation of a specific action in a particular situation". According to Schwartz (1977), an individual's personal norm is determined by the influences of awareness of consequences and ascription of responsibility. Awareness of consequences is defined as "a disposition to became aware of the potential consequences of one's acts" (Schwartz, 1968, p. 357). In other words, it is to be aware of the harmful consequences of not being helpful for others or the environment. Ascription of responsibility is considered as feeling responsible for the negative consequences of not acting pro-socially (Steg & De Groot, 2010, p. 725). Furthermore, Stern (2000) posits that ascription of responsibility can be also interpreted as "the perception of ability to reduce the threat" in environmental behavior studies.

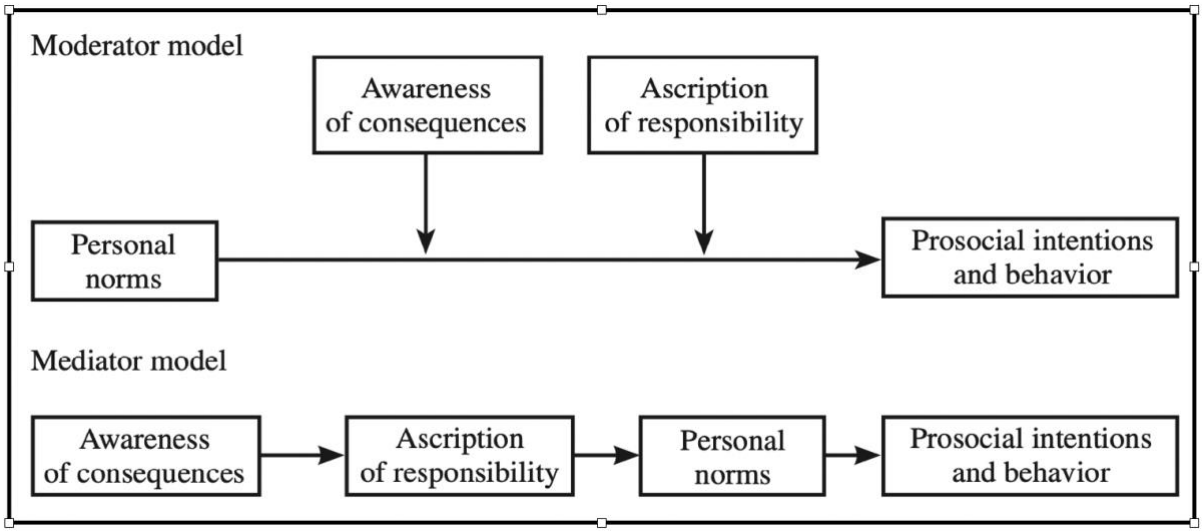
Many researchers have argued that the model construction of NAM should be interpreted as either a moderator or mediator model (**Figure 9**). Moderator model proposes that both awareness of consequences and ascription of responsibility moderate the personal norms and behavior (Hopper & Nielsen, 1991; Schwartz & Howard, 1980; Vining & Ebreo, 1992; Steg & De Groot, 2010). In other words, awareness of consequences and ascription of responsibility together directly influence personal norms, and personal norms are immediate predictors of pro-social behavior or intention (Steg & De Groot, 2010). Moreover, De Groot and Steg (2009, p. 427) explain that the moderator model suggests "…the relationship between personal norms and pro-social behavior to be especially strong among people who are highly aware of the consequences of not acting pro-socially and people who feel highly responsible for the consequences of this behavior".

On the other hand, according to mediator (or sequencer) model, awareness of consequences and ascription of responsibility have indirect effects on the behavior (De Groot & Steg, 2009; Stern & Dietz, 1994; Onwezen, Antonides & Bartels, 2013; Steg & De Groot, 2010). Ascription of responsibility has a mediator impact on the relationship between awareness of consequences and personal norms whereas personal norms have a

mediator impact on the relationship between ascription of responsibility and behavior or behavioral intention (Onwezen, Antonides & Bartels, 2013, p. 142; De Groot & Steg, 2009; Steg & De Groot, 2010; Stern et al., 1999; Han, 2014). In other words, awareness of consequences influences ascription of responsibility, and ascription of responsibility leads to expose personal norms.

De Groot and Steg (2009) employed five studies to examine both mediator and moderator models of NAM. Their implications have proposed that "…the relationship between ascription of responsibility and prosocial intentions was (partially) mediated by personal norms, and ascription of responsibility (partially) mediated the relationship between awareness of consequences and personal norms" (De Groot & Steg, 2009, p. 446). Overall, they support the idea that NAM should be interpreted as a mediator model rather than a moderator model (Onwezen, Antonides & Bartels, 2013). In this thesis study, however, it is aimed to employ NAM with both interpretations in order to provide a wider theoretical framework towards the combination of TPB and NAM in the context of household energy conservation behavior.

**Figure 9.** Mediator and Moderator Interpretations of NAM




(Citated from De Groot & Steg, 2009, p. 427)

### *3.2.1. Awareness of Consequences*

According to Schwartz (1968), awareness of consequences is a personal orientation that represents the individual's tendency to become aware of his/her behavior's potential consequences (e.g., psychological or physical effects) for the welfare of others. During the decision-making process of whether or not to perform a

behavior, the individual high in awareness of consequences is expected "to become aware of extensive and specific consequences of possible acts for others, and to adopt the perspective of those to be affected" (Schwartz, 1968, p. 357). Moreover, Schwartz (1968) also mentions that the emphatic ability is not requited for the individual's awareness of his/her behavioral consequences because the individual who is aware in detail of how his/her behavior might affect others is possibly to experience activation of moral norms. According to De Groot and Steg (2009, p. 426) definition, awareness of consequences is stated as follows; "whether someone is aware of the negative consequences for others or for other things one values when not acting pro-socially". In terms of pro-environmental behavior, awareness of consequences refers to the extent to which the individual links his/her behavior to environmental effects (Kirby, 2021). In this context, Stern et al. (1995) argue that awareness of consequences construct should not be considered for only other people, but other living species and "adverse consequences for the self" (Loo, Yeow & Eze, 2013, p. 6). For the individual, it is hard to feel a strong sense of obligation to perform a pro-environmental behavior unless he/she is not aware of the behavioral consequences. Thereby, the individual is more likely motivated to perform a pro-environmental behavior if he/she is aware of which way to solve or mitigate environmental problems (Park & Ha, 2014).

As mentioned earlier, there are two main approaches toward the role of awareness of consequences in NAM structure. According to the mediator interpretation of NAM, the role of awareness of consequences construct is to influence ascription of responsibility, and ascription of responsibility construct influences personal norms. On the other hand, the moderator interpretation proposes that in addition to ascription of responsibility, awareness of consequences also directly impacts personal norms, without the need for any other mediator variable (De Groot & Steg, 2009).

### *3.2.2. Ascription of Responsibility*

Many researchers have emphasized that the ascription of responsibility component in NAM either directly or indirectly affects the individual's personal norms that influence his/her intention to perform the behavior for the benefit of society or the environment (Schwartz & Howard, 1981, 1984; Steg & De Groot, 2010; Onwezen, Antonides & Bartels, 2013; Han, 2014). Accordingly, the individual who ascribes responsibility to himself/herself on pro-social issues is more likely to support and perform pro-environmental behaviors (Fang et al., 2019; Steg, Dreijerink & Abrahamse,

2005). According to Steg and De Groot (2010, p. 725), ascription of responsibility is defined as “feelings of responsibility for the negative consequences of not acting pro-socially”. In terms of environmentally related behaviors, the ascription of responsibility is the degree of responsibility that an individual assumes over his/her acts toward the environment (Aguilar-Luzón et al., 2012). Basil, Ridgeway and Basil (2006, p. 1037) suggest that the emergence of the individual's sense of responsibility might stem from either his/her “causing something to occur” or “failing to avoid the onset of some occurrence”.

As a comprehensive approach, Schwartz (1977) claims that the sense of responsibility refers to the individual’s sense of connection and/or relatedness with others in need. According to his research, the emergence of a sense of responsibility is based on the following five conditions (Schwartz, 1977, p. 246-250). Firstly, the individual can evoke his/her sense of responsibility if he/she becomes aware of his/her own ability to perform a useful/pro-social behavior for another's need even in a chance encounter. Secondly, the sense of responsibility can be established if the individual is causally connected to another's need. Schwartz (1977) explains this as follows; "…theorizing about harm-doer responses to their victims postulates that harmful acts are seen as establishing a relationship with the victim (i.e., responsibility) which fosters activation of internalized equity-based norms" (Schwartz, 1977, p. 246). Thirdly, a sense of responsibility can be induced if an individual feels accountable for what happens to another. To the extent that, this type of responsibility might be emerged by pointing out an individual that he/she is "responsible", or by allocating someone as "in charge" in a particular situation. Fourthly, another main basis of responsibility is "the possession of distinctive suitability to respond" as skills, knowledge, or physical characteristics, or the relative exclusiveness of the individual's availability Schwartz, 1977, p. 248). Helping is influenced by the suitability of various sorts through the implication of special relatedness, and thus activation of personal norms. Furthermore, the helping can be also influenced through some alternative processes (e.g., "increasing mood or self-esteem, and the expectation of social sanctions for inaction") that are not mediated by senses of moral obligations (Schwartz, 1977, p. 248). Lastly, exposure to a direct appeal is the fifth basis of responsibility. Schwartz (1977) explained this as follows; "Implicit in any appeal is the focusing of responsibility by the solicitor of help upon the person addressed. In addition to inducing responsibility, of course, appeals may promote helping by drawing attention to the existence of a need, overcoming

ambiguity regarding its reality, and pointing to social expectations for behavior" (Schwartz, 1977, p. 249). Additionally, Schwartz (1977) also indicates that the dependency is an important condition which promotes the sense of responsibility. The dependency condition is a complex variable, and it might impact the individual's decision-making process. According to Schwartz (1977), dependency is operationalized as the degree to which the potential helper's actions determine the outcomes of the other. He explains the dependency factor as follows "…the greater the other's dependency, the more salient and serious the other's need, the more able one is to relieve it, and the more suitable and distinctive one is as the source of aid" (Schwartz, 1977, p. 250). Consequently, dependency can be considered as the combination of need, ability and responsibility.

### *3.2.3. Personal Norms*

NAM (Schwartz, 1977) posits that the individual's personal norm is the key determinant of his/her pro-social behavior. Personal norm refers that to what extent the individual feels right or wrong in terms of his/her self-moral grounds whether or not to perform a specific behavior (Schwartz, 1977). In other words, personal norm can be also described as the feeling of a "moral obligation to perform or refrain from specific actions" (Schwartz & Howard, 1981, p. 191). The concept of personal norms has been successfully tested, and developed in pro-social behavior domain (Harland, Staats and Wilke, 1999; Bamberg, Hunecke & Blöbaum, 2007). Therefore, personal norm can be considered as the basic premise of performing altruistic behaviors (Park and Ha, 2014). The individual's personal norm is interchangeably used as "moral norm" or "sense of obligation" to take pro-environmental actions (Han et al., 2018, p, 6). Fang et al. (2019, p. 2) propose that the individual's moral obligation in personal norm can "serve as a motivating factor that engages in pro-environmental behaviors". According to van der Werff & Steg (2015, p. 8), although a pro-environmental behavior is difficult or somewhat costly to perform, the individual who has strong personal norms can be intrinsically motivated to perform the behavior in question in order to feel good on his/her moral ground. However, they also noted that people can be less likely to perform upon their personal norms when the behavior in question is very difficult or costly. (van der Werff & Steg, 2015)

Schwartz and Howard (1984) assume that personal norms include "cognitive component of value-based expectations or goals", and/or "emotional component of

anticipatory feelings of self-(dis)satisfaction", and "a personal norm is constructed for each potential action perceived as relevant" (Schwartz & Howard, 1984, p. 234). In terms of pro-environmental behavior, the individual implicitly investigates whether or not he/she is morally responsible for the potential pro-environmental actions as considering his/her own internalized moral values. Accordingly, the individual's personal norm exposes as a "self-based standard" that is stemmed from internalized values as momentary for a specific pro-environmental action in the behavioral decision-making process. Eventually, personal norm is considered as a "situation-specific" reflection of both cognitive and affective implications of the individual's values for specific behaviors (Schwartz & Howard, 1984, p. 234).

The activation of personal norms that is relevant to morally evaluated altruistic behavior bases on three criteria (Schwartz, 1973; Harland, Staats & Wilke, 1999). Firstly, when the individual becomes "aware of consequences for the welfare of people in a situation", second, when the individual holds "personal norms enjoining action pertinent to these consequences", and third, when the individual feels "some capability to control the action enjoined and its outcomes – some personal responsibility" (Schwartz, 1973, p. 353). As result, the individual's awareness of consequences and ascription of responsibility constructs are considered as main determinants of his/her personal norms in the process of performing an altruistic behavior.

## 3.3. Behavior

Behavior analysis was an essential topic in the 1950s and 1960s, and eventually, it became a discipline unto itself through the state funds and contributions of some associations in the mid of 1970s in the United States (Morris et al., 1990). Since then, although behavioral studies have gained an important place in many scientific fields such as social sciences, life sciences and psychology, many researchers have refrained from defining behavior term in a general way (Eilam & Trop, 2012; Uher, 2016). As a matter of fact, a philosophical definition of behavior is different than a biological one, or there might be some distinctions between the psychological and sociological views to explain what behavior refers to. Therefore, it has not been easy to propose a common definition of behavior due to each discipline tends to redefine behavior.

Levitis, Lidicker and Freund (2009) explain behavior as the general name for all kinds of cognitive, affective, and psychomotor (bodily-physical) reactions of living things to the outside world in psychological terms. Eventually, the cognitive, affective,

and psychomotor dimensions in question interact with each other, and behavior emerges as a result of this process. According to Popescu's (2014, p. 443) definition, behavior is "a total response of an organism, in reply to living circumstances, depending on the environmental stimulation and its internal tension of successive movements which are oriented in a significant way". In addition, behavior is usually called "*response*" in behavioral studies (Lazzeri, 2014), and it can be influenced by genetic factors besides culture, values, ethics, attitudes, coercion, authority, and/or persuasion impacts (Hemakumara and Rainis, 2018, p. 93).

Generally speaking, individuals are mostly in an interaction with the environment; when having dinner in a restaurant, choosing the vegetables in the supermarket, taking a bus or having a walk, as well as purchasing eco-friendly products or using chemicals for the garden soil. According to Krajhanzl (2010, p. 251), the individual is connected to the environment by his/her physical nature, and any kind of human movement within the environment can be called environmental behavior. As he also states, however, even though this overall approach is correct, it would be still relatively insufficient to explain environmental behavior in terms of disciplinary communication (Krajhanzl, 2010). Thereby, it is crucial to make a distinction between "significantly environmental behavior" and "general environmental behavior" in order to crystalize the meaning of the environmental behavior. Following this, Stern (2000, p. 408) mentions that "environmentally significant behavior can reasonably be defined by its impact". Thus, environmental behavior term can be explained by a respect to environmental concerns (Van Liere & Dunlap, 1981). To that extent, a behavior that has a threat to change the availability of natural resources or any kind of materials from the environment, or has a significant impact on the alteration of the structure of the biosphere (Stern, 1997) can be related to the environmentally significant behavior. As a result, human behavior that has negative or positive, greater or smaller impacts on the environment should be separated from any human movements which might not have any significant impact on the environment.

### *3.3.1. Pro-environmental Behaviors*

In the literature, pro-environmental behaviors can be sometimes called as "environmental-friendly behaviors", "environmentally concerned behaviors", "ecological behaviors", "environmentally significant behavior", "environment-preserving behavior", and/or "environmentally responsible behavior" (Kurisu, 2015;

Krajhanzl, 2010; Stern, 2000; Thøgersen, 2004; Lee, Jan & Yang; 2013). In broad, pro-environmental behaviors can include any kind of responsible behavior that refrains from harmful acts for the environment's sake, and/or attempting to solve environmentally related issues. In other words, pro-environmental behaviors refer to "…behavior that harms the environment as little as possible, or even benefits the environment" (Steg & Vlek, 2009, p. 309). In this sense, some environmentally related behaviors such as changing travel modes, conserving residential energy (i.e., gas, electricity and water) consumption, purchasing green products, or recycling household wastes can be considered as pro-environmental behaviors. To that extent, Cleveland, Kalamas and Laroche (2012) suggest that pro-environmental behaviors can be identified in six categories as "activist", "avoider", "green consumer", "utility saver", "recycler" and "green passenger". Accordingly, Ghazali et al. (2019, p. 3) explain those categories as follows;

The "activist" refers to the individual who intends to take public action such as participating in environmental demonstrations, and/or supporting environmental organizations and institutions in order to influence the masses about the matter of environmental protection (Stern et al., 1999). The "avoider" refers to the individual who boycotts harmful products and goods for the environment and living species. For example, avoiding buying a leather jacket or avoiding particular products that are environmentally harmful packaged can be considered as examples of the avoider's decisions (Cleveland, Kalamas & Laroche., 2012). The "green consumer" refers to the individual who is morally motivated to make awareness or contribute to solving environmental problems by purchasing eco-friendly (or green) products, goods, and services rather than conventional ones. (Lee et al., 2014; Ghazali et al., 2017; Arisbowo & Ghazali, 2017). The "green passenger" refers to the individual who is willing to reduce negative impacts of carbon dioxide, and greenhouse gas emissions in the atmosphere that stem from petrol engine vehicles. The "green passenger" can be engaged in both personal reasons such as taking the bus or cycling to conserve on petrol costs for a private car, and public reasons such as taking tramway to protect the environment from carbon pollution (Cleveland, Kalamas & Laroche., 2012). The "recycler" refers to the individual who tends to deal with recyclable materials (e.g., glass, paper, plastic, battery, and cans) and recycled products. Previous research showed that recycling behavior leads to positive long-term both social and environmental consequences such as conserving resources and/or reducing in general waste (McCarty

& Shrum, 1994; Vining & Ebero, 1990). The “utility saver” refers to the individual who made effort to minimize (or conserve) the utilities (electricity, gas or water) usage because of the awareness of environmental consequences. This can be explained through, for example, turning off the lights or the heater before leaving home, or conserving water usage while brushing the teeth.

It is crucial to understand pro-environmental behaviors in the development of environmentally related theories and models in order to encourage individuals to take pro-environmental actions as well as contribute to the developments of policymakers’ sustainability projects (Sawitri, Hadiyanto & Hadi, 2015). In social psychology literature, many behavior models and theories have been developed to predict pro-environmental behaviors. Generally, the common purpose of those models has been to understand the relationship between social and psychological elements of pro-environmental behaviors, and to predict how those socio-psychological constructions affect the individual’s performance process of environmentally related behaviors. In this context, both "Theory of Planned Behavior" (TPB) (Ajzen, 1985) and "Norm Activation Model" (NAM) (Schwartz, 1977) have been the most employed behavior models to predict pro-environmental behaviors. Therefore, the main focus of this thesis is to examine both TPB and NAM constructions because beside their popularity, TPB and NAM propose also different perspectives to explain pro-environmental behaviors.

In addition to TPB and NAM, it is also important to note that some behavior models have developed various approaches toward the examination of pro-environmental behaviors. Hence, this section aims to provide brief information about what kind of socio-psychological as well as cognitive factors are effective in the prediction of pro-environmental behaviors through the approaches of various models.

**Theory of Interpersonal Behavior (TIB) Model**

TIB model was developed by Triandis (1977) in order to examine psycho-social factors behind the individual’s specific behavior. Basically, Triandis’ (1977) TIB model proposes that emotions (affective), attitudes and social factors have a crucial role in shaping the individual’s intention. Intention is an antecedent of behavior, and the behavior is also mediated by habits. Both habits and intentions are moderated by “facilitating conditions”. Eventually, the individual performs the behavior (Egmond & Bruel, 2007).

**Motivation Opportunity Ability (MOA) Model**

MOA model was developed by Ölander and Thøgersen (1995). They focus on three concepts to explain the individual's environmentally related behaviors; and these factors are "ability", "opportunity", and "motivation". In MOA model, the "motivation" concept is a simplified version of Theory of Planned Behavior (see Ajzen, 1985; 1991). Furthermore, several options were also suggested by Ölander and Thøgersen (1995), including use of the motivational aspect of Triandis' (1977) model (Sajeewanie et al., 2019). The "opportunity" component is connected to Stern's (2000) notion of external conditions and Triandis' (1977) concept of facilitating conditions.

**Two-Phase Model**

The "Two-Phase" model was developed by Hirose (1994). Hirose (1994) proposes that intention consists of two phases as "goal intention" and "behavior intention". According to Kurisu (2015, p. 53), the individual's intention to contribute to solve an environmental problem is defined as "goal intention". "Perceived seriousness", "ascription of responsibility" and "belief in the effectiveness" are proposed as main determinants for the "goal intention". "Behavior intention" is directly connected with the behavior in question, and is determined by "feasibility evaluation", "cost-benefit evaluation" and "social norm evaluation" (Kurisu, 2015, p. 53).

**Value Belief Norm (VBN) Model**

VBN model (Stern et al., 1999, Stern, 2000) was developed in order to explain pro-environmental behaviors. Basically, VBN combines Schwartz's (1977) Norm Activation Model (NAM), Dunlap and Van Liere's (1978) New Environmental Paradigm (NEP), and Schwartz's (1994) Value theory. According to Stern (2000), the individual's pro-environmental behavior can be categorized into four types; these are "environmental activism", "behaviors in organizations", "private-sphere behaviors" and "non-activist behaviors in the public sphere". VBN proposes that a casual chain of five variables influences pro-environmental behavior (Chen, 2015). These variables are values (egoistic, altruistic, and biospheric), NEP, awareness of consequences (AC), the ascription of responsibility (AR), and personal norms (PN). Three types of value orientation (ego, alt, and bio) influence the individual's ecological worldview (NEP). The individual's NEP enacts his/her awareness about the possible consequences (AC) of

pro-environmental behaviors. The individual who becomes aware of the consequences develops a feeling of responsibility (AR) for pro-environmental behaviors. Eventually, the individual develops a sense of obligation to perform pro-environmental behaviors (PN).

### *3.3.2. Theory of Planned Behavior in Pro-environmental Context*

TPB has been one of the most used models in the social psychology literature (Bamberg, 1996). Especially, many studies in the pro-environmental context such as; green product consumption (Chan, 2001; Albayrak, Aksoy & Caber, 2013; Paul, Modi & Patel, 2016), waste management and recycling (Taylor & Todd, 1995; Aguilar-Luzon et al., 2012; Echegaray & Hansstein, 2017), food waste behavior (Russel et al., 2017; van der Werff, Seabrook & Gilliland, 2019; Coskun & Yetkin Ozbuk, 2020; Graham-Rowe, Jessop & Sparks, 2015), energy conservation (Allen & Marquart-Pyatt, 2018; Clement, Henning & Osbaldiston, 2014; Lynch & Martin 2013; Macovei, 2015; Gao et al., 2017; Liu et al. 2020) and travel choices (Bamberg, Ajzen & Schmidt, 2003; Sonja, 2004; Tsai, 2010) have shown that Ajzen's (1985, 1991) TPB model can be employed in predicting pro-environmental behaviors and intentions.

As an example, Masud et al. (2016) have found that attitude towards climate change, subjective norms, and PBC have a positive influence on adapting to climate change, but PBC was found statistically insignificant. Wu and Chen's (2014) study on the purchasing intention for green products have revealed that attitude, subjective norm and behavioral control are positively related to green purchasing intention, and green purchasing intention is significantly and positively related to the green purchasing behavior. Bamberg, Ajzen and Schmidt's (2003) study on travel choices have demonstrated that college students' intention to take the bus to the campus is significantly influenced by attitude, subjective norm, and perceived behavioral control.

The model structure of TPB is available to include other socio-psychological constructs (Ajzen, 1991) that might have significant influences on determining the individual's intention or behavior (e.g., social characteristics, values, personal norms, self-efficiency belief and etc.). Thus, several researchers have developed some models based on TPB with considering the possible influences of other social-psychological constructs to provide a better prediction towards energy conservation behavior and intention.

In particular, examining energy consumption behaviors provides a broad understanding which factors might have significant roles on individuals' energy-saving behaviors in the household domain. Yet, although TPB has been used to predict household energy conservation intentions and behaviors, fewer studies are available in the literature (Clement, Henning & Osbaldiston, 2014). Gao et al. (2017) have found that individuals' energy conservation intention in workplaces is significantly affected by personal moral norm, and descriptive norm, besides attitude towards energy conservation behavior and perceived behavioral control. Additionally, their study has also shown that the subjective norm factor had not any significant impact on individuals' energy conservation intention in workplaces. Wang, Zhang and Li (2014) have developed a theoretical model that based on TPB to focus on the relationship between energy conservation intention of household and its corresponding determinants. Their study has proposed that "subjective norms, environmental attitude, information publicity, lifestyle, and perceived behavioral control have obvious effects on residential energy-saving behavior" (Wang, Zhang & Li, 2014, p. 14). Lee and Tanusia (2016) have examined the predictors of energy conservation intentions of students who stay in a campus hostel. According to their findings, participants' intention to conserve energy usage on campus was positively and significantly driven by attitudes, subjective norms, and self-efficiency on campus. In addition, they have also revealed that participants' attitude at home towards energy conservation had not a significant impact on energy conservation intention on campus, but had an indirect influence via the mediating effect of attitude on campus.

Liu et al. (2020) have found that attitude and PBC have significant roles in the household energy-saving behavioral process whereas the significance of subjective norm is lower than expected. Additionally, they have also shown that behavioral intention towards energy conservation is significantly influenced by the two interaction terms (i.e., subjective norm – attitude, and attitude – perceived behavioral control). Abrahamse and Steg' (2011) have studied household energy consumption behavior, and intention to conserve energy usage in the household domain. They have supported the idea that household energy conservation behavior can be achieved through energy conservation intention at the household level. Accordingly, participants who have higher levels of perceived behavioral control and positive attitudes to conserve energy are more likely to intend to reduce their energy consumption. However, this study has

also found that subjective norms had not any significant impact on behavioral intentions toward energy conservation.

### *3.3.3. Norm Activation Model in Pro-environmental Context*

Some research has supported the idea that NAM can be employed in the social as well as the environmental domain in order to examine why individuals engage in pro-environmental behavior (Steg & De Groot, 2010). Several studies have integrated some variables into NAM structure to provide a better explanation for the individual's pro-environmental behavior. As it mentioned earlier, Stern et al. (1999) have developed the Value Belief Norm model by adding New Ecological Paradigm (Dunlap et al., 2000) and Values theory (Schwartz, 1992) variables into NAM to strengthen the predictive power of NAM in pro-environmental behavior explanations. In several studies, social norm variable has been implanted into NAM model in order to indicate the influence of social factors on the individual's pro-environmental acts (Bamberg, Hunecke & Blöbaum, 2007; Onwezen, Bartels & Antonides, 2014; Han, 2014).

Many studies have shown that NAM can be employed successfully in order to explain various types of pro-environmental behaviors such as recycling (Hopper & Nielsen, 1991; Vining & Ebreo, 1992), pro-environmental consuming choice (Thøgersen, 1999), waste reduction (Ebero, Vining & Cristancho, 2003; van der Werff et al., 2019), carbon footprint mitigation (Vaske, Jacobs & Espinosa, 2015), choice of travel mode (Hunecke et al., 2001), and energy conservation behavior (van der Werff & Steg, 2015). For example, Fang et al. (2019) studied pro-Environmental Behaviors of public servants at the central and local governments in Taiwan. The study findings have indicated that personal norms of public servants at the central government have a significant and positive effect on their pro-environmental behaviors. Moreover, personal norms of public servants at the central government have an important role in influencing their pro-environmental behaviors indirectly via ascription of responsibility and awareness of consequences.

In particular, NAM emphasizes that moral obligations are important in the motivation of environmentally friendly behaviors such as energy conservation (van der Werff & Steg, 2015). In this context, NAM postulates that personal norm is an important indicator of energy conservation behavior. When the relationship between energy conservation behavior and personal norms is examined, it is expected that the individual who believes that the protection of natural resources is important performs

energy consumption activities by feeling a moral responsibility (Harland, Staats and Wilke, 2007).

According to van der Werff and Steg's (2015) research, NAM is strongly related to general indicators of the intention to reduce energy usage. In turn, NAM can be used to predict the different types of energy usage behaviors. The research findings have shown that the individuals who are aware of environmental problems due to energy consumption strongly feel that they can mitigate the environmental problems by changing their environmental behavior. Accordingly, the individuals who think that the environmental problems can be mitigated by a responsible behavior-changing have stronger feelings of moral obligation to conserve energy. Zhang, Wang & Zhou (2013) studied on the energy conservation behavior of office workers in Beijing. The study findings have indicated that personal norm variable positively influences office workers' electricity saving behavior. Accordingly, both awareness of consequences and ascription of responsibility positively and significantly impacted personal norms of office workers. Additionally, the study results have also revealed that awareness of consequences positively affected ascription of responsibility, which means that the mediator interpretation of NAM might be valid for this study. Song, Zhao & Zhang (2019) conducted research that examines the influencing factors of Chinese urban resident’s consuming energy-conserving appliances in the context of haze pollution. According to the findings, personal norms significantly and positively influence the purchasing behavior of energy-saving appliances. Moreover, personal norms were positively and significantly influenced by both awareness of consequences and ascription of responsibility. Furthermore, the findings have also supported the moderator interpretation of NAM that personal norm can be activated by both awareness of consequences and ascription of responsibility.

Black, Stern & Elworth (1985) studied on 478 residential electricity consumers in Massachusetts in order to investigate the interactive effects of economic, demographic, structural and psychological variables on energy conservation responses. Their study findings have revealed that the personal norm towards energy conservation in the household domain was influenced by awareness of consequences to others of energy efficiency at home and ascription of responsibility for energy conservation to individuals like oneself (Black, Stern & Elworth, 1985, p. 12).

## 3.1. The Study Model in The Framework of Theory of Planned Behavior and Norm Activation Model

Several studies have shown that combining TPB (Ajzen, 1985, 1991) and NAM (Schwartz, 1977; Schwartz & Howard, 1981) provides a wide perspective in the prediction of the individual's pro-environmental intention and behavior (e.g., Liu et al., 2017; Bamberg, Hunecke & Blöbaum, 2007; Park & Ha, 2014; Wall, Devine-Wright & Mill, 2007; Harland, Staats & Wilke, 1999; Parker, Manstead, & Stradling, 1995; Han, 2014; Setiawan, Afiff & Heruwasto, 2020; Macovei, 2015b). Both TPB and NAM are empirically supported models, but also distinctive theoretical frameworks to predict the individual's pro-environmental behaviors (Liu et al., 2017). TPB assumes that the individual's pro-environmental behavior is "a result of the process of weighing costs and benefits of the relevant behavior" whereas NAM asserts that the individual's pro-environmental behavior is a form of altruistic behavior "for the sake of collective interests" (Abrahamse & Steg, 2009, p. 712).

Understanding the impacts of individuals' psychological, motivational, and socio-demographic factors on household energy conservation can reveal a hint as to what kind of incentives should be taken into account to mitigate environmentally related issues caused by energy consumption. Thereby, various researches have been conducted to examine socio-demographic and psychological or motivational factors of household energy consumption and conservation behavior (Frederiks, Stenner & Hobman, 2015). In this context, the conceptual integration model of TPB and NAM in this thesis study specifically aims to focus on the relationship between the components of both moral obligations and personal cost-benefits in the prediction of the individuals' household energy conservation behavior. Furthermore, this thesis study also aims to indicate to what extent each model separately is able to explain the individuals' household energy conservation behavior. Hence, 11 hypotheses were developed in order to examine the psychological variables of both NAM and TPB separately as well as combined.

Abrahamse and Schuitema (2020) have stressed that TPB is a useful framework to examine energy conservation behaviors and intentions. In TPB model, attitude towards behavior is one of the determinant factors of the individual's intention of whether or not to perform the behavior (Ajzen, 1991). TPB proposes that attitude towards behavior refers to the individual's favorable or unfavorable evaluation to

perform the behavior. Therefore, the individual's attitude can be defined as negative or positive emotions or beliefs regarding energy conservation behavior in the household domain. Some studies have shown that the individual's attitude toward behavior has a direct and positive influence on his/her behavioral intention (Ajzen, 1991; Clement, Henning & Osbaldiston, 2014; Fishbein & Ajzen, 1975). Accordingly, a positive attitude of the individual towards the environment can promote energy conservation behaviors (Wang, Zhang, & Li, 2014). Supporting this approach, Liu et al. (2017, p. 14) have found that the attitude towards energy conservation behavior is a significant contributor to household energy conservation intention. Similarly, Ru, Wang, and Yan's (2018) study results have revealed that attitude towards energy conservation behavior is positively related to behavioral intentions to save energy consumption. Abrahamse and Steg's (2011) research findings have also indicated that the participants who have a positive attitude to conserve energy have stronger intentions to save their energy consumption in the household domain. As result, the first hypothesis is proposed as below;

**H1:** Attitudes toward household energy conservation positively affect household energy conservation intention.

In the TPB model, subjective norm is another psychological determinant of behavioral intention. According to Ajzen (1991), the subjective norm refers to perceived social pressures about performing a particular behavior. In this sense, the individual evaluates the social pressure towards a specific behavior with its social costs-benefits in turn for himself/herself. Eventually, the individual develops an intention to perform or refrain from the behavior in question. In other words, subjective norm can be explained as the individual's social benefit-cost evaluation of whether or not intend to perform energy conservation behavior according to approval or disapproval of his/her social surroundings. Many studies have shown that the individual's subjective norm has a direct and positive influence on his/her behavioral intention (Ajzen, 1991; Wu & Chen, 2014; Graham-Rowe, Jessop & Sparks, 2015). Lee and Tanusia (2016) have revealed that subjective norms are significantly and positively related to energy conservation intention. Webb et al. (2013) have found that subjective norm is a significant determinant of intention to conserve household energy use. Wang, Zhang and Li's (2014) research findings have supported that subjective norm has a significant influence on the individual's household energy conservation intention. Yet, Gao et al. (2017) have

found that the subjective norm influence on behavioral intention is insignificant. As result, the second hypothesis is proposed as below;

**H2:** Subjective norms toward household energy conservation positively affect household energy conservation intention.

PBC is the most important factor that distinguishes TPB (Ajzen, 1991) from TRA model (Fishbein & Ajzen, 1975). TPB postulates that PBC is not only another determinant factor of the behavioral intention, but also a direct predictor of the actual behavior in some particular situations (Ajzen, 1991). In this sense, the PBC refers to two meanings. The first meaning is that the individual evaluates a behavior is hard or easy to perform, and that means that his/her "perceived degree of difficulty". The second meaning is that the individual's evaluation of his/her capability or ability whether or not to perform a specific behavior (Ajzen, 1991). Furthermore, the individual's behavior might depend on the existence of particular resources, such as time, money, skills, convenience, knowledge, or wisdom (Macovei, 2015). Macovei (2015, p. 19) states that "these resources act as constraints in individuals' intention and adoption of a certain behavior, representing the actual degree of control over one's behavior". In this context, when the individual has a higher degree of control over the behavior, then he/she would have a stronger intention to perform the behavior in question (Gao et al., 2017).

According to Fredericks, Stenner and Hobman (2015, p. 596), the individual's PBC "tends to be positively associated with pro-environmental behavior such as energy conservation". Various studies have shown that the individual's PBC determines directly the intention to conserve household energy consumption. For example, Liu et al. (2020) have found that PBC is an effective factor to explain household energy conservation intention. Abrahamse and Steg's (2011) study findings have revealed that there is a positive correlation between personal behavioral control and intention to conserve household energy use. Oikonomou et al. (2009) have stressed that higher levels of perceived behavioral control can drive towards greater energy conservation. Clement, Henning & Osbaldiston's (2014) study findings have also indicated that PBC is the strongest predictor of energy conservation behavior. However, Weeb et al. (2013) found that PBC is not a predictor of behavior. Taken together, the third and fourth hypotheses are stated below as;

**H3:** Perceived behavioral control toward household energy conservation positively affects household energy conservation intention.
**H4:** Perceived behavioral control toward household energy conservation positively affects household energy conservation behavior.

TPB (Ajzen, 1991) proposes that the main predictor of a pro-environmental behavior is the individual's intention to perform the behavior. According to Park and Ha (2014), the individual's intention refers to "self-commitment" to perform a specific behavior. In TPB model, the construction of the individual's behavioral intention is determined by three motivational factors; attitude towards behavior, subjective norms, and PBC. The higher the intention of the individual to engage in a certain behavior, the more likely he/she would perform the behavior in question (Ajzen, 1991). Many research has suggested that the individual's behavioral intention is directly engaged with pro-environmental behaviors (Bamberg & Möser, 2007; Pierrette Coulibaly et al., 2021; Shin et al., 2018). According to Abrahamse and Steg (2011, p. 39), the individual's "household energy conservation behavior is achieved through strengthening behavioral intentions". Macovei (2015) proposes that the individual's intention to conserve energy has a positive influence on the his/her energy conservation behavior. Alomari, Kanj and Topal's (2021) also suggest that the individual's energy saving intention is significantly and positively influence his/her energy conservation behavior. In accordance with previous studies, the fifth hypothesis is stated below as;
**H5:** Intention toward household energy conservation positively affects household energy conservation behavior.

Although NAM was developed to explain altruistic behaviors, it has been widely used in the prediction of many pro-environmental behaviors. NAM proposes that personal norms variable is the key determinant of the individual's behavior. Personal norms refer to the individual's moral obligations to act in a certain way for the benefit of others or the environment. Personal norms are considered as "the self-expectation of a specific action in a particular situation" (Thøgersen, 2006, p. 248), and the feeling of the moral obligations to perform or refrain from the behavior in a certain manner (Schwartz, 1977). Therefore, personal norm term has been used interchangeably with the concept of "moral obligations" and "moral norms" in some studies (Han, 2015; Tan, Ooi & Goh, 2017). According to Wang, Lin & Li (2018), high degree of personal norms

can motivate the individual to perform pro-environmental behavior whereas low degree of personal norms also can demotivate the individual, and he or she might refrain from performing pro-environmental behavior. NAM postulates that the individual's personal norms are activated once he/she becomes aware of negative or positive consequences for others or the environment (awareness of consequences) as well as feels a responsibility in turn for the consequences in question (ascription of responsibility). Eventually, personal norms enact the pro-environmental behavior through the influences of awareness of consequences and ascription of responsibility.

Various studies have argued that personal norms can directly affect pro-environmental behaviors (Stern & Dietz, 1994; Stern et al., 1995; Thøgersen, 1996). In terms of energy conservation behavior, the research findings of Steg, Dreijerink and Abrahamse (2005) have indicated that personal norms contribute strongly to the explanation of acceptability of energy conservation policies (see De Groot & Steg, 2009, p. 431). Abrahamse and Steg (2009) have found that household's personal norm is positively related with their total energy conservation. Similarly, Ibtissem (2010) have also revealed that the energy conservation behavior is positively and significantly connected to personal norms. Wang et al., (2018, p. 74) study findings have shown that the residents' daily energy conservation behavior stems from the activation of their personal norms to a certain extent.

Some studies have supported that the main components of both NAM and TPB can be integrated into one model in order to explain pro-environmental behaviors (see Wall, Devine-Wright & Mill, 2007; Kaiser, Hubner & Bogner, 2005; Bamberg & Möser; 2007). Accordingly, many studies have argued that NAM's personal norm can be a strong influencer of TPB's intention to perform pro-environmental behaviors (Thøgersen, 1996; Harland, Staats & Wilke, 1999; Steg, Dreijerink and Abrahamse et al., 2005; Onwezen, Antonides, & Bartels, 2013; Chan & Bishop, 2013; Park & Ha, 2014; Wang et al., 2018). Han et al. (2018) have suggested that personal norms have crucial role in forming the individual's conservation intentions. Hien and Chi (2020) have found that the individual's intention is positively affected by personal moral norm factor. Wang, Lin & Li's (2018) research findings have revealed that the individuals' personal norm is positively related to their intention to conserve electricity. Similarly, Ru, Wang and Yan (2018) have indicated that the individual's personal norm positively influences energy conservation intention. In the accordance with these previous studies, the sixth and seventh hypotheses are stated as below;

**H6:** Personal norm toward household energy conservation positively affects household energy conservation behavior.

**H7:** Personal norm toward household energy conservation positively affects household energy conservation intention.

Ascription of responsibility and awareness of consequences are determinant factors of personal norms. Basically, ascription of responsibility can be defined as the individual's sense of feeling responsible whether or not to perform a particular behavior (Blamey, 1998; De Groot & Steg, 2009). On the other hand, awareness of consequences is considered as "a disposition to became aware of the potential consequences of one's acts" (Schwartz, 1968, p. 357). As mentioned before, two main interpretations towards NAM's structure have been postulated; and these are mediator (sequencer) and moderator interpretations. In both interpretations, ascription of responsibility is considered as an absolute influencer of the individual's personal norm. Yet, the role of awareness of consequences variable in NAM is arguable.

According to the mediator interpretation, ascription of responsibility variable has a mediator role between the individual's awareness of consequences and personal norms (van der Werff & Steg., 2015). Moderator interpretation suggests that both ascription of responsibility and awareness of consequences influence personal norms (Schwartz, 1977; Schwartz & Howard, 1980). De Groot and Steg (2009) tested both interpretations as conducting five researches toward pro-social behavior (see De Groot & Steg, 2009 p. 429-443). According to their research findings, they have built a consensus that NAM should be interpreted as a mediator (sequencer) model. De Groot and Steg (2009, p. 443) have stressed that "one must be aware of the consequences of behavior before feeling responsible to engage in this behavior or acknowledging that one's own contribution may be useful". According to Munerah, Koay & Thambiah (2020), the mediator interpretation has also supported by their study because their findings have indicated that awareness of consequences is not a significant predictor of personal norms. On the contrary, research findings of Harland, Staats and Wilke (2007) have found that personal norms are positively influenced by awareness of consequences in the pro-environmental context.

Several studies have proposed that both awareness of consequences and ascription of responsibility determine personal norms (moderator) to perform pro-environmental behaviors (e.g., Shin et al., 2018; Liu et al., 2017). In the context of

energy conservation behavior, Black, Stern, & Elworth's (1985, p. 12) have found that both awareness of consequences to others of energy efficiency in homes and ascription of responsibility for energy conservation to individuals like oneself affect personal norms. Thus, their study findings are consistent with Schwartz's (1977) "activation of personal norms". Ibtissem (2010), on the other hand, have revealed that the individuals' awareness of consequences positively affects the ascription of responsibility, and the ascription of responsibility directly and positively influences personal norms in the context of energy conservation behavior.

Zhang, Wang and Zhou's (2013) research findings have indicated that awareness of consequences is not only positively related with ascription of responsibility, it is also positively related to personal norms to electricity conservation behavior in organizations. Furthermore, their research findings have also shown that the individuals' ascription of responsibility is positively related to their personal norms. Therefore, these studies can support the idea that both mediator and moderator interpretation can be relatively considerable in the context of energy conservation behavior. Consequently, the eighth, ninth, and tenth hypotheses are stated below as;

**H8:** Ascription of responsibility toward household energy conservation positively affects personal norm to conserve household energy consumption

**H9:** Awareness of consequences toward household energy conservation positively affects personal norm to conserve household energy consumption

**H10:** Awareness of consequences toward household energy conservation positively affects ascription of responsibility to conserve household energy consumption

The interaction between subjective norms and personal norms is significant for the integration of TPB and NAM. Social (or subjective) norms and moral motivations (personal norms) are significant determinants of the individual's daily behavior (Nyborg, 2003). As it mentioned earlier, subjective norms refer to perceived social pressures to perform a particular behavior in the accordance with approval or disapproval of the social surrounding (Ajzen, 1991) whereas personal norm reflects the moral obligation that the individual acquires within the social structure (Nyborg, 2018). In other words, the influence of social norms on a particular behavior is derived from social pressure (i.e., "social sanctions"), and the personal norm's influences on a particular behavior are derived from anticipated emotions (i.e., "anticipation of negative self-related feelings") (Onwezen, Antonides & Bartels, 2013, p. 144). According to

Valle et al. (2005), individuals mostly tend to look to society before performing the behavior. To that extent, the gathered information about how others perform or what others think about a specific behavior can be an important determining factor in the pro-environmental behavior (Valle et al., 2005). In this context, Bamberg and Möser (2007) claim that social norms are significant to determine personal norms. The standards of social norms are shaped by the individual's social reference group views that is a social evaluation of whether the behavior is right or wrong. If the individual internalizes those social views, then the internalized social norms can provide the individual's personal norm content. In other words, a pro-social behavior is derived from internalized social norms, and accordingly, social norms reinforce the internalization of personal norms (Park & Shon, 2012). Bamberg, Hunecke & Blöbaum (2007) state that if the individual observes a contradiction between his/her own behavior and perceived social norms, then he/she can feel "a sense of guiltiness" and activate his/her personal norms (Onwezen, Antonides, & Bartels, 2013). Schwartz (1977) suggests that personal norm has a mediator role between social norms and altruistic behavior. Similarly, Bamberg and Möser (2007) also stress that social norms directly contribute to the development of personal moral norms. In the pro-environmental behavior context, many studies have also shown that subjective norms have direct influence on personal norms (Hopper & Nielsen, 1991; Valle et al., 2005; Bamberg, Hunecke & Blöbaum 2007). In consequence, the last hypothesis towards the psychological determinants of energy conservation behavior is stated below as;

**H11:** Subjective norms to conserve the household energy consumption positively affect the personal norm toward household energy conservation

## 3.2. Socio-Demographic Factors Related to Household Energy Conservation Behavior

In addition to psychological factors, several studies have indicated that socio-demographic factors such as; age, gender, income, household size, level of education and geographic location can also impact household energy conservation intention and behavior (Poortinga, Steg & Vlek, 2004; Sardianou, 2007; Abrahamse & Steg, 2011; Liu et al., 2020). It is important to mention that socio-demographic factors are effective in the explanation of household energy consumption amount whereas psychological factors are effective in the prediction of household energy conservation behaviors (Abrahamse & Steg, 2009). This would propose that household energy conservation

behavior can be explained by addressing both psychological and socio-demographic variables (Abrahamse & Steg, 2011).

On the other hand, Abrahamse and Steg (2011) argue that psychological variables might have little impact on the prediction of household energy consumption behavior whereas socio-demographic variables might provide a particular prediction. They have stated the logical framework of this idea as follows "socio-demographic variables influence the possibilities and constraints that people face, which in turn affect energy use (e.g., high income groups can afford bigger houses and more appliances, and as a consequence use more energy). Intentions to reduce energy use seem to be more strongly related to psychological variables, probably because intentions to reduce energy are voluntary in nature and may be less constrained by contextual factors as is energy use." (Abrahamse & Steg, 2011, p. 31).

Nevertheless, this section does not concern with comparing the explanatory strength of both socio-demographic variables and psychological factors. Instead, this section specifically focuses on a few socio-demographic characteristics such as education level, income, and household size (number of occupants) variables in order to examine whether or not these socio-demographical variables have a statistical significance on household energy conservation behavior. The availability of opportunities and resources such as income, knowledge, or even the number of family members in the house can affect the individual to perform a specific pro-environmental behavior. This may suggest that individuals who have different levels of knowledge (education), income, and household size might perform the energy conservation behavior at different levels. Thus, the general assumption of this section is that household energy conservation behaviors might vary across to different levels of such socio-demographic attributes.

**Education**

A few studies have showed that the level of education can have an influence on the taking energy efficiency measures (Held, 1983; Olsen, 1983). Susanti et al. (2017) propose that the individuals who hold higher levels of education have better knowledge to conserve energy whereas the individuals who hold lower level of education tend to be less aware of energy conservation. Yet, despite a higher level of education is generally associated with increased knowledge, awareness, and more concern about environmental problems, higher education level does not always lead the individual

directly to perform energy conservation behavior (Frederiks, Stenner & Hobman, 2015). Thus, it is possible to issue that there is a gap between the individual's "knowledge and action" in terms of household energy consumption behavior (e.g., Barr, Gilg & Ford; 2005) (Frederiks, Stenner & Hobman, 2015, p. 581).

On the other hand, several studies have shown that the individuals' education level has an insignificant role on energy consumption and conservation behavior (Curtis, Simpson-Housley & Drever, 1984). For example, Gatersleben, Steg and Vlek's (2002) study findings have indicated that the individuals' educational level is not significantly related to energy consumption behavior. Yet, many studies have indicated that the education level can promote household energy conservation practices (Mills & Schleich, 2010; Nair, Gustavsson & Mahapatra, 2010; Sardianou, 2007). To give an illustration, Semenik, Belk and Painter's (1982) have revealed that there is a positive association between energy conservation behavior and education level. Similarly, Poortinga, Steg and Vlek, (2004) have also reported that the individuals who have a higher educational level likely to conserve energy in the home. As result, the next hypothesis toward the relationship between level of education and household energy conservation behavior is stated as;

**H12:** Household energy conservation behavior varies across the level of education.

**Income**

Individuals' income level can be one of the strongest socio-demographic predictors of household energy conservation behavior (Frederiks, Stenner & Hobman, 2015). Some earlier research has found positive associations between energy conservation and income (Grier, 1976; Bultena, 1976). However, although individuals' income level is positively related to household energy consumption, the influence of the income at different levels on energy consumption and conservation behaviors has been debatable.

A few studies have revealed that the relationship between energy conservation and income is insignificant (Hogan, 1976). The increase in households' income level might lead to an increase in the amount of energy consumption as well (Ma, Wang, & Li, 2019). This would suggest that individuals who have higher income can afford higher energy costs whereas individuals who have lower income tend to conserve energy for financial reasons. Supporting this, many studies have indicated that individuals who have higher income tend to consume more household energy than

individuals who have lower income (Abrahamse & Steg, 2009, 2011; Poortinga, Steg and Vlek, 2004; Wan, Shen & Choi, 2018; Gatersleben, Steg & Vlek, 2002). In addition, Frederiks, Stenner and Hobman (2015) mention some research that found individuals who have "middle-income level" might be the most likely group to conserve energy (Kilkeary, 1975) because individuals who have high-income levels are not willing to save their energy consumption whereas individuals who have low-income levels are unable to conserve their energy consumption (e.g., Verhage, 1980; Cunningham & Joseph, 1978).

On the other hand, individuals with higher income levels might tend to purchase energy-saving appliances, even though they conserve relatively less energy compared to individuals with lower income levels (Black, Stern, & Elworth, 1985; Sardianou, 2007). In the literature, some research has supported the idea that individuals who have higher income tend to "invest in the energy-efficient measure, participate in the energy-saving scheme, or be willing to perform household energy-saving behaviors" (Liu et al., 2020, p. 5; Sardianou, 2007; Shi, Wang & Zhao, 2017). In conclusion, it is possible to suggest that incomes at different levels impact individuals' energy conservation behavior differently. Thereby, the next hypothesis toward the relationship between income and household energy conservation behavior is stated as;

**H13:** Household energy conservation behavior varies across the income level.

**Household Size**

In the literature, the relationship between household size and energy conservation behavior has led to various discussions. Although earlier studies found that there is no significant relationship between household size and energy conservation behavior (Hogan, 1976; Morrison, 1977), some studies have provided that household energy consumption is positively related to household size (Sardianou, 2007; Brounen, Kok & Quigley, 2012). Several researches have revealed that larger households tend to consume more energy than smaller households. (Benders et al., 2006; Gatersleben, Steg & Vlek, 2002; Abrahamse & Steg, 2009, 2011). According to Frederiks, Stenner, and Hobman (2015, p. 583), this situation can be derived from three reasons.

Firstly, larger households might use more "energy-intensive appliances". Secondly, larger households might have "more disposable income to spend on energy". Lastly, larger households might have "greater energy demands" such as more heating/cooling or washing. Moreover, some changes in the number of occupants such

as the absence of family members or newborn baby can also directly influence total household energy consumption (Frederiks, Stenner, and Hobman, 2015). On the other hand, it is also assumed that the higher number of individuals might also lead to the individuals tend to perform greater energy conservation behavior in the household (O'Neill & Chen, 2002). Accordingly, this condition might be stemmed from the situation that the greater number of family members, the tendency to conserve energy would be more visible in the household (Susanti, Fithri & Bestarina, 2015). Consequently, the last hypotheses towards the relationship between household size and energy conservation behavior is stated as;

**H14:** Household energy conservation behavior varies across the household size.

# 4. RESEARCH DESIGN AND METHODOLOGY

In this section, it is indicated which methods were addressed to examine the interrelationships between TPB and NAM components in revealing to what extent the socio-psychological factors (i.e., *attitude towards behavior, subjective norms, perceived behavioral control, intention, awareness of consequences, the ascription of responsibility, and personal norms*) are effective on individuals to perform household energy conservation behavior. In order to ensure that the results of this thesis study are reliable and valid, the scales of the TPB and NAM components must provide standard validity and reliability criteria. Thereby, before testing the hypotheses of this thesis study, the validity and reliability analysis must be conducted for the measurement scales in the proposed model.

## 4.1. Reliability Analysis

In this context, Validity and Reliability analyses are necessary statistical methods to provide the items of measuring instrument are trustable and accurate in testing the prepared model and hypotheses. Firstly, reliability analysis is an important and necessary process that helps to reveal the consistency between the items in a developed measuring instrument. The main purpose of applying the reliability analysis is to expose how reliable a developed measuring instrument (i.e., test or survey) is in terms of the given items in the questionnaire. A reliability analysis is about the extent to which the measurement of a phenomenon provides a stable and consistent result (Taherdoost, 2018, p. 33). Although various methods have been developed for reliability analysis, Cronbach's Alpha is an internal consistency estimation method, and

it is one of the most widely used reliability analysis methods in the social sciences (Bonett & Wright, 2014). In particular, when Likert scales are used in surveys, Cronbach's Alpha is considered as the most appropriate reliability measure (Taherdoost, 2018). Hence, in order to test the reliability of the questionnaire items, the total correlation values of the items in the questionnaire are calculated with the Cronbach's Alpha, and the relationship of these items in the line with the subject is evaluated according to the calculated correlation value.

## 4.2. Validity Analysis

On the other hand, validity analysis is one of the necessary processes that is generally used in social sciences. Basically, a validity analysis refers to how accurately a measurement method measures what it is to be measured. In this sense, it is important to test whether a measurement method is suitable for the feature that is intended to be measured, whether the measurements comply with the rules, and whether the data of the measurements reflect the feature of what is intended to be measured. Generally, if a test produces accurate results and if it has also a reproducible structure, then this can suggest that the measurement is valid and reliable. Yet, although high validity results can address high-reliability scores, high-reliability results might not give sufficient information about validity. Therefore, it is required to analyze reliability and validity tests as separately. The measurement validity is based on three kinds of evidence (i.e., content validity, criterion validity, and predictive validity), and these kinds are evaluated either by experts or resulted by statistical methods.

According to Ercan & Kan (2004, p. 215), "*Content Validity*" is the extent to which each item in the scale and test as a whole serves the purpose. The content validity of a scale can be examined in two ways, logically and statistically. The logical way proposes that the validity of the measurement scale is estimated and it is investigated whether or not each item and their distribution can exemplify the measurement subject before the scale in question is employed to sampling group. The statistical way, on the other hand, proposes that previously developed scale and newly developed scale is employed to same sampling group at the same time, then those two scales are statistically compared. "*Criterion Validity*" is the degree to which the results obtained from the used measurement instrument are related to other previously obtained measurements. In other words, this type of validity examines the future or current relationship (correlation) between the scores obtained from the scale and determined

criteria in order to determine the effectiveness of the scale. "*Construct Validity*" refers to the statistical relationships between the items in the measurement instrument. Each item in the scale should be integrity with all items in the measurement instrument. In other words, it can be defined as the level of measuring dependent and independent variables and grounding the relationship between them with scientific concepts. In order to test the construct validity of the questionnaire items, Confirmatory Factor Analysis (CFA) method was employed via JASP software. CFA is a method for generating a latent variable (factor) based on the variables observed through a pre-built model, it is usually used in scale development and validity analyzes or aims to verify a predetermined structure (Yaşlıoğlu, 2017, p. 78).

### *4.2.1. Construct Validity (Confirmatory Factor Analysis)*

As stated earlier, although a high validity score indicates a high level of reliability, reliability analysis might not be sufficient to validate measurement data because technical calculations are made in reliability analysis whereas both technical calculations and judgmental evaluations are made in the validity analysis. Therefore, CFA was employed as a construct validity test in order to examine the model within both technical calculations and judgmental evaluations before testing the hypotheses with structural equation modeling (SEM) and variance analysis (ANOVA) methods.

Basically, CFA is a statistical technique that is used to test hypotheses about the "commonality" amongst variables, and it allows to test of multiple hypotheses that collectively constitute at the same time a measurement design (Hoyle, 2004, p. 169). This method is a process for creating a latent variable (factor) based on the observed variables through a pre-built model and it is generally used in scale development and validity analyzes or it aims to verify a predetermined structure. (Yaşlıoğlu, 2017, p. 78). In sum, CFA is an important and necessary step in order to determine the construct validity of the measurement scales in the research of interest, and to examine whether or not the fit values of the measurement design are at an acceptable level as well.

The difference between the observed and expected covariance matrices can be examined with the chi-square ($X^2$) test. If chi-square value is close to zero in between the expected and observed covariance matrices, it can be proposed that this result indicates a good fit because there is little difference between these covariance matrices (Suhr, 2006). Yet, if the model is not suitable for the data, the results then indicate a sizeable chi-squared score with a small p-value (Suhr, 2006). Due to the chi-square

statistic is highly affected by the sample size, the χ2/df ratio, which is less affected by the sample, is a criterion that can be used instead. Therefore, this value that is obtained by dividing χ2 by the degrees of freedom must be 2 or less, and 5 or less can be also accepted (Çapık, 2014, p. 200). According to Hu and Bentler (1999), examining the fit indices is another way to evaluate the model fit as a supplement to the chi-square test. It is crucial to consider the fit indices because the model fit indices table indicates that whether the relationship between the factors propose sufficient scores in terms of their acceptability as a whole model. Accordingly, CFI, TLI, RMSEA, and SRMR values are significant, and must be examined in order to evaluate the proposed model's validity.

Comparative Fit Index (CFI) means that the adjusted discrepancy function for the sample size, and its range must be between 0 to 1, and mostly the acceptable model fit of CFI value is 0.90 or greater scores (Suhr, 2006).

Tucker-Lewis's Index (TLI, also known as NNFI) refers to a combination of parsimony measures with a comparative index, and it measures the null model and the alternative model or compares alternative models. The fit value of TLI is considered as very good if it equals or greater than 0.95 whereas the range between 0.90 and 0.95 is considered as acceptable (Sarmento & Costa, 2019).

Root Mean Square Error of Approximation (RMSEA) measures the level of compliance of the variance-covariance matrix obtained from the model and the sample. RMSEA values that closer to 0 refers to a good fit, and if the value is equal or less than 0.05 indicates very good whereas if the value is equal or smaller than 0.08 is considered as a reasonable model-data fit (Xia & Yang, 2019).

Standardized Root Mean Square Residual (SRMR) refers to the square-root of the difference between the hypothesized covariance model and the residuals of the sample covariance matrix (Hooper, Coughlan & Mullen, 2008, p. 54). The general recommendation proposes that the value fit of SRMR is considered as "well-fitting" if the value is equal or less than 0.050 whereas it is considered as acceptable if the fit value is equal or less than 0.08 (Hooper, Coughlan & Mullen, 2008)

## 4.3. Structural Equation Modeling

Structural Equation Modeling (SEM) was employed via JASP software to test the proposed hypotheses towards the integration of TPB and NAM. Briefly, SEM is a very popular method that is used in several fields of social sciences to investigate many theories, and to develop new models. SEM is a multivariate statistical method that is

formed by the combination of various analytic techniques. To that extent, SEM method is successful in testing complex models, performs multiple analyzes at once, recommends new adjustments to the network of relationships (if necessary), facilitates the examination of mediation and moderation effects, and takes measurement errors into account (Dursun & Kocagöz, 2015, p. 2). On the one hand, SEM allows employing variance, covariance analysis, factor analysis, and multiple regression techniques to predict dependency relationships, and on the other hand, it is employed to test the proposed models in which the causal and/or correlation relationships between the exogenous variables and the endogenous variables (Dursun & Kocagöz, 2015). In SEM, the relationships between the factors are visualized by graphical path diagrams whereas a set of matrix equations represent the statistical model equations (Hox & Bechger, 1998, p. 1). The diagram theoretically indicates the relationships between latent and observed variables, and the relationships between regression and correlation parameters. Consequently, SEM provides a wide framework in order to analyze and develop complex relationships between multiple variables in empirical models (Beran & Violato, 2010).

## 4.4. Variance Analysis

In this study, variance analysis (ANOVA) was employed in order to test the proposed hypotheses towards the relationship between household energy conservation behavior and socio-demographic factors. ANOVA is a statistical method that is used to test the differences in group means of parametric dependent and one or more independent variables (Sawyer, 2009, p. 27). Basically, ANOVA provides statistical information about whether the groups in question are different from each other, but this does not provide information that if groups in question are different from each other. Therefore, a Post-hoc test should also be applied to indicate which groups differ from each other and whether or not these differences are statistically significant. Lastly, ANOVA method is generally preferred if there are more than two groups in the independent variable.

## 4.5. Preparing the Questionnaire

In this thesis study, a web-based questionnaire form was developed as a data collection method. A web-based questionnaire (i.e., online survey) form is a fast and economical tool to allow both asking multiple questions and reaching a large portion of

people at the same time. The collected quantitative data can be transferred to various software such as SPSS, AMOS, and JASP to make statistical analysis for accurate means towards the interpretation of obtained results. Thereby, the method of collecting data via a questionnaire form has been one of the most preferable methods in social sciences.

In this study, the questionnaire form was prepared in Google forms, and it consist of nine sections in total. The survey includes a cover letter describing the research, a socio-demographic section, a section for energy conservation behavior assessment as well as seven separate sections for the components of both TPB and NAM (see **Appendix 2, Appendix 3, Appendix 4**). Based on a comprehensive literature review on household energy conservation behavior, socio-psychological items toward TPB and NAM variables in which the participants could express themselves in the best way were included in the questionnaire. For the socio-demographical questions section, participants were asked about their gender, age range, total income per month, employment status, level of education, household size, membership of an environmental organization, and financial contribution to environmental organizations. For the behavioral assessment section, participants were asked their frequency to conserve energy at home. For the TPB and NAM items, participants were asked to what extent they agree or disagree with the given psychological statements in the context of energy consumption. The questionnaire items were adapted from previous studies on both TPB and NAM towards energy conservation behavior. Furthermore, the 7-point Likert scale has been one of the most preferable scales by many researchers in the literature because it provides more self-expression options for the participant and more accurate reflections of the participant's evaluation for the researcher. Therefore, in the questionnaire form, the 7-point Likert Scale (*1= Strongly disagree, 2= Disagree, 3= Somewhat disagree, 4= Neither agree nor disagree, 5= Somewhat agree, 6= Agree, 7= Strongly agree*) was used to measure the participants' perceptions and reactions toward the given statements in the context of household energy conservation.

## 4.6. Data Collection

The sample group of this thesis study consists of occupants who live in Prague. Through some particular Facebook groups, the "Convenience sampling" method was employed to reach the participants. Simply, this method aims to reach every individual who wishes to voluntarily participate in the research. Hence, the convenience sampling

method only needs individuals who are eager to be participants in the research. The process of reaching individuals can continue until the aimed sample size is reached because this method provides cost savings in terms of both time and economy. Web-based surveys or phone-based surveys can be examples of convenience sampling methods. In this thesis study, however, respondents must be over the age of 18 years old. Apart from this criterion, any individual who lives in Prague has had an equal chance to participate in the survey regardless of any socio-demographic characteristics. In this sense, the survey was prepared as easily understandable for any individual who might have different educational levels and socio-demographical backgrounds.

The survey form was prepared both in English and Czech languages in order to reach both Czechs and English speakers in Prague. The English version was shared first on April 28, 2021, then the Czech version was shared first on May 11, 2021 in some particular Facebook groups such as “Prague Sustainability Group” “International students in Prague”, “University students in Prague”, “Prague Expats “, “Charles University Prague”, ”Expats in Prague“, “#PragueLife!”, “BIO EKO - zdravý životní styl, ekologická domácnost” “Dotazníky k diplomkám... aneb potřebuji respondenty”, “Everything Czech - History, Culture, Music, Food, Arts & More”, “Çek Cumhuriyeti ilan ve yardımlaşma grubu”, “Fakulta sociálních ved UK”, and “bydlení PRAHA / FLATSHARE pronájem, spolubydlení a prodej”. In addition, the request of sharing the survey was not approved by the admins of the “Expats in Prague” and “#PragueLife!”. Due to the shared post might be somehow missed or ignored by these Facebook group members, the survey was re-shared during May and June in the same Facebook groups in order to get new attention from new participants. Furthermore, it was specifically stated in the post that individuals who previously participated in this survey are kindly requested not to re-participate. Participation to the survey was finally terminated on 3 July 2021. According to Weston and Gore Jr. (2016), the number of participants should be over at least 200 in order to get sufficient results from the SEM analysis. Therefore, it was decided to reach approximately 300 participants would be quite sufficient in order to employ SEM analysis in this thesis study.

# 5. RESULTS

## 5.1. Descriptive Statistics

The all variables that are given below were placed in the survey form to examine the socio-demographic characteristics of the participants. The frequency distribution of demographic variables of participants (*n=303*) is given in **Table 2**.

**Table 2.** Distribution of Socio-Demographic Characteristics

| Variables | Characteristics | Frequency | Percent |
|---|---|---|---|
| **To which gender identity do you most identify?** | Female | 169 | 55.776 |
| | Male | 127 | 41.914 |
| | Gender Variant/Non-Conforming | 1 | 0.330 |
| | Prefer not to answer | 6 | 1.980 |
| | Missing | 0 | 0 |
| | **Total** | **303** | **100.000** |
| **What is your age range?** | 18-24 | 121 | 39.934 |
| | 25-34 | 145 | 47.855 |
| | 35-44 | 37 | 12.211 |
| | Missing | 0 | 0 |
| | **Total** | **303** | **100.000** |
| **What is your current employment status?** | A student | 139 | 45.875 |
| | Employed for wages | 113 | 37.294 |
| | Out of work and looking for work | 15 | 4.950 |
| | Out of work but not currently looking for work | 2 | 0.660 |
| | Self-employed | 33 | 10.891 |
| | Unable to work | 1 | 0.330 |
| | Missing | 0 | 0.000 |
| | **Total** | **303** | **100.000** |
| **What is your total income per month?** | 0-2.500 kč | 12 | 3.960 |
| | 2.500-4.999 kč | 4 | 1.320 |
| | 5.000-7.999 kč | 10 | 3.300 |
| | 8.000-9.999 kč | 9 | 2.970 |
| | 10.000-11.999 kč | 21 | 6.931 |
| | 12.000-13.999 kč | 20 | 6.601 |
| | 14.000-15.999 kč | 29 | 9.571 |
| | 16.000-17.999 kč | 24 | 7.921 |
| | 18.000-19.999 kč | 20 | 6.601 |
| | 20.000-22.999 kč | 32 | 10.561 |
| | 23.000-25.999 kč | 25 | 8.251 |
| | 26.000-29.999 kč | 21 | 6.931 |
| | 30.000-49.999 kč | 41 | 13.531 |

| | | | |
|---|---|---|---|
| | 50.000 or more kč | 16 | 5.281 |
| | Missing | 19 | 6.271 |
| | **Total** | **303** | **100.000** |
| **What is the highest degree or level of school you have completed?** | Bachelor's degree | 136 | 44.884 |
| | Doctorate degree | 1 | 0.330 |
| | High school graduate, diploma or the equivalent | 31 | 10.231 |
| | Master's degree | 32 | 10.561 |
| | Professional degree | 4 | 1.320 |
| | Some college credit, no degree | 93 | 30.693 |
| | Some high school, no diploma | 3 | 0.990 |
| | Trade/technical/vocational training | 1 | 0.330 |
| | Primary school | 2 | 0.660 |
| | Missing | 0 | 0.000 |
| | **Total** | **303** | **100.000** |
| **What is your household size? (i.e., number of people)** | 1 | 40 | 13.201 |
| | 2 | 112 | 36.964 |
| | 3 | 71 | 23.432 |
| | 4 | 58 | 19.142 |
| | 5 | 20 | 6.601 |
| | 6 | 1 | 0.330 |
| | 8 or more | 1 | 0.330 |
| | Missing | 0 | 0.000 |
| | **Total** | **303** | **100.000** |
| **Are you a member of an environmental organization?** | Yes | 9 | 2.970 |
| | No | 294 | 97.030 |
| | Missing | 0 | 0.000 |
| | **Total** | **303** | **100.000** |
| **If yes, in which ecological / environmental organization are you active?** | Citizens Climate Lobby | 1 | 0.330 |
| | Doğal Hayatı Koruma Derneği | 1 | 0.330 |
| | Děti Země | 1 | 0.330 |
| | Green Dock | 1 | 0.330 |
| | Greenpeace | 1 | 0.330 |
| | Hnutí Brontosaurus | 1 | 0.330 |
| | n/a | 1 | 0.330 |
| | Obránci Zvířať | 1 | 0.330 |
| | Sauvons le Climat | 1 | 0.330 |
| | The Nature Conservancy | 1 | 0.330 |
| | Žádné | 1 | 0.330 |
| | Missing | 292 | 96.370 |
| | **Total** | **303** | **100.000** |

| | | | |
|---|---|---|---|
| **Do you contribute financially to environmental organizations?** | Yes | 6 | 1.980 |
| | No | 251 | 82.838 |
| | Sometimes | 46 | 15.182 |
| | Missing | 0 | 0.000 |
| | **Total** | **303** | **100.000** |

As shown in **Table 2**, 169 individuals (55.77%) who participated in the survey described themselves as "Female", 127 individuals (41.91%) described themselves as "Male", 1 individual (0.33%) described itself as "Gender variant/non-conforming", and 6 individuals (1.98%) did not prefer to specify their gender. When the participants were asked their age range, 121 individuals (39.93%) specified their age range as between "18-24 ages", 145 individuals (47.85%) specified it as between "25-34 ages", and 37 individuals (12.21%) specified it as between "35-44 ages". When the participants were asked about their current employment status, 139 individuals (45.87%) stated that they are students, 113 individuals (37.29%) stated that they are employed for wages, 15 individuals (4.95%) stated that they are out of work but not currently looking for work, 33 individuals (10.89%) stated that they are self-employed, and 1 individual (0.33%) stated that he/she is unable to work. When the participants were asked about their income per month, 19 participants out of 303 did not prefer to answer this question (missing percent is 6.27%). In total, 284 responses from the participants were considered. The income distribution of the respondents can be found in **Table 2** as detailed. When the participants were asked about what is the highest degree or level of school that they have completed, 136 individuals (44.88%) stated as "Bachelor's degree", 1 individual (0.33%) stated as "Doctorate degree", 31 individuals (10.23%) stated as "High school graduate, diploma or the equivalent", 32 individuals (10.56%) stated as "Master's degree", 4 individuals (1.23%) stated as "Professional / MBA degree", 93 individuals (30.69%) stated as "Some college credit, no degree", 3 individuals (0.99%) stated as "Some high school, no diploma", 1 individual (0.33%) stated as "Trade/technical/vocational training", and 2 individuals (0.66%) stated as "Primary school". When the participants were asked about the size of the household (i.e., number of family members, roommates and etc.) where they live, 40 individuals (13.20%) stated as "1", 112 individuals (36.96%) stated as "2", 71 individuals (23.43%) stated as "3", 58 individuals (19.14%) stated as "4", 20 participants (6.60%) stated as "5", 1 participant (0.33%) stated as "6" and 1 participant (0.33%) stated as "8 or more". Only 9 participants out of 303 stated that they are a member of an environmental or

ecological organization. They are also specified in which ecological/environmental organization they are active; such as Citizens Climate Lobby, Doğal Hayatı Koruma Derneği, Děti Země, Green Dock, Greenpeace, Hnutí Brontosaurus, Obránci Zvířať, Sauvons le Climat, The Nature Conservancy, and Žádné. Yet, one individual did not specifically mention in which ecological organizations they are active. Lastly, 6 individuals (1.98%) stated that they financially contribute to some environmental/ecological organizations whereas 46 individuals (15.18%) stated that they sometimes financially contribute. Nevertheless, 251 individuals (82.83%) stated that they do not financially contribute to any ecological or environmental organizations.

## 5.2. Reliability Analysis (Cronbach's Alpha)

In this thesis study, TPB and NAM components (*Behavior, Attitude towards behavior, Subjective norm, Perceived behavioral control, Intention, Awareness of consequences, Ascription of responsibility, and Personal norm*) were examined. According to general recommendation, the standard coefficient ranges of Cronbach's alpha, and their reliability references are given in **Table 3.**

**Table 3**. DeVellis (1991) Cronbach's Alpha Reference

| | |
|---|---|
| **$0.00 \leq \alpha < 0.60$** | Unacceptable |
| **$0.60 \leq \alpha < 0.65$** | Undesirable |
| **$0.65 \leq \alpha < 0.70$** | Minimally acceptable |
| **$0.70 \leq \alpha < 0.80$** | Respectable |
| **$0.80 \leq \alpha < 0.90$** | Very good |
| **$0.90 \leq \alpha < 1.00$** | Consider shortening the scale |

(*Citated from Harkness, Arthur & McKelvie., 2013, p. 30*)

In accordance with **Table 3**, it was observed that the reliability coefficient of the Ascription of Responsibility (AR) variable was at a minimally acceptable level (*0.662*) due to some of the items in the variable disrupt the internal consistency, and eventually they impact the total Cronbach's alpha score (see **Table 4**). Even though the obtained score can be minimally accepted, some researchers have argued that internal consistency reliability score should be at minimum 0.70 coefficient alpha standard as Nunally (1978) suggested (Spector et al., 2002). Therefore, in order to increase the

alpha coefficient of Ascription of Responsibility variable, the third item "*My contribution to the energy problems is negligible*" (*0.661*) and the fifth item "*In principle, individuals at their own cannot contribute to the reduction of energy problems*" (*0.641)* in the Ascription of Responsibility variable were excluded from the Cronbach's Alpha reliability test as based on their "if item dropped" coefficient scores. As a result of that, Cronbach's Alpha scores achieved at a respectable level (0.753) (see **Table 5**). On the other hand, Personal Norm (PN) variable's eighth item; "*I would be a better person if I saved energy*" (*0.121*) was also removed due to the item disrupts the internal consistency of the variable as its' item rest correlation value was found less than 0.30. Because, according to Ferketich (1991), item-rest correlations should be at the range between 0.30 and 0.70. In **Table 4**, both Ascription of Responsibility and Personal Norm reliability scores are given before applying the item removal process. The final reliability scores of the retained items with their coefficients are given in **Table 5.**

**Table 4.** AR and PN Reliability Scores (*before the item exclusion*)

| Item | | If item dropped Cronbach's α | Item-rest correlation | Cronbach's α |
|---|---|---|---|---|
| **AR1** | I feel jointly responsible for the exhaustion of energy sources | 0.633 | 0.298 | ***0.662*** |
| **AR2** | I feel jointly responsible for global warming | 0.556 | 0.464 | |
| **AR3** | ***My contribution to the energy problems is negligible*** | ***0.661*** | ***0.338*** | |
| **AR4** | Not only the government and industry are responsible for high energy consumption levels, but me too | 0.544 | 0.536 | |
| **AR5** | ***In principle, individuals at their own cannot contribute to the reduction of energy problems*** | ***0.641*** | ***0.393*** | |
| **PN1** | I feel personally obliged to save as much energy as possible | 0.813 | 0.689 | **0.846** |
| **PN2** | I feel morally obliged to save energy, regardless of what others do | 0.812 | 0.680 | |
| **PN3** | I feel guilty when I waste energy | 0.822 | 0.629 | |
| **PN4** | I feel morally obliged to use green instead of regular electricity | 0.810 | 0.711 | |
| **PN5** | People like me should do everything they can to reduce energy use | 0.827 | 0.580 | |
| **PN6** | If I would buy a new washing machine, | | | |

| | | | | |
|---|---|---|---|---|
| | I would feel morally obliged to buy an energy efficient one | 0.831 | 0.549 | |
| **PN7** | I feel obliged to bear the environment and nature in mind in my daily behavior | 0.818 | 0.647 | |
| **PN8** | ***I would be a better person if I saved energy*** | ***0.881*** | ***0.121*** | |

**Table 5.** Cronbach's Alpha Final Scores

| **Variables** | | **Items** | **If item dropped** | **Item rest correlation** | **Cronbach's Alpha (std.)** |
|---|---|---|---|---|---|
| **Attitude Towards Behavior** | **ATT1** | Reducing heating in the home has no effect in tackling climate change* | 0.499 | 0.703 | **0.756** |
| | **ATT2** | Reducing water usage in the home has no effect in tackling climate change* | 0.585 | 0.649 | |
| | **ATT3** | I can save money by performing energy-saving behaviors at home | 0.875 | 0.398 | |
| **Subjective Norms** | **SN1** | Most people who are important to me support my effort to conserve energy for environmental reasons | 0.879 | 0.871 | **0.921** |
| | **SN2** | Most people who are important to me think I should conserve energy for environmental reasons | 0.897 | 0.819 | |
| | **SN3** | Most people who are important to me take steps to conserve energy for environmental reasons | 0.893 | 0.830 | |
| | **SN4** | I value the opinion of people who are significant in my life when it comes to making a decision on energy conservation | 0.919 | 0.753 | |
| | **PBC1** | I have the resources, time, and opportunity to conserve energy at my home | 0.831 | 0.765 | |
| | **PBC2** | Household energy- | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Perceived Behavioral Control** | | saving behaviors are easy to perform | 0.828 | 0.774 | **0.877** |
| | **PBC3** | I have enough environmental knowledge for discerning between responsible and harmful energy consumption behavior | 0.870 | 0.664 | |
| | **PBC4** | I have the necessary will and wisdom to reduce my energy consumption at home for environmental reasons | 0.841 | 0.739 | |
| **Intention** | **INT1** | I intend to conserve energy at home for environmental reasons | 0.916 | 0.736 | **0.922** |
| | **INT2** | I intend to use natural resources at home in a responsible manner (e.g., water, electricity, gas) | 0.908 | 0.774 | |
| | **INT3** | I will try to reduce my carbon footprint in the forthcoming month | 0.897 | 0.841 | |
| | **INT4** | I will conserve energy at home even if it is less comfortable to protect the environment | 0.892 | 0.864 | |
| | **INT5** | I am willing to participate in the energy-saving scheme at home in the following week | 0.908 | 0.786 | |
| **Awareness of Consequences** | **AC1** | Global warming is a problem for society | 0.766 | 0.517 | **0.784** |
| | **AC2** | Energy savings help reduce global warming | 0.798 | 0.372 | |
| | **AC3** | The exhaustion of fossil fuels is a problem | 0.746 | 0.524 | |
| | **AC4** | The exhaustion of energy sources is a problem | 0.687 | 0.711 | |
| | **AC5** | Environmental quality will improve if we use less energy | 0.710 | 0.644 | |
| **Ascription of Responsibility** | **AR1** | I feel jointly responsible for the exhaustion of energy sources | 0.647 | 0.621 | **0.760** |
| | **AR2** | I feel jointly responsible for global warming | 0.532 | 0.717 | |
| | **AR4** | Not only the government and | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | industry are responsible for high energy consumption levels, but me too | 0.824 | 0.455 | |
| **Personal Norms** | **PN1** | I feel personally obliged to save as much energy as possible | 0.857 | 0.718 | **0.881** |
| | **PN2** | I feel morally obliged to save energy, regardless of what others do | 0.871 | 0.732 | |
| | **PN3** | I feel guilty when I waste energy | 0.855 | 0.611 | |
| | **PN4** | I feel morally obliged to use green instead of regular electricity | 0.871 | 0.734 | |
| | **PN5** | People like me should do everything they can to reduce energy use | 0.875 | 0.609 | |
| | **PN6** | If I would buy a new washing machine, I would feel morally obliged to buy an energy efficient one | 0.873 | 0.586 | |
| | **PN7** | I feel obliged to bear the environment and nature in mind in my daily behavior | 0.863 | 0.670 | |
| **Behavior** | **BHV1** | I leave the water while I brush my teeth* | 0.891 | 0.614 | **0.898** |
| | **BHV2** | I turn the shower off while I soap up and then turn it back on to rinse off | 0.888 | 0.649 | |
| | **BHV3** | At home, I make sure that taps do not drip | 0.887 | 0.664 | |
| | **BHV4** | I turn off lights in common area rooms when I am the last person to leave | 0.882 | 0.713 | |
| | **BHV5** | I turn off standby appliances | 0.887 | 0.664 | |
| | **BHV6** | At home, I add or remove clothing rather than turning heating or fan or air conditioning up when it's hot or cold | 0.877 | 0.752 | |
| | **BHV7** | At home, I open or close windows rather than turning heating or fan or air conditioning up when it’s hot or cold | 0.877 | 0.756 | |
| | **BHV8** | I turn down/off heating before I leave the house | 0.891 | 0.607 | |

(* *reverse code item*)

As indicated in **Table 5**, the Cronbach's Alpha scores with the total correlation coefficients of the items show that all the retained items were reliable at a respectable level in order to be tested for the validity analysis.

## 5.3. Construct Validity Analysis

In this thesis study, there is no evaluation that was addressed by a behavioral scientist in order to determine the *Content Validity*. Nevertheless, the measurement items of the questionnaire were prepared and determined in accordance with Dr. Ing. Petr Soukup's opinions and suggestions. In order to ensure *Criterion Validity*, the items of measurement scales in this research were adapted from similar studies that were previously applied by various researchers and whose success was proven statistically (see **Appendix 2**). In the literature, it is generally proposed that the *Construct Validity* should be provided by Confirmatory Factor Analysis (CFA) results. Therefore, CFA was employed via JASP software to determine the construct validity of the measurement scales of the proposed model.

As shown in **Table 6**, the chi-square factor model value was found as 1958.511, and the degrees of freedom value was found as 674 ($p < .001$). Even though the chi-square test results are promising, it is also crucial to consider the additional fit indices in order to provide an accurate evaluation of whether or not the proposed model is well-fitting to obtained data. The additional fit indices are given in **Table 7**.

**Table 6.** Chi-square test

| Model | $X^2$ | df | p |
|---|---|---|---|
| Baseline model | 9471.703 | 741 | |
| Factor model | 1958.511 | 674 | < .001 |

**Table 7.** Fit indices

| Index | Value |
|---|---|
| Comparative Fit Index (**CFI**) | 0.853 |
| Tucker-Lewis Index (**TLI**) | 0.838 |
| Root Mean Square Error of Approximation (**RMSEA**) | 0.079 |
| Standardized Root Mean Square Residual (**SRMR**) | 0.070 |

According to **Table 7**, CFI TLI, and SRMR fit values were found at an insufficient level due to the calculated fit values out of standard value limits. Thus, this

model is unacceptable. In such a case, there are two processes that needed to be considered in order to improve the values of fit indices of the proposed model. Firstly, the items with a low factor loading should be removed to make sure the construct validity of the proposed model acceptable. Although it is a general recommendation that items with a factor loading of 0.40 (and greater should be retained) as the lowest acceptable threshold, a factor loading of 0.60 or 0.70 can be taken as the limit of the conservative end (Matasunaga, 2010, p. 101). Secondly, the standardized regression coefficients between the items should be examined. Accordingly, the most influencer regression coefficients that can decrease the chi-square and increase the values of fit indices should be applied. Eventually, these two processes are enough to make sure that the construct validity of the proposed model is an acceptable level. In this context, it is given the standardized factor loadings values with r-squared test results of the items in the **Table 8**.

**Table 8.** Parameter Estimates

| | | | | | | | **95% Confidence Interval** | | |
|---|---|---|---|---|---|---|---|---|---|
| **Factor** | **Indicator** | **R²** | **Estimate** | **Std. Error** | **z-value** | **p** | **Lower** | **Upper** | **Std. Est.** |
| **ATT** | att1 | 0.880 | 1.222 | 0.062 | 19.676 | < .001 | 1.100 | 1.344 | 0.938 |
| | att2 | 0.674 | 0.930 | 0.057 | 16.349 | < .001 | 0.819 | 1.042 | 0.821 |
| | ***att3*** | ***0.212*** | ***0.653*** | ***0.081*** | ***8.099*** | ***< .001*** | ***0.495*** | ***0.810*** | ***0.460*** |
| **SN** | sn1 | 0.837 | 1.408 | 0.069 | 20.475 | < .001 | 1.274 | 1.543 | 0.915 |
| | sn2 | 0.755 | 1.290 | 0.069 | 18.800 | < .001 | 1.155 | 1.424 | 0.869 |
| | sn3 | 0.783 | 1.258 | 0.065 | 19.362 | < .001 | 1.130 | 1.385 | 0.885 |
| | sn4 | 0.617 | 1.135 | 0.071 | 16.073 | < .001 | 0.996 | 1.273 | 0.785 |
| **PBC** | pbc1 | 0.692 | 1.150 | 0.066 | 17.431 | < .001 | 1.020 | 1.279 | 0.832 |
| | pbc2 | 0.649 | 0.992 | 0.060 | 16.600 | < .001 | 0.875 | 1.109 | 0.806 |
| | pbc3 | 0.509 | 0.929 | 0.067 | 13.949 | < .001 | 0.798 | 1.059 | 0.713 |
| | pbc4 | 0.718 | 1.058 | 0.059 | 17.930 | < .001 | 0.942 | 1.173 | 0.847 |
| **INT** | int1 | 0.636 | 0.992 | 0.060 | 16.550 | < .001 | 0.875 | 1.110 | 0.797 |
| | int2 | 0.688 | 1.052 | 0.060 | 17.579 | < .001 | 0.935 | 1.169 | 0.830 |
| | int3 | 0.743 | 1.550 | 0.083 | 18.670 | < .001 | 1.387 | 1.712 | 0.862 |
| | int4 | 0.799 | 1.460 | 0.074 | 19.835 | < .001 | 1.315 | 1.604 | 0.894 |
| | int5 | 0.682 | 1.213 | 0.069 | 17.461 | < .001 | 1.077 | 1.349 | 0.826 |
| **AC** | ***ac1*** | ***0.212*** | ***0.523*** | ***0.065*** | ***8.057*** | ***< .001*** | ***0.396*** | ***0.650*** | ***0.460*** |
| | ***ac2*** | ***0.113*** | ***0.629*** | ***0.110*** | ***5.709*** | ***< .001*** | ***0.413*** | ***0.844*** | ***0.336*** |
| | ac3 | 0.518 | 1.010 | 0.073 | 13.926 | < .001 | 0.868 | 1.152 | 0.720 |
| | ac4 | 0.720 | 1.070 | 0.061 | 17.656 | < .001 | 0.951 | 1.188 | 0.849 |
| | ac5 | 0.721 | 1.200 | 0.068 | 17.672 | < .001 | 1.067 | 1.334 | 0.849 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **AR** | ar1 | 0.692 | 1.124 | 0.073 | 15.395 | < .001 | 0.981 | 1.267 | 0.832 |
| | ar2 | 0.697 | 1.115 | 0.072 | 15.461 | < .001 | 0.974 | 1.257 | 0.835 |
| | ***ar4*** | **0.271** | **0.677** | **0.076** | **8.966** | **< .001** | **0.529** | **0.825** | **0.521** |
| **PN** | pn1 | 0.601 | 0.843 | 0.054 | 15.724 | < .001 | 0.738 | 0.949 | 0.775 |
| | pn2 | 0.669 | 0.971 | 0.057 | 17.026 | < .001 | 0.859 | 1.083 | 0.818 |
| | pn3 | 0.432 | 0.956 | 0.076 | 12.536 | < .001 | 0.806 | 1.105 | 0.657 |
| | pn4 | 0.545 | 1.178 | 0.080 | 14.657 | < .001 | 1.020 | 1.335 | 0.738 |
| | pn5 | 0.445 | 0.789 | 0.062 | 12.782 | < .001 | 0.668 | 0.910 | 0.667 |
| | pn6 | 0.377 | 0.919 | 0.080 | 11.514 | < .001 | 0.763 | 1.076 | 0.614 |
| | pn7 | 0.560 | 1.013 | 0.068 | 14.941 | < .001 | 0.880 | 1.146 | 0.748 |
| **BHV** | bhv1 | 0.434 | 1.360 | 0.108 | 12.544 | < .001 | 1.148 | 1.573 | 0.659 |
| | bhv2 | 0.448 | 1.511 | 0.118 | 12.812 | < .001 | 1.280 | 1.742 | 0.670 |
| | bhv3 | 0.444 | 1.181 | 0.093 | 12.722 | < .001 | 0.999 | 1.363 | 0.666 |
| | bhv4 | 0.575 | 0.977 | 0.064 | 15.178 | < .001 | 0.851 | 1.103 | 0.758 |
| | bhv5 | 0.472 | 1.309 | 0.099 | 13.244 | < .001 | 1.116 | 1.503 | 0.687 |
| | bhv6 | 0.695 | 1.227 | 0.070 | 17.490 | < .001 | 1.089 | 1.364 | 0.834 |
| | bhv7 | 0.701 | 1.186 | 0.067 | 17.601 | < .001 | 1.054 | 1.319 | 0.837 |
| | bhv8 | 0.466 | 1.128 | 0.086 | 13.144 | < .001 | 0.960 | 1.297 | 0.683 |

It should be noted that if the values of fit indices are at an acceptable level, any items should not be removed unless the item's factor loading cutoff is lower than 0.40. However, the values of the fit indices in this model are not at an appreciative level as shown in **Table 8**. Thus, the items with the lowest factor loading cutoffs were needed to be removed. In accordance with the factor loadings in Table 3, att3 (0.460, p<0.001) "*I can save money by performing energy-saving behaviors at home*", ac1 (0.460, p<0.001) *"Global warming is a problem for society",* ac2 (0.336, p<0.001) "*Energy savings help reduce global warming*", and ar4 (0.521, p<0.001) "*Not only the government and industry are responsible for high energy consumption levels, but me too*" items were removed in order to increase the fit indices values due to the factor loading values of these items are below 0.60.

In addition, removing the items with the lower factor loading cutoffs might not be quite enough to provide minimum validity values of fit indices. Therefore, the residual modification suggestions should be also taken into account. In this sense, it is needed to examine the residual covariances table as suggested by CFA analysis to improve the values of fit indices. The higher the regression coefficients in the residual covariances, the greater the effect on the chi-square result. Thus, in order to improve the chi-square value and the fit indices values, it is necessary to create covariances between the standard errors as suggested in the residual covariances table. Additionally, it is also recommended that the residual covariances should be from the same factors. The effects

of the suggested residual covariances between standard errors of the items to the chi-square result are given in **Table 9**.

**Table 9.** Suggested Residual covariances

| Covariances | Mod. Ind. | EPC |
|---|---|---|
| **bhv6 ↔ bhv7** | **104.803** | **0.509** |
| pbc4 ↔ int1 | 40.180 | 0.213 |
| **int3 ↔ int4** | **36.641** | **0.305** |
| **pn6 ↔ pn7** | **31.060** | **0.369** |
| **ac3 ↔ ac4** | **28.996** | **0.302** |
| sn1 ↔ bhv3 | 21.480 | 0.275 |
| att2 ↔ int1 | 20.887 | 0.147 |
| bhv1 ↔ bhv6 | 18.537 | -0.369 |
| pbc4 ↔ bhv3 | 18.319 | -0.247 |
| bhv1 ↔ bhv4 | 16.601 | 0.340 |
| pn5 ↔ pn7 | 16.576 | -0.204 |
| ac4 ↔ ac5 | 15.703 | -0.268 |
| pbc1 ↔ pbc2 | 15.327 | 0.167 |
| pn3 ↔ pn4 | 15.028 | 0.288 |
| bhv4 ↔ bhv6 | 14.720 | -0.187 |
| att1 ↔ pn7 | 14.558 | -0.156 |
| bhv3 ↔ bhv6 | 14.482 | -0.279 |
| sn3 ↔ bhv3 | 14.146 | -0.223 |
| pbc1 ↔ pbc4 | 14.042 | -0.159 |
| pbc2 ↔ bhv8 | 13.620 | 0.209 |
| sn4 ↔ pbc4 | 13.605 | -0.147 |
| int1 ↔ bhv3 | 13.512 | -0.228 |
| int2 ↔ bhv5 | 13.481 | -0.227 |
| sn3 ↔ int1 | 13.112 | 0.124 |
| pbc3 ↔ pn1 | 12.921 | -0.143 |
| att1 ↔ int1 | 12.474 | -0.121 |
| int1 ↔ int4 | 12.368 | -0.136 |
| ar1 ↔ bhv1 | 12.367 | -0.294 |
| ac4 ↔ pn6 | 11.979 | 0.189 |
| bhv2 ↔ bhv3 | 11.662 | 0.470 |

| | | |
|---|---|---|
| bhv4 ↔ bhv8 | 11.449 | -0.221 |
| sn3 ↔ pbc4 | 11.411 | 0.108 |
| int1 ↔ ar1 | 11.411 | 0.141 |
| sn4 ↔ pn3 | 11.407 | 0.207 |
| pn2 ↔ pn7 | 11.321 | -0.141 |
| att2 ↔ bhv3 | 11.255 | -0.187 |
| att1 ↔ pn2 | 10.801 | 0.107 |
| sn2 ↔ bhv4 | 10.628 | -0.136 |
| att2 ↔ int4 | 10.457 | -0.106 |
| pn4 ↔ pn7 | 10.394 | -0.202 |
| pn4 ↔ pn5 | 10.357 | 0.193 |
| sn1 ↔ sn4 | 10.155 | 0.153 |

As indicated in **Table 9**, highest residual covariances such as bhv6 ↔ bhv7 (104.803), int3 ↔ int4 (36.641), pn6 ↔ pn7 (31.060), and ac3 ↔ ac4 (28.996) were created in order to decrease the chi-square value whereas to improve the fit indices values (see **Table 10**).

**Table 10.** Applied Residual Covariances

| | | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | **Estimate** | **Std. Error** | **z-value** | **p** | **Lower** | **Upper** |
| **bhv6 ↔ bhv7** | 0.510 | 0.070 | 7.289 | < .001 | 0.373 | 0.647 |
| **int3 ↔ int4** | 0.331 | 0.062 | 5.369 | < .001 | 0.210 | 0.452 |
| **pn6 ↔ pn7** | 0.372 | 0.074 | 5.056 | < .001 | 0.228 | 0.516 |
| **ac3 ↔ ac4** | 0.299 | 0.063 | 4.737 | < .001 | 0.175 | 0.423 |

Eventually, it was observed that chi-square and the degree of freedom values were improved (see **Table 11**) through removing “att3”, “ac1”, “ac2” and “ar4” items with creating the residual covariances between the suggested items.

**Table 11.** Chi-square test

| **Model** | **$X^2$** | **df** | **p** |
|---|---|---|---|
| **Baseline model** | 8665.273 | 595 | |
| **Factor model** | 1181.355 | 528 | < .001 |

Accordingly, the chi-square value in the factor model was found as 1181.355, and 528.000 for the degree of freedom value ($p < .001$). Even though this chi-square and

the degrees of freedom values are better than the previous calculation, this result still does not mean that this is an acceptable model. Thus, the fit indices values of the model should be examined again in order to provide whether or not CFI, TLI, RMSEA, and SRMR values are compatible with the acceptable standards. The fit indices values of the new calculation are given in **Table 12**.

**Table 12.** Fit indices

| Index | Value |
|---|---|
| Comparative Fit Index (**CFI**) | 0.919 |
| Tucker-Lewis Index (**TLI**) | 0.909 |
| Root Mean Square Error of Approximation (**RMSEA**) | 0.064 |
| Standardized Root Mean Square Residual (**SRMR**) | 0.048 |

As it can be seen in **Table 11**, the values of fit indices such as CFI value (0.919), TLI value (0.909), RMSEA value (0.064), and SRMR value (0.048) are within the limits of "acceptable fit" and "good fit" standards. In consequence, when the fit indices are considered as a whole, CFA calculation indicates that the model is at an acceptable fit level in the scale design. In **Table 13**, on the other hand, factor loading values of the items and r-squared test results are given. Accordingly, when the factor loadings values are examined, it was found that only pn6 (0.587, $p<0.001$) item was below 0.60. However, as mentioned before, this item does not need to be removed anymore due to the values of fit indices were already at an acceptable fit.

**Table 13.** Factor loadings

| | | | | | | | 95% Confidence Interval | | |
|---|---|---|---|---|---|---|---|---|---|
| **Factor** | **Indicator** | **$R^2$** | **Estimate** | **Std. Error** | **z-value** | **p** | **Lower** | **Upper** | **Std. Est.** |
| **ATT** | att1 | 0.939 | 1.262 | 0.064 | 19.677 | < .001 | 1.136 | 1.388 | 0.969 |
| | att2 | 0.645 | 0.910 | 0.059 | 15.459 | < .001 | 0.794 | 1.025 | 0.803 |
| **SN** | sn1 | 0.837 | 1.409 | 0.069 | 20.487 | < .001 | 1.274 | 1.544 | 0.915 |
| | sn2 | 0.754 | 1.288 | 0.069 | 18.776 | < .001 | 1.154 | 1.423 | 0.868 |
| | sn3 | 0.783 | 1.258 | 0.065 | 19.364 | < .001 | 1.130 | 1.385 | 0.885 |
| | sn4 | 0.618 | 1.135 | 0.071 | 16.092 | < .001 | 0.997 | 1.274 | 0.786 |
| **PBC** | pbc1 | 0.687 | 1.145 | 0.066 | 17.336 | < .001 | 1.016 | 1.275 | 0.829 |
| | pbc2 | 0.645 | 0.989 | 0.060 | 16.524 | < .001 | 0.872 | 1.106 | 0.803 |
| | pbc3 | 0.505 | 0.925 | 0.067 | 13.882 | < .001 | 0.795 | 1.056 | 0.711 |
| | pbc4 | 0.727 | 1.064 | 0.059 | 18.116 | < .001 | 0.949 | 1.179 | 0.853 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **INT** | int1 | 0.653 | 1.006 | 0.060 | 16.887 | < .001 | 0.889 | 1.122 | 0.808 |
| | int2 | 0.694 | 1.057 | 0.060 | 17.697 | < .001 | 0.940 | 1.174 | 0.833 |
| | int3 | 0.687 | 1.490 | 0.085 | 17.510 | < .001 | 1.323 | 1.657 | 0.829 |
| | int4 | 0.754 | 1.418 | 0.075 | 18.872 | < .001 | 1.270 | 1.565 | 0.868 |
| | int5 | 0.668 | 1.200 | 0.070 | 17.170 | < .001 | 1.063 | 1.337 | 0.817 |
| **AC** | ac3 | 0.437 | 0.927 | 0.076 | 12.213 | < .001 | 0.778 | 1.076 | 0.661 |
| | ac4 | 0.625 | 0.997 | 0.063 | 15.704 | < .001 | 0.872 | 1.121 | 0.791 |
| | ac5 | 0.788 | 1.255 | 0.068 | 18.473 | < .001 | 1.122 | 1.388 | 0.888 |
| **AR** | ar1 | 0.909 | 1.289 | 0.084 | 15.354 | < .001 | 1.124 | 1.453 | 0.954 |
| | ar2 | 0.540 | 0.982 | 0.081 | 12.200 | < .001 | 0.824 | 1.140 | 0.735 |
| **PN** | pn1 | 0.605 | 0.846 | 0.054 | 15.778 | < .001 | 0.741 | 0.951 | 0.778 |
| | pn2 | 0.679 | 0.978 | 0.057 | 17.202 | < .001 | 0.867 | 1.090 | 0.824 |
| | pn3 | 0.433 | 0.957 | 0.076 | 12.552 | < .001 | 0.808 | 1.107 | 0.658 |
| | pn4 | 0.543 | 1.175 | 0.081 | 14.600 | < .001 | 1.018 | 1.333 | 0.737 |
| | pn5 | 0.452 | 0.796 | 0.062 | 12.916 | < .001 | 0.675 | 0.916 | 0.673 |
| | **pn6** | **0.345** | **0.879** | **0.081** | **10.856** | < .001 | **0.720** | **1.038** | **0.587** |
| | pn7 | 0.538 | 0.993 | 0.068 | 14.505 | < .001 | 0.859 | 1.127 | 0.733 |
| **BHV** | bhv1 | 0.482 | 1.433 | 0.107 | 13.337 | < .001 | 1.222 | 1.643 | 0.694 |
| | bhv2 | 0.470 | 1.548 | 0.118 | 13.126 | < .001 | 1.316 | 1.779 | 0.686 |
| | bhv3 | 0.473 | 1.220 | 0.093 | 13.179 | < .001 | 1.039 | 1.401 | 0.688 |
| | bhv4 | 0.618 | 1.012 | 0.064 | 15.874 | < .001 | 0.887 | 1.137 | 0.786 |
| | bhv5 | 0.468 | 1.305 | 0.100 | 13.092 | < .001 | 1.110 | 1.500 | 0.684 |
| | bhv6 | 0.579 | 1.119 | 0.074 | 15.115 | < .001 | 0.974 | 1.265 | 0.761 |
| | bhv7 | 0.587 | 1.085 | 0.071 | 15.265 | < .001 | 0.946 | 1.225 | 0.766 |
| | bhv8 | 0.448 | 1.107 | 0.087 | 12.721 | < .001 | 0.936 | 1.277 | 0.670 |

In addition, when the factor covariances calculations are examined (see **Table 14**), all the correlations between the factors are found positive at a significant level ($p<0.001$) as it was expected. According to Table 9., the strongest correlations were found between Intention and Personal Norm factors (0.933) and Perceived Behavioral Control and Intention factors (0.925)

**Table 14.** Factor Covariances

| | | | | | **95% Confidence Interval** | | |
|---|---|---|---|---|---|---|---|
| | **Estimate** | **Std. Error** | **z-value** | **p** | **Lower** | **Upper** | **Std. Est. (all)** |
| **ATT ↔ SN** | 0.432 | 0.051 | 8.399 | < .001 | 0.331 | 0.533 | 0.432 |
| **ATT ↔ PBC** | 0.604 | 0.044 | 13.721 | < .001 | 0.517 | 0.690 | 0.604 |
| **ATT ↔ INT** | 0.627 | 0.042 | 15.025 | < .001 | 0.545 | 0.709 | 0.627 |
| **ATT ↔ AC** | 0.601 | 0.046 | 13.112 | < .001 | 0.511 | 0.691 | 0.601 |
| **ATT ↔ AR** | 0.278 | 0.059 | 4.754 | < .001 | 0.163 | 0.393 | 0.278 |
| **ATT ↔ PN** | 0.643 | 0.042 | 15.465 | < .001 | 0.561 | 0.724 | 0.643 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **ATT ↔ BHV** | 0.542 | 0.047 | 11.421 | < .001 | 0.449 | 0.635 | 0.542 |
| **SN ↔ PBC** | 0.705 | 0.035 | 20.088 | < .001 | 0.636 | 0.774 | 0.705 |
| **SN ↔ INT** | 0.759 | 0.030 | 25.489 | < .001 | 0.700 | 0.817 | 0.759 |
| **SN ↔ AC** | 0.622 | 0.043 | 14.436 | < .001 | 0.538 | 0.707 | 0.622 |
| **SN ↔ AR** | 0.329 | 0.057 | 5.740 | < .001 | 0.217 | 0.441 | 0.329 |
| **SN ↔ PN** | 0.680 | 0.037 | 18.378 | < .001 | 0.607 | 0.752 | 0.680 |
| **SN ↔ BHV** | 0.726 | 0.033 | 21.794 | < .001 | 0.661 | 0.791 | 0.726 |
| **PBC ↔INT** | 0.925 | 0.017 | 55.686 | < .001 | 0.892 | 0.957 | 0.925 |
| **PBC ↔ AC** | 0.779 | 0.033 | 23.434 | < .001 | 0.714 | 0.844 | 0.779 |
| **PBC ↔ AR** | 0.446 | 0.055 | 8.093 | < .001 | 0.338 | 0.553 | 0.446 |
| **PBC ↔ PN** | 0.861 | 0.024 | 36.631 | < .001 | 0.815 | 0.907 | 0.861 |
| **PBC ↔ BHV** | 0.786 | 0.030 | 26.044 | < .001 | 0.726 | 0.845 | 0.786 |
| **INT ↔ AC** | 0.858 | 0.026 | 33.340 | < .001 | 0.807 | 0.908 | 0.858 |
| **INT ↔ AR** | 0.488 | 0.053 | 9.264 | < .001 | 0.385 | 0.591 | 0.488 |
| **INT ↔ PN** | 0.933 | 0.016 | 59.385 | < .001 | 0.902 | 0.964 | 0.933 |
| **INT ↔ BHV** | 0.793 | 0.029 | 27.815 | < .001 | 0.737 | 0.849 | 0.793 |
| **AC ↔ AR** | 0.483 | 0.055 | 8.762 | < .001 | 0.375 | 0.591 | 0.483 |
| **AC ↔ PN** | 0.793 | 0.032 | 24.806 | < .001 | 0.731 | 0.856 | 0.793 |
| **AC ↔ BHV** | 0.631 | 0.044 | 14.259 | < .001 | 0.544 | 0.717 | 0.631 |
| **AR ↔ PN** | 0.481 | 0.054 | 8.971 | < .001 | 0.376 | 0.587 | 0.481 |
| **AR ↔BHV** | 0.285 | 0.060 | 4.745 | < .001 | 0.167 | 0.403 | 0.285 |
| **PN ↔ BHV** | 0.763 | 0.032 | 23.800 | < .001 | 0.700 | 0.825 | 0.763 |

Overall, the standard factor loading values of the observed variables are between 0.587 and 0.969, and all of the standard factor loading and standard error values are significant at the $p<0.01$ level. As mentioned before, factor loading coefficient values higher than 0.60 indicate a high effect. Hence, the results assert that the observed variables can explain the latent variables at a high level because the standard loading values of the variables in this thesis study are above 0.60, except “pn6” item (0.587). In conclusion, taken together with the results of fit indices values, it can be asserted that the proposed model structure and variables are at an acceptable level for the construct validity.

## 5.4. Structural Equation Modeling

In order to test the proposed hypotheses (**H1**-**H11**), Structural Equation Modeling (SEM) was employed via JASP software. First of all, the standard indices of fit values need to be examined in order to determine the statistical significance of a developed theoretical model. As in the CFA, standard indices of fit values in SEM should be considered in terms of indicating whether the results of the model provide a statistical sufficiency to explain the relationship between the items and variables in the model. Accordingly, the reference indices of fit values in SEM are given in **Table 15**. In **Table 16**, it is given that the fit indices values of the proposed model.

**Table 15**. The Reference Values of Standard Fit Indices

| Fit indices | Very Good | Acceptable |
|---|---|---|
| $X^2$ "p" value | p >0.05 | - |
| $X^2$/df | <2 | <5 |
| RMSEA | ≤0 | ≤0.08 |
| SRMR | <0.05 | <0.08 |
| TLI/NNFI | ≥0.95 | ≥0.90 |
| CFI | ≥0.95 | ≥0.90 |

(Citated from Hooper, Coughlan and Mullen (2008, p. 53-55)

**Table 16**. Fit Indices of The Study Model

| Fit indices | Value |
|---|---|
| $\chi^2$ | 1247.055 |
| Degrees of freedom (df) | 539.000 |
| p | < .001 |
| Comparative Fit Index (CFI) | 0.912 |
| Tucker-Lewis Index (TLI) | 0.903 |
| Root Mean Square Error of Approximation (RMSEA) | 0.066 |
| Standardized Root Mean Square Residual (SRMR) | 0.050 |

As shown in **Table 16**, Chi-square value was found as 1247.055, and degrees of freedom value was found as 539.00. CFI value was found as "0.913" which is at an acceptable fit level, TLI value was found as "0.903" which is at an acceptable fit level, RMSEA value was found as "0.066" which is at an acceptable fit level, and SRMR value was found as "0.050" which is at a very good fit level. To sum up, the fit values of all indices are within the limits of "acceptable fit" or "very good fit". As a result, it is possible to say that this structural equation model structure is at an acceptable level.

After evaluating the fit indices values of the SEM, it is necessary to examine the relationships of the model components and the impact levels of these relationships to reveal whether these relationships are statistically significant. This examination, on the other hand, also indicates that whether the proposed hypotheses toward the factor relationships in the study model structure are acceptable. The parameter estimates of the relationship between the factor components of the study model are given in **Table 17**.

**Table 17.** Parameter Estimates

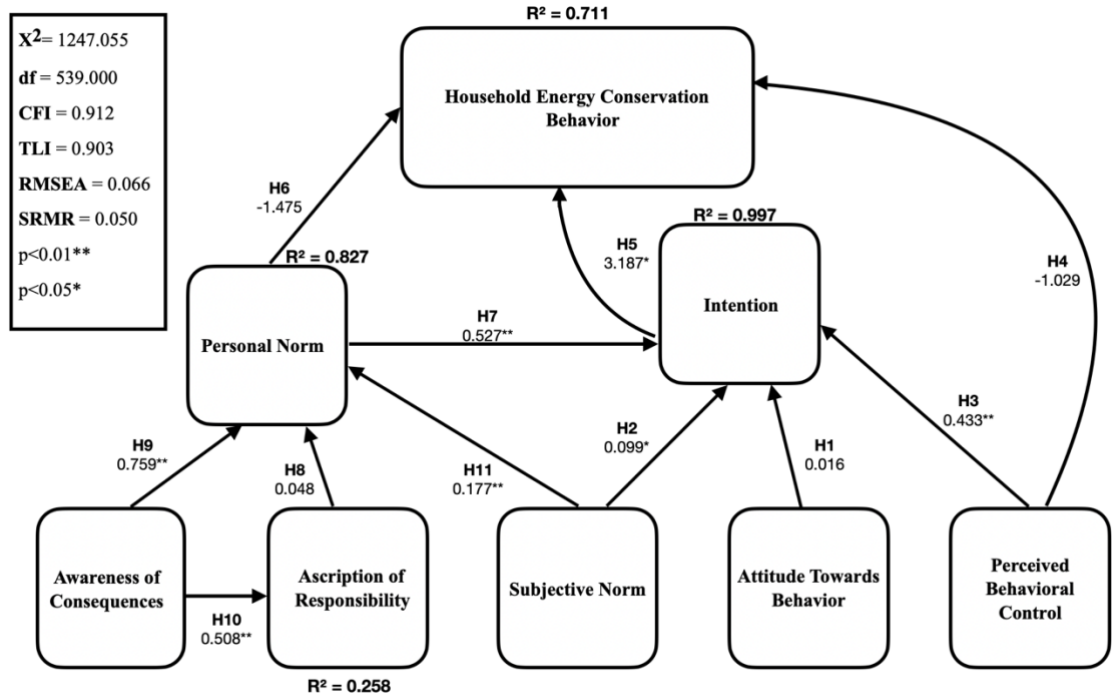
| Hypotheses | Est | Se | z | p | CI (lower) | CI (upper) | Std (all) |
|---|---|---|---|---|---|---|---|
| **INT ~ ATT (H1)** | 0.013 | 0.014 | 0.925 | ***0.355*** | -0.015 | 0.041 | ***0.016*** |
| **INT ~ SN (H2)** | 0.070 | 0.028 | 2.447 | 0.014 | 0.014 | 0.125 | 0.099 |
| **INT ~ PBC (H3)** | 0.378 | 0.055 | 6.906 | < .001 | 0.271 | 0.485 | 0.433 |
| **BHV ~ PBC (H4)** | -1.288 | 0.861 | -1.496 | ***0.135*** | -2.975 | 0.400 | ***-1.029*** |
| **BHV ~ INT (H5)** | 4.564 | 1.968 | 2.319 | 0.020 | 0.706 | 8.421 | 3.187 |
| **BHV ~ PN (H6)** | -2.508 | 1.346 | -1.863 | ***0.062*** | -5.147 | 0.131 | ***-1.475*** |
| **INT ~ PN (H7)** | 0.626 | 0.076 | 8.269 | < .001 | 0.478 | 0.775 | 0.527 |
| **PN ~ AR (H8)** | 0.031 | 0.030 | 1.041 | ***0.298*** | -0.028 | 0.090 | ***0.048*** |
| **PN ~ AC (H9)** | 0.728 | 0.090 | 8.098 | < .001 | 0.552 | 0.904 | 0.759 |
| **AR ~ AC (H10)** | 0.744 | 0.102 | 7.303 | < .001 | 0.545 | 0.944 | 0.508 |
| **PN ~ SN (H11)** | 0.105 | 0.035 | 2.996 | 0.003 | 0.036 | 0.174 | 0.177 |

*(n=303)*

According to Table 3 results, *Attitude Towards Behavior* has a weak influence on *Intention* in the line with standardized estimate value of 0.016 which is also statistically insignificant for a p< 0.05 (p=0.355), thus **H1** is rejected. *Subjective Norm* has a weak influence on *Intention* in the line with standardized estimate value of 0.099, but it is statistically significant for a p< 0.05 (p=0.014), thus **H2** is validated. *Perceived Behavioral Control* has a positive influence on *Intention* in the line with standardized estimate value of 0.433 which is also statistically significant for a p<0.01 (p<0.001), thus **H3** is validated. *Perceived Behavioral Control* has a negative influence on *Behavior* in the line with standardized estimate value of -1.029 which is also statistically insignificant for a p<0.05 (p=0.135), thus **H4** is rejected. *Intention* has the strongest influence on *Behavior* in the line with standardized estimate value of 3.187 which is also statistically significant for a p<0.05 (p=0.020), thus **H5** is validated. *Personal Norm* has a negative influence on *Behavior* in the line with standardized estimate value of -1.475 which is also statistically insignificant for a p<0.05 (p=0.062), thus **H6** is rejected. *Personal Norm* has a positive influence on *Intention* in the line with standardized estimate value of 0.527 which is also statistically insignificant for a p<0.01 (p<0.001), thus **H7** is validated. *Ascription of Responsibility* has a weak influence on *Personal Norm* in the line with standardized estimate value of 0.048, but it is

statistically insignificant for p<0.05 (p=0.298), thus **H8** is rejected. *Awareness of Consequences* has positive influence on *Personal Norm* in the line with standardized estimate value of 0.759 which is also statistically significant for a p< 0.01 (p<0.001), thus **H9** is validated. *Awareness of Consequences* has a positive influence on *Ascription of Responsibility* in the line with standardized estimate value of 0.508 which is also statistically significant for p<0.01 (p<0.001), thus **H10** is validated. *Subjective Norm* has positive influence on *Personal Norm* in the line with standardized estimate value of 0.177 which is also statistically significant for p<0.01 (p=0.003), thus **H11** is validated. According to obtained result from parameter estimates, the path diagram of the model is given in **Figure 10**.

**Figure 10.** The Path Diagram of the Study model




The cumulative effects of the three predictors such as *Intention, Perceived Behavioral Control* and *Personal Norm* explain in a proportion of 71% the variance of individuals' household energy conservation behavior ($R^2 = 0.711$). This result suggests that *Intention* has the highest impact on performing household energy conservation behavior amongst the other predictors of *Behavior* (3.187, p<0.05). *Intention* variable was explained in a proportion of 99% by its four predictors such as *Attitude Towards Behavior, Subjective Norm, Perceived Behavioral Control* and *Personal Norm* ($R^2$ =

0.997). This result suggests that *Personal Norm* variable has the highest impact on Intention variable amongst the other predictors of *Intention* (0.527, p<0.001). *Personal Norm* variable was explained in a proportion of 82% by its three predictors such as *Subjective Norm, Awareness of Consequences* and *Ascription of Responsibility* ($R^2$ = 0.827). This result suggest that *Awareness of Consequences* variable has the highest impact on Personal Norm variable amongst the other predictors of *Personal Norm* (0.759, p<0.001). Lastly, *Ascription of Responsibility* variable was explained in a proportion of 25% by only is one prediction which is *Awareness of Consequences* ($R^2$ = 0.258). Consequently, the validation results of the proposed hypotheses towards the developed model construction are given in **Table 18**.

**Table 18**. Results of Proposed Hypotheses

| CODE | Hypotheses | Results |
|---|---|---|
| **H1** | Attitude towards household energy conservation positively affects household energy conservation intention. | **Reject** |
| **H2** | Subjective norms toward household energy conservation positively affect household energy conservation intention. | **Valid** |
| **H3** | Perceived behavioral control toward household energy conservation positively affects household energy conservation intention. | **Valid** |
| **H4** | Perceived behavioral control toward household energy conservation positively affects household energy conservation behavior. | **Reject** |
| **H5** | Intention toward household energy conservation positively affects household energy conservation behavior. | **Valid** |
| **H6** | Personal norm toward household energy conservation positively affects household energy conservation behavior. | **Reject** |
| **H7** | Personal norm toward household energy conservation positively affects household energy conservation intention. | **Valid** |
| **H8** | Ascription of responsibility toward household energy conservation positively affects personal norm to conserve household energy consumption | **Reject** |
| **H9** | Awareness of consequences toward household energy conservation positively affects personal norm to conserve household energy consumption | **Valid** |
| **H10** | Awareness of consequences toward household energy conservation positively affects ascription of responsibility to conserve household energy consumption | **Valid** |
| **H11** | Subjective norms to conserve the household energy consumption positively affect the personal norm toward household energy conservation | **Valid** |

## 5.5. Analysis of Variances (ANOVA)

In this section, it was analyzed whether the differences in the household energy conservation behavior variable in terms of education level, income level, and household size of the individuals have statistical significance.

**ANOVA - Education**

The results of one-way ANOVA regarding the household energy conservation behaviors of the participants according to the level of education are given in **Table 19.**

**Table 19**. Behavior by Education

| Education | Mean | SD | N | F | p |
|---|---|---|---|---|---|
| High school graduate or lower | 4.074 | 1.413 | 37 | 13.790 | < .001 |
| Some college credit, no degree | 5.172 | 1.177 | 93 | | |
| Bachelor's degree or higher | 5.264 | 1.275 | 173 | | |

As indicated in **Table 19**, the options specified separately at the level of education in the survey form (i.e., "No schooling completed", "Primary school", "Some high school, no diploma", "High school graduate, diploma or the equivalent", "Some college credit, no degree", "Trade/technical/vocational training", "Associate degree", "Bachelor's degree", "Master's degree", "Professional degree/ MBA", and "Doctorate degree") were consolidated into 3 groups as "High school graduate or lower", "some college credit, no degree" and "Bachelor's degree or higher" in order to analyze whether or not the participants' household energy conservation behaviors vary across different levels of education.

When the relationship between the household energy conservation behavior variable and the education levels of the sample individuals (n=303) is examined, the mean of the participants who are at the level of "High school graduate or lower" was found as 4.074, the mean of the participants who are at the level of "Some college credit, no degree" was found as 5.172, and the mean of the participants who were at the level of "Bachelor's degree or higher" was found as 5.264. As a result, this difference shows that as the education levels of the participants increase, the household energy conservation behavior performance increases as well, and this increase was found statistically significant at the $p<0.05$ level ($p<0.001$).

In addition to the ANOVA test, the Tukey test under the post-hoc comparison analysis was also conducted to evaluate the results of the relationships between the groups (High school graduate or lower, Some college credit, no degree, and Bachelor's degree or higher). Thus, it was aimed to reveal whether or not the differences between education levels were statistically significant. **Table 20** shows the Tukey test results regarding the differences in the education levels of the participants between the mean values of the variable of household energy conservation behavior.

**Table 20**. Post-Hoc Comparison – What is the highest degree or level of school you have completed?

| **Post-Hoc Comparison** | | **Mean Difference** | **SE** | **t** | **P tukey** |
|---|---|---|---|---|---|
| Bachelor's degree, or higher | High school graduate, or lower | 1.189 | 0.229 | 5.198 | <0.001 |
| | Some college credit, no degree | 0.092 | 0.162 | 0.564 | 0.839 |
| High school graduate, or lower | Some college credit, no degree | -1.098 | 0.246 | -4.471 | <0.001 |

When the mean differences between the education levels of the participants in terms of the behavior variable were examined, the mean differences in the household energy conservation behavior of the participants at the level of "Bachelor's degree, or higher" and "High school graduate, or lower" were found as 1.189. This result indicates that there is a difference between these two groups, and it is also statistically significant at the $p<0.05$ level ($p<0.001$). On the other hand, the mean differences in the household energy conservation behavior of the participants at the level of "Bachelor's degree, or higher" and "Some college credit, no degree" were found as 0.092. This result indicates that there is a difference between these two groups, but it is not statistically significant at the $p<0.05$ level ($p=0.804$). Lastly, the mean differences in the household energy conservation behavior of the participants at the level of "High school graduate, or lower" and "Some college credit, no degree" were found as -1.098. This result indicates that there is a difference between these two groups, and it is statistically significant at the $p<0.05$ level ($p<0.001$).

To sum up, when **Table 20** is examined, although there was a difference between the participants at the "Bachelor's degree or higher" and "Some college credit, no degree" education levels as a result of the Tukey test, this difference was not found at a statistically significant level. Nevertheless, in "Bachelor's degree or higher " and "High school graduate, or lower ", it was found that there is a difference between the participants' education level, and this difference is at a statistically significant level. Similarly, the difference between the means of the participants at the education level of "High school graduate, or lower" and "Some college credit, no degree " was detected as well, and this difference is at a statistically significant level. Consequently, it is possible to propose that as the education levels of the participants increased, the mean of household energy conservation behavior increased as well. Thereby, **H12**: "Household energy conservation behavior varies across to the level of education" is validated.

**ANOVA – Income**

The results of one-way ANOVA regarding the household energy conservation behaviors of the participants according to the income levels are given in **Table 21**

**Table 21**. ANOVA – Behavior by Income

| Income | Mean | SD | N | F | p |
|---|---|---|---|---|---|
| 0-13.999 kč | 5.503 | 0.986 | 76 | 7.968 | 0.001 |
| 14.000-29.999 kč | 5.131 | 1.266 | 151 | | |
| 30.000 or more kč | 4.612 | 1.600 | 57 | | |

As indicated in **Table 21**, the options were specified separately at the income level in the survey form (i.e., 0-2.500 kč, 2.500-4.999 kč, 5.000-7.999 kč, 8.000-9.999 kč, 10.000-11.999 kč, 12.000-13.999 kč, 14.000-15.999 kč, 16.000-17.999 kč, 18.000-19.999 kč, 20.000-22.999 kč, 23.000-25.999 kč, 26.000-29.999 kč, 30.000-49.999 kč, and 50.000 or more kč) were consolidated into 3 groups as "0-13.999 kč", "14-29.999 kč" and "30.000 or more kč" in order to analyze whether or not the participants' household energy conservation behaviors vary across different income levels. It should be also noted that, 19 participants out of 303 did not specify their income level in the survey, and thus this analysis was based upon 284 participants.

When the relationship between the household energy conservation behavior variable and the income level of the sample individuals (*n=284*) is examined, the mean

of the participants who are at the level of "0-13.999 kč" was found as 5.503, the mean of the participants who are at the level of "14,000-29.999 kč" was found as 5.131, and the mean of the participants who are at the level of "30.000 or more kč" was found as 4.612. As a result, this difference shows that as the income levels of the participants increase, the household energy conservation behavior performance decreases, and this decrease was found statistically significant at the $p<0.05$ level ($p=0.001$).

In addition to the ANOVA, the Tukey test under the post-hoc comparison analysis was also conducted to evaluate the results of the relationships between the groups (0-13.999 kč, 14.000-29.999 kč, 30.000 or more kč). Thus, it was aimed to reveal whether or not the differences between income levels were statistically significant. **Table 22** shows the Tukey test results regarding the differences in the income levels of the participants between the mean values of the variable of household energy conservation behavior.

**Table 22**. Post-Hoc Comparison – What is your total income per month?

| **Post-Hoc Comparison** | | **Mean Difference** | **SE** | **t** | **P tukey** |
|---|---|---|---|---|---|
| 0-13.999 kč | 14.000-29.999 kč | 0.372 | 0.179 | 2.078 | 0.096 |
| | 30.000 or more kč | 0.891 | 0.223 | 3.991 | < .001 |
| 14.000-29.999 kč | 30.000 or more kč | 0.519 | 0.198 | 2.619 | 0.025 |

When the mean differences between the income levels of the participants in terms of the behavior variable were examined, the mean differences in the household energy conservation behavior of the participants at the level of "0-13,999 kč" and "14.000-29.999 kč " were found as 0.372. This result indicates that there is a difference between these two groups, but it is not statistically significant at the $p<0.05$ level ($p=0.096$). On the other hand, the mean differences in the household energy conservation behavior of the participants at the level of "0-13,999 kč" and "30.000 or more kč " were found as 0.891. This result indicates that there is a difference between these two groups, and it is statistically significant at the $p<0.05$ level ($p<0.001$). Lastly, the mean differences in the household energy conservation behavior of the participants at the level of "0-14,000 kč" and "30.000 or more kč " were found as 0.519. This result indicates that there is a difference between these two groups, and it is statistically significant at the $p<0.05$ level ($p=0.025$).

To sum up, when **Table 22** is examined, although there was a difference between the participants at the "0-13,999 kč " and "14,000-29,999 kč " income levels as a result of the Tukey test, this difference was not found at a statistically significant level, and similarly in "30,000 or more kč " and "14,000-29.999 kč ", although there was a difference between the participants' income level, this difference was not found at a statistically significant level. The difference between the means of the participants at the income level of "0-13,000 kč " and "30,000 or more kč " was found, and this difference is at a statistically significant level. Nevertheless, it was proven that as the income levels of the participants increased, the mean of household energy conservation behavior decreased. Thereby, **H13**: "Household energy conservation behavior varies across to the income level" is validated.

**ANOVA – Household Size**

The results of one-way ANOVA regarding the household energy conservation behaviors of the participants according to their household size (i.e., number of occupants) are given in **Table 23**

**Table 23**. Behavior by Household Size

| Household Size | Mean | SD | N | F | p |
|---|---|---|---|---|---|
| 1 | 5.344 | 1.363 | 40 | 5.623 | < .001 |
| 2 | 5.261 | 1.225 | 112 | | |
| 3 | 5.246 | 1.251 | 71 | | |
| 4 or more | 4.586 | 1.362 | 80 | | |

As indicated in **Table 23**, the options specified separately at the level of education in the survey form (i.e., "1", "2", "3", "4", "5", "6", "7", and "8 or more") were consolidated into 4 groups as "1 ", "2", "3", and "4 or more" in order to analyze whether or not the participants' household energy conservation behaviors vary across different levels of education.

When the relationship between the household energy conservation behavior variable and the household size of the sample individuals (n=303) is examined, the mean of the participants who are at the household size of "1" was found as 5.344, the mean of the participants who are at the household size of "2 was found as 5.261, the mean of the participants who were at the household size of "3" was found as 5.246, and

the mean of the participants who were at the household size of “4 or more” was found as 4.586. Consequently, it was found that as the household size increase, household energy conservation behavior decreases in accordance at a statistically significant level ($p<0.001$). In other words, it is possible to suggest that individuals who live in larger household sizes perform less household energy conservation behavior.

In addition to the ANOVA test, the Tukey test under the post-hoc comparison analysis was also conducted to evaluate the results of the relationships between the groups (1, 2, 3, and 4 or more). Thus, it was aimed to reveal that whether or not the differences between household sizes were statistically significant. **Table 24** shows the Tukey test results regarding the differences in the household sizes of the participants between the mean values of the variable of household energy conservation behavior.

**Table 24**. Post-Hoc Comparison – What is your household size (i.e., number of occupants)?

| **Post-Hoc Comparison** | | **Mean Difference** | **SE** | **t** | **P tukey** |
|---|---|---|---|---|---|
| 1 | 2 | 0.083 | 0.237 | 0.349 | 0.985 |
| | 3 | 0.097 | 0.254 | 0.382 | 0.981 |
| | 4 or more | 0.758 | 0.249 | 3.042 | 0.014 |
| 2 | 3 | 0.015 | 0.195 | 0.075 | 1.000 |
| | 4 or more | 0.675 | 0.188 | 3.585 | 0.002 |
| 3 | 4 or more | 0.661 | 0.210 | 3.149 | 0.010 |

When the mean differences between the household sizes of the participants in terms of the behavior variable were examined, the mean differences in the household energy conservation behavior of the participants at the household size of "1" and "2" were found as 0.083. This result indicates that although there is a difference between these two groups, it is not statistically significant at the $p<0.05$ level ($p=0.985$). Similarly, the mean differences in the household energy conservation behavior of the participants at the household size of "1" and "3" were found as 0.097. This result indicates that although there is a difference between these two groups, it is not statistically significant at the $p<0.05$ level ($p=0.981$). However, the mean differences in the household energy conservation behavior of the participants at the household size of "1" and "4 or more" were found as 0.758 and this result indicates that there is a difference between these two groups, and it is statistically significant at the $p<0.05$ level

(p=0.014). On the other hand, the mean differences in the household energy conservation behavior of the participants at the household size of "2" and "3" were found as 0.015. This result indicates that there is a difference between these two groups, but it is not statistically significant at the p<0.05 level (p=1.000). However, the mean differences in the household energy conservation behavior of the participants at the household size of "2" and "4 or more" were found as 0.675 and this result indicates that there is a difference between these two groups, and it is statistically significant at the p<0.05 level (p=0.002). Lastly, the mean differences in the household energy conservation behavior of the participants at the household size of "3" and "4 or more" were found as 0.661 and this result indicates that there is a difference between these two groups, and it is statistically significant at the p<0.05 level (p=0.010).

To sum up, when **Table 23** and **Table 24** are examined, As the household size of the participants increases, there is a stable decrease in the mean of household energy conservation behaviors. As a result of the post-hoc comparison, although there are differences between household size groups, only differences between the groups of "1 - 4 or more", "2 - 4 or more" and "3 - 4 or more" groups were found as statistically significant. As a result, **H14**: Household energy conservation behavior varies across to the household size is validated.

In conclusion, taken together both Tukey test and ANOVA results, there is a positive increase in household energy conservation behaviors as the participants' education level increases. On the other hand, as the income levels of the participants increased, a decrease was observed in their household energy conservation behaviors. In addition, the participants' means of household energy conservation behavior decrease in the line with an increase in the size of the households where they live in. In addition, some statistically significant differences were found between the education level groups, income level groups, and household size groups as separately.

# 6. DISCUSSION

The main purpose of this thesis study is to examine the effects of socio-psychological factors on individuals' household energy conservation behaviors by providing a comprehensive theoretical framework based upon the combination of Ajzen's (1991) Theory of Planned Behavior (TPB) and Schwartz's (1977) Norm Activation Model (NAM). In this context, the interrelationships between NAM and TPB components (variables) such as personal norm, awareness of consequences, ascription of responsibility, perceived behavioral control, intention, attitude towards behavior, and social norm were examined in accordance with the findings of similar studies in the literature. In addition, the effect of socio-demographic factors on the household energy conservation behaviors of individuals was also analyzed.

In this thesis study, a total of 14 hypotheses were developed. 11 of the hypotheses were created to examine how both TPB and NAM explain the household energy conservation behaviors separately, and to test the success of the experimental model which was developed by combining the TPB and NAM components in explaining the individuals' household energy conservation behaviors. 3 of the hypotheses were created to test whether the household energy conservation behaviors of the individuals vary across education level, income level, and household size.

Before testing the hypotheses, the reliability (Cronbach's Alpha) and construct validity (Confirmatory Factor Analysis) criteria of the measurement model were analyzed by considering the reference fit indices in the literature. Structural Equation Modeling (SEM) analysis was applied to test the created hypotheses after statistically acceptable results were obtained from the reliability and construct validity analysis. Lastly, ANOVA tests were employed in order to reveal whether or not some demographic characteristics such as income per month, education level, and household size influence the frequency of the individuals' household energy conservation behaviors.

The sampling group of this thesis study consisted of 303 volunteer participants who residing in Prague between the ages of 18-44. The participants of the study were reached by posting an online survey form (created via Google forms) on various Facebook pages.

Considering the demographic characteristics of the participants, 169 individuals defined themselves as female (55.77%), 127 individuals as male (41.91%), and one

individual as "gender variant/non-conforming" (0.33%), whereas 6 individuals did not prefer to specify any gender (1.98%). On the other hand, 121 individuals stated that they are between 18-24 years old (39.93%), 145 individuals are between 24-35 years old (47.85%), and 37 individuals are between 35-44 years old (12.21%). In this context, it is noteworthy that the participants are from the young and middle age group. This might be stemmed from two different reasons. First, the questionnaire form was shared on particular Facebook pages, where the number of young people could be higher. For this reason, the access of individuals who are over the middle age to the survey may be relatively limited. The second reason, as Inglehart (1971) mention, might stem from the possibility that individuals from the younger generation may be more interested in environmental issues.

When the working status of the participants was asked, it was found that 139 individuals are students (45.87%), 113 individuals are employed for a wage (37.29%), 15 individuals are out of work and looking for work (4.95%), 2 individuals are out of work but not currently looking for work (0.66%), 33 individuals are self-employed (10.89%), and an individual is unable to work (0.33%). Briefly, significant portion of the sampling group consists of students and employers.

When the participants were asked about their income per month, 19 individuals did not prefer to answer this question. Out of 288 participants, it was found that 12 individuals stated as 0-2.500 kč (4.22%), 4 individuals as 2.500-4.999 kč (1.32%), 10 individuals as 5.000-7.999 kč (3.30%), 9 individuals as 8.000-9.999 kč (2.97%), 21 individuals as 10.000-11.999 kč (7.39%), 20 individuals as 12.000-13.999 kč (7.04%), 29 individuals as 14.000-15.999 kč (10.21%), 24 individuals as 16.000-17.999 kč (8.45%), 20 individuals as 18.000-19.999 kč (7.04%), 32 individuals as 20.000-22.999 kč (11.26%), 25 individuals as 23.000-25.999 kč (8.80%), 21 individuals as 26.000-29.999 kč (7.39%), 41 individuals as 30.000-49.999 kč (14.43%), and 16 individuals as 50.000 or more kč (5.63%). Considering the minimum wage in Czech Republic (15.200 kc), it is possible to say that a significant portion of participants are in the middle-high level income groups.

When the participants were asked about the highest level of education they have completed, 136 individuals responded as "Bachelor's degree" (44.88%), 1 individual as "Doctorate degree" (0.33%), 31 individuals as "High school graduate, diploma or the equivalent" (10.23%), 32 individuals as "Master's degree" (10.56%), 4 individuals as "Professional degree / MBA" (1.32%), 93 individuals as "Some college credit, no

degree" (30.69%), 3 individuals as "Some high school, no diploma" (0.99%), 1 individual as "Trade/technical/vocational training" (0.33%), and 2 individuals as "Primary school" (0.66%).

When the participants were asked about their household size (i.e., number of people where they live together), 40 individuals stated as 1 (13.20%), 112 individuals as 2 (36.96%), 71 individuals as 3 (23.43%), 58 individuals as 4 (19.14%), 20 individuals as 5 (6.60%), 1 individual stated as 6 (0.33%), and 1 individual stated as “8 or more” (0.33%).

Last but not least, in the questions about the relations of the participants with environmental or ecological organizations, 9 of the participants stated that they are members of environmental organizations such as Citizens Climate Lobby, Wildlife Conservation Society, Děti Země, Green Dock, Greenpeace, Hnutí Brontosaurus, Obránci Zvířať, Sauvons le Climat, The Nature Conservancy, and Žádné. Additionally, 6 participants stated that they financially contribute to environmental organizations, and 46 participants stated they sometimes financially contribute to environmental organizations whereas 251 participants do not financially contribute to any environmental or ecological organizations.

When the success of TPB in explaining household energy conservation behavior was examined, firstly, it was concluded that the variable of attitude towards behavior has a weak effect on the variable of intention and this result is not statistically significant. Unexpectedly, this result contradicts with the findings of previous studies on household energy conservation behavior (see Abrahamse & Steg, 2011; Liu et al., 2017; Wang, Zhang & Li, 2014). However, in future studies, this result may evolve to a statistically positive result with the increase of the participant size, and the revision of the items in the attitude towards behavior scale.

On the other hand, as expected, it was found that the subjective norm variable has a positive effect on the intention variable, and this result is also at a statistically significant level. Thus, this result has parallel findings with some similar studies in the literature (see Wang, Zhang & Li, 2014; Lee & Tanusia, 2016). Besides, it was concluded that the subjective norm variable also has a positive effect on the personal norm variable, and this result is at a statistically significant level. Therefore, the fact that the subjective norm variable significantly and positively influences the personal norm variable is provided a supportive outcome for the combination of TPB and NAM models. As a result, the obtained statistical results are in parallel with the findings of

similar studies in the literature (see Hopper & Nielsen, 1991; Valle et al., 2005; Bamberg, Hunecke & Blöbaum 2007).

As expected, it was found that PBC variable has a positive influence on intention variable, and this result is also statistically significant. The results obtained from the statistical relationship between PBC and intention variables have parallel findings with similar studies in the literature (Abrahamse & Steg, 2011; Liu et al., 2020). Surprisingly, on the contrary to the findings of many similar studies in the literature, it was concluded that PBC variable do not have a direct effect on household energy conservation behavior. In fact, PBC variable has a negative effect on energy conservation behavior, and this result is not statistically significant. As a result, it is possible to assert that PBC variable do not affect the household energy conservation behavior directly, but through the intention variable's mediator role.

To support that, it was found that the intention variable has a significant impact on the household energy conservation behavior, and this result is at a statistically significant level. Intention was found as the strongest predictor of household energy conservation behavior in this thesis study. The conclusion that the intention variable has a strong influence on behavior is in accordance with the findings of similar studies in the literature (see Bamberg & Möser, 2007; Abrahamse & Steg, 2011; Macovei, 2015; Alomari, Kanj & Topal; 2021).

Unexpectedly, it was concluded that personal norm variable has a negative effect on the household energy conservation behavior, and this result is not at a statistically significant level. Therefore, on the contrary to the findings of similar studies in the literature (Wang et al., 2018; Abrahamse & Steg, 2009; Ibtissem, 2010), obtained results that personal norm variable directly influences the behavior could not be provided statistically significant. Nevertheless, it was also found that the personal norm variable affect intention variable positively at a statistically significant level. Therefore, this result is in parallel with the findings of similar studies in the literature (see Hien & Chi, 2020; Ru, Wang and Yan, 2018; Wang, Lin & Li, 2018). Considering this result, it is possible to state that intention variable has a mediator role between the personal norm variable and the household energy conservation behavior. In addition, the finding that personal norm variable positively affects the intention variable at a significant level supports similar studies in the literature that have proposed the idea of combining TPB and NAM models (see Wall, Devine-Wright & Mill, 2007; Kaiser et al., 2005; Bamberg & Möser; 2007).

In the literature, NAM has been interpreted in two different ways as mediator model and moderator model (De Groot & Steg, 2009). While some researchers argue that the variables ascription of responsibility and awareness of consequences affect the personal norm variable at the same time (moderator), some researchers have argued that ascription of responsibility variable has a mediator role between awareness of consequences variable and the personal norm variable (mediator). According to the results, it was concluded that the awareness of consequences variable directly and positively affects the personal norm, and this result is at a statistically significant level. In addition, when the predictors of personal norm were considered, it was found that the awareness of consequences variable affects the personal norm more than the subjective norm variable and ascription of responsibility variables. On the other hand, the awareness of consequences variable also has a positive effect on the ascription of responsibility variable, and this result is at a statistically significant level. As a result, the obtained results are in parallel with the findings in similar studies in the literature (see Harland, Staats, & Wilke, 2007; Zhang, Wang & Zhou, 2013; Zhang, Wang & Zhou, 2013; Ibtissem, 2010).

On the contrary to the previous studies towards the structure of NAM, it was found that the ascription of responsibility variable had a weak effect on the personal norm and this effect was not statistically significant. In this context, it cannot be proposed that both interpretations of the NAM structure in the literature are valid in this thesis. However, if the items in the ascription of responsibility variable scale are revised in future studies, it is possible to obtain positive results in different sampling groups.

The effects of socio-demographic factors on household energy conservation behaviors were analyzed according to variables of education level, monthly income and the household size (i.e., number of occupants).

For the ANOVA test, the answers given by the participants regarding their educational status were divided into three groups as “high school graduate or lower,” “some college credit, no degree,” and “bachelor's degree or higher”. According to the results, as the education level of the participants increases, their household energy conservation behaviors significantly increase as well. This result is supported by the findings of similar studies in the literature (see Poortinga, Steg & Vlek, 2004; Mills & Schleich, 2010). The answers given by the participants to their monthly income levels were divided into three groups as “0-13.999 kc”, 14.000-29.999 kc” and “30.000 or more kc”. 19 individuals who did not want to answer about their monthly income level

were found, and therefore the impact of income level per month on household energy conservation behavior was analyzed through the responses of 284 participants out of 303. According to the findings, as the income level of the participants increased, there was a decrease in the average of household energy conservation behaviors. Therefore, this correlation between monthly income level and household energy conservation behavior is in line with the findings of similar studies in the literature (see Abrahamse & Steg, 2009, 2011; Poortinga, Steg and Vlek, 2004; Wan, Shen & Choi, 2018; Gatersleben, Steg & Vlek, 2002). The answers given by the participants regarding the household size were divided into 4 groups as “1”, “2”, “3”, and “4 or more”. According to the obtained results, as the number of household size increase, a parallel decrease was found in household energy conservation behaviors. Therefore, it can be proposed that this result is similar to the findings of some studies in the literature that have proposed household with higher sizes tend to consume more energy (see Benders et al., 2006; Gatersleben, Steg & Vlek, 2002; Abrahamse & Steg, 2009, 2011).

In a broad perspective, it can be summarized that intention has a much greater effect on individuals' household energy conservation behaviors than personal norm and PBC variables. In other words, Intention variable should be considered as the last step of individuals (Ajzen, 1991) before performing household energy conservation behavior. Among the predictors of intention, such as personal norm, subjective (social) norm, attitude towards behavior, and PBC, personal norm was found as the most influential factor on intention variable. In this context, the combination of Planned Behavior Theory and Norm Activation Model provided a supportive result in explaining household energy conservation behaviors (Bamberg & Möser, 2007). Among the predictors of personal norm variable such as subjective norm, ascription of responsibility and awareness of consequences variables, the most effective variable that affects personal norm was found as awareness of consequences. Considering invalid results, it was not found that the personal norm variable has a direct effect on household energy conservation behavior, and the ascription of responsibility variable does not statistically affect the personal norm variable when Norm Activation Model was examined. When Theory of Planned Behavior model was examined, it was not found that attitude towards behavior variable has a statistically significant effect on intention, and it was not found that the PBC variable has a direct and positive effect on the household energy conservation behavior. Consequently, it was statistically provided that intention variable has a mediator role between “personal norm – behavior”, “PBC –

behavior", and "subjective norm – behavior" whereas personal norm has a mediator role between "subjective norm – intention", and "awareness of consequences – intention". Finally, the general results propose that the combination of TPB and NAM models might provide a wider theoretical basis to explain household energy conservation behavior. Additionally, when the participants' household size and income increase, their energy conservation behavior frequency in the house domain decrease whereas as the education level increases the household energy conservation frequency increases as well.

# 7. CONCLUSION

As Beck (1992) mentioned, industrially and technologically developed countries have also created many cross-border environmental risks, and most of these risks have emerged as a result of anthropogenic-based behaviors. Undoubtedly, environmental problems such as regional climate change and global warming cause many problems such as the loss of biodiversity, the problem of thirst, the melting of glaciers, bush fires, environmental migration, poor product quality in the food sector, and economic problems. Therefore, people have to struggle with the risks that they create by themselves. In terms of the consequences of energy consumption, it is possible to reduce energy production and consumption in industry and technology fields to reasonable levels with the rules, restrictions, or incentives of EU laws, government policies, or non-governmental organizations. In this way, a significant amount of energy can be saved and natural resources can be used more sparingly. Because every resource that can be converted into energy in nature has a limit, and over energy consumption might cause serious impacts on the environment. However, in addition to renewable and sustainable energy projects, the contribution of social awareness to current energy problems and their environmental consequences is placed on the agenda of many countries.

In today's world, the energy need that arises due to industrial and technological developments directly or indirectly affects all living things in our environment. Because the high energy requirement contributes to the high levels of carbon emissions. Therefore, high carbon emissions pave the way for many environmental disasters, especially global warming. Some EU countries are quite aware of environmental problems. For example, Czech Republic has come a long way to reduce carbon emission per capita in the burning of fossil fuels. In the decade of the country between

1997-2017, the amount of carbon emissions per capita has been 12.65t in 1997, but this amount decreased to 9.93t in 2017. Moreover, while electricity and heat consumption of the country was 71.3 million t in 1996, this amount decreased to 59.2 million t in 2016. As a result, considering the heat and electricity consumption amounts, it is possible to say that Czech Republic has taken important steps to reduce GHG emissions. Yet, it is likely that energy conservations with a collective consciousness will yield much better results on a larger scale. As mentioned before, according to the 2019 European Green Deal, the EU commission has set some targets to 2030 in to reduce environmental problems such as climate change and the EU's dependence on external oil and gas suppliers (2030 Climate and Energy Framework, 2020). According to the EU's action plan as based on 2019 Green Deal, it is aimed to achieve "at least 40% cuts in greenhouse gas emissions (from 1990 levels), at least 32% share for renewable energy, and at least 32.5% improvement in energy efficiency". However, since there can be no direct restrictions or sanctions (regardless of taxation or equivalent regulations) against individuals' household energy usage, each individual should pay attention to their energy usage within the framework of ethical responsibility. According to the current data of Eurostat, households accounted for 26.3% of the energy consumption in Europe in 2019, and this rate remains in third place after the energy consumption in the transportation (30.9%) and industrial (25.6%) areas. Of course, different types of household energy needs arise in different parts of European geography. However, household energy consumption behaviors can be shaped by the contribution of socio-psychological factors and demographic characteristics.

If we look at the general result, it was found that personal norm in the NAM affects the behavioral intention in the TPB, and thus this finding can be considered as a strong evidence that the combination of NAM and TPB models is effective in explaining the behavior. In this context, it is possible to assert that combining the TPB and NAM models gives promising results as theoretically in explaining household energy conservation. Additionally, it was also statistically proven that the household energy conservation behaviors vary across to differences in demographic characteristics such as income per month, education level or household size

However, this thesis study has still some limitations. Firstly, this study addresses the self-report of individuals, and this can suggest that the participants' responses might consist of biased or socially desirable statements. Hence, as Clement, Henning, and Osbaldiston (2014) suggest, addressing objective assessments of the frequency of a

specific behavior might provide a better explanation. Secondly, the possible impacts of some external factors such as energy prices and taxation on household energy conservation behavior were not examined within the scope of this study, and it should be noted that such factors can also affect the energy conservation process of individuals. Thereby, the examination of pricing and taxation policies is highly recommended for future studies. Lastly, it was also not directly measured how much the individuals knew about the consequences of their household energy conservation and consumption behaviors. Therefore, an objective assessment of the household energy consumption and conservation knowledge towards the possible environmental consequences may provide more accurate results for future studies in understanding the motivations of individuals to perform household energy conservation.

Finally, it is possible to suggest that individuals' household energy conservation behavior can be affected by both demographic characteristics and socio-psychological factors. Nevertheless, it should be noted that socio-psychological factors and demographic characteristics have different effects on individuals. Therefore, household energy conservation behavior can make many individuals more aware of the importance and necessity of household energy conservation, through various contributions from the EU policies, governments, local authorities, opinion leaders, non-governmental organizations, and environmental organizations. In this context, significant incentives can be provided in the implementation of household energy conservation behaviors. Because local authorities, non-governmental organizations, and governments should consider both socio-psychological and demographic characteristics of individuals, and then develop appropriate action plans for contribution to the collective awareness in the society towards the significance of household energy conservation. In conclusion, energy conservation in the household domain has a very important place for individuals to protect the environment locally and globally. From this point of view, governments, local authorities, environmental institutions, and organizations need to provide physical and socio-psychological conditions that will facilitate individuals' household energy conservations. Besides, many scholars from different disciplines such as environmental sociologists, social psychologists, and environmental engineers have a very important responsibility to analyze the socio-psychological motivations and demographic factors behind the household energy consumption and conservation behaviors of individuals.

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# 9. LIST OF APPENDICES

**Appendix 1.** The list of multilateral environmental agreements (1971-2015)

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# 10. APPENDIX

**Appendix 1** The list of multilateral environmental agreements (1971-2015)

| List of international agreements | Specification |
|---|---|
| • Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP) (1979) | Air |
| • Cartagena Biodiversity Protocol (2000) | Biotechnology |
| • PIC Rotterdam Convention on Prior Informed Consent (1998)<br>• POP Stockholm Convention on Persistent Organic Pollutants (2001)<br>• Minamata Convention on Mercury (2013) | Chemicals |
| • Helsinki Convention on Industrial Accidents (1992)<br>• Barcelona Convention (1976)<br>• Helsinki Convention on the Baltic Sea (1992)<br>• OSPAR Convention (1992)<br>• Bonn Agreement (1983)<br>• Lisbon Agreement (1990)<br>• Bucharest Convention on the Protection of the Black Sea Against Pollution (1992) | Civil Protection and Environmental Accidents |
| • UNFCCC Framework Convention on Climate Change (1992)<br>• Kyoto Protocol (1997)<br>• Paris Agreement (2015)<br>• Vienna Convention for the Protection of the Ozone Layer (1985) | Climate Change and Ozone Depletion |

| | |
|---|---|
| • Montreal Protocol (1987) as amended | |
| • Aarhus Convention (1998)<br>• Espoo Convention on Environmental Impact Assessment (1991) | Governance |
| • Helsinki Convention on Industrial Accidents (1992) | Industry |
| • Alpine Convention (1991) | Land Use |
| • CBD Convention on Biological Diversity (1992)<br>• Cartagena Protocol on Biosafety (2003)<br>• Nagoya Protocol (2010)<br>• Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Convention) (1973)<br>• Bonn CMS Convention on the Conservation of Migratory Species (1979)<br>• Agreement on the conservation of African-Eurasian Migratory Waterbirds (AEWA-CMS) (1995)<br>• Bern Convention on European Wildlife and Habitats (1979)<br>• Convention for the protection of Vertebrate Animals used for Experimental and other Scientific Purposes (1986)<br>• International Tropical Timber Agreement (ITTA) (1994)<br>• Alpine Convention (1991) and its protocols<br>• Ramsar Convention on Wetlands of International Importance (1971)<br>• Agreement on the Protection and Sustainable Development of the Prespa Park Area (2010)<br>• CAMLR Convention for the Conservation of Antarctic Marine Living Resources (1980) | Nature and biodiversity |
| • Helsinki Convention on Watercourses and International Lakes (1992)<br>• Danube river basin convention (1987)<br>• Rhine river basin convention (1999)<br>• Barcelona Convention (1976) as amended and its protocols<br>• OSPAR Convention (1992)<br>• Bonn Agreement (1983)<br>• Helsinki Convention on the Baltic Sea (1992)<br>• Bucharest Convention on the Protection of the Black Sea Against Pollution (1992) | Water |

| | |
|---|---|
| • Basel Convention on hazardous wastes (1989) | Waste |
| • UNCCD Convention to Combat Desertification in Africa (1994) | Soil |

(citated from https://ec.europa.eu/environment/international_issues/agreements_en.htm)

**Appendix 2.** Survey items

| | CODE | Items | Adapted from |
|---|---|---|---|
| **Attitudes toward behavior** | **ATT1** | Reducing heating in the home has no effect in tackling climate change* | Wells et al., 2016 |
| | **ATT2** | Reducing water usage in the home has no effect in tackling climate change* | Wells et al., 2016 |
| | **ATT3** | I can save money by performing energy-saving behaviors at home | Liu et al., 2020 |
| **Subjective Norms** | **SN1** | Most people who are important to me support my effort to conserve energy for environmental reasons | Macovei, 2015 |
| | **SN2** | Most people who are important to me think I should conserve energy for environmental reasons | Macovei, 2015 |
| | **SN3** | Most people who are important to me take steps to conserve energy for environmental reasons | Macovei, 2015 |
| | **SN4** | I value the opinion of people who are significant in my life when it comes to making a decision on energy conservation | Lee & Tanusia, 2016 |
| **Perceived Behavioral Control** | **PBC1** | I have the resources, time, and opportunity to conserve energy at my home | Alomari, Kanj & Topal 2021 |
| | **PBC2** | Household energy-saving behaviors are easy to perform | Liu et al., 2020 |
| | **PBC3** | I have enough environmental knowledge for discerning between responsible and harmful energy consumption behavior | Macovei, 2015 |
| | **PBC4** | I have the necessary will and wisdom to reduce my energy consumption at home for environmental reasons | Macovei, 2015 |
| **Intention** | **INT1** | I intend to conserve energy at home for environmental reasons | Macovei, 2015 |
| | **INT2** | I intend to use natural resources at home in a responsible manner (e.g., water, electricity, gas) | Macovei, 2015 |
| | **INT3** | I will try to reduce my carbon footprint in the forthcoming month | Macovei, 2015 |
| | **INT4** | I will conserve energy at home even if it is less comfortable to protect the environment | Alomari, Kanj & Topal 2021 |
| | **INT5** | I am willing to participate in the energy-saving scheme at home in the following week | Liu et al., 2020 |
| **Awareness of Consequences** | **AC1** | Global warming is a problem for society | Steg, Dreijerink & Abrahamse, 2005 |
| | **AC2** | Energy savings help reduce global warming | Steg, Dreijerink & |

| | | | |
|---|---|---|---|
| | | | Abrahamse, 2005 |
| | **AC3** | The exhaustion of fossil fuels is a problem | Steg, Dreijerink & Abrahamse, 2005 |
| | **AC4** | The exhaustion of energy sources is a problem | Steg, Dreijerink & Abrahamse, 2005 |
| | **AC5** | Environmental quality will improve if we use less energy | Steg, Dreijerink & Abrahamse, 2005 |
| **Ascription of Responsibility** | **AR1** | I feel jointly responsible for the exhaustion of energy sources | Steg, Dreijerink & Abrahamse, 2005 |
| | **AR2** | I feel jointly responsible for global warming | Steg, Dreijerink & Abrahamse, 2005 |
| | **AR3** | My contribution to the energy problems is negligible | Steg, Dreijerink & Abrahamse, 2005 |
| | **AR4** | Not only the government and industry are responsible for high energy consumption levels, but me too | Steg, Dreijerink & Abrahamse, 2005 |
| | **AR5** | In principle, individuals at their own cannot contribute to the reduction of energy problems | Steg, Dreijerink & Abrahamse, 2005 |
| **Personal Norm** | **PN1** | I feel personally obliged to save as much energy as possible | Steg, Dreijerink & Abrahamse, 2005 |
| | **PN2** | I feel morally obliged to save energy, regardless of what others do | Steg, Dreijerink & Abrahamse, 2005 |
| | **PN3** | I feel guilty when I waste energy | Steg, Dreijerink |

| | | | |
|---|---|---|---|
| | | | & Abrahamse, 2005 |
| | **PN4** | I feel morally obliged to use green instead of regular electricity | Steg, Dreijerink & Abrahamse, 2005 |
| | **PN5** | People like me should do everything they can to reduce energy use | Steg, Dreijerink & Abrahamse, 2005 |
| | **PN6** | If I would buy a new washing machine, I would feel morally obliged to buy an energy efficient one | Steg, Dreijerink & Abrahamse, 2005 |
| | **PN7** | I feel obliged to bear the environment and nature in mind in my daily behavior | Steg, Dreijerink & Abrahamse, 2005 |
| | **PN8** | I would be a better person if I saved energy | Steg, Dreijerink & Abrahamse, 2005 |
| **Behavior** | **BHV1** | I leave the water while I brush my teeth* | de Leeuw et al., 2015 |
| | **BHV2** | I turn the shower off while I soap up and then turn it back on to rinse off | Barr, Gilg & Ford 2005 |
| | **BHV3** | At home, I make sure that taps do not drip | Wells et al., 2016 |
| | **BHV4** | I turn off lights in common area rooms when I am the last person to leave | Alomari, Kanj & Topal 2021 |
| | **BHV5** | I turn off standby appliances | Sütterlin, Brunner & Siegrist 2011 |
| | **BHV6** | At home, I add or remove clothing rather than turning heating or fan or air conditioning up when it's hot or cold | Wells et al., 2016 |
| | **BHV7** | At home, I open or close windows rather than turning heating or fan or air conditioning up when it's hot or cold | Wells et al., 2016 |
| | **BHV8** | I turn down/off heating before I leave house | Dursun, Kabadayı & Tuğer 2019 |

** Reverse code item*

**Appendix 3.** Demographic Questions

| **To which gender identity do you most identify?** |
|---|
| ◎Female<br>◎Male<br>◎Transgender Female<br>◎Transgender Male<br>◎Gender Variant/Non-Conforming<br>◎Prefer not to answer<br>◎Other |
| **What is your age range?** |
| ◎18-24 years old<br>◎25-34 years old<br>◎35-44 years old<br>◎45-54 years old<br>◎55-64 years old<br>◎65-74 years old<br>◎45 years or older |
| **What is your current employment status?** |
| ◎Employed for wages<br>◎Self-employed<br>◎Out of work and looking for work<br>◎Out of work but not currently looking for work<br>◎A homemaker<br>◎A student<br>◎Military<br>◎Retired<br>◎Unable to work |
| **What is your total income per month?** |
| ◎0-2.500 kc<br>◎2.500-4.999 kc<br>◎5.000-7.999 kc<br>◎8.000-9.999 kc<br>◎10.000-11.999 kc<br>◎12.000-13.999 kc<br>◎14.000-15.999 kc<br>◎16.000-17.999 kc<br>◎18.000-19.999 kc<br>◎20.000-22.999 kc<br>◎23.000-25.999 kc<br>◎26.000-29.999 kc<br>◎30.000-49.999 kc<br>◎50.000 or more kc<br>◎n/a |

| **What is the highest degree or level of school you have completed?** |
| --- |
| ◎No schooling completed<br>◎Primary school<br>◎Some high school, no diploma<br>◎High school graduate, diploma or the equivalent<br>◎Some college credit, no degree<br>◎Trade/technical/vocational training<br>◎Associate degree<br>◎Bachelor's degree<br>◎Master's degree<br>◎Professional degree<br>◎Doctorate degree |
| **What is your household size? (i.e. number of people)** |
| ◎1<br>◎2<br>◎3<br>◎4<br>◎5<br>◎6<br>◎7<br>◎8 or more |
| **Are you a member of an environmental organization?** |
| ◎Yes<br>◎No |
| **If yes, in which ecological / environmental organization are you active?** |
| **Do you contribute financially to environmental organizations?** |
| ◎Yes<br>◎Sometimes<br>◎No |

**Appendix 4.** Cover Letter

# The Household Energy Consumption Survey

Please read carefully before you begin.

Dear Participant,

My name is Çağatay Boyacı. I am a graduate student from Sociology in European Context at Charles University. I am currently undertaking quantitative research in Prague as part of my master's thesis study under the supervision of Ph.D. Ing. Petr Soukup.

The information to be obtained through the following survey study will be used only for scientific purposes in my master's thesis that I prepare in order to examine the factors that affect the household energy use behavior of individuals. Therefore, your honest responses to the given statements are extremely important in terms of obtaining accurate results in my thesis.

All your information will be treated in the strictest confidence.

The information provided will be used solely for the purpose of this research project and only aggregated results will be reported in reputable academic publications. No persons other than my supervisor and I will have access to the information you provide.

Your participation is voluntary and you are free to withdraw consent at any time and to withdraw any unprocessed data you have previously supplied.

The survey will take about 8-10 minutes to complete.

Thank you for your active participation.

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