

**UNIVERSITY OF VERONA**  
**DEPARTMENT OF ECONOMICS**

Master's Degree in  
Economics and Data Analysis

**Living Environment and Resource Saving  
Behavior: Evidence from Italy**

**Supervisor:**

Prof. Alessandro Buccioli

**Candidate:**

Lisa Salvetti

VR461417

**Academic Year 2022 - 2023**



*The biggest problem  
is not to let people accept the new ideas,  
but to let them forget the old ones.  
(Keynes 2009 [1936], Preface)*



# **Abstract**

The aim of this thesis is to investigate the beliefs and attitudes held by individuals with regard to the environmental issues in the world and the corresponding behaviors that people might adopt in the attempt of mitigation of such issues.

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Exploring the context and urgency of environmental challenges . . .	1
1.2	Literature review . . . . .	5
1.2.1	Factors influencing pro-environmental behavior . . . . .	5
1.2.1.1	Individual determinants of green behavior . . . . .	6
1.2.1.2	Contextual determinants of green behavior . . . . .	9
1.2.2	The Ecological Systems Theory in the context of eco-friendly behavior formation . . . . .	12
1.2.3	Further theories and conceptual frameworks . . . . .	15
1.2.3.1	The Theory of Planned Behavior (TPB) . . . . .	16
1.2.3.2	The Norm-Activation Theory (NAT) . . . . .	17
1.2.3.3	The Value-Belief-Norm (VBN) Theory . . . . .	19
1.2.3.4	The Behavior-Change Wheel (BCW) . . . . .	20
1.3	Energy-saving behavior . . . . .	21
1.3.1	Role Within the Italian Context . . . . .	23
1.4	Aim and Objectives . . . . .	27
<b>2</b>	<b>Material and methods</b>	<b>29</b>

2.1	Survey description . . . . .	29
2.2	Data, variables and methods of analysis . . . . .	33
2.2.1	Sample selection and data cleaning . . . . .	33
2.2.2	Variables of interest . . . . .	36
2.2.2.1	Demographic and socioeconomic variables . . . . .	36
2.2.2.2	Geographic and spacial variables . . . . .	38
2.2.2.3	Attitudinal variables . . . . .	40
2.2.2.4	Behavioral variables . . . . .	43
2.3	Introductory descriptive analysis . . . . .	45
2.3.1	Description of sample data . . . . .	45
2.3.2	Beliefs on environmental issues in Italy . . . . .	52
2.3.3	Behaviors towards climate change mitigation in Italy . . . . .	56
<b>3</b>	<b>Analysis</b>	<b>60</b>
3.1	Research questions: hypotheses and empirical strategy . . . . .	60
3.1.1	Research question 1: Demographics affecting Eco-friendly behavior . . . . .	62
3.1.2	Research question 2: Relationship between neighborhood characteristics and Eco-friendly behavior . . . . .	65
3.1.3	Research question 3: Attitudinal variables affecting Eco- friendly behavior . . . . .	68
3.2	Regressions . . . . .	70
3.3	Findings and interpretations . . . . .	74
<b>4</b>	<b>Conclusion and future perspectives</b>	<b>75</b>

# List of Figures

1.1	CO2 emissions per dollar of GDP. Source: Our World in Data based on the Global Carbon Project (2023) . . . . .	4
1.2	Bronfenbrenner’s Ecological Systems Theory Model. Source: Simply Psychology . . . . .	13
1.3	Final energy consumption in the residential sector by fuel, EU, 2021. Source: Eurostat . . . . .	24
1.4	Final energy consumption in the residential sector by use, EU, 2021. Source: Eurostat . . . . .	24
2.1	Distribution of data regarding eco-friendly behaviors . . . . .	44
2.2	Summary statistics of demographic variables, in percentage values. Source: own elaboration with STATA . . . . .	48
2.3	Summary statistics of geographic variables, in percentage values. Source: own elaboration with STATA . . . . .	49
2.4	Summary statistics of the attitudinal variable PAECO, in percentage values. Source: own elaboration with STATA . . . . .	52
2.5	The environmental problems of greatest concern to Italians, in percentage values. Source: own elaboration with STATA . . . . .	53



2.6	Environmental concerns by geographical area, in percentage values. Source: own elaboration with STATA . . . . .	54
2.7	Eco-friendly behaviors among Italians in 2020, in percentage values. Source: own elaboration with STATA . . . . .	58
2.8	Italians engaging in eco-friendly action on a usual basis in 2020, in percentage values. Source: own elaboration with STATA . . . .	59

# List of Tables

2.1	Demographic and socioeconomic variables . . . . .	38
2.2	Geographic variables . . . . .	40
2.3	Attitudinal variables . . . . .	42
2.4	Behavioral variables . . . . .	45
2.5	Summary statistics. STATA-generated output. . . . .	46
3.1	Description of variables used for regressions . . . . .	61
3.2	Baseline linear & logit regressions predicting the carefulness to- wards water saving behavior. Source: own elaboration on STATA	70
3.3	Baseline linear & logit regressions predicting the carefulness to- wards energy saving behavior. Source: own elaboration on STATA	71
3.4	Linear & logit regressions predicting the carefulness towards wa- ter saving behavior. Source: own elaboration on STATA . . . . .	72
3.5	Linear & logit regressions predicting the carefulness towards en- ergy saving behavior. Source: own elaboration on STATA . . . . .	73

# **Chapter 1**

## **Introduction**

### **1.1 Exploring the context and urgency of environmental challenges**

The world is witnessing a concerning outbreak of weather-related disasters, including massive wildfires, lethal heat waves, strong hurricanes, and unprecedented floods. Global warming is undeniably one of the most significant challenges of our time with the potential of shaping both human society and the natural world, with headlines like «The last decade was the warmest on record.» being increasingly common whenever we use social networks or consume information. From climate change and deforestation to pollution and resource depletion, the repercussions of the environmental crisis have become increasingly evident. These catastrophic events serve as clear indications that we are only witnessing the initial impact of climate change, with more dire consequences expected in the years ahead.

The critical question at present revolves around whether our political systems

can effectively respond to the physical realities that pose significant threats to the planet's sustainability and the well-being of its inhabitants. As world leaders grapple with the challenge, their primary focus is on formulating and implementing policies that can decelerate the rate of global warming and alleviate its consequences (Nordhaus, 2021). The global community is being subjected to continuous challenges as environmental issues continue to escalate. Consequently, understanding the beliefs, attitudes, and behaviors of individuals towards environmental issues has become a critical area of research and social concern. As a matter of fact, despite the serious effects of environmental challenges across the globe, our understanding of the beliefs held by the general public regarding global climate change is limited, and it is common to encounter individuals who express skepticism about its occurrence (Heath & Gifford, 2006).

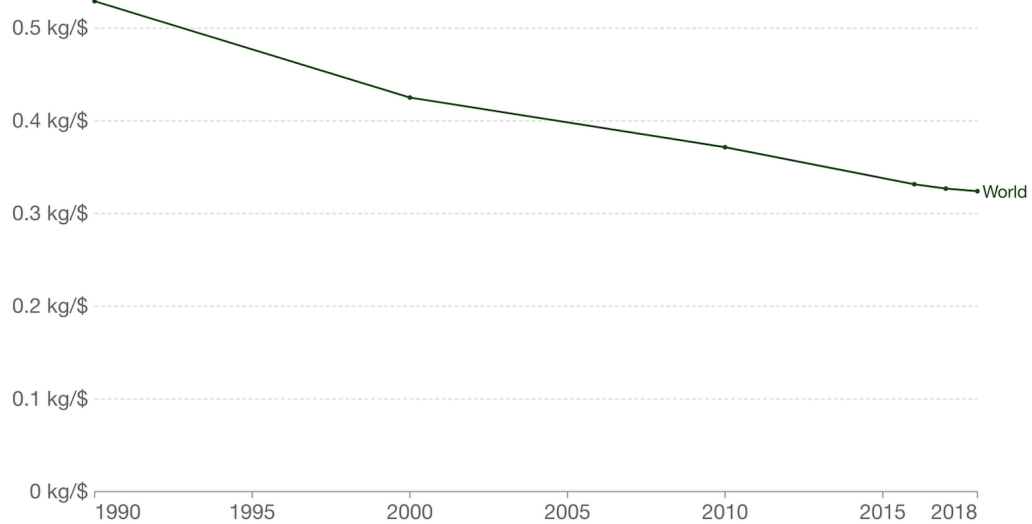
Over time, there has been a noticeable shift in societal attitudes towards environmental concerns. Historically, humans often exploited the environment, prioritizing short-term gains without considering long-term consequences, but with the links between human activities and environmental damage being increasingly recognized, our attitudes started to change.

Several factors have contributed to this shift in recent decades. Firstly, advances in science and improved access to information have given us a better understanding of the far-reaching effects of environmental degradation. Research has highlighted how human activities can severely impact ecosystems, biodiversity, and even human life itself. Additionally, environmental advocacy groups and activism have played a vital role in raising public awareness and mobilizing collective action. High-profile events like international conferences, mass protests, and media coverage have helped spread environmental knowledge and galvanize

public sentiment. Moreover, the emergence of sustainable development frameworks, international agreements, and policy initiatives has pushed environmental issues to the top of political agendas. Governments, corporations, and individuals are increasingly recognizing the importance of addressing these concerns through legislation, corporate social responsibility efforts, and individual actions. Since the early 1990s, nations have engaged in discussions and deliberations on how to address the challenges posed by climate change, in a collective attempt to slow down global warming through intensified diplomacy. The negotiations among governments have led to significant international agreements, among which the Paris Climate Agreement of 2015 remains today the fundamental basis for tackling and overcoming the challenges posed by climate change, with its target to limit the global temperature increase to two degrees Celsius. However, despite international agreements and conferences, the rate of decarbonization, measured through carbon intensity, has not improved significantly. As Figure 1 illustrates, the trend of carbon intensity from 1990 to 2019 is pictured through a relatively straight line with a declining trend and small annual fluctuations, that are far from reaching the goal set by Paris Agreement and raise concern, given the urgency of addressing climate change. Nordhaus (2021) identifies three main reasons for this lack of progress: the absence of a market incentive to decarbonize due to the low price of carbon emissions, inadequate investment in low-carbon technologies, and the issue of free-riding in international climate agreements.

The role played by human-oriented factors in energy use and demand-side management strategies is undeniable, given the strong reliance of smart resource management on changes in human attitudes and behaviors. Conversely human-oriented factors are uncertain and introduce unpredictable challenges, that can re-

Figure 1.1: CO2 emissions per dollar of GDP. Source: Our World in Data based on the Global Carbon Project (2023)



sult in disparities between expected and actual sustainability target outcomes. This leads decision-makers to consider the specific context of the target society in order to guide the design of successful behavioral change interventions (Zaidan et al., 2022). Indeed, the root of environmental troubles cannot be blamed on misbehaving markets only. Oftentimes, people's poor decisions, encompassing a range of harmful actions that seem lazy, uninformed, or counterproductive, can also produce and worsen harmful environmental side effects. These behaviors have been formally identified in the term of behavioral anomalies, which have become a major topic of study in psychology and behavioral economics and are not limited to environment: people may take poor decisions about their health and finances on a daily basis, e.g., when they decide to not take their medications or not to pay enough attention to contract clauses. Environmentally speaking, the excessive use of energy, and resources in general, is one of the abnormalities that has

been most documented and that leads to excessive pollution. The important aspect of behavioral anomalies is that they result from individual acts rather than market imperfections. The sources of such anomalies are various and can go from incomplete or not available information, e.g., ignoring the price of electricity, to having non rational or non economic preferences, e.g., status quo bias (Nordhaus, 2021).

Examining the primary factors influencing human behavior and attitudes towards energy efficiency and interactions with buildings has the potential to provide valuable insights for shaping energy policies and programs towards eco-friendly consumption. These insights could include strategies for targeting specific population segments to enhance awareness, creating incentive models, and planning for Demand Response programs (Zaidan et al., 2022).

## **1.2 Literature review**

### **1.2.1 Factors influencing pro-environmental behavior**

Pro-environmental behavior can be defined as the set of conscious actions performed by an individual to lessen the negative impact of human activities on the environment and enhance its quality with the background thought of making choices that minimize negative environmental impacts. This behavior encompasses a range of actions, including environmental activism, recycling, energy conservation, sustainable transportation choices and green purchase behavior (Sawitri et al., 2015).

Understanding the factors that influence pro-environmental behavior is crucial for promoting sustainable practices and thereby developing a more sustainable society. We can distinguish two main types of such determinants: individual and

contextual factors.

#### **1.2.1.1 Individual determinants of green behavior**

Individual factors can be defined as those factors pertaining to characteristics, traits, and attributes that are specific to an individual person. These factors include personal beliefs, attitudes, values, cognitive abilities, personality traits, and past experiences.

The individual factors prompting ecologically friendly behavior are several and can vary across different demographics and personal characteristics.

One important factor is represented by environmental knowledge. People who have a better understanding of environmental issues and the impact of their actions are more likely to engage in ecologically friendly behavior (Darmawan et al., 2018), with evidence showing that higher education levels are associated with more positive views towards climate change mitigation (Weckroth & Ala-Mantila, 2022) (Zhao et al., 2019). It can be deduced that education can effectively encourage environmentally conscious actions. Moreover, education leads individuals to show greater concern for societal well-being, which in turn prompts them to engage in more environmentally responsible behavior (Meyer, 2015). Begum et al. (2021) found that environmental education can significantly impact students' ecologically friendly behavior. Additionally, knowledge management in households, particularly in terms of energy-saving awareness, can play a crucial role in influencing energy-saving behavior (Żywiłek et al., 2021). This suggests that educational interventions can play a crucial role in promoting eco-friendly behavior by increasing individuals' awareness and understanding of environmental issues.

Age has also been found to be a significant factor, with previous studies consis-



tently showing that younger people tend to be more concerned about the environment than older adults (Wright et al., 2003) and that younger individuals are more likely to engage in ecologically friendly behavior (Fang et al., 2018). The reasons behind this difference in environmental concern between younger and older individuals can vary. Younger respondents have been found to prioritize environmental welfare in their evaluations of food quality, while older respondents prioritize health Kim & Seock (2009). Additionally, younger people may have grown up in an era where environmental issues have received more attention and awareness, leading to a greater sense of concern (Wright et al., 2003). One study found that young adults who engage in pro-environmental behaviors in general are more likely to volunteer for environmental nonprofit organizations McDougale et al. (2011). This suggests that younger individuals are actively involved in environmental initiatives and are motivated to contribute to environmental causes.

Psychological factors also play a crucial role in influencing pro-environmental behavior. Emotion, for example, has been found to have a significant impact on individuals' behavior at work. Environmental concern, anger, and guilt are among the cognitive and affective aspects that have been extensively studied in relation to pro-environmental behavior (Li et al., 2022). Furthermore, environmental identity has been identified as an important factor influencing everyday pro-environmental behaviors, such as waste utilization, purchasing green products, and water and electricity saving (Liu, 2022).

Studies have shown that ecological value cognition and environmental attitude, as well as place attachment, play a significant role in shaping pro-environmental behavior among rural farmers (Meng & Si, 2022) and that attitudes play a significant role in predicting and moderating ecologically friendly behavior (Laroche

et al., 2001). Indeed, individuals with positive attitudes towards the environment are more likely to engage in behaviors that are beneficial for the environment.

Attitudes are individuals' evaluations or feelings towards specific objects or aspects of the environment. These attitudes can influence individuals' intentions and subsequent behaviors related to eco-friendly practices. Several studies have examined the relationship between attitudinal variables and eco-friendly attitudes and behaviors.

Research has shown that attitudes towards eco-friendly products and environmental concerns positively influence individuals' intentions to engage in eco-friendly behaviors (Carrete et al., 2012). For example, attitudes towards green buying behavior have been shown to influence consumers' actual green purchasing behavior (Khare, 2015).

Participating in meetings organized by ecological associations can also be regarded as an attitudinal variable, as it reflects an individual's interest in environmental matters. Such involvement in ecological associations' meetings can promote environmental awareness and identity, subsequently encouraging individuals to integrate more ecological behaviors into their daily lives (Han et al., 2011).

Income and financial aspects play a role, as well. Research has shown that economic interests can influence eco-consumption, with individuals sometimes choosing not to purchase eco-friendly products due to their higher cost (Karginova-Gubinova et al., 2021), suggesting that affordability and economic considerations can impact environmentally friendly behavior. On the other hand, another study highlighted the influence of income and age on environmental concern, showing that higher income and younger age groups tend to be more environmentally concerned (Kim & Seock, 2009). People who perceive themselves as belonging to a

higher social class are said to be more inclined to sacrifice their money in support of more robust environmental protection measures. This stems from the observation that lower-income communities might prioritize addressing their immediate economic needs, whereas higher-income communities may exhibit a greater capacity and inclination to allocate resources towards adopting environmentally sustainable technologies and methods.

As regards actual pro-environmental behaviors, people in the lowest income groups tend to report making more efforts to use less energy, while those in the top deciles tend to do the opposite. In other words, people with lower incomes seem to be more focused on saving energy, but wealthier people tend to use more energy despite expressing concerns about the environment. This difference between words and actions is what researchers call the «attitude-behavior gap» (Weckroth & Ala-Mantila, 2022).

#### **1.2.1.2 Contextual determinants of green behavior**

While psychological research has primarily focused on individual factors that promote such behavior, contextual factors at the aggregate level have been largely ignored (Wu et al., 2013). It is important to note that energy-saving behavior is not solely influenced by individual factors, but also by external factors such as the availability of renewable energy sources and the overall energy consumption patterns in society (Bohdanowicz et al., 2021).

Contextual factors refer to the external and environmental conditions that surround an individual. These can encompass social, cultural, economic, physical, and situational elements that influence behavior. They can include societal norms, cultural values, economic conditions, physical surroundings, and social interac-

tions and play a significant role in facilitating or constraining pro-environmental behavior.

For instance, the availability of recycling facilities, the quality of public transport, and the market supply of environmentally friendly goods strongly affect individuals' engagement in pro-environmental behavior (Sawitri et al., 2015). Additionally, the influence of contextual factors on pro-environmental intention, which is a predictor of behavior, has been acknowledged, even though individuals do not always translate their intentions into actual pro-environmental behaviors (Bergman et al., 2022).

Markle (2019) found that cultural orientation, pro-environmental orientation, environmental identity, and environmental influence are predictors of pro-environmental behavior, proving that individuals develop culturally-specific environmental socio-cognitive schemes that guide their environmentally significant behavior. Therefore, understanding the cultural factors that influence pro-environmental behavior is essential for developing effective interventions and policies.

Social norms and peer influence play a significant role in shaping individuals' perceptions and behaviors towards climate change. The prevailing attitudes and behaviors within a community can influence how individuals perceive and respond to environmental issues. Several studies have examined the relationship between social norms and pro-environmental behaviors, highlighting how individuals are systematically more likely to engage in eco-friendly behaviors when they perceive that such behaviors are the norm within their social group or when they believe that others are also engaging in such behaviors (Cialdini et al., 1990) (Bicchieri & Xiao, 2009). Schultz et al. (2007) further emphasized the constructive, destructive, and reconstructive power of social norms, highlighting how norms can shape

individuals' behaviors positively or negatively.

A 2022 study using ESS (European Social Survey) Round 8 data finds that there are differences in climate change scepticism and concern based on where people live, and that living in urban areas or in regions with constant population growth is associated with higher levels of climate change concern and pro-environmental norms, thus suggesting that climate change mitigation is not uniform across different geographic areas (Weckroth & Ala-Mantila, 2022). The impact of residence on environmental concern has also been debated by Huddart-Kennedy et al. (2009). They found that urban residents are more likely to be concerned about the environment and act on this concern compared to rural residents, the reason behind that is that urban areas often provide greater access to information and resources, facilitating environmentally conscious attitudes and behaviors. On the other hand, the availability of green areas and proximity to nature can also influence behavior. People who live in close proximity to green areas, or regularly interact with nature, are more likely to understand the importance of protecting the environment and, as a result, engage in eco-friendly behavior (Darmawan et al., 2018).

There is evidence to suggest that people may not implement eco-friendly behavior due to living in a degraded area. Several studies have explored the relationship between environmental degradation and individuals' eco-friendly behavior.

One study by Kim & Lee (2023) found that while many consumers who are sensitive to environmental degradation express support for eco-friendly products, this support does not always translate into actual action, suggesting that living in a degraded area may not necessarily lead to the adoption of eco-friendly behaviors. However, other research suggests that knowledge about environmental issues can

influence individuals' pro-environmental behavior. Yadav & Pathak (2016) found that knowledge about environmental issues is associated with pro-environmental behavior and influences consumers' intention to purchase eco-friendly products. This suggests that individuals who are aware of the environmental degradation in their area may be more likely to engage in eco-friendly behavior.

Ultimately, individual attitudes and actions are shaped by a complex interplay of factors, and the living environment is just one of them. Nonetheless, creating supportive, sustainable living environments can be a powerful way to foster positive change and encourage widespread action on climate change.

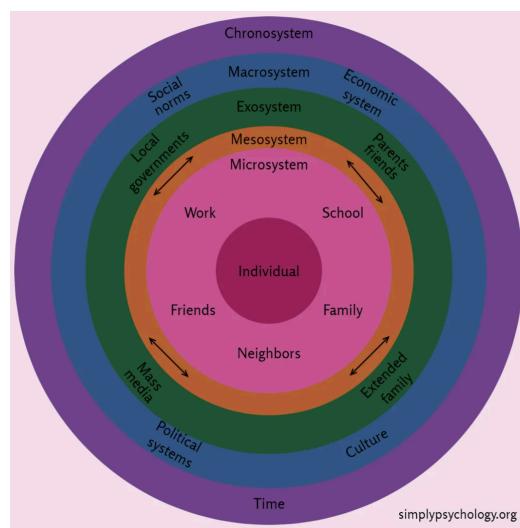
### **1.2.2 The Ecological Systems Theory in the context of eco-friendly behavior formation**

As we delve into the exploration of resource-saving behavior among individuals in Italy, we recognize the importance of considering the multifaceted ecological influences that shape their attitudes and actions. In the pursuit of understanding the mechanism of behavior change, we turn our attention to the Ecological Systems Theory developed by Bronfenbrenner (1979), a framework that offers valuable insights into the complex interplay between individuals and their environments, prompting us to examine not only individual characteristics but also the broader context in which these behaviors occur. Bronfenbrenner's Ecological Systems Theory summarized decades of theory and research about the underlying mechanisms that shape lifespan development (Darling, 2007). Bronfenbrenner suggests that human development is profoundly influenced by the various ecological systems in which individuals are embedded, demonstrating how complicated human devel-

opment is.

According to Bronfenbrenner, human development is constituted by a series of layers, also called systems. Each system is related to one another, either directly or indirectly and changes in one system cause changes in every system. These systems range from the immediate microsystem of one's family and peers to the broader macrosystem of culture and society. Over time, Bronfenbrenner's Ecological Systems Theory has been used to study changes in social, economic, physical, psychological and cultural conditions of people (Amrutha et al., 2016).

Figure 1.2: Bronfenbrenner's Ecological Systems Theory Model. Source: Simply Psychology



The relationship between systems is represented diagrammatically in Figure 1.2 and unfolds as follows: the individual is considered at the center and is encircled by five systems namely microsystem, mesosystem, exosystem, macrosystem and chronosystem.

- The microsystem involves the immediate environments of the individual,

comprising the individuals who have close contact with an individual, such as family members and colleagues;

- the mesosystem is a collection of the relationships between people belonging in the different microsystems;
- the exosystem includes connections and events that occur between different settings, one of which does not directly involve the individual but impacts the immediate environment in which they live;
- the macrosystem encompasses the broader patterns of micro-, meso- and exosystems within a particular culture or subculture. It includes belief systems, knowledge, resources, customs, lifestyles, opportunities, risks, and life choices embedded within these larger systems;
- the chronosystem takes into account changes or consistencies over time in both the individual's characteristics and their environment. Part of it relates to when events occur in a person's life; the other element is the larger historical context, i.e. changes in the expected cost of living.

In the context of eco-friendly behavior formation, the ecological systems theory suggests that individuals' attitudes and behaviors are shaped by their interactions with various environmental factors. For example, at the individual level, personal values, beliefs, and knowledge about environmental issues play a significant role in influencing eco-friendly behavior (Liobikienė & Poškus, 2019). At the interpersonal level, social norms and peer influence can either encourage or discourage eco-friendly behavior (Channa et al., 2022)(Flammer, 2013). At the community level, access to resources and infrastructure, such as recycling facilities or public transportation, can facilitate or hinder eco-friendly behavior (Olsson et al.,



2022). Finally, at the environmental level, broader societal and cultural factors, such as government policies and economic incentives, can shape individuals' attitudes and behaviors towards the environment (Karginova-Gubinova et al., 2021).

The ecological systems theory also highlights the importance of considering the dynamic interactions between these different levels of influence. For example, changes in the broader macrosystem, such as the implementation of environmental regulations or the promotion of sustainable practices, can have cascading effects on individuals' attitudes and behaviors at the microsystem level. Similarly, individuals' eco-friendly behaviors can also influence their immediate social networks and communities, leading to the spread of pro-environmental norms and practices.

Overall, the ecological systems theory provides a comprehensive framework for understanding the formation of eco-friendly behavior by considering the complex interactions between individuals and their environment at multiple levels of influence and by enriching our comprehension of how an individual's development and, consequently, their eco-friendly behavior can be influenced by social norms, peer pressure, their environment, and community-level factors. This perspective acknowledges that one's destiny is not predetermined by genetics. By recognizing the interconnectedness of these factors, policymakers and practitioners can develop interventions and strategies that target the various levels of influence to promote sustainable behaviors and create a more eco-friendly society.

### **1.2.3 Further theories and conceptual frameworks**

While the Ecological Systems Theory offers valuable insights into behavior formation, a comprehensive understanding of pro-environmental behavior, including

green purchase behavior and sustainable living practices, requires us to explore additional theories and conceptual frameworks. These supplementary perspectives, theories and concepts provide nuanced insights into the complexities of human behavior and its relationship with the environment, offering a comprehensive framework for understanding and promoting eco-friendly behaviors

#### **1.2.3.1 The Theory of Planned Behavior (TPB)**

The Theory of Planned Behavior (TPB), developed by Ajzen (1991), is a widely recognized framework for understanding and predicting human behavior, including eco-friendly behavior. According to TPB, an individual's intention to engage in pro-environmental behavior is influenced by three main factors:

1. Attitudes, i.e., an individual's positive or negative evaluation of the behavior.
2. Subjective Norms, i.e., perceptions of social pressure and the influence of others on the behavior.
3. Perceived Behavioral Control, i.e., the individual's perception of their ability to perform the behavior, in other words the ease with which they can perform the behavior.

If these factors are positive, it is more likely that the individual will engage in eco-friendly behaviors (Ekasari & Zaini, 2020). The TPB has been applied to understand various pro-environmental behaviors, including energy-saving actions, as it highlights the role of personal beliefs, social influences, and perceived barriers in shaping intentions and behaviors.

Several studies have applied TPB to investigate eco-friendly behavior. For example, Mamun et al. (2018) found that attitudes towards environmentally friendly products, normative beliefs, and perceived behavioral control significantly influenced the willingness to pay for such products. Similarly, Sia & Jose (2019) combined TPB variables with the norm activation model and found that attitudes, subjective norms, and moral obligation predicted the intention to build eco-friendly houses, suggesting how individuals' behavioral intentions and social influences are the strongest predictor of their actual behavior. Gao et al. (2022) examined the impact of technological and social factors on eco-friendly consumer behavior in the context of social commerce. They found that intrinsic and extrinsic motivations, driven by factors such as perceived ease of use and enjoyment, played a significant role in influencing eco-friendly behavior. This suggests that the design and usability of eco-friendly products and platforms can influence consumer behavior.

The Theory of Planned Behavior provides a useful framework for understanding and predicting eco-friendly behavior. Attitudes, subjective norms, and perceived behavioral control are key factors that influence individuals' intentions to engage in eco-friendly behavior. However, other factors such as intrinsic motivations, environmental concerns, and knowledge also play a role in shaping eco-friendly behavior (Sobuj et al., 2021). Understanding these factors can inform interventions and strategies aimed at promoting sustainable and eco-friendly practices.

### **1.2.3.2 The Norm-Activation Theory (NAT)**

The Norm-Activation Theory (NAT) posits that personal norms play a crucial role in activating behavior change towards more eco-friendly actions (Han et al., 2018),

proposing that individuals are more likely to engage in pro-environmental behaviors when they perceive an issue as personally relevant, hence they feel a moral obligation to act. According to the NAT, individuals are more likely to engage in pro-environmental behavior when they are aware of the consequences of their actions, feel a sense of responsibility, and have internalized a personal moral norm that aligns with environmental values (Han et al., 2018) (Onel, 2017).

Studies have applied the NAT in various contexts, including tourism, consumption, and corporate social responsibility. For example, in the context of tourism, user-generated content in social media has been found to be an effective approach to encourage greater pro-environmental behavior (Han et al., 2018). In the context of consumption, the theory has been used to explain green purchase behavior, particularly in the hospitality industry (Han, 2020). According to the NAT, both awareness of consequences and ascription of responsibility contribute to activating one's sense of moral obligation to take a pro-social action, where ascribed responsibility refers to one's feeling about the negative consequences derived from their socially irresponsible behavior. Activating personal norms through education or awareness campaigns can promote green purchase behavior.

However, it is important to note that the Norm-Activation Theory has its limitations. It tends to overlook the influence of social and situational factors on behavior (Han et al., 2018). To address this limitation, researchers have combined and integrated the NAT with other theories, such as the TPB and the Value-Belief-Norm (VBN) Theory, to provide a more comprehensive understanding of eco-friendly consumer behavior (Han et al., 2018) (Kim et al., 2012) (Sia & Jose, 2019). These studies highlight the importance of subjective norms, attitudes, and perceived behavioral control in predicting intentions to engage in eco-friendly behaviors.

In general, the Norm-Activation Theory is a valuable model for understanding pro-environmental behavior, emphasizing the influence of personal norms in motivating eco-friendly behavior change. However, it is important to consider both the influence of social and situational factors on behavior and the integration of the NAT with other theories, to offer a more holistic insight on eco-friendly behavior formation.

#### **1.2.3.3 The Value-Belief-Norm (VBN) Theory**

The Value-Belief-Norm Theory (VBN) emphasizes the role of intrinsic values and the belief that an individual has about protecting the environment, suggesting that an individual's personal values, beliefs about environmental issues, and perceived social norms influence their intention to engage in pro-environmental behaviors Stern (2000). According to the VBN theory, individuals who hold strong environmental values are more likely to develop pro-environmental beliefs and norms, which in turn motivate them to engage in eco-friendly behaviors Stern (2000).

Several studies have examined the role of the VBN theory in the context of eco-friendly behavior formation. For example, Han et al. (2020) integrated the VBN theory with the Theory of Planned Behavior and Environmental Corporate Social Responsibility to develop a theoretical framework for understanding customers' decision-making process for eco-friendly products in the airline and restaurant industries. They found that the VBN theory, along with other factors such as attitude and environmental CSR, significantly influenced customers' intention to choose eco-friendly products.

Similarly, Sawitri et al. (2015) highlighted the importance of the VBN theory in explaining pro-environmental behavior. They argued that the VBN theory, along

with other theories such as the Theory of Planned Behavior and Norm Activation Theory, can contribute to a better understanding of the factors that influence pro-environmental behavior. By considering individuals' values, beliefs, and norms, the VBN theory provides a comprehensive framework for understanding the formation of eco-friendly behavior.

Ultimately, it can be assumed that the knowledge of the Value-Belief-Norm Theory integrated with other significant frameworks and model may be useful to inform interventions and policies aimed at promoting sustainable behavior.

#### **1.2.3.4 The Behavior-Change Wheel (BCW)**

The frameworks that have been presented in the previous sections are all relevant for understanding eco-friendly behavior formation, since they approach and describe behavior change from different angles. The TPB focuses on intentions while the NAT targets on personal morals and the VBN Theory focuses on values and beliefs.

The Behavior-Change Wheel, on the other hand, focuses on the practical aspects of change. It is a pragmatic framework providing a structured way to design interventions with the aim of changing behavior by focusing on three particular aspects: capability, i.e., one's ability to act; opportunity, i.e., the environment and context that makes one's action possible; and motivation, i.e., one's desire to perform a certain action.

The challenges associated with behavior change and sustainability are several. Bouton (2014) explains that behavior change is difficult to sustain because the methods used to create behavior change often inhibit the original behavior rather than erasing it. Additionally, behavior change is often specific to the context in

which it is learned. This suggests that interventions to promote eco-friendly behavior need to consider the specific context and address potential relapse phenomena (Bouton, 2014).

Lasrado & Zakaria (2020) apply the BCW model to identify effective ways in which it is possible to predict the success of pro-environmental interventions on behavior change with the ultimate objective to analyze the organizational factors that actively guide employees towards green behaviors. The study findings highlight how the contextual factors differ across different regions, and how significant is the leaders' exemplary behavior has on the green engagement of their employees.

Kolodko et al. (2021) demonstrate the application of the Behavior Change Wheel methodology in optimizing pro-environmental behaviors by concluding that interventions completely informed by the Wheel are more effective than interventions less, or not at all, informed by the it.

Overall, by leveraging insights gained from the BCW model to identify effective interventions for promoting green engagement within an organizational context, organizations can subsequently integrate this knowledge into their policymaking processes aimed at fostering green engagement. The BCW can be therefore considered as a systematic way to encourage people to change their behavior and for for developing behavior change interventions.

### **1.3 Energy-saving behavior**

Energy-saving behavior is a crucial aspect of promoting sustainability and reducing environmental impact. It involves individuals and households adopting prac-

tices and making choices that aim to minimize energy consumption and maximize efficiency, encompassing a wide range of activities aimed at reducing energy consumption, promoting energy efficiency, and mitigating the environmental impact associated with energy production and consumption. These behaviors may include but are not limited to:

- Energy-efficient appliance usage: Choosing and using energy-efficient appliances and lighting.
- Thermal comfort management: Regulating heating and cooling systems efficiently.
- Transportation choices: Opting for eco-friendly transportation modes and practices.
- Renewable energy adoption: Utilizing renewable energy sources like solar or wind power.
- Behavioral adjustments: Simple actions such as turning off lights, unplugging devices, and reducing waste.

The significance of energy-saving behavior lies in its potential to reduce greenhouse gas emissions, alleviate strain on finite energy resources, lower utility bills, and promote a more sustainable and resilient living environment. Indeed, households play a role in the rise of greenhouse gas emissions through their everyday energy-related actions, especially through the consumption of gas and electricity, as well as the utilization of energy-intensive products and services (Abrahamse et al., 2007). In 2021, the residential sector accounted for 27% of final energy



consumption in the EU, equivalent to 18.6% of the total gross inland energy consumption (Eurostat, 2023) and the economic value of household consumption in the EU increased by 69% between 2000 and 2019 (Agency, 2023). In view of this, households can be considered an important target group for energy conservation. By targeting energy-related behaviors at home, household energy use may be reduced, resulting in a reduction of households' impact on the environment.

Households in the EU utilize energy for various purposes, including space and water heating, space cooling, cooking, lighting, electrical appliances, and other activities outside their homes. The majority of the energy used in EU households comes from natural gas (31.7%) and electricity (24.8%). Renewable energy sources contributed to 20.3% of the total, followed by oil and petroleum products at 12.3%, and derived heat at 8.2%. A smaller portion, 2.7%, is still derived from coal products and solid fuels.

When considering the breakdown of energy consumption by end-use, heating homes is the most significant, accounting for 62.8% of the final energy consumption in residential sectors. Electric power used for lighting and various electrical devices constitutes 14.5%, while energy used for water heating is slightly higher at 15.1% (Eurostat, 2023).

### **1.3.1 Role Within the Italian Context**

Energy-saving behavior is a topic of great importance in Italy due to the country's unique socio-economic and environmental characteristics. Italy faces specific challenges and opportunities in terms of energy sustainability, making it an intriguing case study. Understanding energy-saving behavior in the Italian context

Figure 1.3: Final energy consumption in the residential sector by fuel, EU, 2021.  
Source: Eurostat

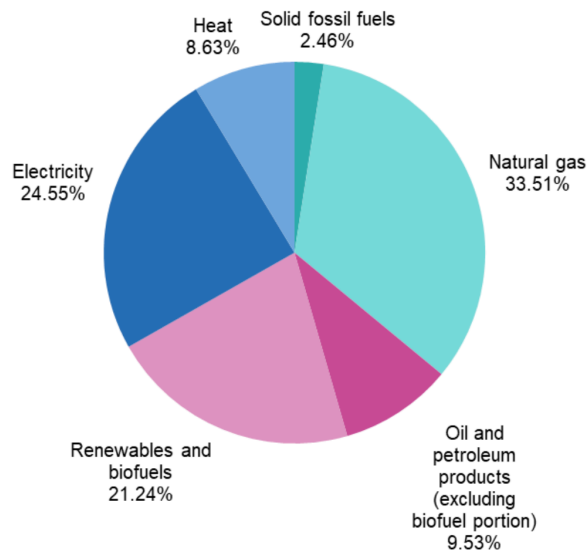
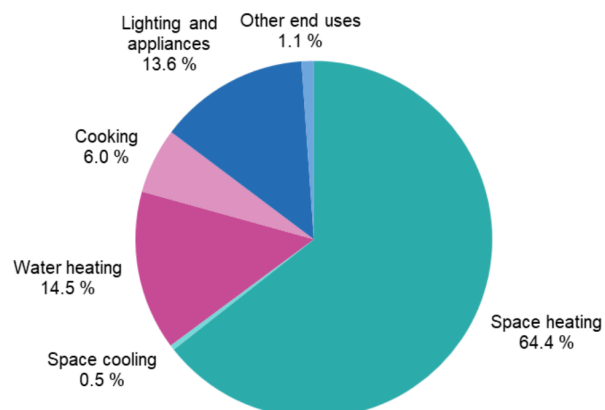


Figure 1.4: Final energy consumption in the residential sector by use, EU, 2021.  
Source: Eurostat



requires considering the specific contextual factors that influence it.

In Italy, household emissions primarily stem from the consumption of fossil fuels for private transportation, contributing to 57.0% of the total greenhouse gas emissions generated by human activity, 74.6% of acidifying emissions, and 43.0% of tropospheric ozone precursors. The emissions associated with household heating, cooking, and hot water production represent 42.6% of greenhouse gases and 25.0% of acidification, with a notable share of approximately 43.6% in tropospheric ozone generation. Other household activities, such as painting and the use of cleaning products also have a significant role in generating tropospheric ozone emissions (Istat, 2022).

The consumption of energy within households is influenced by several factors, including the number of family members, local climate conditions, the types of appliances owned, individual lifestyles, the structural features of a house, and human energy-related habits. While there has been considerable research and practical application in addressing energy concerns related to design, materials, and installation over the years, the study of energy usage and behavior is a relatively recent development (Yohanis, 2012).

Italy, like other EU countries, exhibits a significant dependence on energy imports. Renewable energy sources contribute to 41.7% of the total gross production, with a predominant share coming from hydroelectric power (17.6%), and contributions from photovoltaic (8.9%), bioenergy (7.0%), and wind power (6.7%). The distribution of renewable energy sources across the country shows a greater utilization of hydroelectric power in mountainous regions, wind power in the southern part of Italy, and photovoltaic energy in the central regions, while geothermal energy production is concentrated in Tuscany.

Approximately 48.8% of households in Italy are equipped with one or more air conditioning systems. The prevalence of air conditioning is evident across all regions, with rates of 51.2% in the south, 49.1% in the north, and 44.2% in central regions. Among households with air conditioning, 28.5% use it nearly every day during the warm season, 35.3% use it a few days a week, 12.1% use it a few days a month, and 24.1% use it infrequently or not at all.

Among major household appliances, refrigerators and washing machines are the most common and are present in nearly all households (99.5% and 97.3%, respectively). Half of the households (50.2%) have a dishwasher, 15.2% have a separate dryer from the washing machine, and 27.3% have an external freezer separate from the refrigerator. Stove-tops are primarily powered by natural gas (75.5%) or liquefied petroleum gas (17.6%), while ovens are mostly electric (82.5%) or powered by natural gas (13.9%). Energy-efficient light bulbs are widely used, with 54.8% of households exclusively using them, while 4.2% still use traditional filament bulbs. Additionally, 61.1% of households have double or triple glazing installed on all windows and doors. (Istat, 2022)

Tiberio et al. (2020) conducted a case-study analysis of a local community in Northeast Italy to understand the psychological processes and institutional actors involved in the sustainable energy transition. Their research highlighted the importance of considering individual and collective dimensions in energy-related choices. Furthermore, Abrahamse & Steg (2009) investigated the relationship between socio-demographic and psychological factors and households' direct and indirect energy use and savings. They found that factors such as income, education, and environmental values were significant predictors of energy-saving behavior. It is also worth noting that the COVID-19 pandemic and associated lockdown mea-

asures have had a significant impact on urban road traffic and air quality in Italy, highlighting the potential for behavioral changes and the importance of sustainable transportation practices (Gualtieri et al., 2020).

Ultimately, an individual can choose to become an environmental activist, engaged as a member of organizations defending the planet, or a non-activist, simply observing proper social-ecological practices, or, less likely, remaining indifferent to the problem.

In the subsequent chapters, we will delve into empirical evidence and analyses to explore the patterns, determinants, and impacts of energy-saving behavior in Italy. By doing so, we aim to contribute to a deeper understanding of resource-saving behavior within this specific cultural and environmental context. However, it is necessary to recognize that achieving the significant reductions necessary to reach the 1.5°C goal cannot rely solely on short-term voluntary initiatives. Instead, households require a regulatory framework to underpin and facilitate their behavioral adjustments (Dubois et al., 2019).

## **1.4 Aim and Objectives**

Before we dive into our study of energy-saving behavior in Italy, it's important to clarify what we aim to achieve overall and the specific goals we want to reach with this research. These objectives serve as a compass for our research, guiding our inquiry, framing our research questions, and ultimately leading to meaningful conclusions in subsequent chapters.

Our primary aim is threefold:

1. To understand the human characteristics that contribute to develop Eco-

friendly attitudes and behaviors.

2. To grasp the variations in electricity and water consumption attitude and behavior in the Italian society based on their socioeconomic traits, motivations and preferences.
3. To determine the key spatial features and crucial attributes of the living area that influence residents' motivation and preferences regarding electricity and water consumption.

Overall, our research is informed by ecological systems theory, complemented by other relevant theories such as the theory of green purchase behavior, the theory of planned behavior, and institutional theory. These theoretical frameworks highlight the significance of education, economic interests, attitudes, social norms, and institutional factors in shaping individuals' Eco-friendly intentions and behaviors.

Through an examination of some perceived neighborhood characteristics, we aim to unravel the intricate interplay between living environment and resource consumption, shedding light on the motivations and barriers to Eco-friendly behavior.

Ultimately, this thesis contributes to the literature on environmental and energy knowledge and action and the results may help in understanding the factor enhancing or counteracting pro-environmental behaviour.

# **Chapter 2**

## **Material and methods**

### **2.1 Survey description**

The data, variables and statistical techniques used in the analyses presented in the next chapter are now described.

The data used originate from the survey «Aspects of Daily Life» of 2021, a survey that is part of the Istat (Italian Institute of Statistics) integrated system of Multi-purpose-household-surveys and that has been carried out every year since 1993. Overall, the investigation is aimed at collecting information on the habits, perceptions and concerns of Italian citizens on various topics. The topics covered in it include several thematic areas such as school, work, family life and relationships, characteristics of the home and the area in which it is located, leisure time, political and social participation, health, lifestyles and relationship with services. The data collected, combined with information derived from public administrative records, form the essential information base for understanding the social dynamics of the country. More specifically, the main information covered in the survey

includes:

- family structure and population characteristics. Education and training, private courses, and lessons;
- daily commuting for study or work purposes;
- weekly activities: domestic and non-domestic work;
- leisure time: sports, socializing with friends, reading, media consumption, cinema, theater, shows, etc;
- use of new technologies: Internet and personal computers;
- social and political participation (involvement in associations, etc.);
- citizen and services: utilization and satisfaction with hospitals and other healthcare services, registry and administrative offices, post offices, local health authorities, banks, transportation, electricity and gas services, and waste recycling services;
- lifestyles: eating habits, beverages, smoking;
- health conditions and chronic diseases, medication usage, domestic accidents;
- housing and living area, changes in housing;
- family's economic situation;
- satisfaction with the past year;
- subjective well-being and trust.

The evolution of phenomena and the changes that have occurred over time require periodic adjustments to the survey questionnaire, which involve not only the information to be collected but also the questions through which such information is gathered. The question about environmental concerns was introduced in 1998



as part of a thematic investigation on the environment. It has been consistently included since 2012 to meet the increasing need for knowledge on environmental matters and to provide indicators for the environmental domain of the Istat-Cnel project on equitable and sustainable well-being (Mignolli et al., 2021). In recent years, this information framework has been enriched by incorporating a series of questions aimed at assessing Eco-friendly behaviors. The actions of the population, their lifestyles, opinions, and attitudes greatly influence environmental sustainability. Examining these behaviors, which hold importance for environmental sustainability, social well-being, and overall quality of life, provides valuable information for guiding environmental policy decisions.

Information on environmental aspects, i.e. beliefs and behaviors, are gathered in section 27 of the survey. In particular this section comprises of two questions: question 27.1, which concerns the environmental issues that are of most concern to the sample population, and question 27.2, which permits to assess Eco-friendly behaviors among the population.

The target population comprises households resident in Italy, referred to as a set of cohabiting persons bound by marriage, kinship, affinity, adoption, guardianship or affective ties, while the period to which the data refers is intended as the twelve months preceding the interview. The study's results are based on data collected from a representative sample that mirrors the characteristics of the target population.

The survey is conducted on approximately 25,000 households residing in around 800 Italian municipalities, representing various demographic sizes. All individuals residing in the sampled households were interviewed. In cases where a resident was unavailable or occupied during the interview conducted by an interviewer, ef-

forts were made to schedule an appointment within the designated survey period. Alternatively, another family member present at the time could provide answers on behalf of the absent individual.

The sampling design is carried out in clusters: households are selected at random, without reinstatement, from the registry list and all household members are surveyed. The minimum number of sample households per municipality is set at 24.

The data collection is performed in two separate stages. Initially, the respondent households are sent the surveyor for the interview, then the sample households are offered the interview via self-completion. The methodology of data collection was therefore mixed, i.e., involving both a self-administered online questionnaire through Computer-Assisted Web Interviewing (CAWI) and a face-to-face interview technique conducted by an interviewer using either Computer-Assisted Personal Interviewing (CAPI) or Paper and Pencil Interviewing (PAPI).

The information is gathered through two questionnaires, the first of them consisting of three main sections:

- a general sheet that captures socio-demographic and socio-economic information (such as age gender, marital status, educational background, etc.), targeting all family members;
- an individual questionnaire, filled independently by each family member;
- a family questionnaire, filled by one adult member and collecting general information about the household.

The second survey is designed to be completed by individuals themselves, using a form provided by the surveyor. The form contains questions that are easy for

the respondents to fill out independently, without the surveyor's direct involvement. With regard to children and young people under the age of 14, they are interviewed in proxy mode, i.e. through information provided on their behalf by a parent or adult member.

## **2.2 Data, variables and methods of analysis**

To ensure the quality and reliability of the original data set, various procedures of sample selection were implemented, laying the groundwork for the subsequent analysis and interpretation of the research findings.

All the analyses presented in chapter 3 were conducted using the statistical software STATA. Before conducting the analysis, it was essential to prepare the Istat survey data for input into STATA. Section 2.2.1 will outline the steps taken to clean, format, and structure the data set to ensure its suitability for statistical analysis.

To corroborate the achievement of the research objectives, listed in section 3.1, we identified a set of useful variables and grouped them based on their specific function in four main macro-groups: demographic and socioeconomic variables, geographic and spatial variables, attitudinal variables and behavioral variables. A detailed explanation of these variables will be provided in section 2.2.2.

### **2.2.1 Sample selection and data cleaning**

As mentioned in section 2.1, the survey covers approximately 25,000 households, resulting in an original data set comprising 45,597 observations and 735 variables. To ensure data integrity and suitability for analysis, several data cleaning measures

were implemented, yielding to a refined data set with fewer, more accurate observations.

In the first place, observations relative to people aged under 14 years of age were dropped. This decision was undertaken with a specific purpose in mind: the main section of the survey under consideration, i.e. section 27, was designed to focus exclusively on respondents aged 14 years and above. By excluding data for individuals below this age threshold, the analysis could concentrate on the target population that aligns with the survey's intended scope. This approach enhances the relevance and accuracy of the findings, allowing for a more focused examination of the research objectives within the appropriate age range.

Secondly, observations pertaining to individuals whose region of residence is unknown were excluded from the data set as well. The decision to exclude observations pertaining to individuals whose region of residence is unknown was motivated by the need to maintain data accuracy and reliability for the analysis. Regions play a crucial role in the survey as they represent significant geographical and administrative units within Italy.

By excluding records with missing or unknown region information, potential errors or inaccuracies in the analysis due to incomplete or ambiguous data were minimized. This data cleaning measure ensures that the data set remains consistent and applicable to the research objectives, allowing for more robust and meaningful insights regarding the surveyed population and their regional characteristics.

Another significant data cleaning measure involved the removal of observations related to respondents who provided «don't know» responses, as they could lead to inaccurate information provision. Specifically, this measure was applied to question 2.1 in section 2 of the survey, which targeted the main household mem-

ber and inquired about various characteristics of the household's area of residence, such as the presence of litter, parking difficulties, traffic, noise, and more. Our primary focus was on two characteristics: the presence of litter on the streets and the presence of air pollution. Since these characteristics rely on self-reported data from respondents, they were also given the option to answer «I don't know» for each characteristic.

To improve the data-set's reliability, we decided to remove observations with «don't know» responses for the specific characteristics of interest. This step ensures that the analysis is based on more informative data, thus facilitating more robust insights into the presence of litter and air pollution in the surveyed areas.

The criteria employed to identify the appropriate subset of observations from the survey for our analysis involved acknowledging the presence of missing values and, therefore, attempts to address them, improving the data-set's readiness for analysis.

In addition, inconsistencies were removed and we ensured that variables were correctly defined and appropriately labeled.

Furthermore, it's worth noting that this data cleaning process also involved a thorough review of variable labels and definitions to ensure clarity and accuracy.

In conclusion, the diligent application of these various data cleaning measures has resulted in a refined and more focused data-set for our research.

The result is the final data-set, which now comprises 34,110 observations and 735 variables. This refined data-set forms the foundation for our analysis, providing a more accurate and focused basis for our research, and allowing us to draw meaningful conclusions and insights related to the surveyed population and their regional characteristics.

## **2.2.2 Variables of interest**

In this section, we will pinpoint the pivotal variables that are essential to addressing our research inquiries. All the key variables will be extracted from the Istat «Aspects of Daily Life» 2021 survey data and will hold a fundamental significance in our empirical analysis.

### **2.2.2.1 Demographic and socioeconomic variables**

Demographic and socioeconomic variables are fundamental components of social research, providing valuable insights into the composition and characteristics of populations and serving as the initial building blocks upon which we will construct a robust framework for understanding Eco-friendly behaviors and environmental attitudes. Analyzing these variables in conjunction with our research questions, allows us to gain a comprehensive understanding of the complex interplay between social dynamics and factors that shape our communities.

As highlighted in section 1.2.1.1, previous research studies examining Eco-friendly behaviors have identified some significant demographic trends.

In the first place, climate change attitudes, including concern and pro-environmental norms, are found to be strongly and positively linked to the individual's level of environmental knowledge and therefore to their level of education.

Other relevant relationships are found with the demographic variables age, and income, with older individuals in lower income brackets being less inclined to endorse pro-environmental values.

In Table 2.1, we present the demographic and socioeconomic variables extracted from both individual and family surveys along with their labels and de-

scriptions.

In the absence of a specific numeric variable describing the household's net income, we are using the variable RISEC as a substitute. RISEC, that literally stands for economic resources, gauges the household's financial well-being in the past year, taking into account the needs of all household members. Although it is a self-reported variable, it provides valuable insights into the perception of economic sufficiency within the family.

Moreover, we decided to include supplementary basic demographic variables such as the number of members in the household, sex and marital status in order to investigate on additional potential existing determinants of environmental concern and Eco-friendly behavior formation.

These variables serve as the foundation upon which we will build our statistical models and regression analyses.

Our research will not stop at this foundational level. Rather, these variables will serve to form a baseline regression for deeper analyses that delve into the influence of neighborhood characteristics and attitudinal factors on Eco-friendly behaviors. By first understanding how demographic and socioeconomic variables shape Eco-friendly behaviors, we can then move forward to explore the connections between individuals, their communities, and their attitudes, all of which are vital in addressing the complex challenges of sustainability and environmental conservation.

Table 2.1: Demographic and socioeconomic variables

<b>Label</b>	<b>Description</b>
NCOMP	Number of members in the household
ETAMi	Age
SESSO	Gender (male or female)
STCIVMi	Marital status
ISTRMi	Educational qualification
RISEC	Household's financial well-being

#### **2.2.2.2 Geographic and spacial variables**

Climate change perspectives, as well as related attitudes and behaviors, are influenced by both socioeconomic factors and distinct geographical contexts. Geographic and spatial variables play a crucial role in understanding the spatial distribution of various phenomena. Indeed, climate change scepticism and concern may develop on the basis of where people live.

As mentioned in section 1.2.1.2, proximity to nature can foster protective attitudes and behaviors towards the environment, while living in a degraded area may either boost, or conversely, reduce the possibility to act Eco-friendly.

To effectively promote environmental sustainability in the European context, strategies for addressing climate change should consider geographical locations and regional dynamics as one of the determinants of pro-environmental attitudes and behaviors.



For this thesis we identified as main geographical variable the broader area of residence of the respondent's family (RIPMf), that follows the natural conformation of the country and is commonly expressed as «North», «Centre», «South and islands». The variable RIPMf in turn aggregates the more specific geographical variable REGMf, representing instead the administrative region of residence of the respondent's family, i.e. the most significant geographical and administrative unit within the country. Indeed, each Italian region is characterised by its own unique geographical conformation, history, traditions, and sometimes even dialects, features that may allow the development of different sensitivity to the various environmental issues and their mitigation.

Additionally, within geographic variables we decided to include several indicators or attributes of the respondent's living area, which does not coincide with the broader administrative region, but rather with a smaller and undefined space surrounding the respondent's home where he or she bases his or her family and social life, and engages in his or her main daily actions. These variables are listed in Table 2.2 and permit to uncover patterns, trends, and relationships that might not be apparent when looking at data in a non-spatial manner. It is again important to point out that we are working with only self-reported answers, and therefore variables.

The first two attributes identified, AMBIENTE and PAESAGGIO, represent respectively the satisfaction with the environmental situation and the landscape deterioration in respondents area and originate from two different questions (19.2 and 19.3) of the individual questionnaire. The next three attributes are depicted in the variables INQUAR, SPORCO and PARCHI, originating from two questions of the family questionnaire: 2.1 and 2.2, that give an idea of the respective presence,

according to the respondent, of air pollution, litter in the streets, and public green areas.

Table 2.2: Geographic variables

Label	Description
RIPMf	Geographical area of residence
REGMf	The region of residence
AMBIENTE	Satisfaction with the environmental situation (air, water, noise, etc.) in respondent's area
PAESAGGIO	Opinion about landscape deterioration in respondent's area (dilapidated buildings, degraded areas)
INQUAR	Presence of air pollution
SPORCO	Presence of litter in the streets
PARCHI	Proximity to public green areas

### 2.2.2.3 Attitudinal variables

Attitudinal variables refer to the psychological constructs that capture individuals' attitudes, beliefs, opinions, and values. These variables are often measured through self-report questionnaires or surveys and are used to understand individuals' thoughts, feelings, and preferences related to a particular topic or phenomenon.

In Chapter 1, we established the theoretical framework that underpins our understanding of how attitudes shape behavior. These theories serve as a foundation for guiding the selection and interpretation of attitudinal variables in our research.

Consistently, research has highlighted the strong connection between individuals' eco-friendly attitudes towards the environment and their inclination to engage in sustainable behaviors. This connection is rooted in the notion that attitudes and behaviors are often influenced by concerns about the environment, including awareness of environmental issues, individual values, and personal consciousness. Factors such as environmental identity and cultural orientation further contribute to this intricate interplay.

In essence, our research aims at recognizing that eco-friendly attitudes are potent drivers of eco-friendly behaviors, and we draw upon established theories to explore these dynamics in greater detail.

While the source of our data, i.e. the «Aspects of Daily Life» survey, primarily focuses on various aspects of daily life, it does not offer a multitude of attitudinal variables. However, through our analysis, we have identified a key attitudinal variable: PAECO, which represents an individual's participation in meetings organized by Ecological Associations.

This attitudinal variable plays a significant role in our research as it reflects an individual's active engagement in environmental issues and their strong consideration for environmental problems. Implicitly, we regard those who participate in ecological association meetings as individuals with heightened environmental awareness and a deep concern for ecological matters. It is our hypothesis that these individuals are more likely to exhibit protective behaviors towards the environment, in contrast to those who do not partake in such meetings.

Incorporating PAECO as an independent variable in our research model is a strategic choice. We anticipate that this variable will provide insights into the relationship between active engagement in environmental associations and the adop-

tion of eco-friendly behaviors. By including PAECO in our analyses, we seek to shed light on the role of environmental attitudes in influencing eco-friendly behaviors and to better understand the motivations that drive individuals towards sustainable and environmentally responsible actions.

Our research approach involves a two-fold analysis. Initially, we will perform a general descriptive analysis to provide a comprehensive overview of the data, offering insights into the distribution and characteristics of PAECO, as well as those of other independent variables. Subsequently, we will employ regression analysis to explore the relationships between PAECO and the behavioral variables presented in section 2.2.2.4.

By investigating the influence of PAECO on eco-friendly behaviors, we aim to contribute to the broader understanding of the connections between attitudinal factors and environmental actions in Italy. Our study not only provides insight into the role of ecological association participation but also underscores the importance of fostering strong environmental considerations in individuals, with the ultimate goal of promoting sustainable and protective behaviors for the well-being of our planet.

Table 2.3: Attitudinal variables

<b>Label</b>	<b>Description</b>
PAECO	Participation in ecological associations' meetings

#### **2.2.2.4 Behavioral variables**

Behavioral variables are crucial components of social and psychological research because they shed light on people's actions and responses to stimuli, by providing insightful data on how people interact with their surroundings and make choices.

In pursuit of our research objectives, we place particular emphasis on examining specific behavioral variables associated with eco-sustainability and environmental practices. To ascertain these variables, we refer to Section 27 of the questionnaire «Aspects of Daily Life», specifically focusing on Question 27.2.

The analysis of environmental behaviors, lifestyles, and consumption patterns is of great interest in constructing a comprehensive overview of citizens' approach towards the environment. The environmentally-friendly behaviors tracked in the survey and they are as follows:

- Reading the ingredients on food product labels before purchasing them.
- Buying organic food and products.
- Purchasing local food and products (locally sourced or "kilometer zero").
- Avoiding littering on the streets.
- Being mindful of not wasting water.
- Being mindful of not wasting electricity (e.g., turning off lights in unused rooms, using appliances during energy-saving hours, etc.).
- Avoiding double parking with the car.
- Being considerate not to engage in noisy driving behaviors (e.g., honking, unnecessary acceleration, etc.).
- Opting for alternative means of transportation other than private cars or motorized vehicles (e.g., bicycle, public transport, walking, etc.).

- Avoiding the use of disposable products (plastic bags, paper napkins, plastic plates, etc.).

Question 27.2 is set to investigate the self-reported frequency of each of these behaviors among respondents, where the frequency is expressed through Likert scale values with one representing a regularity of the eco-friendly behavior and four the absence of it.

Figure 2.1: Distribution of data regarding eco-friendly behaviors

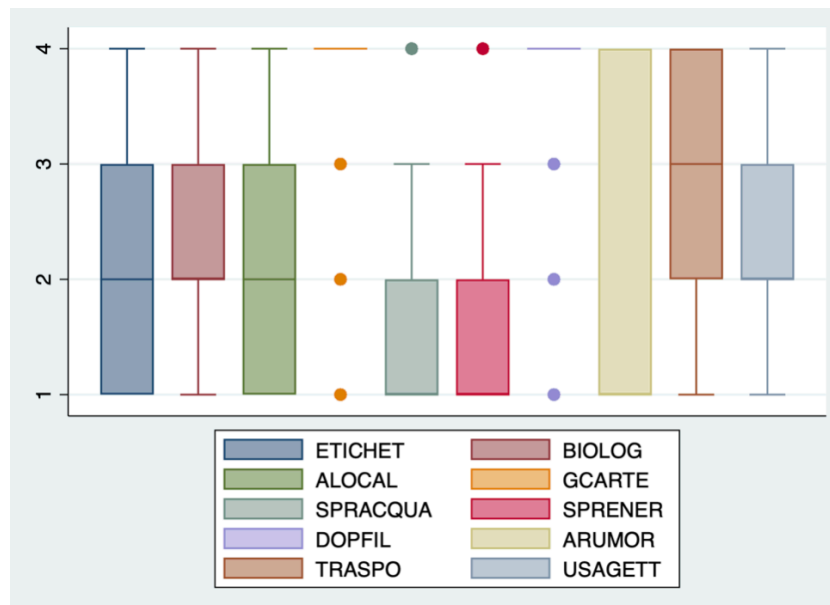


Figure 2.1 depicts the distributions of data in respect of eco-sustainable behaviors exhibited by Italians.

Of particular interest to us are the two central behaviors, SPRACQUA and SPRENER, respectively representing water- and energy-saving behavior and presented in Table 2.4. These two behaviors will serve as our dependent variables in the regressions displayed and implemented in chapter 3.

In tandem with our exploration of behavioral variables, it is worth noting that

the environmentally-friendly behaviors mentioned in this chapter, such as 'Being careful not to waste water' and 'Being careful not to waste electricity,' align closely with the energy-saving practices detailed in chapter 1.3.

Table 2.4: Behavioral variables

Label	Description
SPRACQUA	Being careful not to waste water
SPRENER	Being careful not to waste electricity

## 2.3 Introductory descriptive analysis

### 2.3.1 Description of sample data

Table 2.5 illustrates the summary statistics derived from the 2021 «Aspects of Daily Life» micro-data through STATA, that permit to draw conclusions about the demographic characteristics of the relative and representative sample of the Italian population in 2020.

The data is comprised of 34,110 observations, providing valuable insights into various key variables. These variables encompass the most basic aspects of the population, including the number of family members, age, gender, marital status, educational qualifications, and employment status, i.e. the demographic variables that will allow to construct our baseline regression.

Table 2.5: Summary statistics. STATA-generated output.

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Sd</b>	<b>Min</b>	<b>Max</b>
Family members	34,110	2.79	1.22	1	8
Age	34,110	11.56	2.51	5	15
Gender	34,110	1.52	0.50	1	2
Marital Status	34,110	1.95	0.88	1	4
Educational qualification	34,110	2.43	0.95	1	4
Employment status	34,110	2.07	0.95	1	3
Financial well-being	34,110	2.31	0.56	1	4
Area of residence	34,110	1.95	0.90	1	3
Environmental satisfaction	34,110	2.15	0.72	1	4
Landscape deterioration	34,110	1.18	0.38	1	2
Air pollution	34,110	2.89	0.92	1	4
Litter in the streets	34,110	2.95	0.89	1	4
Public green areas	34,110	1.78	0.41	1	2
Participation in Eco-meetings	34,110	1.01	0.11	1	2

On average, the Italian households that took part in the survey were formed by approximately 2 to 3 family members, with a standard deviation of 1.22, suggesting a relatively consistent family size within the sample, and providing an accurate description of the actual Italian households' situation.

The average age of individuals in the data set was approximately 55 years,



since the original labels used by Istat associate the value «11» to the age group 45-54 and «12» the the age group 55-59. The standard deviation of the variable age being 2.51 indicates some very slight variability in the age distribution.

Gender information indicates that there is a slight prevalence of female respondents in the data-set, implying that there are more females than males in the sample, since the characteristic of being male is coded through the value «2».

Marital status demonstrated that the average individual was married, given that it is the status coded through the value «2». Nevertheless, a standard deviation of 0.88 for this variable suggests a diverse range of marital statuses within the sample. The relative histogram in Figure 2.2 clearly shows that half of the people in the sample are married, while 30% of them are single while the rest are separated or widowed.

Educational qualification, with an average code of 2.43 and a standard deviation of 0.95, revealed a wide spectrum of educational backgrounds among the population, with the average education being between «high school» and «middle school» levels and almost 40% of the population in the sample pertaining to the high-school level of education.

The variable employment status, with an average code of 2.07 and a standard deviation of 0.95, offered insights into the varied employment situations among the sampled individuals. In particular the relative histogram in Figure 2.2 shows almost half of the sample being unemployed.

Lastly, as regards financial well-being, the central tendency of the data goes towards being «adequate», characteristic coded by the value of 2.

In summary, this data description provides insights into the demographic characteristics of the Italian population in 2020, indicating some consistencies in fam-

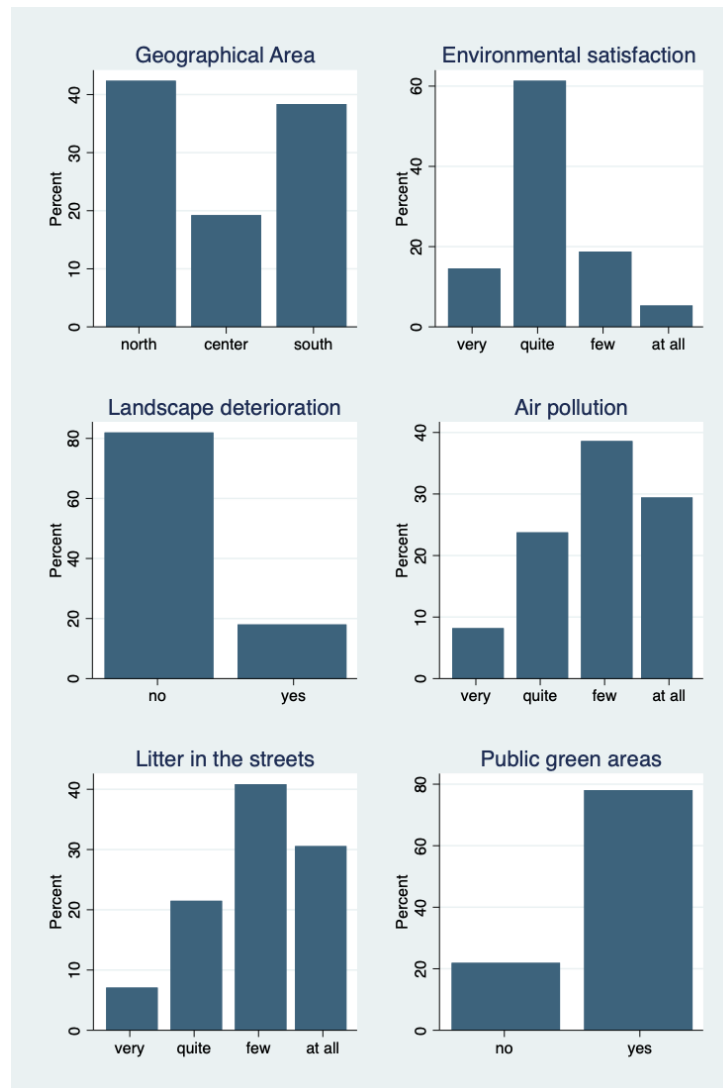
ily size and marital status, while also highlighting significant variability in age, education, employment status, and marital status within the sample. Further analysis and interpretation would require detailed statistical analysis, and it's important to ensure that any conclusions drawn are based on the actual data and not just the descriptive statistics provided.

Figure 2.2: Summary statistics of demographic variables, in percentage values.  
Source: own elaboration with STATA



Ultimately, Table 2.5 also includes the summary statistics relevant to the independent variables pertaining to the groups of geographic and attitudinal variables.

Figure 2.3: Summary statistics of geographic variables, in percentage values.  
Source: own elaboration with STATA



Regarding the geographical grouping of variables, it appears that the average respondent comes from the central region of Italy. This inference is based on the re-coding of the «Area of Residence» variable into values ranging from 1 to 3,

with the extreme values representing the «North» and «South», respectively. Upon closer examination of the data distribution, it becomes evident that just over 40% of the respondents hail from Northern Italy, while slightly less than 40% reside in Southern Italy. The remaining 20% of respondents call the central region of the country their home.

It is worth noting that the remaining geographical variables, as explained in Chapter 2.2.2.2, do not pertain to the broader geographical regions of Northern, Central, or Southern Italy but instead focus on more localized areas where the respondents live.

In terms of general satisfaction with the environmental situation in the respondents' respective areas, the average satisfaction score is 2.15. The majority of respondents, approximately 60%, report being quite satisfied with the environmental conditions in their local areas. The next most common satisfaction level is «few» satisfied (20%), followed by «very» satisfied (15%), and a smaller proportion of respondents (5%) express no satisfaction «at all».

As for the perception of landscape deterioration, the average opinion score is 1.18, with a standard deviation of 0.38. Approximately 80% of respondents indicate that they do not perceive any landscape deterioration in their areas, while the remaining 20% acknowledge its presence.

When it comes to the perception of air pollution, the average score stands at 2.89, with a standard deviation of 0.92. Notably, nearly 40% of respondents report perceiving «few» signs of air pollution in their areas. Around 30% of respondents, on the other hand, express that they perceive «no» air pollution whatsoever. A slightly larger than 20% share the sentiment of being «quite» exposed to air pollution, while less than 10% of respondents, a small minority, assert that they reside

in «very» polluted areas.

The average perception of litter in the streets is 2.95, with a standard deviation of 0.89. Around 30% of respondents report «no» litter pollution, approximately 40% observe «few» instances, about 20% see the streets in the area «quite» littered, and only the remaining almost 10% note «very much» litter pollution in their living area.

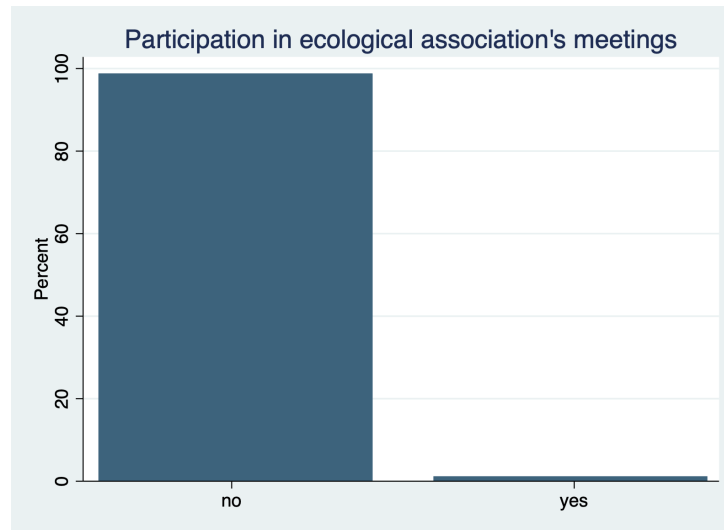
Lastly, the data reveal an encouraging trend regarding the presence of public green areas near respondents' homes. With an average score of 1.78 and a standard deviation of 0.41, it is evident that the majority of respondents affirm the existence of such green spaces in proximity to their residences. This positive response underscores the prevalence of accessible public green areas, which could contribute to a more environmentally friendly and aesthetically pleasing living environment.

These findings provide valuable insights into respondents' perceptions of their environmental surroundings and landscape conditions. Further analysis and exploration of the data could shed more light on the factors influencing these perceptions and their implications for environmental policies and initiatives.

Regarding the unique attitudinal variable we are including in our analysis, PAECO, the data reflects a noteworthy insight into participation in ecological association meetings, with an average score of 1.01 and a low standard deviation of 0.11. While the percentage of individuals actively engaging in these meetings is relatively small (1.2% of the sample), this unique subset of participants remains of particular interest. Their involvement may hold significant potential in fostering eco-friendly behavior and initiatives, despite their limited numbers. This underscores the significance of understanding the impact and potential benefits that even a small, dedicated group of individuals can have on promoting environmental con-

sciousness and sustainable practices.

Figure 2.4: Summary statistics of the attitudinal variable PAECO, in percentage values. Source: own elaboration with STATA



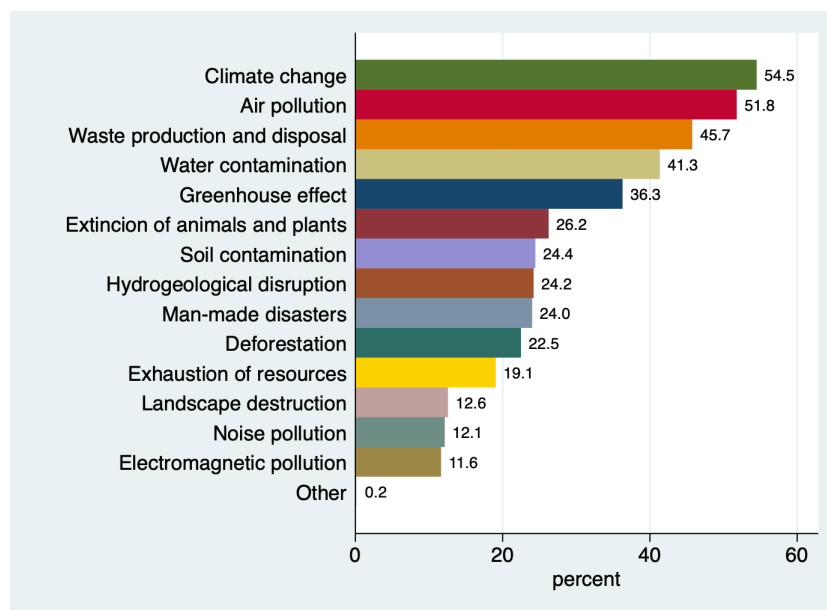
### 2.3.2 Beliefs on environmental issues in Italy

A preliminary and descriptive analysis of the survey reveals the environmental problems of greatest concern to Italians. The corresponding information is reported in Figure 3.1.

Between 2019 and 2021, a significant portion of the population expressed heightened concerns regarding environmental issues, with climate change and air pollution emerging as the primary concerns, by capturing the attention of more than 50% of citizens. When taking into account both issues – the greenhouse effect and climate change – it's clear that public awareness of the environmental crisis has notably risen since 2019 with the worldwide expansion of student-led protest movements inspired by Greta Thunberg's «Fridays For Future» initiative

(ISTAT, 2023). Following closely behind are concerns related to waste disposal and water contamination, which garnered the attention of approximately 40% of the population.

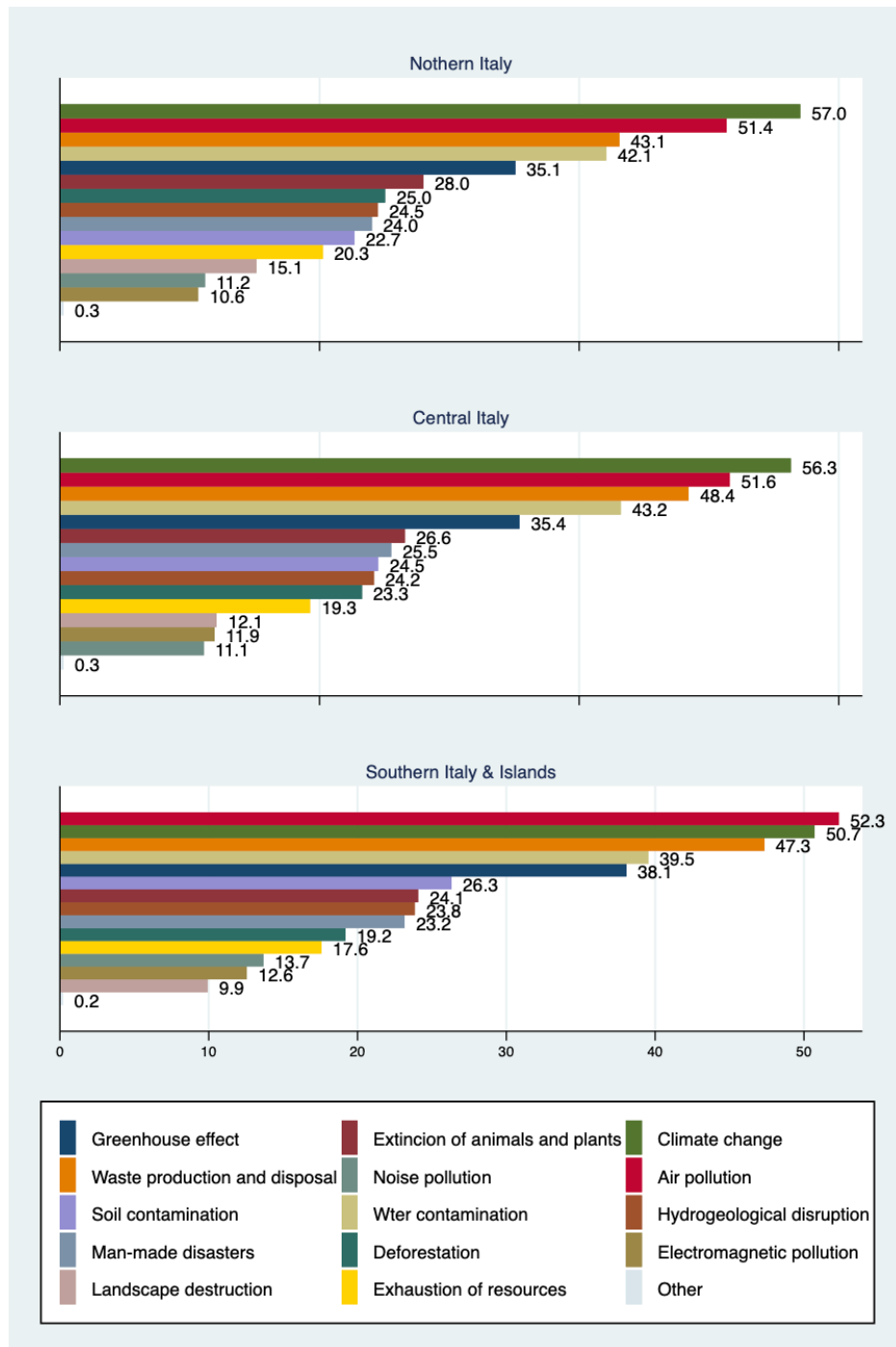
Figure 2.5: The environmental problems of greatest concern to Italians, in percentage values. Source: own elaboration with STATA



The data on the environmental concerns of Italians are derived from question 27.1 of the individual questionnaire, where respondents are asked to choose a maximum of 5 out of the 14 problems identified by the interviewer, 15 if allowing for the possibility of indicating others. As previously emphasized in section 2.2.1, the question was thoughtfully directed only to individuals aged 14 and above, thereby guaranteeing that responses were obtained exclusively from respondents within this particular age demographic.

The focus on climate change reflects an increasing awareness of the profound impact of human activities on Earth's ecosystems and the subsequent consequences

Figure 2.6: Environmental concerns by geographical area, in percentage values.  
Source: own elaboration with STATA





for human well-being. It is, however, important to point out that climate change is a global problem, referring to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns. It is to some extent possible that people may mistake the term «climate change», with «global warming», which refers to the rise in global temperatures, in great part, due to the increasing concentrations of greenhouse gases in the atmosphere. Both are one of the defining issues of our time and rank, among pandemics and economic depressions, as one of the challenges that have the potential to shape both the natural and human environments for all time.

It is crucial to recognize that that climate change represents a global challenge and can potentially contribute to various other environmental disasters. Addressing global environmental issues presents distinct challenges in governance compared to addressing national concerns like air and water pollution. National public goods primarily require ensuring that political institutions at the national level are responsive to the broader public interest rather than catering to the interests of a concentrated few. However, when it comes to global environmental concerns, the key lies in developing, implementing, and enforcing cooperative multinational policies that nations can effectively enforce to tackle these issues (Nordhaus, 2021).

Figure 2.6 presents a lens through which we can explore the distinctive environmental concerns in Italy's three main geographical areas - the North, Center, and South with the islands. While there appears to be no significant disparities in the overall environmental consciousness of these regions, some slight variations detect geographical patterns in the environmental perception.

In general, environmental concerns resonate similarly across the nation, af-

firming a shared commitment to addressing pressing issues. However, when we shift our focus to specific environmental domains, distinct patterns emerge. Climate change, for instance, emerges as a more prominent concern in the North and Central regions, with 57% of Northern inhabitants expressing apprehension. In the South, air pollution is the environmental issue capturing a higher degree of attention.

Issues related to waste production and disposal (47.3% in the South, 48.4% in the Central regions, and 43.1% in the North) and soil pollution (26.3% in the South and 22.7% in the North) draw more attention, especially from residents of the Central and Southern regions.

### **2.3.3 Behaviors towards climate change mitigation in Italy**

Section 2.2.2.4 highlighted the importance of studying behavioral variables in social and psychological research, particularly those related to Eco-sustainability and environmental practices. It discussed specific environmentally-friendly behaviors identified in the questionnaire «Aspects of Daily Life» and highlighted two central behaviors, water- and energy-saving, which will be used as dependent variables in upcoming regressions. This section is oriented towards comprehending the entirety of the ten behaviors covered in the survey, shedding light on how Italian citizens approach sustainability. These behaviors offer potential benefits like reducing greenhouse gas emissions, saving energy resources, cutting utility bills, and creating a more Eco-friendly living environment, with a particular focus on energy usage in European Union households.

Information regarding the Eco-friendly behaviors of Italians is sourced from

question 27.2 in the individual questionnaire. In this question, respondents are requested to indicate how often they engage in each of the ten selected behaviors.

Analysis of the survey reveals that out of the ten identified behaviors, four of them — littering on the streets, double parking with the car, and the use of disposable products such as plastic bags, paper napkins, and plastic plates — do not inherently signify virtuous conduct. Instead, they are regarded as Eco-friendly behaviors only when respondents assert that they «never» engage in such actions. Consequently, this group of behaviors demands special attention and scrutiny.

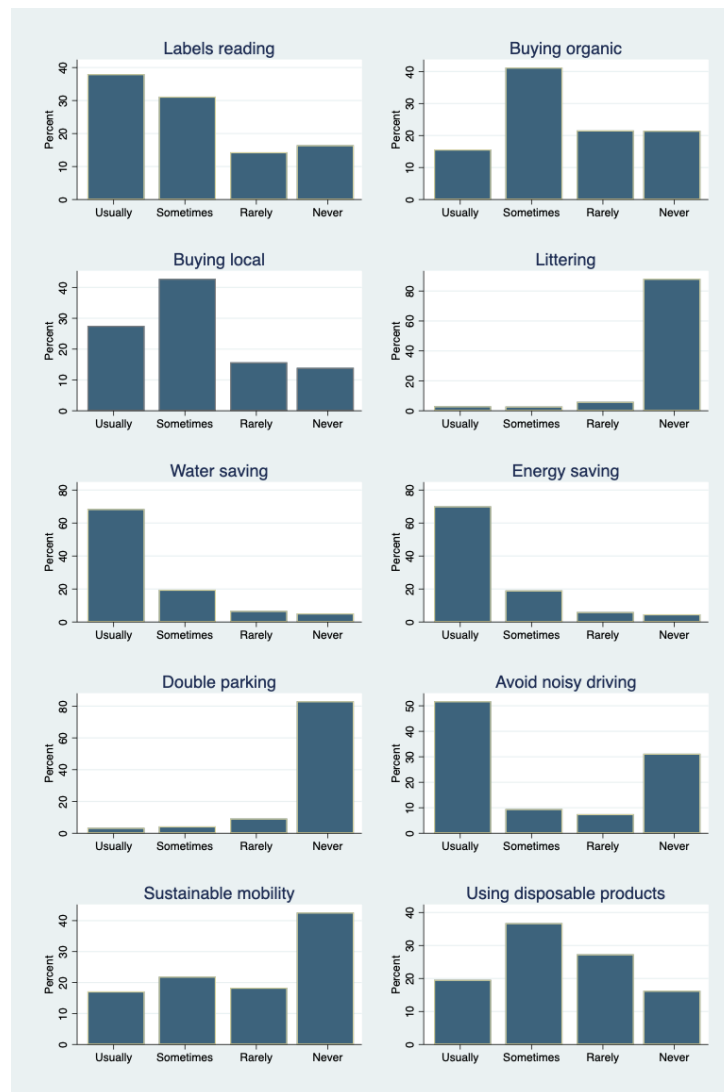
As illustrated in Figure 2.7, the data suggests that a significant proportion of Italians exhibit environmentally-conscious habits as part of their daily lives. Notably, the behaviors associated with buying habits, including buying organic products, purchasing locally sourced goods, and using disposable products, stand out as the most frequently observed actions with respondents often admitting to engaging in them. In contrast, behaviors pertaining to water and energy conservation show a striking consistency, with nearly 70% of respondents reporting regular engagement in these activities.

Surprisingly, when it comes to embracing sustainable mobility practices, which encompass various modes such as cycling, using public transport, walking, carpooling, and car sharing, the data reveals a different trend. This category of behaviors appears to have the highest percentage of respondents who never participate in these activities.

In Figure 2.8, we depict the percentage of individuals who regularly practice the identified eco-friendly behaviors. To facilitate the analysis, we have established seven new variables to represent the seven behaviors that are considered virtuous when performed «usually», and three additional variables to reflect be-

haviors that are eco-friendly only when they are deliberately avoided.

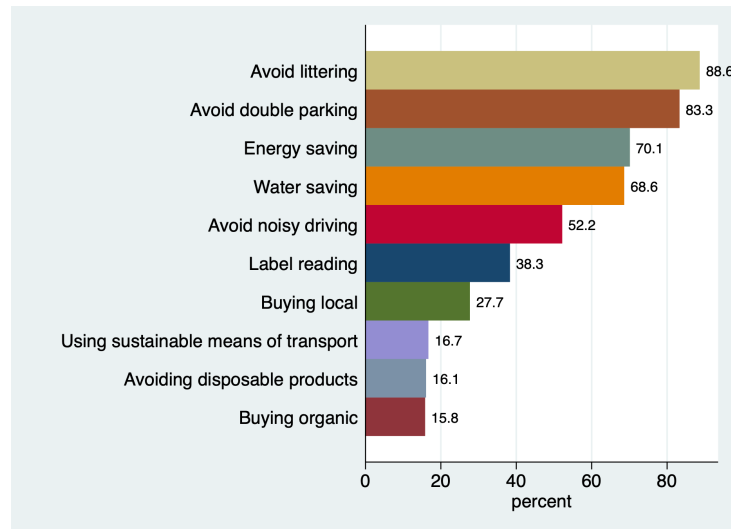
Figure 2.7: Eco-friendly behaviors among Italians in 2020, in percentage values.  
Source: own elaboration with STATA



This figure provides a visual representation of the prevalence of these behaviors among Italians, offering insights into the most and least common environmentally conscious practices embraced by the population.

In conclusion, this section provides a comprehensive overview of eco-sustainability

Figure 2.8: Italians engaging in eco-friendly action on a usual basis in 2020, in percentage values. Source: own elaboration with STATA



behaviors among Italian citizens, offering invaluable insights into the varying degrees of eco-consciousness across different domains. These findings not only lay the foundation for subsequent regression analyses but also contribute to a broader understanding of how Italy is positioning itself with regard to climate change mitigation efforts.

# Chapter 3

## Analysis

This chapter begins by emphasizing the significance of formulating precise research questions and hypotheses, which serve as the focal points of our research. Subsequently, we will provide a detailed account of the empirical analysis that has been carried out to address these crucial topics. The primary aim of this chapter is to examine and interpret the outcomes generated through the utilization of the statistical software STATA. By employing statistical techniques and tools, we will scrutinize the data-set to unveil discernible patterns, relationships, and insights pertaining to our research questions and hypotheses. Finally, we will present the results obtained for each of the research hypotheses formulated in the study.

### **3.1 Research questions: hypotheses and empirical strategy**

With the general aim of this thesis being the investigation on the formation and characteristics of people's attitudes and behaviors towards the environment and

the environmental crisis in Italy, we specifically chose to concentrate on research questions that, when answered, allow to draw general conclusions regarding the formation of Eco-friendly beliefs and behaviors.

Table 3.1: Description of variables used for regressions

<b>Dependent var.</b>	<b>Description</b>
water_saving	Being <i>usually</i> careful not to waste water
energy_saving	Being <i>usually</i> careful not to waste electricity
<b>Demographic var.</b>	<b>Description</b>
ncomp	Number of members in the household
etami	Age
woman	Being of female gender
married	Being married
graduated	Having obtained a university degree
poor	Having insufficient financial resources
<b>Geographical var.</b>	<b>Description</b>
env_dissatisfaction	Discontent with the local environmental conditions
deteriorated_area	Perception of residing in an area in decline
polluted_area	Perception of residing in a polluted area
littered_area	Perception of residing in a littered area
nearby_parks	Having nearby public green areas
<b>Attitudinal var.</b>	<b>Description</b>
pa_ecomeetings	Participating in ecological associations' meetings

As mentioned in the previous chapters our focus, among Eco-friendly behaviors, is specific to resource saving behaviors, in particular we will refer to such behaviors through the proxies of carefulness towards not wasting water and electricity, expressed respectively by the variables SPRACQUA and SPRENER. These two behaviors will serve as our dependent variables in the regressions presented as object of our study.

The research questions are presented and described one by one in the subsections that follow.

To implement our empirical strategy, we have employed regression analysis. It is important to note that, given the categorical nature of a majority of our variables, an initial phase of variable generation was undertaken. The objective of this phase was to identify binary behaviors, simplifying the process from the several categories outlined for each variable in the survey methodology. The output of this step is presented in Table 3.1.

### **3.1.1 Research question 1: Demographics affecting Eco-friendly behavior**

**RQ 1:** *What are the demographic characteristics affecting water- and energy-saving behavior among Italians and what is the direction of their impact?*

The first step of our analysis will center on understanding the impact of demographic determinants on resource saving behavior in Italy. The objective will be to explore the key demographic variables under consideration and their potential effects on environmentally responsible actions and attitudes.



The demographic variables previously individuated and presented in Table 3.1 are expected to have associations with resource-saving behavior. This association and the respective expected effects are hypothesized in Hypothesis 1 below.

**Hypothesis 1:** *There exists a linear association between an individual's demographic characteristics and their resource (water and electricity) saving behavior.*

$$\begin{aligned}\text{water\_saving} = & \beta_0 + \beta_1 \text{ncomp} \\ & + \beta_2 \text{age} \\ & + \beta_3 \text{woman} \\ & + \beta_4 \text{married} \\ & + \beta_5 \text{graduated} \\ & + \beta_6 \text{employed} \\ & + \beta_7 \text{poor} + \epsilon\end{aligned}$$

$$\begin{aligned}\text{energy\_saving} = & \beta_0 + \beta_1 \text{ncomp} \\ & + \beta_2 \text{age} \\ & + \beta_3 \text{woman} \\ & + \beta_4 \text{married} \\ & + \beta_5 \text{graduated} \\ & + \beta_6 \text{employed} \\ & + \beta_7 \text{poor} + \epsilon\end{aligned}$$

The hypothesis is implemented through two regression equations, one for water-saving behavior and another for energy-saving behavior. In both equations, the dependent variable (water\_saving and energy\_saving) is modeled as a linear function of several independent demographic variables, including the number of house-

hold members, the age of the individual, and binary variables representing gender, marital status, educational qualification and the household's financial well-being. The regression equations aim to assess the impact of these demographic variables on resource-saving behavior, where  $\beta_0$  represents the intercept or constant term,  $\beta_1$  to  $\beta_7$  represent the coefficients for the respective demographic variables, and  $\epsilon$  represents the error term.

Drawing from the literature review presented in the introductory chapter, we can make preliminary and informed assumptions regarding the expected directions of the linear relationships under investigation. To begin, we may anticipate a negative correlation between age and resource-saving behavior. This expectation aligns with the concept that younger individuals tend to exhibit a higher level of environmental awareness and a greater inclination to adopt Eco-friendly practices. Our research aims to delve deeper into this relationship, shedding light on potential variations within different age groups.

Additionally, we hypothesize that individuals who report lower household financial well-being, indicating inadequate financial resources, will display greater resource-saving behavior. This assumption is grounded in the idea that individuals with greater financial stability are better positioned to invest in and adopt Eco-friendly practices. It is plausible that economic constraints may lead individuals with limited financial resources to be more conscientious about conserving resources, such as water and electricity.

In summary, Hypothesis 1 underscores the significance of demographic characteristics in shaping individuals' resource-saving behaviors. Our research seeks to explore and quantify these relationships using both linear and logistic regression models, aligning with our pre-assumptions based on the existing body of literature.

### **3.1.2 Research question 2: Relationship between neighborhood characteristics and Eco-friendly behavior**

**RQ 2:** *Do neighborhood characteristics have an influence on water- and energy-saving behavior among Italians, and if so, what is the nature of this impact?*

In the previous chapters, we investigated the intricate relationship between environmental awareness and Eco-friendly actions. We explored how individuals' behaviors can vary, influenced by their knowledge of environmental issues and the characteristics of their living environment. This second step of our analysis focuses on the latter aspect, i.e. investigating the link between neighborhood characteristics and Eco-friendly behavior.

The behaviors related to environmental awareness and actual eco-friendly actions are not solely a product of personal convictions. They may also be profoundly affected by the qualities and conditions of one's living environment. The introductory chapter hinted at this complexity by highlighting two intriguing observations from existing research.

Some research suggests that residents of degraded areas may not necessarily adopt Eco-friendly behaviors, even when they are aware of the environmental issues in their vicinity. In addition, the lack of external pressure to act in an environmentally responsible manner, stemming from the challenging conditions in their living environment, could be a contributing factor. This finding raises critical questions about the factors influencing Eco-conscious actions.

In contrast, evidence demonstrates that knowledge about environmental issues can significantly boost pro-environmental behavior. Individuals well-informed

about the environmental degradation in their area tend to engage in Eco-friendly actions and express their intent to purchase Eco-friendly products. This underscores the role of knowledge in shaping Eco-conscious behaviors.

As we delve deeper into the relationship between neighborhood characteristics and Eco-friendly behavior, our aim is to understand whether resource wastage, particularly concerning water and electricity, is significantly influenced by the environment in which one resides. In pursuit of this, we decided to formulate the following hypothesis:

**Hypothesis 2:** *As the residential environment displays signs of degradation, the level of resource wastage (water and electricity) will increase as well.*

$$\begin{aligned}\text{water\_saving} = & \beta_0 + \beta_1 \text{ncomp} \\ & + \beta_2 \text{age} \\ & + \beta_3 \text{woman} \\ & + \beta_4 \text{married} \\ & + \beta_5 \text{graduated} \\ & + \beta_6 \text{employed} \\ & + \beta_7 \text{poor} \\ & + \beta_8 \text{env\_dissatisfaction} \\ & + \beta_9 \text{deteriorated\_area} \\ & + \beta_{10} \text{polluted\_area} \\ & + \beta_{11} \text{littered\_area} \\ & + \beta_{12} \text{nearby\_parks} + \epsilon\end{aligned}$$

$$\begin{aligned}
\text{energy\_saving} = & \beta_0 + \beta_1 \text{ncomp} \\
& + \beta_2 \text{age} \\
& + \beta_3 \text{woman} \\
& + \beta_4 \text{married} \\
& + \beta_5 \text{graduated} \\
& + \beta_6 \text{employed} \\
& + \beta_7 \text{poor} \\
& + \beta_8 \text{env\_dissatisfaction} \\
& + \beta_9 \text{deteriorated\_area} \\
& + \beta_{10} \text{polluted\_area} \\
& + \beta_{11} \text{littered\_area} \\
& + \beta_{12} \text{nearby\_parks} + \epsilon
\end{aligned}$$

This hypothesis investigates the influence of the residential environment on resource-saving behaviors. It posits that as the quality of the living environment deteriorates, reflected in variables like environmental dissatisfaction, living in a deteriorated area, pollution, littering, and proximity to parks, resource saving behavior (specifically water and electricity consumption) will increase.

This second hypothesis is implemented through two additional regression equations, in which we introduce additional variables related to the local environment, including environmental discontent, residing in deteriorated, polluted, or littered areas, and the presence of nearby parks. The regression equations aim to assess the impact of these variables on resource-saving behavior, where  $\beta_0$  represents the intercept or constant term,  $\beta_1$  to  $\beta_7$  represent the coefficients for the demographic variables,  $\beta_8$  to  $\beta_{12}$  represent the coefficients for the respective geographical vari-

ables, and  $\epsilon$  represents the error term.

In the subsequent sections, we will explore the data and analyses that either support or refute this hypothesis.

### **3.1.3 Research question 3: Attitudinal variables affecting Eco-friendly behavior**

**RQ 3:** *Do attitudinal variables have an influence on water- and energy-saving behavior among Italians, and if so, what is the nature of this impact?*

The primary attitudinal variable identified in the survey pertains to participants who have engaged in ecological association meetings within the last 12 months. It holds a central position in our research, since it symbolizes an individual's proactive involvement in environmental affairs and their sincere dedication to ecological concerns. By implication, those who engage in meetings of ecological associations are perceived as individuals with an elevated level of environmental consciousness and a profound commitment to ecological issues.

The empirical research presented in the introductory chapter has shown that participation in ecological organization meetings has the potential to raise environmental consciousness and foster a sense of environmental identity, ultimately inspiring people to incorporate eco-friendly practices into their everyday routines. Indeed, when individuals are actively involved in discussions and activities related to ecological issues, they may become more conscious of the importance of resource conservation. Ecological associations often serve as platforms for sharing knowledge and information about environmental challenges and solutions. This

knowledge can empower individuals to take action, such as reducing water and energy consumption. Being part of ecological associations can expose individuals to pro-environmental norms and values. This social influence can motivate members to adopt eco-friendly behaviors as they align with the group's objectives and expectations. In addition, participation in group activities can enhance an individual's sense of collective efficacy, i.e., the belief that collective efforts can bring about positive change. This increased self-efficacy can translate into actions aimed at conserving resources.

**Hypothesis 3:** *Participation in ecological associations' meetings is positively associated with increased water- and energy-saving behavior among Italians.*

$$\begin{aligned}\text{water\_saving} &= \beta_0 + \beta_1 \text{ncomp} \\ &+ \dots \\ &+ \beta_{13} \text{pa\_ecomeetings} + \epsilon\end{aligned}$$

$$\begin{aligned}\text{energy\_saving} &= \beta_0 + \beta_1 \text{ncomp} \\ &+ \dots \\ &+ \beta_{13} \text{pa\_ecomeetings} + \epsilon\end{aligned}$$

Our hypothesis is rooted in the belief that the individuals who have participated to at least one ecological association meeting in the last year are more inclined to demonstrate protective behaviors toward the environment, contrasting with those who abstain from participating in such meetings.

Ultimately, hypothesis 3 aims at exploring whether individuals' participation

in ecological associations' meetings influences their eco-friendly behavior in the context of water and energy conservation.

## 3.2 Regressions

We implemented two different regression models considering as dependent variables the binary variables "water\_saving" and "energy\_saving". The first regression was estimated through OLS with robust standard errors, in order to remedy for

NB: Riportare R2 delle regressioni

Table 3.2: Baseline linear & logit regressions predicting the carefulness towards water saving behavior. Source: own elaboration on STATA

water_saving	OLS	Logit
ncomp	-0.016*** (0.003)	-0.075*** (0.012)
etami	0.022*** (0.001)	0.097*** (0.006)
woman	0.049*** (0.005)	0.231*** (0.024)
married	0.047*** (0.006)	0.214*** (0.028)
graduated	0.024*** (0.007)	0.109*** (0.033)
employed	0.039*** (0.006)	0.162*** (0.026)
poor	0.020 (0.014)	0.091 (0.066)
Constant	0.498*** (0.016)	-0.036 (0.070)
Observations	34110	34110

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



Table 3.3: Baseline linear & logit regressions predicting the carefulness towards energy saving behavior. Source: own elaboration on STATA

energy_saving	OLS	Logit
NCOMP	-0.019*** (0.003)	-0.091*** (0.012)
ETAMi	0.027*** (0.001)	0.126*** (0.006)
woman	0.041*** (0.005)	0.197*** (0.025)
married	0.044*** (0.006)	0.200*** (0.029)
graduated	0.018*** (0.007)	0.080** (0.034)
employed	0.052*** (0.005)	0.218*** (0.026)
poor	0.027*** (0.005)	0.127*** (0.027)
Constant	0.471*** (0.016)	-0.163** (0.071)
Observations	34110	34110

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 3.4: Linear & logit regressions predicting the carefulness towards water saving behavior. Source: own elaboration on STATA

water_saving	OLS	Logit
NCOMP	-0.016*** (0.003)	-0.075*** (0.012)
ETAMi	0.022*** (0.001)	0.097*** (0.006)
woman	0.049*** (0.005)	0.229*** (0.024)
married	0.048*** (0.006)	0.218*** (0.028)
graduated	0.025*** (0.007)	0.113*** (0.033)
employed	0.040*** (0.006)	0.163*** (0.026)
poor	0.017*** (0.006)	0.077*** (0.026)
env_dissatisfaction	-0.006 (0.004)	-0.029 (0.018)
deteriorated_area	-0.017** (0.007)	-0.082** (0.032)
polluted_area	0.016* (0.009)	0.076* (0.046)
littered_area	0.006 (0.010)	0.029 (0.049)
nearby_parks	0.008 (0.006)	0.038 (0.029)
pa_ecomeetings	0.027 (0.023)	0.129 (0.111)
Constant	0.488*** (0.017)	-0.081 (0.075)
Observations	34110	34110

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Table 3.5: Linear & logit regressions predicting the carefulness towards energy saving behavior. Source: own elaboration on STATA

energy_saving	OLS	Logit
NCOMP	-0.075*** (0.012)	-0.090*** (0.012)
ETAMi	0.097*** (0.006)	0.127*** (0.006)
woman	0.229*** (0.024)	0.196*** (0.025)
married	0.218*** (0.028)	0.200*** (0.029)
graduated	0.113*** (0.033)	0.076** (0.034)
employed	0.163*** (0.026)	0.217*** (0.026)
poor	0.077*** (0.026)	0.129*** (0.027)
env_dissatisfaction	-0.029 (0.018)	-0.027 (0.019)
deteriorated_area	-0.082** (0.032)	-0.008 (0.033)
polluted_area	0.076* (0.046)	0.095** (0.047)
littered_area	0.029 (0.049)	-0.011 (0.050)
nearby_parks	0.038 (0.029)	0.024 (0.030)
pa_ecomeetings	0.129 (0.111)	0.002 (0.109)
Constant	-0.081 (0.075)	-0.186** (0.076)
Observations	34110	34110

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

### **3.3 Findings and interpretations**

## **Chapter 4**

### **Conclusion and future perspectives**

# Bibliography

- Abrahamse, W. & Steg, L. (2009). How do socio-demographic and psychological factors relate to households' direct and indirect energy use and savings? *Journal of Economic Psychology*, 30, 711–720.
- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology*, 27, 265–276.
- Agency, E. E. (2023). Environment and climate pressures from household consumption in europe.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211.
- Amrutha, P., Sravani, P. M., Ashok, M., Sowmya, K. P., Naga, P., & Manasa, S. G. (2016). Noise pollution and its impact on human health and social behavior using systems approach-a case study in kurnool city. 8.
- Begum, A., Jingwei, L., Marwat, I. U. K., Khan, S., Han, H., & Ariza-Montes, A. (2021). Evaluating the impact of environmental education on ecologically

- friendly behavior of university students in pakistan: The roles of environmental responsibility and islamic values. *Sustainability*, 13, 10188.
- Bergman, C., Good, R., & Moreo, A. (2022). Influencing hotel patrons to use reef-safe sunscreen. *Tourism and Hospitality*, 3, 536–557.
- Bicchieri, C. & Xiao, E. (2009). Do the right thing: but only if others do so. *Journal of Behavioral Decision Making*, 22, 191–208.
- Bohdanowicz, Z., Łopaciuk Gonczaryk, B., Kowalski, J., & Biele, C. (2021). Households' electrical energy conservation and management: An ecological break-through, or the same old consumption-growth path? *Energies*, 14, 6829.
- Bouton, M. E. (2014). Why behavior change is difficult to sustain. *Preventive Medicine*, 68, 29–36.
- Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Harvard University Press.
- Carrete, L., Castaño, R., Felix, R., Centeno, E., & González, E. (2012). Green consumer behavior in an emerging economy: confusion, credibility, and compatibility. *Journal of Consumer Marketing*, 29, 470–481.
- Channa, N. A., Tariq, B., Samo, A. H., Ghumro, N. H., & Qureshi, N. A. (2022). Predicting consumers' intentions to purchase eco-friendly athletic wear in a moderated model of individual green values and gender. *International Journal of Sports Marketing and Sponsorship*, 23, 410–436.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative

- conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58, 1015–1026.
- Darling, N. (2007). Ecological systems theory: The person in the center of the circles. *Research in Human Development*, 4, 203–217.
- Darmawan, D., Mangundjaya, W. L., & Herdiansyah, H. (2018). In searching the appropriate elements: study on the community's environmental friendly behavior in daily activities to achieve an urban sustainability. *E3S Web of Conferences*, 74, 08003.
- Dubois, G., Sovacool, B., Aall, C., Nilsson, M., Barbier, C., Herrmann, A., Bruyère, S., Andersson, C., Skold, B., Nadaud, F., Dorner, F., Moberg, K. R., Ceron, J. P., Fischer, H., Amelung, D., Baltruszewicz, M., Fischer, J., Benevise, F., Louis, V. R., & Sauerborn, R. (2019). It starts at home? climate policies targeting household consumption and behavioral decisions are key to low-carbon futures. *Energy Research Social Science*, 52, 144–158.
- Ekasari, A. & Zaini, S. M. (2020). Moral norm and theory of planned behavior: The intention to use eco-friendly reusable bag. *Indonesian Journal of Sustainability Accounting and Management*, 4, 56.
- Eurostat (2023). Energy consumption in households.
- Fang, W.-T., Ng, E., & Zhan, Y.-S. (2018). Determinants of pro-environmental behavior among young and older farmers in taiwan. *Sustainability*, 10, 2186.
- Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The



- environmental awareness of investors. *Academy of Management Journal*, 56, 758–781.
- Gao, B., Li, Z., & Yan, J. (2022). The influence of social commerce on eco-friendly consumer behavior: Technological and social roles. *Journal of Consumer Behaviour*, 21, 653–672.
- Gualtieri, G., Brilli, L., Carotenuto, F., Vagnoli, C., Zaldei, A., & Gioli, B. (2020). Quantifying road traffic impact on air quality in urban areas: A covid19-induced lockdown analysis in Italy. *Environmental Pollution*, 267, 115682.
- Han, H. (2020). Theory of green purchase behavior (tgpb): A new theory for sustainable consumption of green hotel and green restaurant products. *Business Strategy and the Environment*, 29, 2815–2828.
- Han, H., Chua, B., Montes, A. A., & Untaru, E. (2020). Effect of environmental corporate social responsibility on green attitude and norm activation process for sustainable consumption: Airline versus restaurant. *Corporate Social Responsibility and Environmental Management*, 27, 1851–1864.
- Han, H., Hsu, L.-T. J., Lee, J.-S., & Sheu, C. (2011). Are lodging customers ready to go green? an examination of attitudes, demographics, and eco-friendly intentions. *International Journal of Hospitality Management*, 30, 345–355.
- Han, W., McCabe, S., Wang, Y., & Chong, A. Y. L. (2018). Evaluating user-generated content in social media: an effective approach to encourage greater pro-environmental behavior in tourism? *Journal of Sustainable Tourism*, 26, 600–614.

- Heath, Y. & Gifford, R. (2006). Free-market ideology and environmental degradation: The case of belief in global climate change. *Environment and Behavior*, 38, 48–71.
- Huddart-Kennedy, E., Beckley, T. M., McFarlane, B. L., & Nadeau, S. (2009). Rural-urban differences in environmental concern in Canada. *Rural Sociology*, 74, 309–329.
- Istat (2022). Ambiente, clima ed energia.
- ISTAT (2023). Preoccupazioni ambientali e comportamenti ecocompatibili.
- Karginova-Gubinova, V., Volkov, A., Tishkov, S., & Shcherbak, A. (2021). The impact of economic interests on eco-consumption: the case of the Russian Arctic zone of Karelia. *Entrepreneurship and Sustainability Issues*, 8, 68–84.
- Khare, A. (2015). Antecedents to green buying behaviour: a study on consumers in an emerging economy. *Marketing Intelligence Planning*, 33, 309–329.
- Kim, H., Lee, E.-J., & Hur, W.-M. (2012). The normative social influence on eco-friendly consumer behavior: The moderating effect of environmental marketing claims. *Clothing and Textiles Research Journal*, 30, 4–18.
- Kim, N. & Lee, K. (2023). Environmental consciousness, purchase intention, and actual purchase behavior of eco-friendly products: The moderating impact of situational context. *International Journal of Environmental Research and Public Health*, 20, 5312.
- Kim, S. & Seock, Y.-K. (2009). Impacts of health and environmental conscious-

- ness on young female consumers' attitude towards and purchase of natural beauty products. *International Journal of Consumer Studies*, 33, 627–638.
- Kolodko, J., Schmidtke, K. A., Read, D., & Vlaev, I. (2021). letsunlitteruk: A demonstration and evaluation of the behavior change wheel methodology. *PLOS ONE*, 16, e0259747.
- Laroche, M., Bergeron, J., & Barbaro-Forleo, G. (2001). Targeting consumers who are willing to pay more for environmentally friendly products. *Journal of Consumer Marketing*, 18, 503–520.
- Lasrado, F. & Zakaria, N. (2020). Go green! exploring the organizational factors that influence self-initiated green behavior in the united arab emirates. *Asia Pacific Journal of Management*, 37, 823–850.
- Li, S., Chen, F., & Gu, X. (2022). Effects of group emotion and moral belief on pro-environmental behavior: The mediating role of psychological clustering. *International Journal of Environmental Research and Public Health*, 19, 11190.
- Liobikienė, G. & Poškus, M. S. (2019). The importance of environmental knowledge for private and public sphere pro-environmental behavior: Modifying the value-belief-norm theory. *Sustainability*, 11, 3324.
- Liu, H. (2022). *Study on Adolescent Pro-Environmental Behaviors from the Perspective of Intergenerational Transmission*.
- Mamun, A. A., Fazal, S., Ahmad, G., Yaacob, M., & Mohamad, M. (2018). Willingness to pay for environmentally friendly products among low-income households along coastal peninsular malaysia. *Sustainability*, 10, 1316.

- Markle, G. (2019). Understanding pro-environmental behavior in the us: Insights from grid-group cultural theory and cognitive sociology. *Sustainability*, 11, 532.
- McDougle, L. M., Greenspan, I., & Handy, F. (2011). Generation green: understanding the motivations and mechanisms influencing young adults' environmental volunteering. *International Journal of Nonprofit and Voluntary Sector Marketing*, 16, 325–341.
- Meng, L. & Si, W. (2022). Pro-environmental behavior: Examining the role of ecological value cognition, environmental attitude, and place attachment among rural farmers in china. *International Journal of Environmental Research and Public Health*, 19, 17011.
- Meyer, A. (2015). Does education increase pro-environmental behavior? evidence from europe. *Ecological Economics*, 116, 108–121.
- Mignolli, N., Albanesi, M., Balzano, P., & Alessandro, F. (2021). Equitable and sustainable well-being in italy.
- Nordhaus, W. D. (2021). *The spirit of green: the economics of collisions and contagions in a crowded world*. Princeton University Press, 1st edition edition.
- Olsson, L. E., Sinha, R., Frostell, B., & Friman, M. (2022). What can be done to change?—the environmental and behavioral consequences of interventions for sustainable travel. *Sustainability*, 14, 1345.
- Onel, N. (2017). Pro-environmental purchasing behavior of consumers. *Social Marketing Quarterly*, 23, 103–121.

- Sawitri, D. R., Hadiyanto, H., & Hadi, S. P. (2015). Pro-environmental behavior from a socialcognitive theory perspective. *Procedia Environmental Sciences*, 23, 27–33.
- Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, 18, 429–434.
- Sia, S. K. & Jose, A. (2019). Attitude and subjective norm as personal moral obligation mediated predictors of intention to build eco-friendly house. *Management of Environmental Quality: An International Journal*, 30, 678–694.
- Sobuj, M., Khan, A. M., Habib, M. A., & Islam, M. M. (2021). Factors influencing eco-friendly apparel purchase behavior of bangladeshi young consumers: case study. *Research Journal of Textile and Apparel*, 25, 139–157.
- Stern, P. C. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56, 407–424.
- Tiberio, L., Gregorio, E. D., Biresselioglu, M. E., Demir, M. H., Panno, A., & Carrus, G. (2020). Psychological processes and institutional actors in the sustainable energy transition: A case-study analysis of a local community in italy. *Frontiers in Psychology*, 11.
- Weckroth, M. & Ala-Mantila, S. (2022). Socioeconomic geography of climate change views in europe. *Global Environmental Change*, 72, 102453.
- Wright, S. D., Caserta, M., & Lund, D. A. (2003). Older adults' attitudes, con-

- cerns, and support for environmental issues in the “new west”. *The International Journal of Aging and Human Development*, 57, 151–179.
- Wu, D. W., DiGiacomo, A., & Kingstone, A. (2013). A sustainable building promotes pro-environmental behavior: An observational study on food disposal. *PLoS ONE*, 8, e53856.
- Yadav, R. & Pathak, G. S. (2016). Young consumers’ intention towards buying green products in a developing nation: Extending the theory of planned behavior. *Journal of Cleaner Production*, 135, 732–739.
- Yohanis, Y. G. (2012). Domestic energy use and householders’ energy behaviour. *Energy Policy*, 41, 654–665.
- Zaidan, E., Abulibdeh, A., Alban, A., & Jabbar, R. (2022). Motivation, preference, socioeconomic, and building features: New paradigm of analyzing electricity consumption in residential buildings. *Building and Environment*, 219.
- Zhao, S., Song, Q., & Wang, C. (2019). Characterizing the energy-saving behaviors, attitudes and awareness of university students in macau. *Sustainability*, 11, 6341.
- Żywiółek, J., Rosak-Szyrocka, J., & Mrowiec, M. (2021). Knowledge management in households about energy saving as part of the awareness of sustainable development. *Energies*, 14, 8207.

# Appendices

## Appendix I

### Survey questions

## Appendix 2

### Main variable's label coding

```
1 recode etami (5 = 1) (6 = 2) (7 = 3) (8 = 4) (9 = 5) (10 = 6)
    (11 = 7) (12 = 8) (13 = 9) (14 = 10) (15 = 11)
2 label define label_etami 1 "14-15 years" 2 "16-17 years" 3
    "18-19 years" 4 "20-24 years" 5 "25-35 years" 6 "35-44 years"
    7 "45-54 years" 8 "55-59 years" 9 "60-64 years" 10 "65-74
    years" 11 ">75 years"
3 label values etami label_etami
4
5 label define label_ripmf 1 "north" 2 "center" 3 "south"
6 label values ripmf label_ripmf
7
8 label define label_sesso 1 "male" 2 "female"
9 label values sesso label_sesso
```

```

10
11 recode stcivmi (1 = 1) (2 = 2) (3 = 3) (6 = 4)
12 label define label_stcivmi 1 "single" 2 "married" 3 "separated/
    divorced" 4 "widowed"
13 label values stcivmi label_stcivmi
14
15 recode istrmi (1 = 1) (7 = 2) (9 = 3) (10 = 4)
16 label define label_istrmi 1 "university" 2 "high-school" 3 "
    middle school" 4 "primary school"
17 label values istrmi label_istrmi
18
19 label define label_condmi 1 "employed" 2 "job seeker" 3 "
    unemployed"
20 label values condmi label_condmi
21
22 label define label_risec 1 "optimal" 2 "adequate" 3 "poor" 4 "
    insufficient"
23 label values risec label_risec
24
25 label define label_behavior 1 "Usually" 2 "Sometimes" 3 "Rarely"
    4 "Never"
26 label values etichet biolog alocal gcarte spracqua sprener
    dopfil arumor traspo usagett label_behavior
27
28 label define label_regmf 010 "Piemonte" 020 "Valle d'Aosta" 030
    "Lombardia" 040 "Trentino-Alto Adige" 050 "Veneto" 060 "
    Friuli-Venezia Giulia" 070 "Liguria" 080 "Emilia-Romagna"
    090 "Toscana" 100 "Umbria" 110 "Marche" 120 "Lazio" 130
    "Abruzzo" 140 "Molise" 150 "Campania" 160 "Puglia"
    170 "Basilicata" 180 "Calabria" 190 "Sicilia" 200 "

```



```
    Sardegna"  
29 label values regmf label_regmf
```

## Binary variables generation for regression analysis

```
1 * DEPENDENT VARIABLES  
2 generate water_saving = 0  
3 replace water_saving = 1 if spracqua == 1  
4  
5 generate energy_saving = 0  
6 replace energy_saving = 1 if sprener == 1  
7  
8 * INDEPENDENT DEMOGRAPHICAL VARIABLES  
9 generate woman = 0  
10 replace woman = 1 if sesso == 2  
11  
12 generate married = 0  
13 replace married = 1 if stcivmi == 2  
14  
15 generate graduated = 0  
16 replace graduated = 1 if istrmi == 1  
17  
18 generate employed = 0  
19 replace employed = 1 if condmi == 1  
20  
21 generate poor = 0  
22 replace poor = 1 if risec == 4  
23  
24 * INDEPENDENT GEOGRAPHICAL VARIABLES
```

```

25 generate env_dissatisfaction = 0
26 replace env_dissatisfaction = 3 if ambiente == 4
27
28 generate deteriorated_area = 0
29 replace deteriorated_area = 1 if paesaggio == 2
30
31 generate polluted_area = 0
32 replace polluted_area = 1 if inqar == 1
33
34 generate littered_area = 0
35 replace littered_area = 1 if sporco == 1
36
37 generate nearby_parks = 0
38 replace nearby_parks = 1 if parchi == 2
39
40 * INDEPENDENT ATTITUDINAL VARIABLES
41 generate pa_ecomeetings = 0
42 replace pa_ecomeetings = 1 if paeco == 2

```

# **Acknowledgements**