MASTER'S DISSERTATION

THE PERCEPTIONS OF RESIDENT-CONSUMERS IN PORTUGAL REGARDING SUSTAINABLE MOBILITY OPTIONS

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There is an old African proverb that says. "It takes a village to raise a child", which means that children need to interact with a whole community of people to properly grow. I believe that it takes a village to get throw life, and gladly I have mine. That is why this thesis is not entirely my own, it is also from my village, which deserves the proper recognition.

Joana, my sister, who always showed me that you can thrive while fighting the status quo and was the main inspiration behind this theme. Jorge, my father, and my whole family, that has taught me that passion and dedication are always behind great achievements.

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LIST OF ABBREVIATIONS

ALV - Altruistic values

ATM - Attitudes towards sustainable mobility

BAV – Bio-altruistic values

BIV - Biospheric values

EA - Environmental attitudes

EFA – Exploratory factor analysis

EGV - Egoistic values

KMO - Kaiser-Meyer-Olkin Test

LSM - Likelihood of choosing a sustainable mobility option

MaaS – Mobility as a Service

PBC – Perceived behavior control

SN - Subjective norms

UITP – The International Association of Public Transport

ABSTRACT

Objective - This study aims to analyze the perceptions of the resident-consumers in Portugal regarding sustainable mobility options.

Methodology – A quantitative methodology was adopted to test, through several hypotheses, the impact of different variables on the likelihood of choosing sustainable mobility options. To collect the data, an online survey with a sample of 645 valid responses was applied. A thematic content analysis of 402 observations was used to understand which factors respondents consider to be able to contribute to their adoption of more sustainable mobility behaviors.

Results and main conclusions: Attitudes towards sustainable mobility, subjective norms, perceived behavior control, and egoistic values influence the likelihood of choosing sustainable mobility options. However, environmental attitudes, altruistic and biospheric values do not impact this choice. The existence of a broad public transport network, safe bicycle lanes, and accessible prices impact the adoption of sustainable mobility behaviors.

Limitations: The use of a non-probabilistic sample by convenience, limits the extrapolation of the results obtained.

Originality/Value: The growing interest of governments and companies in reducing the emissions caused by urban mobility, and the lack of academic studies and empirical data on this subject, especially in Portugal, reveals the originality and relevance of this research.

Keywords: Mobility, sustainable mobility, active mobility, shared mobility, consumer behavior, mobility choices

RESUMO

Objetivo – Analisar quais as perceções dos consumidores-residentes em Portugal quanto aos meios de mobilidade sustentável.

Metodologia – Utilizou-se uma metodologia quantitativa que testou, através de várias hipóteses, o impacto de diferentes variáveis na probabilidade de escolher estes meios. Para recolher dados realizou-se um questionário online com uma amostra válida de 645 inquiridos. A análise temática de conteúdo de 402 observações permitiu entender que fatores os inquiridos consideram contribuir para que adotem mais comportamentos de mobilidade sustentável.

Resultados e principais conclusões: Atitudes quanto a meios de mobilidade sustentável, normas subjetivas, controlo percebido e valores egoístas, influenciam a probabilidade de escolher meios de mobilidade sustentável. Ao contrário das atitudes ambientais, valores altruístas e biosféricos. Uma rede ampla de transportes públicos, ciclovias seguras, e preços acessíveis impactam a adoção de comportamentos de mobilidade sustentável.

Limitações: A utilização de uma amostra não probabilística por conveniência, limitou a generalização dos resultados obtidos.

Originalidade/Valor: O crescente interesse de governos e empresas em reduzir as emissões causadas pela mobilidade urbana, e a falta de estudos académicos e dados empíricos sobre este assunto, especialmente em Portugal, revelam a originalidade e relevância desta investigação.

Palavras-chave: mobilidade, mobilidade sustentável, mobilidade ativa, mobilidade partilhada, comportamento do consumidor, escolhas de mobilidade

INTRODUCTION

Sustainability is frequently associated with the connection of three pillars: environment, society, and economy. Although each pillar exists independently, they should be tied to properly fulfill the purpose of sustainable development, defined as the capacity of satisfying present needs without neglecting the needs of future generations (Giddings, Hopwood & O'Brien, 2002; Cassen, 1987).

Just like sustainability, mobility is a complex field that affects the environment, society, and economy. For instance, mobility enables access to education, work, services, facilities, and other activities, such as leisure ones. Hence, by providing access, mobility impacts economic growth, enabling not only trading activities but also job creations. Inefficient mobility systems have an impact on the environment and human health, decreasing the quality of life in urban areas (World Health Organization, 2018).

According to the European Environment Agency (2019), road transports account responsible for the majority of nitrogen dioxide emissions, 39% in 2019. These kinds of emissions are a threat to public health. Last year, air pollution contributed to 6,67 million deaths worldwide (Health Effects Institute, 2020).

Besides the impact on the economy and public health, the appearance of covid-19 also caused changes in the way citizens perceived public transports. According to Automóvel Clube de Portugal, (2020), the drop-out rate of public transportation is above 50%, with 69% of the inquired predicting to use cars more, or a lot more, in the next five years and the majority considering cars to be

the safest mean of transport. These findings are a threat to solving environmental problems since reducing car trips is one effective measure to decrease air pollution. Thus, encouraging citizens to use green transports, including active mobility modes, such as walking and cycling, is a priority to address the main urban problems (Wang, Wang & Yang, 2020; Ferretto, Bruzzone & Nocera, 2021). This encouragement in Portugal was already made by Mubi (Associação pela Mobilidade Urbana em Bicileta), who proposed measures to increase the use of bicycles in this country since, due to health reasons (caused by Covid-19), public transportation can no longer guarantee peoples' mobility in the way it previously could (MUBI, 2020). Portugal even has an advantage on this matter, being the largest producer of bicycles in Europe (Pereira & Gonçalves, 2020).

Although, to efficiently promote the use of sustainable mobility options it is necessary to take into consideration the behavior of consumers, their motivations, and the external factors inhibiting them to change their behaviors (Yin, Quian & Singhapakdi 2018; Keyson, Guerra-santin, & Lockton, 2017). Research in the field of mobility is evolving by linking different methodologies and providing new approaches to such a complex theme (Büscher, Sheller & Tyfield, 2016). Literature shows that many different models of mobility consumption have been rising in the last years, such as sharing models. Services like these are contributing to the reduction of CO2 emissions, promoting urban traffic connectivity, and increasing their popularity as a more economical and ecological way of consumption (Shaheen, Guzman & Zhang, 2010; Bardhi & Eckhardt, 2012).

Yet, further research is necessary to properly target different groups for the different transportation options related to Mobility as a Service (MaaS), defined as the incorporation of, and access to, various transports services via one single digital mobility offer. To do so, first, it is necessary to gather insights regarding trip behaviors and users' motivations for each kind of transport, so governments can have better control of traffic and pollution levels and therefore contribute to a more sustainable environment (UITP, 2019; Newbold & Scott, 2017; Lempert, Zhao & Dowlatabadi, 2019). In such a consumer-driven topic, from a marketing perspective, it is crucial to find ways of developing sustainable habits and proper mobility choices, for instance, through incentives and policies adaptable to different life stages (Civitas Satellite, 2020). Taking all the factors mentioned above into consideration, it is possible to understand that a more immersed survey addressing the mobility habits in Europe is needed (Colli, 2020).

Therefore, to build on the literature gap, the main objective of this research is to **analyze the perceptions of resident-consumers in Portugal regarding sustainable mobility options.** To fulfill the main objective, specific objectives were defined: (1) evaluate the impact of Covid-19 on mobility choices; (2) describe the profile of the mobility users: personality, lifestyle, and psychographic factors; 3) evaluate the influence of values, environmental attitudes, and attitudes towards sustainable mobility on mobility choices; (4) evaluate the influence of perceived behavior control and subjective norms on mobility choices; (5) analyze what factors consumers consider that could contribute to an increase in their sustainable mobility choices.

Now that the introduction of this dissertation has been concluded, the next chapter will present the literature review. To establish a solid ground of knowledge on the topic discussed, the literature was analyzed on different scopes considered relevant to the previously defined objectives. This chapter will be a crucial part of this dissertation since it will help to identify relevant variables that influence the likelihood of adopting sustainable mobility options. Thus, this literature review will be helpful to understand the emergent and accessible modes of mobility consumption, the key takeaways of the consumer behavior towards mobility, and their intentions of shifting their behaviors to adopt more sustainable modes. Based on the main findings of the literature review, the conceptual model and hypotheses that will guide this dissertation will be presented. Afterward, an explanation of the methodology and data analysis techniques will take place. Finally, the results of the investigation will be presented and discussed opening the way for the last chapter composed of the main conclusions and implications. It is still important to mention that the main limitations and recommendations for future research will also be stated.

1. LITERATURE REVIEW

This chapter will provide the state of the art on urban mobility through 3 main sections: mobility types of consumption, consumer commuting behavior, and a conclusive summary stating the main takeaways that will be analyzed in this research.

1.1 Mobility types of consumption

Climate change has caused an increase in green marketing as well as an increase in sustainable offers (Rust, 2020), and mobility is not an exception. A key aspect to relieve climate change is to reduce emissions caused by 3mobility. This sector is responsible for 23% of the world's energy-related C02 emissions and three-quarters of these come from road transport, particularly from passenger cars and light-duty trucks (Iyanna, Bosangit, Lazell & Carrigan, 2019).

Classic ways of commuting, such as walking and cycling, are still in the scope of mobility research as a way of reducing carbon emissions (Biehl, Chen, Sanabria-Véaz, Uttal & Sathopoulos, 2019). Besides this, sharing platforms are growing as well, changing the way consumers connect with different categories (Sands, Ferraro, Campbell, Kietzmann & Andonopoulos, 2020).

Furthermore, with the increase of emerging mobility options available, Mobility as a Service appeared to support customer needs, connecting a variety of transports in one interface, aiming to promote multi mobility and public transport, while fighting emissions and traffic (Hoerler et al., 2020).

Despite all the efforts to reduce car usage, this mode of transportation is still one of the main transport modes (Szmelter-Jarosz, 2019). Thus, it is important to consider car ownership when addressing mobility behaviors.

To summarize, mobility can be consumed via ownership, through a physically active way, by sharing, or as a service. Each mode has its characteristics and different transports may fit in each of them. An overview of the mobility consumption that will be analyzed during this dissertation can be seen in figure one.

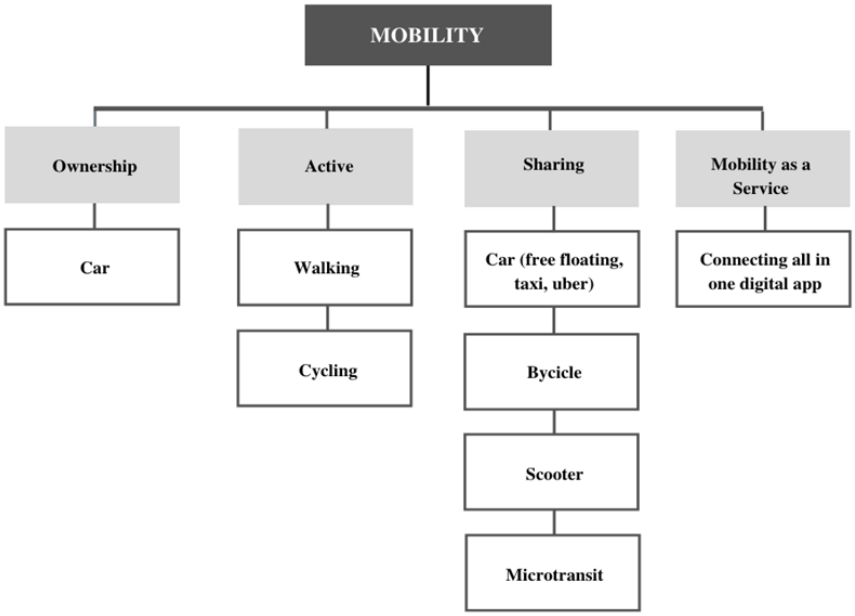

Figure 1: Types of mobility consumption

Source: Own elaboration based on the literature review

To obtain more specific knowledge regarding the current state of the art on the different ways of consuming mobility mentioned above, the next four sections of this literature review will address the particularities of each one.

1.1.1. Car ownership

The main reasons that drive people into having a car go far beyond practical motives, they touch feelings and emotions. That is why car commercial advertisements often appeal to sensations rather than just technical and operative functionalities. Normally when people talk about their cars, is possible to understand the clear connection between cars and feelings of independence, power, thrill, social status, high self-esteem, and enjoyment (Steg, 2005). This relation people tend to have with cars is often referred to in the literature based on two different aspects: affective and functional or instrumental and non-instrumental. The affective motives tend to be associated with men and young drivers. Also, when users give more importance to affective motives, the shift to alternative modes becomes increasingly difficult, they most likely change their destination instead of changing their way of commuting (Zhou & Wang, 2019; He, Fei & He, 2020; von Behren, Bönisch, Niklas & Chlond, 2020).

Considering the frequency of car use, results show that changes in attitudes do not have a strong influence on this aspect (Kalter, Puello & Geurs, 2020). On the other hand, people who express car pride tend to own cars and use them more frequently (Moody & Zhao, 2020). Regarding intentions to reduce car usage, perceived behavior control is the most important indicator, if people perceive they can alter their commuting routine, they have stronger intentions of doing so and of reducing their car usage (Semenescu & Gavreliuc, 2019).

The sense of ownership is the first positive effect related to having a private car, in the second place comes comfort and independence. Regarding

negative aspects, the main ones are cost and issues related to owning a car, and then, stress, traffic, and responsibility (Burlando, Ivaldic, Saiani & Penco, 2019). Even though the cost is one of the main negative aspects associated with having a car, a significant number of car owners are not aware of the total costs implied, as they tend to just consider the cost of fuel (Beirão & Cabral, 2007). Furthermore, the costs of owning a car cause inequalities in the field of mobility. Most of the time, a car is an advantage only available for certain privileged groups, allowing more comfortable journeys in a shorter time (do Carmo, Santos & Ferreira, 2017). This is possibly why unemployed, women, young adults, and people from small households tend to drive less (den Braver et al., 2020). Thus, it is becoming urgent to invest in public transport, for instance by expanding connections, to decrease inequality, and to make cars a complementary mode of commuting (do Carmo et al., 2017).

People rely on cars mostly due to the influence of their surroundings. If their co-workers travel by car to work, if their family members expect them to commute by car, if they perceive through comparing themselves with others that car is a better fit for them, and if they consider that using a car is less stressful, they will more likely keep their car usage (Steg, 2005).

Furthermore, people with a high number of social interactions and activities tend to maximize their time by using more their cars (Arroyo, Ruiz, Mars, Rasouli & Timmermans, 2020). The presence of children also increases the ratio of adult car owners, since regular car drivers are portrayed as families with kids, who own a house and use their vehicles both for work and leisure (Smart &

Klein, 2017; Jensen, 1999). Besides this, just the fact of owning a car increases the frequency of driving (von Behren et al., 2020). When living at a large distance from the city center, both instrumental and affective appreciations of cars tend to increase, resulting in an increase in car usage even for short trips (He et al., 2020). Such findings are in line with another research that concluded that the three main factors that influence individuals way of commuting are their residence location, the family organization, and their work, being the geographic location the factor with the most influence on the possibility of using other ways of commuting besides the car (Heisserer & Rau, 2015). Furthermore, an high-quality experience with public transports, and a high exposure to transit at an early stage and during life forming years, especially between the twenties and thirties, decreases the likelihood of ever owning a car (Smart & Klein, 2017).

1.1.2. Mobility as a Service (MaaS)

Sonja Heikkilä was one of the first authors to develop a definition for Mobility as a Service, (MaaS), the author defines it as a way of offering consumers a wide variety of transportation services through mobile operators (Heikkilä, 2014). Researchers tried to outline the core features of MaaS. Those can be pinned down to one unique digital and technology-oriented platform with real-time data regarding all public and private mobility options, integrated journey planes, schedule options, paying methods, and many features specially adapted to user's personal needs (Sarasini, Sochor & Arby, 2017).

The main interest regarding the adoption of MaaS in urban places is to decrease the environmental impacts of private cars. Nevertheless, researchers

should not rely on MaaS alone to be able to fulfill this goal. MaaS has non-green options available, like taxis and car-sharing, so users who already use environmentally friendly transports, like bicycles, can switch to car-sharing options resulting in the opposite desired effect (Jang, Caiati, Rasouli, Timmermans & Choi, 2020).

Furthermore, citizens perceive MaaS as a sustainable alternative for transportation (Hoerler et al., 2020). Thus, those who use public transports are more willing to use MaaS than those who use their private cars. These findings support concerns regarding the possibility of MaaS not being able to reduce the use of private cars (Jang et al., 2020). This result implies some challenges for one of the core expectations of MaaS, reduce private vehicle ownership. People will abdicate from their cars if they have just as fast and adaptable options. Although, it is important to have in mind that people use mobility for different purposes that impact their vehicle's choice. For leisure activities, aspects like lower price, availability, independence, and baggage storage options, need to be considered. Thus, services need to provide quick transfer times, spontaneity, and small costs if they want to reduce car usage (Hoerler et al. 2020). Therefore, when developing MaaS, it is important to consider users' attitudes, service features, and price. A service like MaaS needs to be 100% customer-oriented, integrating consumer behavior data and perceptions when designing the core concept (Hoerler et al., 2020; Casady, 2020).

Furthermore, because MaaS can be seen as a competitor of public transports, a collaboration between the private and public sector should be

developed upon explicit frameworks, incorporating wholesale pricing, and guidelines for government operative influence regarding tickets, data sharing, and communication of risks (Wilson & Mason, 2020).

1.1.3. Shared mobility

Sharing is a crucial topic in consumer behavior as it tends to dilute the social barriers related to materialism and possessions. The idea of sharing became a trend following the awareness related to issues such as social justice, environmentalism, the wellbeing of consumers, and sustainable environments (Belk, 2010). Such a trend is part of the concept of sharing economy. Models integrated into this concept are indeed growing exponentially, while they impact the global quality of life and economic transactions, altering the way consumers relate with different categories of products and services (Huynh, Vo, Nguyen, Nguyen, Ho & Do, 2020; Sands et al., 2020).

In the literature, there have been defined four common characteristics of the sharing economy models: established in online platforms; peer-to-peer transactions; access instead of ownership, and support of underused capacity (Gerwe & Silva, 2020). It will be possible to conclude further that shared mobility fits those characteristics. The concept of shared mobility is defined as the shared usage of bicycles, scooters, or even cars (Puzio, 2020). It is also used to refer to ridesharing, personal vehicle sharing, transportation network companies (taxis), ride-hailing companies (uber), and also micro-transit services, which complement the fixed routes of buses and rail services (Young & Farber, 2019; Shaheen & Chan, 2016).

As sharing is connected to reduce materialism and possessions, consumers tend to perceive shared mobility as sustainable due to the peculiarity of being shared (Yin et al., 2018). Nevertheless, this recent form of mobility is also part of the solution for other prevalent urban problems, as it is the case of crowded cities, lack of parking spots, and last-mile connectivity with public transports (Winter, Cats, Martens & van Arem, 2020; Shaheen & Chan, 2016). Although each vehicle is normally used individually, the sharing concept is present because, after use, the vehicles are parked and become available to be rented again by a different user. Users can rent the vehicle they want through mobile applications (Puzio, 2020).

The development of information technology contributed to the improvement of these applications, making them more user-friendly. These technological developments also improved other assets of sharing systems, for example, what is called free-floating car sharing. Users no longer need to take or leave the car in a specific location or station, neither make a reservation. They can use the service without restrictions within the city area. Such upgrades reinforce adoption rates (Becker, Ciari & Axhausen, 2017). Reinforcing the use of these modes can also be achieved by making sustainable consumption be perceived not as an individual task but as a shared responsibility, increasing users' motivation (Yin et al., 2018).

Recent results from a study, in the United States, seem promising, out of the different sharing options, mobility platforms are the ones with the higher engagement rate, with 74% of users having used shared mobility (Sands et al.,

2020). Furthermore, results from an online survey showed that 50% of the enquired preferred shared mobility over a car and the regular users of public transport, 20,3% of the total sample, would also choose a shared option over a car (Winter et al., 2020).

Despite this increase in the relevance of the sharing economy, little is known about user's preferences and the demand among different categories (mobility, retail, tourism, and finance) (Sands et al. 2020). In the mobility field, the introduction of new transport modes, as rented scooters, requires understanding users' motivation towards the intended mode, allowing governments to provide citizens with viable and sustainable alternatives (Lempert et al., 2019). Users' satisfaction with shared mobility has been related to quality, trust, perceived usefulness, social value, and environmental impact, which joined with economic benefits or with high satisfaction, affect future intentions. Social value is also mentioned as one of the most important aspects of ridesharing in another research, these findings suggest that aspects like making new friends and social contacts should be used strategically to create social capital (Arteaga-Sánchez, Belda-Ruiz, Ros-Galvez & Rosa-Garcia, 2018). A study concerning bike-sharing also highlights the importance of the easiness of use in users' loyalty, stating that advertisements focused on the fact that sharing mobility options are easier to use than other transport modes can increase the number of loyal users (Jamšek & Culiberg, 2020).

The environmental impact variable plays contradictory roles across different investigations. For instance, environmental impact has been proved to

have no effects on the satisfaction and likelihood of using a sharing platform again, being the main reasons related to usefulness and cost savings (Möhlmann, 2015). While another research found that the will to engage in sharing behavior is strongly motivated by environmental reasons, especially when data is compared with non-users of sharing platforms (Sands et al. 2020). Furthermore, some authors believe that shared mobility will be capable of starting a system change (Burghard & Dütschke, 2019).

1.1.4. Active mobility

Active mobility refers to walking and cycling and is seen as a priority to answer to the most tackling urban problems: noise and air pollution, traffic, and accidents (Ferretto et al., 2021). This way of commuting not only has benefits for the health of urban citizens but can also promote the creation of cycling-related jobs in the urban areas and their surroundings (Scotini, Skinner, Racioppi, Fusé, Bertucci & Tsutsumi, 2017). Still, on the topic of benefits, it has also been found that by walking and cycling people can improve the quality of their social interactions, so investing in areas for pedestrians and cyclists is a way of improving the quality of life in cities (van den Berg, Sharmeen & Weijs-Perrée, 2017). Similarly, it has already been accepted in the literature that active mobility has a positive impact on physical and mental health (Hess et al., 2017). Despite the promising positive aspects, the promotion of active mobility fails to be effective on targeting and profitability, since it is usually based on small scales, mixing different political landscapes (Hackl et al., 2019).

Proper implementation of active mobility requires behavior change and to influence behavior, adequate information and services are needed, as well as incentives to reach specific target groups and knowledge of the defining factors of all the other transportation options available (Markvica, Millonig, Haufe & Leodoter, 2020; Hess et al., 2017). Incentives might be especially useful for people that have their private car since this has been demonstrated to be the biggest challenge for practicing active mobility (Simons, Clarys, De Bourdeaudhuij, Geus, Vandelanotte & Deforche 2014).

The importance of targeting can be proved by the presence of two opposite consumer perceptions. For instance, some see cycling as a way of making their daily routine more human and sustainable, by preserving eye-to-eye contact and appreciating city landscapes (Dalpian, Silveira & Rossi, 2014). For others, the physical effort required to ride a bicycle is seen as an obstacle to the adoption of this way of commuting (McKenzie, 2020). Findings from another research reveal that the majority of people do not cycle to work because of inconvenience, road safety, and weather concerns, while the positive reasons are mainly related to personal health and wellbeing, cost savings, and time savings (Claudy & Peterson, 2014). Although, when it comes to young adults, they only consider walking feasible for considerable short distances. Thus, the promotion of active mobility to this age group should shift away from the health and environmental advantages and focus on cycling as a cheap, flexible, social, and fast way of commuting (Simons et al., 2014).

1.2. Consumer commuting behavior

Mobility is fully integrated with our daily routine, 74% of European citizens move into cities every day and produce 40% of the total CO2 emissions (Diez, Lopez-lambas, Gonzalo, Rojo & Garcia-Martinez, 2018). Governments have been establishing policies to encourage citizens to reduce the use of motorized vehicles and shift to more sustainable modes, especially because altering travel behavior and mode preferences is crucial for diminishing greenhouse emissions (Wang et al., 2020; Wolf & Schröder, 2019). One of the challenges of this approach is that it is hard to change or influence behaviors, and for that reason, strategic interventions directed to individual actions are needed (Ahmed, Adnan, Janssens & Wets, 2020). It is insufficient for mobility to just offer new products or services; users as stakeholders are crucial to address issues like travel habits, cultures, and infrastructures (Sopjani, Stier, Ritzén, Hesselgren & Georén, 2019). Thus, consumer commuting behavior is an essential topic when considering sustainable ways of mobility.

Analyzing the literature, it is possible to identify some general commuting behavior characteristics. For instance, finding the positive relations people have with one particular mobility mode is the greatest indicator to predict their future mobility behavior (Pojani, Van Acker & Pojani, 2018). Moreover, attitudes were also found to influence positively and significantly intentions to adopt specific types of mobility modes, such as autonomous vehicles (Huang & Qian, 2021). Thus, it is important to create positive relations with green modes as a possible guarantee of their future usage.

Besides the positive relations, prior behavior is also relevant. People are more eager to use transport modes they have already tried before (Arias-Molinares & García-Palomares, 2020). A possible explanation for this phenomenon is that people perceive a product as risky if they have not tried it before. One strategy to address this issue is the adoption of free trials, this way the likelihood of users using a new product increases since they can try it without any commitment (Solomon, 2017).

The arrival of the Covid-19 pandemic impacted dramatically the commuting behavior of people, from almost no travels at all, except for front line workers, followed by a slow increase as the restrictions became less severe (Beck, Hensher & Wei, 2020). Public transports were the most impacted mode, different countries reported a decrease in use, as is the case of Italy and Spain, where the city of Santander registered a decrease of 93% (Moslem, Campisi, Szmelter-Jarosz, Duleba, Nahiduzzaman & Tesoriere, 2020; Aloi et al., 2020). Consequently, an increase in walking and car usage was noticed (Moslem et al., 2020). The avoidance of public transports and the preference for car trips were especially evident for people with high income (Beck et al., 2020). Such an increase in private vehicles can be dramatic for the sustainability and traffic of urban areas (Aloi et al., 2020; Moslem et al., 2020). Even though some people returned to public transports as measures became less severe, an increase in trips by car is also expected (Beck et al, 2020). Thus, measures focused on the cleanliness of vehicles and occupancy level, as well as government messages assuring the safety of public transports and promotion of shared mobility, can

contribute to positive perceptions and increase usage of mobility modes able to fight back climate crisis (Aloi et al. 2020; Beck et al. 2020; Moslem et al. 2020).

Furthermore, mobility literature has recently raised interest in analyzing the travel behaviors of younger cohorts. Significant changes are occurring when comparing them to the older generations, mainly due to the decreased likelihood of acquiring a driver's license. Such a decrease has been highlighted mostly in western countries in the last twenty years (Bayart, Havet, Bonnel & Bouzouina, 2020). Different justifications for this are presented in the literature. A particular one suggests that the transit environment and the place in which someone lives during their twenties and thirties will shape their travel behavior. Normally young adults live in urban areas with great access to public transports, which can boost the use of this mobility mode and decline the use of cars, even if citizens move to the suburbs later in life (Smart & Klein, 2017). The reasons behind this suggestion are still a mystery and many other authors have step forward with different explanations for the decrease of driving licenses and changes in mobility patterns of young adults. Most of the causes pointed out have been related to demographic and socio-economic factors that tend to delay significant lifecycle goals, driving license included, such as marriage, living with parents, part-time jobs that reduce income, and specific cohort inconveniences like increase costs of fuel, environmental catastrophes followed by increase environmental awareness, and economic crises (Delbosc & Currie, 2013; Garikapati, Pendyala, Morris, Mokhtarian & McDonald, 2016; Bayart et al., 2020).

The most influencing ones appear to be changes in life stages and households (Delbosc & Currie, 2013). For instance, alterations in the places of residence, as mentioned before, most of this cohort prefers to live in the city center, which negatively impacts car use. This can be due to the increased cost of housing in the center plus the easy access to other mobility options turning the car less important (Bayart et al., 2020). Although, when addressing life transitions it is still important to consider the influence that factors like economic inequalities, local infrastructures and services have on individuals' ability to acquire more sustainable practices (Burningham & Venn, 2020). As such, when considering behavior change it is important not to neglect the influence of external factors (Rundle-Thiele, David, Willmott, Pang, Eagle & Hay, 2019). Another research on the generation Y cohort (18-35 years old in 2016), in New Zealand, even stated that environmental reasons for not driving appeared to be stronger than economic or life-stage motives (Hopkins, 2016). In contradiction, other studies have suggested that Millennials have not increased the use of alternative mobility options, instead, they travel less when compared to other cohorts (Newbold & Scott, 2017; Mcdonald, 2015).

In the end, it remains hard to tell for sure if young adults will keep their peculiar mobility patterns, for example, the decrease of driving licenses, or if it is just a matter of circumstances and they will give up on their decision when they feel the need (Delbosc & Currie, 2013). This increase over time might have the biggest impact in Portugal, Ireland, Italy, Greece, and Eastern countries, as they show higher attachment to cars and the reasons related to not using them so

much are especially economical, so with economic prosperity, the scenario can revert (Colli, 2020).

1.2.1. Sociodemographics, personality, and lifestyle of mobility users

To promote sustainable consumption behavior, it is important to analyze which cultural and socio-psychological factors are triggering that behavior (Yin et al. 2018). When it comes to analyzing the choice between different mobility options, it is no different. Sociodemographic characteristics, like gender, age, and occupation, are important determinants in the mobility models (Lenormand et al., 2015).

Taking gender as an example, women tend to feel stressed while driving and they normally drive for smaller distances than men (Beirão & Cabral, 2007; Lenormand et al., 2015). When considering the time spent driving, results show that women who invest more time in household chores and on their jobs, drive during longer periods (Shirgaokar & Lanyi-Bennett, 2020). Regarding sustainable mobility options, in a study conducted in Poland, women also demonstrate being interested in green mobility alternatives (Szmelter-Jarosz, 2019). Besides the previous differences, results suggest that gender does not influence car ownership or promptness to use car-sharing, although education, city, and age do (Burlando et al., 2019). Furthermore, the impact gender has on mobility decreases when focusing on elderly people and students, which can be related to different mobility routines between women with or without children (Lenormand et al., 2015).

Additionally, the influence of children in households is also present in the mobility literature. It has been associated with an increased ratio of cars (Smart

& Klein, 2017), but also, from 2006 onwards, even young adults with children have decreased the exclusive use of cars in their mobility routine (Bayart et al., 2020). This might suggest that even though having children has been delayed in the younger generations, and their arrival increases mobility needs, this need may not be translated into an increase in car use (Mcdonald, 2015).

Education is also proven to affect user perceptions regarding mobility. When one of the heads of the household still studies, the likelihood of using public transports is way higher than for families composed of more adults or with children (Smart & Klein, 2017). Also, young people with a high level of education tend to be more willing to use sharing modes, as car sharing (Burlando et al., 2019). Although higher education is normally associated with sustainable options, previous findings state that it is also linked with a higher likelihood of having and using a car (Quaglione, Cassetta, Crociata, Marra & Sarra, 2018).

Another indicator that reflects itself in mobility choices is the income, the higher it is, the higher the likelihood of owning a car (Smart & Klein, 2017). Also, regarding changing mobility patterns, it is unlikely for people to stop using their cars if they have struggled economically to buy them, they consider it as giving up on an achievement (Beirão & Cabral, 2007).

Lifestyles are another key aspect to consider when addressing mobility switches. Especially when certain efforts and arrangements in the daily routine are needed, mobility systems need to adapt to them to gain the competitive advantage needed to replace car usage (Sopjani, Stier, Hesselgren & Ritzén, 2020). For instance, when people work in a place outside their residence area, they tend to recur less to alternative transports (Quaglione et al., 2018). Thus,

users' mobility needs and restrains due to daily activities are crucial as aspects of mobility choices, and normally they do not get the awareness needed in large datasets (Thorhauge, Kassahun, Cherchi & Haustein, 2020).

A strong example of the study of the influence of lifestyle in mobility modes is the research conducted on a social movement of cyclists, called Critical Mass. According to the findings, the elements of this group aimed to live a sustainable life and share with others their practices, meanings, and beliefs. For them, riding a bicycle is much more pleasant than driving a car as it allows eye contact, humanization, and tranquility. While these cyclists aim to live a pleasant life, car users' only focus is to get from point A to point B (Dalpian et al., 2014).

It is also shown in the literature that people with more daily endeavors tend to opt for a car or a bicycle, researchers believe this is due to the strictness and unreliability of public transports, although in low-cycling countries that choice is probably reduced to a car (Thorhauge et al., 2020). Not only in low-cycling countries but when living dislocated from the urban areas, as is the case of marginal classes, relying on a bicycle is not always easy (Dalpian et al., 2014). People who can afford driving, but still live far away from the city center, tend to create a higher instrumental and affective perception towards their vehicle which will increase their driving frequency, since they will opt to use a car even for short journeys (He et al., 2020). This marks the place of residence as another relevant topic when considering mobility choices. Living in an area that is not highly populated also leads to a less probability of using other mobility options besides the car (Quaglione et al., 2018).

Furthermore, cultural activities like reading books, visiting museums and archaeological sites, practicing sports, and volunteering have all been linked to a higher probability of using alternative mobility options. This is especially because such activities are paved by social interactions and stimulate our reasoning to unconventional and unpredictive attitudes (Quaglione et al., 2018). Thus, people with this lifestyle may find it easier to go beyond the general consumers' perception that green practices are hard to adopt and maintain (Johnstone & Tan, 2015).

Technology use also seems to impact mobility choices, technology-oriented people tend to exhibit high adoption rates of unmotorized vehicles and public transport, while they also own fewer vehicles (Lavieri, Garikapati, Bhat & Pendyala, 2017). However, the influence of technology use is not clear yet, since it is possible to find in the literature results where technology assets like internet access and smartphone capability had no effects on the adoption of alternative modes (Möhlmann, 2015). The reasons that suggest the possible impact of technology are based on the premise that up-to-date and connected people have more easy access to alternative mobility modes (Lavieri et al., 2017).

Finally, more into the personality field, people who tend to trust more others and who show a high disappointment with the current environmental situation, have higher chances of using sustainable mobility options (Quaglione et al., 2018). Similar to the technology variable, there is still no common ground in the literature regarding the influence of caring for the environment on commuting choices, there are studies that found that this factor does not influence at all (Möhlmann, 2015).

To sum up this chapter, figure 2 provides a categorized overview of the factors that, according to the literature, can influence daily commuting choices.

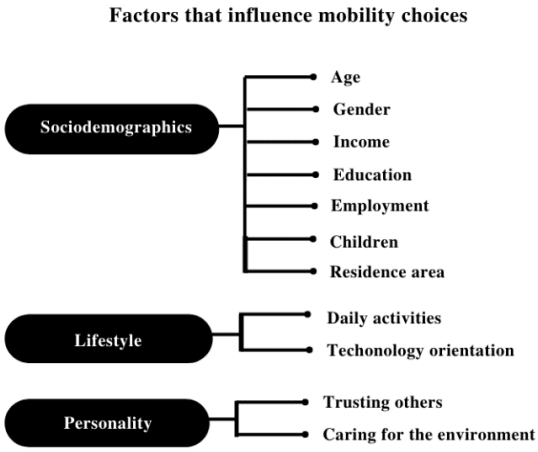

Figure 2: Factors that influence mobility choices

Source: Own elaboration based on the literature review

1.2.2. Impact of values on mobility choices

According to Solomon (2017), values lead to much of the consumer behavior, thus studying this theme implies the identification and measure of values. In the literature, it is possible to identify sets of values applied to travel behavior (García, Mars, Arroyo, Casquero, di Ciommo & Ruiz, 2019; Arroyo et al., 2020), but besides the work of Yin et al. (2018), which connects travel behavior, values, and ethic evaluation, the study of environmental variables together with mobility and values is frequently absent.

Many authors have based their works related to sustainability or mobility on the structure of human values by Schwartz (1992), thus it is relevant to explain what this structure is all about. Schwarz (1992;1994), define ten types of motivational values: self-direction (creativity, independence, achieving own personal goals); stimulation (varied, exciting, and daring life); hedonism (feeling

of pleasure, enjoying life); achievement (success, personal competence, ambition); power (social recognition, wealth, social power); security (sense of belonging, being healthy, national security); conformity (politeness, honoring parents, obedience); tradition (respect customs and ideas imposed, commitment and devotion); benevolence (loyalty; friendship; honesty) and universalism (protection of the environment, equality, caring for nature). Those referred values can then be outlined in a structure that establishes four higher-order domain values: conservation, openness to change, self-enhancement, and self-transcendence. Those four order domains form two basic dimensions, each dimension establishes a high order type combination of opposite values.

The first dimension is called openness to change versus conservation and combines the values of stimulation and self-direction in opposition to security, conformity, and traditional values. The second dimension is known as self-enhancement versus self-transcendence and combines the values of power, achievement, and hedonism in opposition to universalism and benevolence (Schwartz, 1992;1994). Concerning the second dimension, studies have addressed some of the values in this category as bio-altruistic values, defined as values that contemplate caring for nature, animals, and planet preservation, as well as social justice and welfare (Kim & Seock, 2019; Ahn, Kim & Kim, 2020). Some authors have confirmed the reliability of addressing biospheric and altruistic values separately (de Groot & Steg, 2007; Groot & Steg, 2008), although Schwartz has not made this distinction. Recent studies related to environmentally friendly products purchase have opted to keep the constructs together (Kim & Seock, 2019; Ahn et al., 2020), and on a study focused on the

reduction of car use, these two separated constructs acted similarly (de Groot & Steg, 2007).

The literature has already established some conclusions regarding the influence of values on mobility choices. For instance, individuals who are more concerned about protecting the welfare of others and nature, have more influential reasons and probability of engaging in sustainable behaviors, including bicycling and reduce car use (Claudy & Peterson, 2014; Nordlund & Garvill, 2003). Also, openness to change values (stimulation and self-direction) have shown a positive relationship with walking and cycling, while self-enhancement values (power, achievement, and hedonism) did not (García et al. 2019). Moreover, people who identify themselves with the values of stimulation and achievement, tend to use more active modes of transports, like walking or cycling (Arroyo et al., 2020).

A relation between sociodemographic, values, and intention to walk or cycle has also been established. Regarding gender, women identify more with universalism, self-direction, hedonism, security, and benevolence. Apart from security, all the other values are strongly connected with walking or cycling (García et al. 2019). This means women are more inclined to use sustainable mobility modes. Such results are in line with the research from Arroyo (2020), which states that women use more public transports, while men prefer cars. Still related to sociodemographic, students present positive results on values associated with sustainable mobility, self-direction, stimulation, hedonism, and achievement. Workers, on the other hand, have high scores on power and tradition, negatively associated with bicycle use or walking (Garcia et al. 2019).

Most of the studies above-mentioned connect egoistic values (e.g. power), with non-sustainable mobility behaviors, while bio-altruistic values (e.g universalism), show clear connections with more sustainable behaviors (Claudy & Peterson, 2014; Nordlund & Garvill, 2003; García et al. 2019; Arroyo et al., 2020). This changes when addressing eco-friendly purchases. Findings from a study in the USA suggest that egoistic values are more positively correlated with eco-friendly purchasing behavior than bio-altruistic values. Thus, an individual who identifies himself with egoistic values might purchase visible eco-friendly products, like environmentally friendly cars, as a way of showing his financial and environmentally conscious status (Kim & Seock, 2019).

Furthermore, the impact of another set of values was analyzed concerning the adoption of a bike shared scheme in China. The results show that values like collectivism, man-nature orientation, materialism, and face-consciousness influenced positively the user's choice (Yin et al., 2018). Collectivism refers to societies in which individuals have a strong feeling of belonging to a group, which they protect (Hofstede, Hofstede & Minkov, 2010). Man-nature orientation is the relation a man has with nature, it goes from controlling it to living in harmony with it and to subject to it (Kluckhohn & Strodtbeck, 1961). Materialism refers to the value a person gives to material possessions, which can make them be the main reason for them to feel happy or discontent (Belk, 1985). Face-consciousness is a Chinese concept that refers to the image one has of itself and the way that image is perceived by their peers (Bao, Zhou & Su, 2003).

Researchers conclude that values are relevant indicators of consumers' intentions regarding sustainable consumption and different categories must be

considered to understand the full process consumers go through (Yin et al., 2018). Although, previous studies have found no substantial relationship between values and attitudes, which supports the idea that many people do not behave in a way that expresses their values (Maio & Olson, 1994). Authors have established that for that to happen, values need to be activated and central to the individual (Verplanken & Holand, 2002). Thus, in certain situations, such as when individuals face time pressure, an important value can disregard, decreasing the impact of this variable on their behavior (García et al., 2019).

1.2.3. Environmental concerns influence on mobility choices.

Although recently many efforts have been made by academics, governments, and industries, it is still considered that consumers lack the necessary environmental education, attitudes, and knowledge to change their behavior (Liu, 2021). Worrying about the environment can make some consumers adopt different mobility modes like bike-sharing. On the other hand, for some users, utility is the key aspect, they might feel guilty about contributing to pollution, but they admit that the final decision is based on cost gains (Bardhi & Eckdhart, 2012). Setting those inconveniences like cost and practicality apart, when people opt for alternative modes of transportation, like shared bicycles systems, results show that this decision contributes to users ability to share their concerns about the environment and feel proud for being able to show they are doing their part being socially responsible and environmentally conscious (Yin et al., 2018). Thus, some researchers claim that sustainable mobility modes should be promoted based on their ethic and sustainable attributes in opposition

to an unstainable lifestyle and consumption (Algesheimer, Dholakia & Herrmann, 2005; Yin et al., 2018).

Some studies refer avoiding stress, responsibilities, and costs as main reasons for adopting sustainable choices, while the comfort and independence of ownership are related to unstainable choices (Burlando et al., 2019; Eckhardt, 2012), other findings report that environmental consciousness can be one of the main factors influencing sustainable mobility choices. For instance, concerns with the environment have a high influence on deciding not to drive and on opting for public transports or even active modes (Hopkins, 2016). Although some positive samples can be found in the literature, in most scenarios, it seems unlikely that just environmental concerns can cause significant and lasting changes in mobility patterns. For instance, in research regarding car-sharing, nobody considered environmental issues to be the main reason for choosing this mode (Hartl, Sabitzer, Hofmann, & Penz, 2018).

Even if not always coming from the user's motivation, external incentives or information related to sustainability concerns can function as a wake-up call causing consumers to alter their behavior. For instance, a recent study proved that when consumers are presented with information regarding the reduction of CO2 emissions, they are open to choose the mode that causes fewer emissions even if it is the one with which the journey takes longer time and costs more money (Raux, Chevalier, Bougna & Hilton, 2020). Furthermore, results also show that when drivers become more aware of the harm that driving does to the environment, they start believing in their power to mitigate such consequences and increase their intentions of altering their behaviors.

In the end, sustainability concerns have their impact but researchers and politicians cannot forget motivation as an essential factor to cause an effective change in mobility behaviors (Bowden & Hellen, 2019).

1.2.4. Environmental attitudes influence on mobility choices.

In a recent paper aiming to explore qualitative and quantitative methods to explain sustainable behavior, four dimensions were emphasized by experts: environmental protection, knowledge, education, and attitudes, being environmental impacts a critical condition for the development of sustainable behaviors. Results showed direct connections between environmental education, leading to environmental knowledge, which then led to environmental protection culminating in environmental attitudes (Liu, 2021).

Environmental attitudes have been defined as cognitive and affective perceptions established on consumer's previous experiences (Yong, Ariffin, Nee & Wahid, 2017). These attitudes can also reveal an individuals' level of support for environmental sustainability (Haan, Konijn, Burgers, Eden, Brugman & Verheggen, 2018). It is common in the green marketing literature for environmental attitudes to be divided into two categories: general and specific, or in other cases, inward environmental attitudes and outward environmental attitudes (Shatnawi & Chin, 2019; Leonidou, Leonidou & Kvasova, 2010).

In the earlier stages of the literature on this topic, general environmental attitudes were related to overall attitudes regarding the environment or ecology, while specific environmental attitudes relate to attitudes towards specific issues such as the energy crises or attitudes that demand taking environmental action (Hines, Hungerford & Tomera, 1987). Research indicates that specific

environmental attitudes and inward environmental attitudes, such as recycling, have stronger effects on sustainable consumption and green purchasing behavior than general or outward environmental attitudes (Shatnawi & Chin, 2019; Leonidou et al., 2010). Even though clear positive connections have been established between environmental attitudes and green purchasing intentions, as well as an indirect influence between environmental attitudes and environmental protection (Onurlubaş, 2019; Liu, 2021), it is still unclear to what extent individuals, even caring about the environment, are open to undertaking behaviors that demand big efforts, precisely things like changing mobility behaviors in opposition to just, for instance, buying organic food (Farjam, Nikolaychuk & Bravo, 2019). This theory has been addressed in the literature as the low-cost hypothesis, which states that regular environmental concerns only influence environmental behavior in conditions with low costs and few inconveniences (Diekmann & Preisendörfer, 2003).

Besides environmental attitudes, other aspects such as moral concerns and habits also have a high influence on the way people are open to engaging in an environmentally friendly way and, inclusively, modify their mobility patterns (Semenescu & Gavreliuc, 2019). Thus, as mobility is an activity so emersed in the daily routine, dependent on schedules, and many times conducted as a behavior that consumers do automatically without putting much thought into it, changing patterns needs to consider measures at many levels (Hulkkonen, Mielonen & Prisle, 2020).

1.2.5. The influence of perceived behavior control on mobility behavior

Perceived behavioral control (PBC) describes the perceptions people have regarding the easiness or difficulty they have executing a certain behavior, and the resources and opportunities available to them, that later influence their probability of achieving that same behavior (Ajzen, 1991). This concept has been present in different behavior theories, such as the theory of planned behavior (Ajzen, 1991) and behavioral reasoning theory (Westaby, 2005).

Since mobility is an intrinsic part of the daily routine, extremely connected with how people manage different essential tasks, for example, shopping, the slightest change in this behavior can severely impact wellbeing and prevent the adoption of sustainable mobility systems (Iyanna et al., 2019). People do not consume sustainably, even when they want to, mostly due to lack of resources and due to the mainstream behavior, for instance, driving, being highly associated with expectations of security and comfort not met by other options (Scheurenbrand, Parsons, Cappellini & Patterson, 2018), when, for instance, the chance of getting injured or wet when cycling is significantly lower than what the majority of people considers (Claudy & Peterson, 2014). Additionally, consumers can perceive environmental issues like global warming as only having long-term consequences, affecting people only in a faraway reality, making it harder for individuals to engage in practices that demand behavior change without guidelines, restrictions, or incentives (Catlin, Luchs & Phipps, 2017). Thus, when it comes to changing behaviors to acquire a sustainable lifestyle, individuals need to confidently feel that they have the

required skills, resources, and opportunities to effectively adopt them (Rex et al., 2015). That is why, to increase people's intention to change their mobility practices, they need to perceive this is attainable for them, in other words, their PBC needs to be high. It is no coincidence that PBC was found to be the most important indicator of intentions to reduce driving (Semenescu & Gavreliuc, 2019). PBC is used precisely to measure the volitional elements that potentially affect all behaviors. When this indicator is high people have higher intentions to perform a certain behavior, as well as increase their efforts and perseverance, which makes PBC an impactor of intention and a predictor of behavior (Ajzen, 2002). In other words, if the users' expectations regarding the impact and feelings associated with their sustainable actions are met, they are more likely to engage in those behaviors (Chi, George, Huang, Wang & Ping, 2020). Although, results from a study in Australia showed that PBC has a significant impact on the intention of adopting a sustainable lifestyle but only drives actual behavior to a small extent (Rex, Lobo & Leckie 2015).

Concerning the mobility field, PBC was found to have no significant effects on the choice to use public transportation in India (Devika, Harikrsihna & Anjaneyulu, 2020). Such findings contradict older studies stating that PBC has positive effects on increasing users' intention to shift to public transports (Chen & Chao, 2011; Donald et al., 2014). Also, results of a systematic review and meta-analysis found that PBC was one of the strongest elements that correlate car use and non-car use (Hoffmann, Abraham, White, Ball & Skippon, 2017). A study in Taiwan found positive support for the effect of PBC on green loyalty towards public bicycles (Chen, 2016), and in Malaysia, PBC was also found to contribute

to the intention of purchasing green products, such as green vehicles (Yong et al., 2017).

1.2.6. The influence of subjective norms on mobility behavior

Subjective norm consists of is the perception of social pressure from significant others to act and behave in a certain manner (Ajzen, 1991; Hagger & Chatzisarantis, 2006). Similar to PBC, this concept is present in different theories like the theory planned of behavior, and the behavioral reasoning theory (Ajzen, 1991; Westaby, 2005). It is normally measured by asking about the effect of significant others, for instance, friends and family, opinion on a certain behavior (Ajzen, 1991; Rex et al., 2015; Yong, 2017).

In a study conducted in Australia, subjective norms were proven to have a significant influence on the intention to engage in sustainable behavior (Rex et al., 2015). Still in Australia, a social marketing formative research concluded that to promote kids and parents active travel to school would be more effective to influence how significant others, family and friends, perceive this behavior instead of trying to convince their care providers of the benefits (Pang, Rundle-Thiele & Kubacki, 2018). Also, a different study in the USA revealed that the influence of significant others has a crucial role in pro-environmental behaviors since if individuals notice that their family and close friends engage in eco-friendly purchase behaviors they will feel morally obligated to do the same (Kim & Seock, 2019).

The literature in the field of mobility has also found strong evidence of the influence of subjective norms on loyalty, on changing behaviors, and on predicting intentions. In Malaysia, subjective norms and more specifically the

opinion of family and friends were proved to positively influence the purchase of green vehicles, such as hybrid and electrical vehicles (Yong et al., 2017). They also had positive effects on the loyalty towards bike-sharing systems and were one of the strongest indicators of loyalty towards public bicycles for users and non-users (Jamšek & Culiberg, 2020; Chen, 2016). Furthermore, consumers who already had strong motives to use car-sharing were proven to be the ones with more positive attitudes and stronger subjective norms, results suggest that to continue the process of adopting car sharing, consumers require the validation of their significant others (Peterson & Simkins, 2019). These norms also were the most influential factor in the intention to change from private vehicles to public transports (Chen & Chao, 2011). Similarly, they impacted not only intentions and habits to drive to work, but also, increased the intentions and habits of using public transports (Donald, Cooper & Conchie, 2014). Besides the positive influence of subjective norms on predicting intentions and behaviors mentioned above, that is not constant. For instance, subjective norms have proven to affect the intention to use a car, but not on a bicycle (Pojani et al., 2018). Recent studies revealed that subjective norms have a higher power in predicting intentions when the PBC is low, which shows that although they are frequently seen as not important for predicting behavior intention, they still play a relevant role (Barbera & Ajzen, 2020).

Thus, marketers need to make their consumers trust the enduring advantages of their sustainable actions and recall that others are expecting them to act accordingly, at the same time as they provide clear incentives for change if they want to alter their consumers' behaviors (Rex et al., 2015).

1.3. Conclusive Summary

As the mobility sector, due to CO2 emissions, is a critical one to address climate change, it has been noticed an increased effort of governments to decrease the use of motorized vehicles by shifting to more sustainable ways of commuting (Iyanna et al., 2019; Wang et al., 2020; Wolf & Schröder, 2019). However, as this sector is extremely connected with other activities, analyze it requires a holistic perspective (Sands et al., 2020). Having this in mind, this dissertation provides an integrated perspective of different concepts that have been proven to impact individuals' intention to engage in sustainable practices, including sustainable ways of commuting. Being this a pioneering study, the results gathered will not have a clear basis for comparison, although, there are studies in the fields of sustainability and mobility that prove the reliability of the constructs that will be analyzed.

Bio-altruistic and egoistic values have been proven to influence eco-friendly purchases and sustainable mobility behaviors (Kim & Seock, 2019; Claudy & Peterson, 2014; Nordlund & Garvill, 2003; García et al. 2019; Arroyo et al., 2020). Positive attitudes regarding mobility modes influence and predict future mobility behaviors (Pojani et al., 2018; Arias-Molinares & García-Palomares, 2020; Peterson & Simkins, 2019). Environmental attitudes positively relate to green purchasing intentions and an indirect influence on environmental protection (Onurlubaş, 2019; Liu, 2021). PBC has a positive relation with intentions to adopt a sustainable lifestyle, and with intentions to reduce driving and shifting to public transports (Rex et al., 2015; Semenescu & Gavreliuc, 2019). Subjective norms have a significant influence on engaging in sustainable

behavior and on the purchase of green vehicles (Rex et al., 2015; Yong et al., 2017). To provide a clearer view of this integrated perspective, the next chapter will present the conceptual model and the hypotheses that will be used to develop this dissertation.

2. CONCEPTUAL MODEL DEFINITION

As the conceptual model is usually assumed to graphically represent the general and specific objectives of the research, this chapter will begin by recalling the general and specific objectives of this dissertation, followed by the conceptual model that represents these objectives, and finally, the scales and hypotheses used to measure the same objectives.

2.1. General and specific objectives

The general objective of this research is to **analyze the perceptions of resident-consumers in Portugal regarding sustainable mobility options.** To answer this general objective, 5 specific objectives were defined: (1) evaluate the impact of Covid-19 on mobility choices; (2) describe the profile of the mobility users: personality, lifestyle, and psychographic factors; (3) evaluate the influence of values, environmental attitudes, and attitudes towards sustainable mobility on mobility choices; (4) evaluate the influence of perceived behavior control and subjective norms on mobility choices; (5) analyze what factors consumers consider that could contribute to an increase in their sustainable mobility choices.

2.2. Definition of the conceptual model

As specific objectives 3 and 4 aim to evaluate the influence of different variables on mobility choices, the conceptual model presented in figure 3 was specially developed to make the hypotheses established between those variables more visual and clearer. The remaining objectives 1, 2, and 5, will be explored in a complementary way to the model.

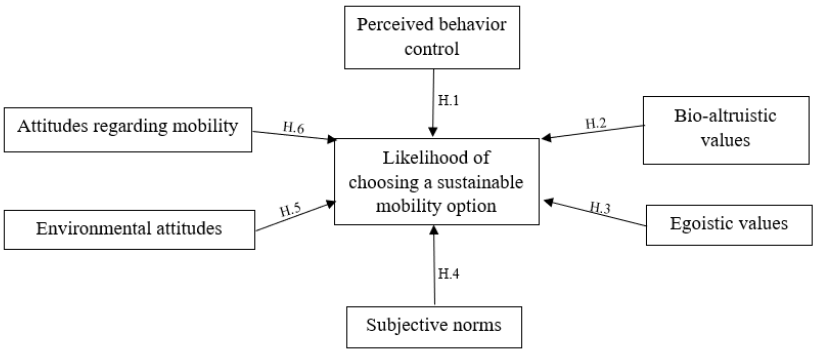

Figure 3 – Conceptual model

Source: Own elaboration based on the literature review

2.3. Definition of the scales

To guarantee the reliability of the whole model it was necessary to rely on the scales of different authors that were previously used to measure the adoption of sustainable lifestyles and attitudes regarding sharing platforms, inclusively shared mobility options, and adapt them to the context of sustainable mobility.

2.3.1. The scale of bio-altruistic values

Table 1 contains the 8 items and the coding of each variable regarding bio-altruistic values.

Construct		Author of the scale
Bio-altruistic values		(Kim & Seock, 2019)
Coding	Items	
Bav1	Equality	
Bav2	World peace	
Bav3	Social justice	
Bav4	Helpfulness	
Bav5	Environmental protection	
Bav6	Respect for the earth	
Bav7	Unity with nature	
Bav8	Pollution prevention	

Table 1 - Items and coding regarding bio-altruistic values

Source: Own elaboration

To measure the bio-altruistic values, a scale by Kim and Seock (2019), also published in the Journal of Retailing and Consumer Services (2019), was used.

The well-known journal, the Cronbach alpha of 0.92, and the year of publication guarantee the reliability and state of the art.

The scale is based on the previous work of de Groot and Steg (2007), and it uses 8 items which the respondents should evaluate as guiding principal on their lives, through a scale ranging from 1 (strongly unimportant) to 7 (strongly important) (Kim & Seock, 2019).

2.3.2. The scale of egoistic values

Table 2 contains the 4 items and the coding of each variable regarding egoistic values.

Construct		Author of the scale
Egoistic values		(Kim & Seock, 2019)
Coding	Items	
Egv1	Social power	
Egv2	Wealth	
Egv3	Authority	
Egv4	Influence	

Table 2 - Items and coding regarding egoistic values

Source: Own elaboration

The egoistic values were measured through the same source as the bio-altruistic values, an article developed by Kim and Seock (2019), based on the previous work of de Groot and Steg (2007) and published in the Journal of Retailing and Consumer Services. This time, the Cronbach alpha is from 0.75, which is still higher than the average accepted value.

Furthermore, the same principle of the bio-altruistic values was used, this time with respondents being asked to evaluate 3 items as a guiding principle of their lives on a scale from 1 (strongly unimportant) to 7 (strongly important) (Kim & Seock, 2019).

2.3.3. The scale of subjective norms

Table 3 contains the 3 items and the coding of each variable regarding subjective norms.

Construct		Author of the scale
Subjective norms		(Rex et al., 2015)
Coding	Items	
Sbn1	My close friends think I should commute sustainably.	
Sbn2	My close family members think I should commute sustainably.	
Sbn3	Most people who are important to me think I should commute sustainably.	

Table 3 - Items and coding regarding subjective norms

Source: Own elaboration

Similar to the PBC, the article written by Rex et al., (2015) for the journal of Nonprofit & Public Sector Marketing in the year 2015 was also the base for the scale used to measure perceived behavior. It is still important to recall that this article was published in a marketing journal addressing the topic of sustainable behavior intention, in the year 2015, proving to be a valid and applicable source.

This scale was composed of 3 items, originally used to measure the subjective norms' influence on living sustainably. In this dissertation, the same items were adapted to commuting sustainably, maintaining the initial Likert-scale ranging from 1 (strongly disagree) to 7 (strongly agree).

2.3.4. The scale of the perceived behavior control

Table 4 contains the 3 items and the coding of each variable regarding the PBC.

Construct		Author of the scale
Perceived behavior control		(Rex et al., 2015)
Coding	Items	
Pbc1	If I wanted to, I would not have problems in adopting a sustainable commuting behavior.	
Pbc2	I have full control over whether or not I adopt a sustainable commuting behavior	
Pbc3	It is completely up to me whether or not I adopt a sustainable commuting behavior.	

Table 4 - Items and coding regarding perceived behavior control

Source: Own elaboration

The article of Rex et al., (2015) published in the journal of Nonprofit & Public Sector Marketing in the year 2015 was the inspiration behind the scale used to measure PBC. The fact that this article was published in a marketing journal addressing the topic of sustainable behavior intention, in the year 2015, is a guarantee of the relevance of the scale.

This scale was designed over 3 statements, initially conceived to measure the PBC influence on adopting a sustainable lifestyle. For this dissertation, those statements were adapted to commuting sustainably, maintaining the original Likert-scale ranging from 1 (strongly disagree) to 7 (strongly agree).

2.3.5. The scale of environmental attitudes

Table 5 contains the 5 items and the coding of each variable regarding environmental attitudes.

Construct		Author of the scale
Environmental attitudes		(Liu, 2021)
Coding	Items	
Ea1	When humans interfere with nature, it often produces disastrous consequences.	
Ea2	Despite our special abilities, humans are still subject to the laws of nature	
Ea3	Humans do not have the right to modify the natural environment to suit their needs.	
Ea4	Plants and animals have as much right as humans to exist.	
Ea5	If things continue on their present course, we will soon experience a major ecological catastrophe.	

Table 5 - Items and coding regarding environmental attitudes

Source: Own elaboration

The scale used to measure environmental attitudes was retrieved from an article by Liu (2021), published in the recognized Journal of Retailing and Consumer Services, which is a great indicator of reliability. The fact that it was published in the year 2021 is another added value since the state of the art is updated.

This scale uses 5 statements which were measured using a 7-point Likert scale going from 1 (strongly disagree) to 7 (strongly agree) (Liu, 2021). The Cronbach value was 0.893, which highly exceeds the average acceptable value in the literature, which is above 0.70 (Nunnally & Bernstein, 1994).

2.3.6. The scale of attitudes towards sustainable mobility

Table 6 contains the 5 items and the coding of each variable regarding attitudes towards sustainable mobility.

Construct		Author of the scale
Attitudes towards sustainable mobility		(Sands et al., 2020)
Coding	Items	
Atm1	Using sustainable ways of commuting is meaningful	
Atm2	Using sustainable ways of commuting is a positive thing	
Atm3	Using sustainable ways of commuting would make me feel happy	
Atm4	Using sustainable ways of commuting makes sense	
Atm5	Using sustainable mobility options is a better way of commuting	

Table 6 - Items and coding regarding attitudes towards sustainable mobility

Source: Own elaboration

To measure the positive attitudes regarding sustainable mobility options a new scale was developed based on the original work of Sands et al., (2020), published in the Australasian Marketing Journal in the year 2020 and on the paper of Huang and Quian, (2021), published on the Journal of Psychology & Marketing in the year of 2021. As the original scale of Sands et al., (2020) had two very similar items "positive thing" and "good thing", the paper of Huang and Quian, (2021), was used to insert the item "happy" in replacement of "good thing".

The fact that both original works have been published very recently in journals of marketing with the subject of sustainable mobility is a guarantee of the state of the art. Finally, this new scale is composed of 5 items measured throw a 7 point Likert-scale, where 1 stand for totally disagree and 7 for totally agree.

2.3.7. The scale of the likelihood of choosing a sustainable mobility option

Table 7 contains the 3 items and the coding of each variable regarding the likelihood of choosing a sustainable mobility option.

Construct		Author of the scale
Likelihood of choosing a sustainable mobility option		(Möhlmann, 2015)
Coding	Items	
Lsm1	I am likely to choose a sustainable mobility option the next time I need a car.	
Lsm2	In the future, I would prefer a sustainable option over an own car.	
Lsm3	In the future, I am likely to choose a sustainable option instead of an owned car.	

Table 7 - Items and coding regarding likelihood of choosing a sustainable mobility option

Source: Own elaboration

The scale used to measure the likelihood of choosing a sustainable mobility option was based on the article of Möhlmann, (2015) published in the journal of Consumer Behaviour. The fact that this article was published in a journal of the marketing field addressing the topic of collaborative consumption related to mobility, in the year 2015, is a guarantee of the relevance of the scale.

This scale was designed over 3 statements, initially conceived to measure the likelihood of choosing a collaborative consumption service, instead of a car or hotel. For this dissertation, those statements were adapted to a sustainable mobility option, instead of a car, maintaining the original Likert-scale ranging from 1 (strongly disagree) to 7 (strongly agree).

It is notorious the use of the 7-point Likert scale in all the scales presented above. This choice is justified since respondents preferred scales with 10, 9, and 7 points, being those between 7 and 10 points the most reliable (Preston & Colman, 2000). Furthermore, when compared to 5 point scales, 7 point scales can

reflect more the respondents' real subjective evaluation (Finstad, 2010). Although some contradictory findings suggest that 5 point scales are less confusing and increase response rates, the majority of research states that 7 points are overall the most accurate and easier to use and therefore recommended (Diefenbach, Weinstein, and O'Reilly, 1993; Taherdoost, 2019).

2.4. Definition of the hypothesis

H1: Perceived behavior control has a positive influence on the likelihood of adopting sustainable mobility options.

In the literature, perceived behavior control was proven to be the main determinant of the intention to reduce car use (Semenescu & Gavreliuc, 2019). Although, as mobility is a behavior that severely impacts the management of daily routine, causing people to avoid engaging in more sustainable options (Iyanna et al., 2019) and since to adopt a more sustainable lifestyle individuals need to feel they have the resources and opportunities required (Rex et al., 2015), it is relevant to test H1 and analyze the effect of PBC in the context of sustainable mobility.

H2: Bio-altruistic values have a positive influence on the likelihood of adopting sustainable mobility options.

In the literature, it has been established a relation between personal values and the orientation towards sustainable behavior, inclusively sustainable commuting behavior. More specifically, people who identify themselves with the values of openness to change and self-transcendence, which are related to welfare and caring for others, are more likely to use sustainable mobility options, for instance, bicycles (Arroyo et al., 2020; García et al., 2019; Claudy & Peterson,

2014). Thus, it is hypothesized that bio-altruistic values have a positive influence on the adoption of sustainable mobility options, and H2 is expected to be proved.

H3: Egoistic values have a negative influence on the likelihood of adopting sustainable mobility options.

During the literature review, it has been found that values of self-enhancement and conservation, which are related to power and tradition, are negatively associated with sustainable mobility behaviors such as walking and cycling (García et al., 2019). On the other hand, recent findings suggest that people with egoistic values may purchase environmentally friendly products to reveal their healthy lifestyle and their conscious consumption status, for instance by buying eco-friendly cars. Thus, egoistic values can be misleading and have a big role in consumers' intentions to prove their pro-environmentally status to themselves and others (Kim & Seock, 2019). Therefore, it is relevant to test the reliability of H3 in the context of sustainable mobility.

H4: Subjective norms have a positive influence on the likelihood of adopting sustainable mobility options.

It has been established in the literature that subjective norms have a strong effect on different scopes of mobility behavior. Whether it is for using car-sharing, bike-sharing, or even for parents to walk their kids to school and for adolescents to drive, the opinion of family and friends has a high influence on behavior change (Peterson & Simkins, 2019; Peterson & Simkins, 2019; Pang et al., 2018; Pojani et al., 2018). Thus, H4 is expected to be validated.

H5: Environmental attitudes have a positive influence on the likelihood of adopting sustainable mobility options.

In the literature review, it has been found that environmental attitudes have a direct influence on sustainable consumption and green purchasing intentions (Shatnawi & Chin, 2019; Yong et al., 2017; Onurlubaş, 2019). Although, these attitudes seem to only impact behaviors if they do not demand high efforts (Farjam et al., 2019). Therefore, it is relevant to test H5 in the context of sustainable mobility.

H6: Positive attitudes regarding sustainable mobility options increase the likelihood of adopting them.

It has been found in the literature that positive relations with one mode of commuting are the biggest sign to predict future mobility behaviors (Pojani et al., 2018). People who have established previous relations with one kind of mobility mode are also more eager to use that mode (Arias-Molinares et al. 2020). Also, if a positive attitude has been created, for example with car sharing, consumers will have more reasons to repeat the use (Peterson & Simkins, 2019). Thus, H6 is expected to be validated.

3. METHODOLOGICAL FRAMEWORK

3.1. Introduction

This chapter presents the methodology approach defined to respond to the previously established research objectives. In detail, this section will be composed of the justification of the methodology, the data collection techniques, the survey structure, the measures, the population and sample, and the data analysis techniques.

3.2. Justification of methodology

According to the research objectives a quantitative methodology was chosen. Researches with a quantitative approach use mathematical models to measure and analyze the way variables influence and interact with each other, to quantify a social phenomenon (Denzin & Lincoln, 2011; Tuli, 2011; McCusker & Gunaydin, 2014). Since this dissertation aims to find the influence of different variables: perceived behavior control, bio-altruistic and egoistic values, subjective norms, environmental attitudes, and attitudes regarding mobility, on the likelihood of adopting a certain behavior a quantitative approach was considered as the most adequate.

With this methodology, the researcher can analyze current problems and future trends producing findings that, based on statistical evidence, can be used to influence the current policies of organizations and decision-makers (McCusker & Gunaydin, 2014). Such characteristics fit the purpose of this dissertation especially because the mobility sector impacts the quality of life in

urban areas, on the environment, and in public health (World Health Organization, 2018).

Additionally, to answer the last specific objective, aimed at understanding the individual factors that could motivate each user to adopt more sustainable ways of commuting, a qualitative analysis of an open-ended question was also employed. This decision contributed to collect information that illustrated particular moments and aspects of the routine of each respondent leading to a better understanding of the topic in question (Denzin & Lincoln, 2011).

To collect the required data, the survey was the instrument used. The justification for this choice and details of the data collection techniques applied to this dissertation will be explained in the next chapter.

3.3. Data collection techniques

3.3.1. Survey

A survey is a range of structured and predefined questions directed to a sample of the population, usually a large one, that makes the researcher able to conduct an extensive statistical analysis and to generalize the results across a population (Pinsonneault & Kraemer, 1993). One of the first purposes of these instruments was to understand a social problem, and they become popular because they make it possible to collect huge amounts of standardized and comparable data in an economic way, therefore they were considered the most practical and viable instrument for this research (Saunders, Lewis, Thornhill & Bristow, 2021; Groves, Jr., Couper, Lepkowski, Singer & Tourangeau, 2009). Additionally, surveys are used to analyze how and why a specific phenomenon

of a current time is happening, and to test the expected relationships between independent and dependent variables of a specific model (Pinsonneault & Kraemer, 1993). Thus, the questions of this research survey will be applied to test the impact of different variables in the individuals' likelihood of choosing sustainable mobility options and to understand how consumer-residents in Portugal perceive the topic of sustainable mobility.

3.3.2. Pre-test

Before the launch of a survey, it is important to conduct pre-tests since this procedure is used to clarify the survey design and to detect possible errors, such as specific word meanings, which may only be visible for the research target population (Reynolds, Diamantopoulos & Schlegelmilch, 1993). To obtain valuable feedback, a sample of 6 persons from the different age cohorts covered by this dissertation was selected. Yet, to ensure more informed and constructive criticism a pre-test was also completed by the supervisor of this research. All the participants were asked to provide honest feedback regarding the expressions used and the writing style, the time of response, possible doubts, and improvement suggestions. After analyzing the results, additional changes were made to ensure a clearer exposition of concepts, as well as an alert for mobile device users regarding the exhibition of all the answers options: "regularly, occasionally and never" in the first two questions.

3.3.3. The questionnaire structure

This questionnaire was designed based on the findings retrieved from the literature review, with each additional set of questions aiming to contribute to a

specific research objective, as it is possible to observe in Table 8. Furthermore, other aspects that are recommended to consider when developing a questionnaire were also properly fulfilled. First, an introduction was written, stating the purpose of the research, to appeal to respondents (Yaddanapudi & Yaddanapudi, 2019). Then, the questions were clear and neutral, to avoid biased and to allow everyone to properly understand and reply to what was being asked. Also, the questionnaire included items regarding different topics, thus different sections were created so respondents could realize that the context had changed (Mooi, Sarstedt & Mooi-Reci, 2018). Finally, the questionnaire mainly contained close-ended questions as they are easier and faster to answer, although, to obtain more in-depth information, an open-ended question was also included. The closed-ended questions were provided first since this way respondents are more likely to stay interested and the chances of higher response rates increase (Yaddanapudi & Yaddanapudi, 2019).

Specific objectives	Construct	Question/Items	Author
1	Frequency	How often have you used these means of transport before/after covid?	(Hoerler et al. 2020; Lempert et al., 2019)
2		In case you have already used scooters or bicycles rented via a mobile application, please indicate the purpose of the use.	
3	Attitudes regarding mobility	1.Using sustainable ways of commuting is meaningful. 2. Using sustainable ways of commuting is a positive thing. 3. Using sustainable ways of commuting would make me feel happy. 4. Using sustainable ways of commuting makes sense. 5. Using sustainable mobility options is a better way of commuting.	(Sands et al., 2020)
3, 4	Likelihood of choosing a sustainable option	1. I am likely to choose a sustainable mobility option the next time I need a car. 2. In the future, I would prefer a sustainable option over an own car.	(Möhlmann, 2015)

Specific objectives	Construct	Question/Items	Author
		3. In the future, I am likely to choose a sustainable option instead of an owned car.	
4	Subjective norms	1. My close friends think I should commute sustainably. 2. My close family members think I should commute sustainably. 3. Most people who are important to me think I should commute sustainably.	(Rex et al., 2015)
4	Perceived Behavior Control	1. If I wanted to, I would not have problems in adopting a sustainable commuting behavior. 2. I have full control over whether or not I adopt a sustainable commuting behavior. 3. It is completely up to me whether or not I adopt a sustainable commuting behavior.	(Rex et al., 2015)
2	Psychographics	How far do you live from the nearest public transportation service?	(Quaglione et al., 2018)
		How far do you live from the city center?	(He et al. 2020)
		How far do you live from your study/workplace?	(Quaglione et al., 2018)
		Do you have children in the household?	(Smart & Klein, 2017)
		How far do you live from the nearest public transportation service?	(Quaglione et al., 2018)
		Sociodemographic questions.	
5	Factors	In your opinion, what factors might contribute for you to adopt more sustainable commuting behaviors?	
3	Environmental Attitudes	1.When humans interfere with nature, it often produces disastrous consequences. 2. Despite our special abilities, humans are still subject to the laws of nature 3. Humans do not have the right to modify the natural environment to suit their needs. 4. Plants and animals have as much right as humans to exist. 5. If things continue on their present course, we will soon experience a major ecological catastrophe.	(Liu, 2021)
3	Biospheric and altruistic values	1. Equality 2. World peace 3. Social justice 4. Helpfulness 5. Environmental protection 6. Respect for the earth 7. Unity with nature 8. Pollution prevention	(Kim & Seock, 2019)
	Egoistic values	1. Social power 2. Wealth 3. Authority 4. Influence	

Table 8 - Survey structure

Source: Own elaboration

3.3.4. Dissemination of the survey and data collection

The developed survey was launched on April 7th and was available until April 18th. To disseminate the survey, the strategy adopted was online distribution. This way, surveys can be disseminated in a time-efficient, flexible, and convenient manner, in other words, surveys can be developed and shared via different formats with low costs, and individuals are allowed to answer at a time they find convenient, which contributes to obtaining a large sample size. Furthermore, surveys are simple to complete, and the data is properly organized for further analysis. It is also easier for the researcher to know the respondents' characteristics, to control and follow-up the sample, for instance, by sending follow-up messages (Evans & Mathur, 2005).

Researchers have suggested that social media channels should be considered as a potential tool to reach participants in social science studies, finding that these users are responsive and eager to contribute to the research (Kayam & Hirsch, 2012). Therefore, to make the sharing process more efficient, a list of possible Instagram, Twitter, and Facebook groups and accounts was created by searching for terms and hashtags related to sustainable mobility, sustainability, and urban cycling. To reach the target sample more efficiently, direct messages were also sent to certain followers of related pages and to Twitter users who were frequently vocal about sustainable mobility issues and had references to sustainable mobility in their bios. The survey was also shared through regular social media publications and directly sent to social media groups with users from different backgrounds and with other interests, aiming to reach sample elements that were not so concerned about the research topic.

3.4. Target Population and Sample

The target population is defined as the type of identities, for instance, individuals or companies, about which the researcher wants to draw conclusions (Hill & Hill, 2008). For this dissertation, individuals above 18 years old that live in Portugal continental were defined as the target population. However, this investigation, and social research in general, covers such a wide range of the elements of a population that it is impossible to consider them as a whole (Prodanov & Freitas, 2013). Thus, most of the time due to lack of resources or time constraints, it is only possible for the researcher to consider a part of the population for the study, this selected part is defined as the sample (Hill & Hill, 2008). Taking these limitations into account and considering the impossibility of reaching a complete list of the target population, a non-probabilistic sample technique was selected for this dissertation (Galloway, 2005). Furthermore, between the available types of non-probabilistic sampling, convenience sampling was adopted. This decision is justified by its simplicity, time-efficiency, and reduced costs of implementation, as well as by allowing the researcher to select participants easily accessible to them (Bhardwaj, 2019).

Concerning the sample size, researchers have defined that the number of valid observations should be at least ten times the number of items used in the analysis (Mooi et al., 2018). Since this investigation has 7 variables (attitudes towards sustainable mobility: 5 items; subjective norms: 3 items; perceived behavior control: 3 items; environmental attitudes: 3 items; bio-altruistic values: 8 items, and egoistic values: 4 items), the ideal sample size would be between

310 (31x10=310). As the number of valid observations used for this research is 645, the sample is considered more than sufficiently large.

3.5. Results treatment

3.5.1. Statistical tests

To choose the proper statistical tests, each hypothesis's purpose was analyzed, as well as the requirements to the realization of the tests. First of all, as the sample size was larger than 30, it can be assumed that it was normally distributed, and parametric tests can be chosen (Mooi et al., 2018). Knowing that the main purpose of the conceptual model developed is to verify the role of different independent variables on the likelihood of choosing sustainable mobility options, the multiple linear regression model was the test chosen. This choice was taken because this statistical analysis method can determine which of the variables selected are important predictors of a response variable (Hill, 2006). Thus, in this dissertations' Multiple Linear Regression Model, the dependent variable is the likelihood of choosing a sustainable mobility option, and the independent variables are attitudes towards sustainable mobility; subjective norms; perceived behavior control; environmental attitudes; egoistic values; biospheric values, and altruistic values.

3.5.2. Content analysis

As the survey included an open-ended question, content analysis was conducted. This technique allows data regarding a specific context to be analyzed through the views and meanings attributed by a group or culture (Krippendorff, 1989), which perfectly fits the aim of this open question, which was to provide a

space for consumers to express the factors they consider that could contribute to an increase in their sustainable mobility choices.

To correctly perform this procedure, the required steps of content analysis were properly investigated. This technique passes through three stages, pre-analysis, material exploration, and the results treatment (interference and interpretation) (Bardin, 2009). The first phase aims to outline the initial ideas proposed by the theoretical framework and determine indicators for the interpretation of the collected information. Finishing this step, the second phase involves the process of codification, which is to clip, aggregate, and enumerate sections of the text, based on precise rules regarding textual pieces of information that represent the characteristics of the content (Silva & Fossá, 2015; Bardin, 1977). The specific objectives of this dissertation were the initial drivers for establishing the different codes. Although, as the qualitative codding process is inductive, new important codes such as electric mobility and politics and urban planning, emerged from key phrases and text segments analyzed during this phase (White & Marsh, 2006). The final step is the treatment of results, which is to capture the manifest and latent contents present in the collected material (Silva & Fossá, 2015).

4. FINDINGS

With the primary data for this research collected through the survey, it is now time to begin the analysis, aided by the SPSS Statistics vs27 program. This chapter introduces the results gathered and confirms or rejects the hypotheses proposed. First, a descriptive analysis of the sociodemographic characteristics of the sample will be conducted, aiming to provide an overview of the data set. Second, an analysis of the reliability of the scales used is performed.

4.1. Characterization of the sample

The survey comprised a total of 677 replies. After carefully analyzing all the answers, 645 were considered valid, because 32 of the respondents have not selected the option "never" and have not replied to the trip purpose of rented bicycles and scooters. In the pre-tests, difficulties in noticing the "never" option were reported, which lead to place a note in the survey. Even so, to guarantee the reliability of the answers, it was assumed that respondents have not seen this option available for selection. To provide a better overview of the sample characteristics two tables will be presented and discussed, Table 9 related to general sociodemographic variables, and Table 10 more focused on mobility-related aspects. The complete version of Table 9 can later be found in the appendices.

Gender	Frequency (n)	Percentage (%)
Feminine	355	55,0
Masculine	289	44,8
Non-binary	1	0,2
Total	645	100,0
Age	**Frequency (n)**	**Percentage (%)**
Between 18 and 24	164	25,4
Between 25 and 30	121	18,8
Between 31 and 40	103	16,0
Between 41 and 50	149	23,1
Between 51 and 60	78	12,1
Above 60	30	4,7
Total	645	100,0
Education	**Frequency (n)**	**Percentage (%)**
Basic education	4	0,6
Secondary education	106	16,4
Higher education	535	82,9
Total	645	100,0
Professional situation	**Frequency (n)**	**Percentage (%)**
Student	105	16,3
Working student	69	10,7
Part-time worker	29	4,5
Full-time worker	395	61,2
Unemployed	47	7,3
Total	645	100,0
District of Residence	**Frequency (n)**	**Percentage (%)**
Porto	259	40,2
Lisboa	174	27,0
Total	645	100,0
Children	**Frequency (n)**	**Percentage (%)**
Yes	255	39,5
No	390	60,5
Total	645	100,0
Householdsize	**Frequency (n)**	**Percentage (%)**
1	102	15,8
2	159	24,7
Between 3 and 5	373	57,8
More than 5	11	1,7
Total	645	100,0
Children in the household	**Frequency (n)**	**Percentage (%)**
Yes	197	30,5
No	448	69,5
Total	645	100,0
Marital Status	**Frequency (n)**	**Percentage (%)**
Single	345	53,5
Married/ non-marital partnership	249	38,6
Divorced/separated	47	7,3
Widower	4	0,6
Total	645	100,0
Individual monthly income	**Frequency (n)**	**Percentage (%)**
Less than 600	57	8,8
Between 600 and 1000	160	24,8
Between 1000 and 1500	150	23,3

Between 1500 and 2000	93	14,4
More than 2000	52	8,1
Without individual income	90	14,0
I rather not reply	43	6,7
Total	645	100,0

***Table 9* - Sociodemographic characterization of the sample**

Source: Own elaboration

Regarding gender, 55% (n=355) of the respondents were women, while 44,8% (n=289) were men, and 0,2% (n=1), were identified as non-binary. Regarding this variable, this sample provided a very close representation of the real percentage of the residents in Portugal continental with more than 18 years old, 53,6% women and 46,4% men (Instituto Nacional de Estatística, 2020). Concerning the variable age, no cohort was overrepresented. The biggest percentage 25,4% (n=164), was from the cohort 18 to 24, immediately followed by the 41 to 50 with 23,1% (n=149), next the 25 to 30 years old with 18,8% (n=121), then the cohort 31 to 40 with 16% (n=103), and with 12,1% (n=78) the 51 to 60 years old. The above 60 years old were in minor representation, the total percentage for this cohort was only 4,7% (n=30). This small percentage can be justified by this generation using less technology and having more concerns regarding data and privacy issues than the younger generations, which is reflected in response rates (Quinn, 2010).

When it comes to academic qualifications, the great majority of the respondents 82,9% (n=535) had higher education. The respondents with secondary education accounted for 16,4% of the total sample (n=106). For basic education, the percentage was the lowest with only 0,6% (n=4).

Regarding the professional situation, full-time workers were predominant 61,2% (n=395), followed by students 16,3% (n=105), working students 10,7% (n=69), and unemployed individuals 7,3% (n=47). The least representative part of this variable was the part-time workers, 4,5% (n=29).

Concerning the districts of residence, Porto represented almost half of the sample, 40,2% (n=259). Besides being the second Portuguese metropolitan area with more populational density (Pordata, 2020), the fact that individuals from this location were easier to reach contributed to their considerable representation. Lisbon was the next district with more respondents 27% (n=74). Besides having a lot of districts with lower scores, it is relevant to mention that the sample was able to reach at least one individual from every district of continental Portugal.

At the level of having children, this does not apply to more than half of the sample 60,5% (n=390), being this only the case for 39,5% (n=255) of the respondents. Also more than half of the respondents 57,8% (n=373) have 3 to 5 elements in their household, while 24.7% (n=159) live with another person, and 15,8% (n=102) live alone. The lowest percentage refers to more than 5 elements, representing only 1,7% (n=11) of the total inquired. Additionally, 69,5% (n=448) does not have any children in their household, and 30,5% (n=448) does.

In respect of the marital status, slightly more than half of the sample was single 53,5% (n=345), followed by individuals that were married or in a non-marital partnership 38,6% (n=249). The lowest percentages come from

respondents who were divorced or separated 7,3% (n=47), and widowers 0,6% (n=4).

Finally, regarding individual monthly income, 24,8% (n=160) of the respondents earn between 600€ and 1000€, immediately followed by 23,3% (m=150), between 1000€ and 1500€. Furthermore, 14,4% (n=93) of the total sample earn between 1500€ and 2000€, while 14% (n=90) do not have an individual income. The fewer percentage values concern respondents who earn 600€ or less 8,8% (n=57), more than 2000€ 8,1% (n=52), and those who preferred not to provide this information 6,7% (n=43).

As previously mentioned, the mobility-related aspects of the sociodemographic characteristics will now be discussed.

Distance to the city center	**Frequency (n)**	**Percentage (%)**
Less than 1km	170	26,4
Between 1 and 3km	135	20,9
Between 3 and 5km	138	21,4
More than 6km	202	31,3
Total	645	100,0
Distance to study/workplace	**Frequency (n)**	**Percentage (%)**
Less than 1km	75	11,6
Between 1 and 3km	100	15,5
Between 3 and 5km	95	14,7
More than 6km	341	52,9
Total	611	94,7
Distance to public transport	**Frequency**	**Percentage (%)**
Less than 1km	463	71,8
Between 1 and 3km	117	18,1
Between 3 and 5km	26	4,0
More than 6 km	39	6,0
Total	645	100,0

Driving license	Frequency (n)	Percentage (%)
Yes	584	90,5
No	61	9,5
Total	645	100,0
Car owner	**Frequency (n)**	**Percentage (%)**
Yes	497	77,1
No	148	22,9
Total	645	100,0
Dependent for commuting	**Frequency (n)**	**Percentage (%)**
Yes	60	9,3
No	585	90,7
Total	645	100,0
Someone depends on the individual for commuting	**Frequency (n)**	**Percentage (%)**
Yes	200	31,0
No	445	69,0
Total	645	100,0

Table 10 - Sociodemographic characterization of mobility-related aspects

Source: Own elaboration

Starting with the respondents' distance rates, when it comes to the distance to the city center, most of the respondents, 31,3% (n=202) live at more than 6km, followed by the ones who live at less than 1km, 26,4% (n=170). When it comes to the distance between 3 and 5km, and 1 and 3km, the respondents' rates were similar, 21,4% (n=138) and 20,9% (n=135) respectively. Regarding the distance to the study/workplace, this sample does not take into consideration unemployed respondents who did not reply to the question. Thus, in 94,7% (n=611) of the total sample more than half of the respondents, 52,9% (n=341), live more than 6km away from their work or educational establishment place. Once again, the rates between 1 and 3km and 3 and 5km were alike, 15,5% (n=100) and 14,7% (n=95) correspondingly. Only 11,6% (n=75) of the respondents live less than 1km away from the previously referred locations. Finally, when it comes to distance to public transportation, most of the sample

live less than 1km away from their nearest public transportation system, 71,8% (n=463). This can be related to the fact that more than half of the sample resides in the main Portuguese districts of Porto and Lisbon. Still, on the same variable, 18,1% (n=117) of the respondents live between 1 and 3 km from public transport, whereas 6% (n=39) live more than 6k away and only 4% (n=26), live in between 3 and 5 km away.

Considering the driving license, almost the total of the sample has it, 90,5% (n=584), leaving only 9,5% (n=61) without it. This percentage is not distinctive with car ownership, 77,1% (n=497) has a car and 22,9% (n=148) does not.

When it comes to dependence on commuting, only 9,3% (n=60) of the sample considers being dependent on someone for commuting. This percentage is extremely similar to the proportion of the sample that does not have a driving license 9,5% (n=61). On the opposite side, 90,7% (n=585) of the respondents do not consider themselves to be dependent on anyone for commuting. On the other hand, 31% (n=200) of the total sample has someone in the household who depends on the respondent for commuting, while 69% (n=445) does not.

Overall, this sample is well distributed in terms of gender, being the main cohorts represented the ones between 18-24 years old and 41-50 years old. The majority of the respondents have higher education, are full-time workers or students, who live in the districts of Porto and Lisbon. A significant part of the inquired lives 6km away from the city center and their work or study place, and less than 1km away from the nearest public transportation system. They have a

driving license and a car. Furthermore, they do not have children, have 3 to 5 persons in their household, none of them children, and do not depend either have someone dependent on them for commuting. They are also single and have an individual monthly income between 600€ and 1000€ or 1000€ and 1500€.

4.2. Covid-19 impact on mobility behavior

Since the impact of Covid-19 on the usage of different transport modes was one of the points analyzed in the survey, the results of the frequency of usage of different modes of mobility after and during the Covid-19 pandemic, more precisely in April 2021, will be presented and analyzed via frequency tables.

Starting with the car, an overview of the results can be seen in the table below and will further be discussed.

Car before Covid-19	**Frequency (n)**	**Percentage (%)**
Regularly	379	58,8
Occasionally	182	28,2
Never	84	13,0
Total	645	100,0
Car nowadays	**Frequency (n)**	**Percentage (%)**
Regularly	362	56,1
Occasionally	188	29,1
Never	95	14,7
Total	645	100,0

Table 11 - Frequency of car use

Source: Own elaboration

Between the two periods, the regular use of cars decreased by 2,7%. A possible justification for this can be the decrease in dislocations due to lockdown measures. Thus, before Covid-19, 58,8% (n=379) of the individuals used the car regularly, while during the pandemic this use was regular for 56,1% (n=362) of the respondents. The occasional use of cars increased 0,9% during Covid-19. Regarding the percentage of respondents who never used cars, before the

pandemic was 13% (n=84), a value that increased 1,7% during Covid-19, with 14,7% (n=95) reporting never having used their car. To conclude, a small increase can be seen in the occasional and non-use of cars during the pandemic, as well as a decrease in the regular use.

The same approach will be followed, now regarding public transportation.

Public transports before Covid-19	**Frequency (n)**	**Percentage (%)**
Regularly	201	31,2
Occasionally	279	43,3
Never	165	25,6
Total	645	100,0
Public transports nowadays	**Frequency (n)**	**Percentage (%)**
Regularly	55	8,5
Occasionally	234	36,3
Never	356	55,2
Total	645	100,0

Table 12 - Frequency of use of public transportation

Source: Own elaboration

Before Covid-19, 31,2% (n=201) of the total sample used regularly public transports, and in April 2021 only 8,5% (n=55) kept the usage. Before the pandemic, 25,6% (n=165) of the respondents never used this type of mobility, while nowadays this number increased to 55,2% (n=356). Concerning the occasional use, before Covid-19, this percentage was 43,3% (n=279), decreasing 7%. Nowadays, occasional users represent 36,3% (n=234) of the respondents. Thus, amongst the two periods, the regular users of public transports decreased by 22,7%, and the non-users had a 29,7% increase.

The results regarding active modes will be discussed below starting with the following table that presents an overview of the users' frequency of own bicycles.

Own bicycle before Covid-19	Frequency (n)	Percentage (%)
Regularly	165	25,6
Occasionally	127	19,7
Never	353	54,7
Total	645	100,0
Own bicycle nowadays	**Frequency (n)**	**Percentage (%)**
Regularly	202	31,3
Occasionally	111	17,2
Never	332	51,5
Total	645	100,0

Table 13 - Frequency of own bicycle use

Source: own elaboration

Regular users of their bicycles accounted for 25,6% (n=165) of the respondents, after the pandemic, a number that increased 5,7% during April 2021, turning the total regular users of owned bicycles into 31,3% (n=202). Besides this increase, more than half of the inquired, 54,7% (n=353), never used an owned bicycle before the Covid-19. This percentage had a small decrease of 3,2%, being the total of respondents that currently do not use this vehicle 51,5% (n=332). Regarding the occasional users, 19,7% (n=127), this number decreased by 2,5%, making a total of 17,2% occasional users nowadays. Thus, although by smaller amounts, results show an increase in the regular use of owned bicycles and a decrease in the occasional and non-users of these vehicles.

Results regarding the frequency of walking are presented in the table below.

Walking before Covid-19	Frequency (n)	Percentage (%)
Regularly	393	60,9
Occasionally	226	35,0
Never	26	4,0
Total	645	100,0
Walking nowadays	**Frequency (n)**	**Percentage (%)**
Regularly	407	63,1
Occasionally	208	32,2
Never	30	4,7
Total	645	100,0

Table 14 – Frequency of walking

Source: Own elaboration

It is possible to state that not many significant changes are visible. Previously to the pandemic, 60,9% (n=393) of the sample used walking as a way of commuting. This number increased 2,2% nowadays, being the recent percentage 63,1% (n=407). When it comes to the occasional use of walking, this percentage was 35% (=226) before the Covid-19 and now it is 32,2% (=208), having decreased 2,8%. Respondents who never walk as a way of commuting were the lowest percentage, 4% (n=26), earlier to the pandemic, increasing 0,7%, now being 4,7%. Therefore, although by smaller amounts, the regular users of this active mode increased, while the occasional and non-users decreased.

Addressing the sharing modes, starting with Uber and other similar companies, following rented scooters and rented bicycles, the results will be provided and analyzed below.

Uber and others before covid-19	**Frequency (n)**	**Percentage (%)**
Regularly	41	6,4
Occasionally	338	52,4
Never	266	41,2
Total	645	100,0
Uber and others nowadays	**Frequency (n)**	**Percentage (%)**
Regularly	19	2,9
Occasionally	235	36,4
Never	391	60,6
Total	645	100,0

Table 15 - Frequency of use of uber and others

Source: Own elaboration

Previously to Covid-19, more than half of the sample, 52,4% (n=338), used this mobility way of consumption occasionally, only 6,4% (n=41) of the respondents were regular users, and almost half of the inquired, 41,2% (n=266),

had never used this way of commuting. These percentages had a significant decrease in the current days. The biggest decreased, 16%, occurred on the occasional users who now are 36,4% of the sample. The decreased in regular users was 3,5%, now being 2,9% (n=19) of the respondents. The percentage of non-users had a considerable increase of 19%, now being 60,6% (n=391). Therefore, results show that besides public transports, sharing modes like Uber were the most impacted by the Covid-19.

The frequencies of use regarding rented scooters and bicycles will be addressed below.

Rented scooters before Covid-19	**Frequency (n)**	**Percentage (%)**
Regularly	8	1,1
Occasionally	69	10,7
Never	568	88,1
Total	645	100,0
Rented scooters now	**Frequency (n)**	**Percentage (%)**
Regularly	4	0,6
Occasionally	39	6,0
Never	602	93,3
Total	645	100,0
Rented bicycles before Covid-19	**Frequency (n)**	**Percentage (%)**
Regularly	24	3,7
Occasionally	65	10,1
Never	556	86,2
Total	645	100,0
Rented bicycles now	**Frequency (n)**	**Percentage (%)**
Regularly	20	3,1
Occasionally	52	8,1
Never	573	88,8
Total	645	100,0

Table 16 - Frequency of use of rented bicycles and scooters
Source: Own elaboration

Before Covid-19, it is important to notice that the regular users of rented scooters were only 1,2% (n=8) of the total sample, and the rented-users of bicycles were also merely 3,7% (n=24) of the respondents. A number that decreased by a minor percentage after the pandemic, 0,6% for both vehicles.

Regular users of rented scooters are now 0,6%(n=4) of the total sample, while users of rented bicycles are 3,1% (n=20). Thus, before the pandemic, rented bicycles had more 2,5% of regular users than rented scooters, and have more 3,1% now. Occasional rented scooters users, previously to Covid-19, accounted for 10,7% (n=69) of the sample, and are now 6% (n=39), having decreased by 4.7%. While for the occasional rented bicycles users, the decrease was smaller. Before Covid-19, these users were 10,1%(n=65), and now are 8,1% (n=52), having decreased 2%. The percentage of non-users for this way of commuting was huge before Covid-19, 88,1% (n=568) for rented scooters, and 86,2% (n=556) for rented bicycles. These values increased during April 2021, in 5,1% for rented scooters, and 2,6% for rented bicycles. Thus, nowadays, non-users of rented scooters are 93,3% (n=602) and of rented bicycles are 88,8% (n=573).

It is possible to conclude that rented bicycles, and especially rented scooters, are not regularly used by the majority of this sample, having the number of non-users increased slightly during Covid-19, which can be due to hygiene concerns, being these vehicles exposed in the streets to several different users with no guarantee of cleanliness. When it comes to the general high percentage of non-users, even before the pandemic, some possible justifications can be the lack of availability in some districts and the fact that some respondents only use this type of options for the experience, having perceived the “never” as the most adequate option for their frequency usage but still stating the purposes of their trips. These purposes will be analyzed and discussed below.

4.3. Travel purposes for rented bicycles and scooters

Purposes of travels with rented scooters/bicycles	Frequency (n)	Percentage (%)
Leisure	88	13,6
Trip with a purpose	94	14,6
Other	5	0,8
Both	3	0,5
1 time exceptionally to try	2	0,3
Total	192	29,8

Table 17 - Travel purposes for rented bicycles and scooters
Source: Own elaboration

Addressing the travel purposes, the percentages regarding leisure, 13,6% (n=88), and travel with a purpose, 14,6% (n=94), were highly similar, only varying in 1%, having 0,8% (n=3) of the respondents stated that they used these options for both of the mentioned purposes. Additionally, 0,3% (n=2) of the inquired referred to having only used these options one time exclusively to try. On the option "others", different reasons were provided: work-related, the respondent worked for two companies of the sector; holidays; experience; having their own scooter, and "varied reasons". It is important to consider that only 29,8% (n=192) of the inquired replied to this question, and not all of them consider using occasionally or regularly these sharing options. Thus, results indicate that when and if using these sharing options, the main purposes for the trips are planned trips with a destination in mind, followed by leisure, holidays, experience, and exclusively one-time trips just for trying. The 14,6% (n=94) users who use sharing options for planned trips can be a positive indicator that people are using these modes instead of more polluting vehicles, like cars, for going to work and to perform other essential tasks or daily endeavors.

4.4. Exploratory factor analysis

To ensure the reliability of the conceptual model introduced in this dissertation, exploratory factor analysis (EFA) was conducted. EFA is useful to find correlations between variables, normally referred to as items, in order to reach a smaller number of unifying variables ultimately identified as factors (Mooi et al., 2018). To define the factors, it is important to conduct first a principal component analysis, which will help to determine the linear components present in the data and how a specific variable (item) contributes to each component (Matos & Rodrigues, 2019). The realization of this analysis requires the fulfillment of certain requirements. First, the variables have to be from the scale type. Then, regarding the sample size, it is expected that the number of valid observations is, at the minimum, ten times the number of the analyzed items (31x10=310) and that these observations are independent. Finally, the variables have to be sufficiently correlated. After carefully analyzing and confirming all the requirements, the tests need for the EFA were conducted.

To ensure that the sample was suitable for conducting the factor analysis, the KMO (Kaiser-Meyer-Olkim) test was performed (Matos & Rodrigues, 2019). The recommended values for this test vary from bellow 0,50 (unacceptable), between 0,50 and 0,59 (miserable), between 0,60 and 0,69 (mediocre), between 0,70 and 0,79 (middling), between 0,80 and 0,89 (meritorious) and 0,90 or higher (marvelous). Therefore, 0,50 is the minimum acceptable value, below this threshold more data should be collected or the researcher should rethink the variables to be included (Hair, Anderson, Tatham & Black, 2014; Kaiser, 1974).

Furthermore, for the realization of the factor analysis, variables have to group to form a construct, if this does not happen, the construction of factors is meaningless. Bartlett's test refers to this situation as the null hypothesis. Thus, to ensure that variables are correlated, this test should be conducted and have a statistically significant result, which is below 0,05 (Matos & Rodrigues, 2019).

Finally, to properly establish the number of factors, those extracted should correspond to at least 50% of the total variance explained, although 75% or more is recommended (Mooi et al., 2018).

By analyzing all the theoretical explanations, it is possible to synthesize some conclusions organized in the table below and summarized as follows: i) The KMO values ranged from 0,5 and 0,8. The lowest score (0,500) belonged to the egoistic values and the highest to the biospheric values (0,820); ii) Regarding the Bartlett test, all the variables were statistically significant (sig=000), thus sufficiently correlated.; iii) Concerning the total variance explained, all the values were above 60%.

Attitudes towards sustainable mobility	
Items	Atm1, Atm2, Atm3, Atm4
KMO	0,758
Bartlett	0,000
% Variance	65,202
Likelihood of choosing a sustainable mobility option	
Items	Lsm1, Lsm2, Lsm3
KMO	0,624
Bartlett	0,000
% Variance	73,905
Subjective norms	
Items	Sn1, Sn2, Sn3
KMO	0,767
Bartlett	0,000
% Variance	89,399
Perceived behavior control	

Items	Pbc1, Pbc2, Pbc3
KMO	0,661
Bartlett	0,000
% Variance	74,850
Environmental attitudes	
Items	Ea1, Ea3, Ea5
KMO	0,647
Bartlett	0,000
% Variance	63,821
Egoistic values	
Items	Eg1, Eg3
KMO	0,500
Bartlett	0,000
% Variance	80,425
Biospheric values	
Items	Biv1, Bv2, Biv3, Biv4
KMO	0,820
Bartlett	0,000
% Variance	71,156
Altruistic values	
Items	Av2, Av3, Av4
KMO	0,682
Bartlett	0,000
% Variance	66,119

Table 18 - KMO Test, Bartlett Test, and Variance Test

Source: Own elaboration

It is important to mention that, for the original item bio-altruistic values, two components were extracted. Thus, to interpret more easily the empirical result and still retaining the statistical properties, a factor rotation technique was conducted (Filho & Júnior, 2010). Between the different factor rotation techniques, Varimax is the commonly used procedure, as it tries to prevent too many variables from having high loadings on a single factor (Field, Miles & Field, 2012). Although, as being an oblique technique, the factors are assumed to be uncorrelated, thus, to use this rotation technique, the researcher needs to have strong theoretical or empirical evidence that the factors are not correlated (Matos & Rodrigues, 2019). As addressed in the literature review, this set of values was proved to be reliable when addressed separately: altruistic values

and biospheric values (de Groot & Steg, 2007; de Groot & Steg, 2008). Through the Varimax rotation technique, it was possible to notice that the different items fit in two different factors, thus two factors were created for this item. Table 18 illustrates the component matrix using the varimax technique, this matrix has two columns (representing the two factors) and eight lines (representing the eight items). To interpret this matrix, it is important to consider that one variable is expected to have high factor loadings in the factor where it belongs, and lower on the one it does not (Matos & Rodrigues, 2019).

Items	Component 1	Component 2
Equality	0,081	0,761
World peace	0,437	0,628
Social justice	0,182	0,824
Helpfulness	0,370	0,629
Environmental protection	0,804	0,185
Respect for the earth	0,833	0,256
Unity with nature	0,788	0,228
Pollution Prevention	0,813	0,217

Table 19 - Bio-altruistic values component matrix with Varimax rotation technique
Source: Own elaboration

Thus, component 1 fits the items of the variable altruistic values, and in component two the items of biospheric values. In the matter of commonalities, their value should lie above 0,50 to ensure the contribution of each item to the factor (Mooi et al., 2018). Thus, several items with this value below 0,50 were excluded from the analysis: i) one item from the attitudes towards sustainable mobility: **Atm5** *"Using sustainable mobility options is a better way of commuting"; ii)* two items belonging to the environmental attitudes: **Ea2** *"Despite our special abilities, humans are still subject to the laws of nature", and* **Ea4** *"Plants and animals have as much right as humans to exist"; iii)* two items from the egoistic values: **Egv2** *"Wealth", and* **Egv4** *"Influence"; iv)* one item from bio-altruistic

values: **Bav1** *"Equality"*, since when included in the new factor, altruistic values, the communality value was below 0,50. With all the requirements adjusted, the next step was to finalize the exploratory factor analysis. As illustrated by the table below and the analysis above, eight factors were created with six items removed.

Component Matrix											
Items	Communalities	M	SD	Attitudes towards sustainable mobility	Likelihood of choosing sustainable mobility option	Subjective norms	PBC	Environmental attitudes	Egoistic values	Biospheric values	Altruistic values
Atm1	0,607	5,940	1,245	0,779							
Atm2	0,613	6,760	0,676	0,783							
Atm3	0,674	6,270	1,114	0,821							
Atm4	0,714	6,670	0,754	0,845							
Lsm1	0,600	4,790	1,742		0,774						
Lsm2	0,676	5,530	1,681		0,869						
Lsm3	0,704	5,150	1,649		0,929						
Sn1	1,740	1,740	1,740			0,936					
Sn2	1,769	1,769	1,769			0,949					
Sn3	1,735	1,735	1,735			0,952					
Pbc1	0,673	5,280	1,963				0,774				
Pbc2	0,676	5,450	1,923				0,916				
Pbc3	0,607	5,720	2,005				0,899				
Ea1	0,729	5,870	1,224					0,854			
Ea3	0,609	5,200	1,566					0,780			
Ea5	0,577	6,400	0,994					0,760			
Egv1	0,561	6,260	1,134						0,804		
Egv3	0,652	6,460	0,867						0,804		
Biv1	0,682	6,590	0,743							0,826	
Biv2	0,768	6,760	0,558							0,876	
Biv3	0,680	6,530	0,791							0,825	
Biv4	0,717	6,680	0,636							0,847	
Alv2	0,659	6,740	0,648								0,812
Alv3	0,704	6,690	0,737								0,839
Alv4	0,620	6,610	0,730								0,787

Table 20 - Exploratory Factor Analysis
Source: Own elaboration

Another important test to conduct is Cronbach's Alpha, which is considered the most popular measure to test the internal consistency of scales. This coefficient generally varies from 0 to 1, being agreed that 0.70 is the lowest limit (Mooi et al., 2018). Although, values above 0,60 are still acceptable, these coefficients can be classified as very good (<0,9); good (0,8 and 0,9); reasonable

(between 0,7 and 0,8); weak, but still acceptable (0,6 to 0,7) and unacceptable (<0,6) (Marôco, 2018). Table 20 illustrates that the Cronbach's Alpha values used were all above 0,70, except for the variable of environmental attitudes (0,698), which was still above 0,60 and close to 0,70. Therefore, all the scales used are consistent.

Factor	Cronbach Alpha	No. Items
Atm - Attitudes towards sustainable mobility	0,796	4
Lsm - Likelihood of choosing a sustainable mobility option	0,818	3
Sn - Subjective norms	0,941	3
Pbc - Perceived behavior control	0,829	3
Ea - Environmental attitudes	0,698	3
Egv - Egoistic values	0,754	2
Biv - Biospheric values	0,855	4
Alv - Altruistic values	0,742	3

Table 21 - Cronbach Alpha Test
Source: Own elaboration

4.5. Descriptive factor analysis

Since the factors that will be used in this dissertation have been identified, it is important now to conduct a descriptive analysis of each one by examining the mean and standard deviation. For a better understanding of this analysis, it is relevant to remember that for the first five factors a 7 point Likert-scale was used: 1= strongly disagree; 2= moderately disagree; 3= slightly disagree; 4= neither agree nor disagree; 5= slightly agree; 6= moderately agree; 7= strongly agree. To measure factor six, a 7 point Likert-scale was also used, but this time to measure the level of importance: 1= strongly unimportant, 2= moderately unimportant; 3= slightly unimportant; 4= neither unimportant nor important; 5= slightly important; 6= moderately important; 7= strongly important.

Considering the first factor, the average of the answers was located on level 6 of the scale (moderately agree), which means that respondents have positive attitudes regarding using sustainable ways of commuting. It is noteworthy to recall that the item Atm5 was removed from the analysis.

Factor			
Attitudes towards sustainable mobility			
Coding	Items	M	SD
Atm1	Using sustainable ways of commuting is meaningful	5,94	1,245
Atm2	Using sustainable ways of commuting is a positive thing	6,76	0,676
Atm3	Using sustainable ways of commuting would make me feel happy	6,27	1,114
Atm4	Using sustainable ways of commuting makes sense	6,67	0,754

Table 22 - Mean and Standard Deviation of the factor Attitudes

Source: Own elaboration

When it comes to the likelihood of choosing a sustainable mobility option, the average response rate was on level 5 (slightly agree), thus there is a predisposition of the majority of respondents to use sustainable mobility options in the future. On the other hand, it is relevant to note that the first item (Lsm1= *I am likely to choose a sustainable mobility option the next time I need a car.*), has an average of 4,79, which is slightly less than the others.

Factor			
Likelihood of choosing a sustainable mobility option			
Coding	Items	M	SD
Lsm1	I am likely to choose a sustainable mobility option the next time I need a car.	4,79	1,742
Lsm2	In the future, I would prefer a sustainable option over an own car.	5,53	1,681
Lsm3	In the future, I am likely to choose a sustainable option instead of an owned car.	5,15	1,649

Table 23 - Mean and Standard Deviation of the factor Likelihood of choosing a sustainable mobility option

Source: Own elaboration

Regarding subjective norms, the average response rate was level 3 (slightly disagree), therefore respondents do not perceive that their loved ones expect them to commute sustainably.

Factor			
Subjective norms			
Coding	Items	M	SD
Sbn1	My close friends think I should commute sustainably.	3,58	1,740
Sbn2	My close family members think I should commute sustainably.	3,52	1,769
Sbn3	Most people who are important to me think I should commute sustainably.	3,70	1,735

Table 24 - Mean and Standard Deviation of the factor Subjective norms

Source: Own elaboration

Concerning PBC, the average of responses was located on level 4 of the scale (neither agree nor disagree), showing that individuals have an indifferent stand regarding their perceived ability to adopt a sustainable way of commuting. On the other hand, item Pbc1 was the closest to five (slightly agree), showing that respondents partially consider that if they had the will to, they could adopt a sustainable way of commuting.

Factor			
Perceived behavior control			
Coding	Items	M	SD
Pbc1	If I wanted to, I would not have problems in adopting a sustainable commuting behavior.	4,73	1,963
Pbc2	I have full control over whether or not I adopt a sustainable commuting behavior	4,47	1,923
Pbc3	It is completely up to me whether or not I adopt a sustainable commuting behavior.	4,12	2,005

***Table 25* - Mean and Standard Deviation of the factor Perceived behavior control**

Source: Own elaboration

On the factor of environmental attitudes, Ea2 and Ea5 were previously removed from the scale. Apart from Ea3, the other average answers were on level 6 or close to 6 (moderately agree), which means respondents are aware of the impact of certain attitudes on the environment and their possible consequences.

Factor			
Environmental attitudes			
Coding	Items	M	SD
Ea1	When humans interfere with nature, it often produces disastrous consequences.	5,87	1,224
Ea3	Humans do not have the right to modify the natural environment to suit their needs.	5,20	1,566
Ea5	If things continue on their present course, we will soon experience a major ecological catastrophe.	6,40	0,994

Table 26 - Mean and Standard Deviation of the factor Environmental attitudes

Source: Own elaboration

Concerning altruistic values, the average of responses was located on level 6 of the scale (moderately important), showing that respondents do give an important role to altruistic values. Furthermore, an item (bav1) of the original bio-altruistic values scale was previously removed.

Factor			
Altruistic values			
Coding	Items	M	SD
Alv2	World peace	6,74	0,648
Alv3	Social justice	6,69	0,737
Alv4	Helpfulness	6,61	0,730

Table 27 - Mean and Standard Deviation of the factor Altruistic values

Source: Own elaboration

Regarding biospheric values, the average of responses was on level 6 of the scale (moderately important), showing that, similarly to the altruistic values, respondents do give an important role to biospheric values.

Factor			
Biospheric values			
Coding	Items	M	SD
Biv1	Environmental protection	6,59	0,743
Biv2	Respect for the earth	6,76	0,558
Biv3	Unity with nature	6,53	0,791
Biv4	Pollution prevention	6,68	0,636

Table 28 - Mean and Standard Deviation of the factor Biospheric values

Source: own elaboration

Finally, from the last factor, egoistic values, two items were removed (Egv2, Egv3). The remaining items show that individuals do not consider social

power to be important for them as the average response was on level 3 (slightly insignificant), and they are indifferent to authority, with the median of responses being on level 4 (neither insignificant nor important). Thus, in opposition to altruistic and biospheric values, egoistic values do not play a significant role in the respondents' lives.

Factor			
Egoistic values			
Coding	Items	M	SD
Egv1	Social power	3,57	1,707
Egv3	Authority	4,33	1,545

Table 29 - Mean and Standard Deviation of the factor Egoistic values

Source: Own elaboration

4.6. Conceptual model hypotheses verification

Before the analysis of the multiple linear regression model, it is essential to validate certain assumptions, since failing to do so can compromise the results (Mooi et al., 2018). Thus, the linearity between the independent and dependent variables was confirmed. Furthermore, it was also verified that there was no multicollinearity, in other words, that variables were not related to each other, by guaranteeing VIF values below 10 and tolerance above 0,1. Autocorrelation values, which is the independence of the model errors, were also corroborated since the result of the Durbin-Watson test was 1,832, and these values can range from 0 to 4. Finally, homoscedasticity, which is the constant variance of errors, was also verified, as well as the normal distribution of errors that was supported by the sample size being above 30. Concluding that all the assumptions were met, it is possible to start testing hypotheses 1, 2, 3, 4, 5, and 6 through a Multiple Linear Regression Model, where the independent variables are: attitudes towards sustainable mobility; subjective norms; perceived

behavior control; environmental attitudes; egoistic values; biospheric values and altruistic values, and the dependent variable is: the likelihood of choosing a sustainable mobility option.

Taking into consideration that the hypotheses developed for this dissertation were based on different studies that are present in the literature review, it is important to analyze the impact of each independent variable on the likelihood of adopting sustainable mobility options, instead of just considering in what percentage all the independent variables together can explain such behavior.

Through the analysis of the results, it is verified that this model of multiple linear regression is significant statistically and can explain 36,6% of the variance in the data (F (7,637) = 52,466, *p*=0,000). This variance was calculated through the R2 value, which indicates how much the dependent variable is affected by the factors measured in the analysis (Moksony, 1990). Furthermore, the appropriate R2 values vary according to different research areas. For instance, values of 0,30 are common in cross-sectional designs, while values of 0,10 are also normal in cross-section exploratory designs. When considering scholarly research focused on marketing, these values can go from 0,50 (substantial) to 0,30 (moderate), and 0,10 (weak) (Mooi et al., 2018). Taking these ranges into consideration, it is possible to conclude that this model can significantly explain the variance of the dependent variable. Addressing each variable in particular, attitudes towards sustainable mobility (β=.394, *t*=10,995, *p*=.000), subjective norms (β=.,255, *t*=7,513, *p*=.000), perceived behavior control (β=.179, *t*=5,365,

p=.000), and egoistic values (β=-.066, *t*=-1,990, *p*=.047) have a significant impact on the likelihood of adopting sustainable mobility options. Thus, results show that the likelihood of adopting sustainable mobility options increases with positive attitudes towards sustainable mobility, as well as with higher subjective norms and perceived behavior control. On the other hand, higher egoistic values slightly decrease the likelihood of adopting sustainable mobility options.

The data presented in the table below allows the confirmation of the hypotheses H1, H3, H4, and H6, being the attitudes towards sustainable mobility the biggest predictor of the likelihood of adopting sustainable mobility options, followed by the subjective norms, perceived behavior control, and finally, the egoistic values causing a decrease in this likelihood. On the other hand, H2 and H5 were not confirmed. This is because the *p*-value of environmental attitudes, biospheric values, and altruistic values was above 0,05, which means that these variables do not have a statistically significant causal relationship with the likelihood of adopting sustainable mobility options.

	Unstandardized coefficients	Standardized coefficients			
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	7,600E-17	,032		,000	1,000
Attitudes towards sustainable mobility	,394	,036	,394	10,995	,000
Subjective norms	,255	,034	,255	7,513	,000
Perceived behavior control	,179	,033	,179	5,365	,000
Environmental attitudes	,029	,036	,029	,809	,419
Egoistic values	-,066	,033	-,066	-1,990	,047
Biospheric values	,022	,042	,022	,529	,597
Altruistic values	,004	,040	,004	,094	,925

Table 30 – Coefficients of the Multiple Linear Regression Model

Source: Own elaboration

To a better overview of the confirmed and rejected hypotheses, the model below illustrates the confirmation of four hypotheses (H1, H3, H4, and H6), as well as the coefficient value of each independent variable to make it easier to understand the impact of each one on the dependent variable. Furthermore, the hypotheses rejected (H2, and H5) are also presented by the dashed arrows.

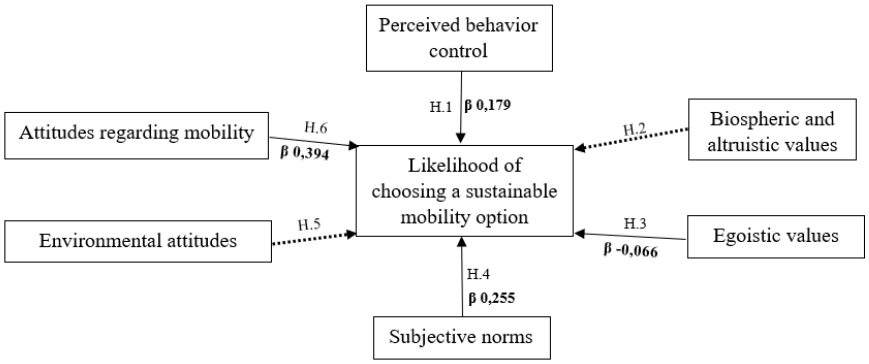

Figure 5 - Conceptual model and confirmed hypotheses

Source: own elaboration

4.7. Thematic content analysis

After concluding the quantitative analysis that allowed us to test the hypotheses and conceptual model developed, thematic content analysis will be conducted with the qualitative data gathered from the open question in the survey. The main purpose of this analysis is to understand what factors consumers identify as important for them to adopt more sustainable ways of commuting. This analysis is especially relevant since the majority of the sample, **56,1%** (n=362) of the 645 respondents still uses car regularly for their commutes. This question counted with 402 answers that formed a document with 18 pages of content. To make the process of the qualitative analysis more ergonomic, the data were analyzed with the support of the qualitative data

research software, NVivo. Table 30 addresses the codes that were established and the number of affirmations related to them. As some affirmations touched on more than one topic, the total number of references is above 402.

Coding	References
Active modes	24
Electric mobility	31
Environmental attitudes	6
Lifestyle and Sociodemographics	84
Perceived behavior control	4
Politics and Urban Planning	113
Public Transportation	115
Subjective norms	6
Supply	74

Table 31- Codings

Source: Own elaboration

More specifically related with active modes, the consequences of the physical efforts required to use these modes, the concerns regarding distances, weather, orography, and the difficulty to transport materials or other people were some of the aspects more mentioned, as described by these affirmations examples: "*Cycling to work means arriving sweaty, often the terrain of the city makes this difficult.*"; "*Weather, safe routes, possibility to change clothes/bath at the destination (bike/walk), not too long routes to avoid pain (bike/walk).*"; "*Having a practical way to transport materials to work and to the gym; willpower to overcome/solve the previous issues*"; "*Distance from the place I intend to go, if it is necessary to go with someone else or to transport something that is large or a large quantity*".

When it comes to electric mobility, this topic was addressed especially by people who consider the car to be a necessity "*Electric cars accessible to everyone. It is essential for me to have my own car.*". Aspects such as the price of the electric

cars, and the absence of places to charge these vehicles were the most frequently mentioned: "*I would love to buy an electric car, but there are still not enough charging stations and not to mention how expensive these means of transportation still are.*".

Regarding environmental attitudes, caring and protecting the environment while also improving health "*Health, freedom, joy, taking care of myself and the planet*"; "*Save money and the environment*", followed by the implementation of "*environmental policies accordingly to the social context*", where the main aspects present in the data for this coding.

Concerning lifestyle and sociodemographic, aspects related to income, the residence place, children, work-home distances, and promotion of a sustainable commuting lifestyle were the main highlights: "*Having more financial capacity. The location where I live*"; "*When you live in the city it is easier to adopt sustainable commuting behaviors, now if you live in the village and there is no other transport besides your car and you have children it is, unfortunately, unsustainable, because the distances are too long to be done by bike for example and there are no other options*"; "*In a more present-focused perspective there could be special lanes for bicycles and scooters and promotion of this lifestyle.*".

The concept of PBC was mostly present in the demanding changes that adopting a sustainable commuting behavior will imply for the current organization of respondents' life's, this affirmation represents this idea perfectly "*It would involve a radical change in my life, in my family's life, for which I am not prepared although I believe it would be quite advantageous in the medium term*".

The coding of politics and urban planning was addressed as many affirmations refer to the need for government incentives for sustainable mobility: "*Greater incentives from local and district governments for the adoption of these means*", the adaption of cities and infrastructures to active modes "*Public infrastructure for getting around on foot and by bike*"; "*A transport system and road network that prioritizes 1° walking, 2° cycling, 3° collective public transport, 4° shared transport, 5° logistics, and 6° motorized private transport, both in policies and strategic options and in the design and adaptation of infrastructure and roadways."*, as well as measures that force the reduction of car usage in urban areas "*Reduce and limit car access to cities; charge and reduce parking spaces*".

References to public transportation were present in most of the responses, showing that these modes have a major impact as an element that can contribute to respondents' commute more sustainably. Aspects related with existence: "*Existence of urban public transportation in my locality*", price: "*Free public transportation*"; "*Trains should have a discount when you travel in a group, as happens in England, making it more competitive than the car*.", coverage: "*Efficient, economical, public transportation network with the coverage that I need professionally*", frequency and schedules: "*better public transportation (wider network and more frequent schedules)*" were the most mentioned.

On the code of subjective norms, aspects like the opinion of family members, closed ones, and social pressure were addressed by individuals: "*Generalization of the adoption of this type of behavior in the population and in the people who are closer to me, with consequent loss of the enormous stigma that is*

to do anything without a car, at least in medium-sized cities"; "*Changing the mentality of my family members.*"; "*A way to get the rest of the family along*."

Finally, the code supply was created as a significant number of affirmations referred to the need of having to have more sustainable options and more access to those options: "*Their offer to be more, better, more accessible*", more diversity in those options: "*Greater diversity*", and faster and cheaper alternatives: "*Lower prices and faster sustainable transports*".

Now that the codifications have been justified and explained, to make the keywords used by respondents more visual, a table of the words, and a world-cloud can be seen below. To correctly interpret the world cloud, one should have in mind that words that appeared more frequently in the data are the ones that are portraited in a bigger size on the image (Atenstaedt, 2017).

Word	References
Transportation	170
Public	117
Bicycle	85
Better	85
Lanes	65
Network	49
Safety	40
Prices	36
Electric	35
Work	34
Accessibility	32
Infrastructure	32
Availability	20
Existence	20
Parks	19
Conditions	18
Schedules	15
Time	12
Improving	12
Shared	12

Table 32 - Word's frequency

Source: Own elaboration via NVivo

Figure 6 - Word cloud

Source: Own elaboration via NVivo

Overall, the steps of the content analysis made it possible to conclude that for respondents to commute more sustainably they mainly need **better** (n=85) **public** (n=117) **transportation** (n=170) networks, especially outside the big urban areas ("*Better transportation network in smaller towns; better public transportation network outside of Porto and Lisbon*"), with more frequent schedules, especially at night "*More regular schedules, better accessibility*"; "*The existence of good public transport networks with frequent connections throughout the metropolitan area. The lack of this means that trips at night, or to very distant places have to be done by car*." Also, connections between transports modes have been mentioned, "*Greater provision of public transport with connections to cycle and bike-sharing networks, both within and between urban centers.*", providing hints that the concept of MaaS could be interesting in Portugal.

Furthermore, **safety** (n=40) was another word frequently mentioned, "*Safety is the main factor.*", especially when it comes to using bicycles: "*Safe conditions for the use of soft means of transport in the city (cycling network, reduction of car traffic speed)*". Besides safety, individuals frequently mentioned **time** (=12) as a factor that influences their adoption of sustainable mobility: "*Have more time*"; "*I very rarely use a car, but when I do, it is because there is no better alternative for that place/time*"; "*Existence of infrastructures means of public transport that allows on-time home-work trips and that favor soft mobility*.").

Bicycle (n=85) **lanes** (n=65) were also one of the most mentioned words, proving that investing in these infrastructures can increase the adoption of sustainable mobility behaviors: "*Having a good scheme of bike lanes, paved,*

signposted, illuminated."; "*More bike lanes outside and inside the city*"; safety was also a word very frequently mentioned when addressing bicycle lanes "*More safe bike lanes in cities*".

Furthermore, **prices** (n=36) also have a big impact on the mobility choices of respondents ("*prices that match the citizens' standard of living*"), especially when it comes to rental ("*reduced rental prices for certain sustainable transport modes"*), and **electric** (n=35) mobility modes ("*More affordable prices for electric bicycles*"; "*I would love to buy an electric car, but there are still not enough charging stations and not to mention how expensive these means of transportation still are*").

Work (n=34) constraints were one of the decisive factors pointed out by respondents for not being able to use sustainable mobility options more frequently: "*I work by shifts, often leave work at night, not being compatible with public transportation, I don't feel safe to use a bicycle at night*"; "*Possibility to work closer to home*"; "*Having a job that does not require me to drive a goods vehicle*".

Adequate infrastructures (n=32) for sustainable mobility were one of the main keywords: "*Appropriate infrastructures for more sustainable means of travel, namely the greater adoption of proper lanes for vehicles such as electric scooters, bicycles, etc., which would allow a more comprehensive and safe use.*"; "*I already commute, but I miss an infrastructure that is adequate for my commute. If the streets were calmed down, speeds were lower, and there was a network of bike lanes on the avenues, there would be more safety and people would opt for sustainable modes*".

Availability (n=20) and **existence** (n=20) of sustainable mobility modes, were also words highlighted in the qualitative data, whether regarding shared mobility: "*Availability (in the city where I live there is no bike share*"; public transport: "*Existence of public transportation in my residential area*", or sustainable options in general: "*The existence of sustainable means of transportation outside major metropolitan areas*".

Parks (n=19) were addressed especially for two main motives, regarding parking places for bicycles: "*Having SAFE bike parks on streets*"; "*Bicycle parking spaces protected from the natural elements, with guards to protect against eventual theft.*", and regarding cars "*Make it harder and more expensive to park your own car*".

Respondents also used regularly the word **conditions** (n=18), whereas referring to urban infrastructure conditions "*Better physical conditions: bike lanes*", or to public transportation "Better conditions in public transportation".

Schedules (n=12) were also frequently mentioned especially regarding public transportation. Respondents asked in particular for more offers of schedules: "*More public transportation schedules and options",* and for them to fit their individual needs: "*Have access to public transportation with schedules that fit my needs.*". The word **improving** (n=12) was another one particularly connected with public transportation: "*Improved quality of public transportation*", and infrastructures, especially for cycling "*Improvement of infrastructure (bike lanes, etc.)".*

The word **shared** (n=12) was also often stated by respondents, suggesting the current trend of shared mobility: "*More bike-sharing offers";*

"*More diversified offer of mobility services (e.g. Carsharing)*"; "*Partnerships between companies and transport companies to provide collective transport to a workplace shared only by people from that same workplace. For instance: Farfetch*".

Finally, although not brought up with as much frequency, there are still words worth mentioning for their relevant insights. For instance, **distance** (n=9) related to the lack of sustainable alternatives for long distances: "*More transportation alternatives for long-distance travel*", and **financial** (n=9) capacity: "*Having more financial capacity*". Also, **respect** (n=6) towards bicycle users, "*More respect for those who cycle on public roads*"; "*Motorists respectful of bicycle users*", and even "*Less abusive behavior by cars (raids, honking)*". **Incentives** (n=6) for sustainable mobility is another factor worth considering for increasing sustainable commuting behaviors: "*If the state gave more incentives*". Changes due to the **pandemic** (n=4) were also influent factors: "*Renting bicycles and scooters is expensive and using public transportation is a good option, since the subway, for example, serves my city well. However, in this pandemic context it becomes an option that I avoid as much as possible."* Limitations caused by **having to transport children** (n=3), were pointed out too: "*Not having to drive children to school*". **Mentalities** (n=2): "*Adaptation of urban territory and mentalities to soft modes*"**, willpower** (n=2): "*The commute I make to work is shorter; having a practical way to transport materials to work and to the gym; willpower to overcome/solve the previous issues*", and also related "*I have yet to take this step, I even bought the bicycle*", and **awareness** (n=2),

"*awareness programs on sustainable transport modes*" are also elements that can contribute for the increasing adoption of sustainable mobility.

5. DISCUSSION OF RESULTS

After having analyzed the qualitative and quantitative results from this research, it is important to relate them with the literature review previously presented and with the already established research objectives.

First, as three of the variables which more strongly influenced the likelihood of choosing sustainable mobility choices were attitudes, perceived behavior control, and subjective norms, both used before in theories such as the theory of planned behavior, and the behavioral reasoning theory (Ajzen, 1991; Westaby, 2005), this investigation provides extra support for their strong effects in models aiming to predict consumers behavior.

Now addressing the research objectives, since the Covid-19 pandemic had a major impact on individuals' behavior, especially in their travels (Beck et al., 2020), this dissertation had to consider this thematic, being its first specific objective to evaluate the impact of Covid-19 on mobility choices. Research indicates that, during the pandemic, public transports were the most impacted mode regarding the decrease in usage (Moslem et al., 2020; Aloi et al., 2020). Although not measure in a time where the Covid-19 restrictions were at their highest, the quantitative results of this dissertation corroborate these findings, being public transportation the mode with the highest decrease in regular users, and the highest increase in non-users. In opposition to Moslem's et al., (2020) findings, which showed an increase in car usage and walking during the pandemic, results of this dissertation point out a decrease in the regular use of the car, in opposition to an increase in the regular use of active modes: walking

and cycling. Qualitative findings also support the decreased usage of public transportation, as this observation shows: "*Using public transportation is a good option, since the subway, for example, serves my city well. However, in this pandemic context, it becomes an option that I avoid as much as possible.*" Besides the big data picture showing a decrease in the car use, the replacement of public transportation for cars is visible in an affirmation of the qualitative data: "*During the pandemic I stopped using public transports + bicycle to use only an owned vehicle, to avoid exposure to contagion, but as soon as the exposure is not so much, I will go back to public transport + bicycle.*" Overall, these findings also support Beck et al., (2020) expectations of a return to public transports as measures became less severe, although the expected increase in car trips was not visible yet in this sample, one possible justification for this is the natural decrease in regular trips in comparison to the period before Covid-19.

Following the analysis of Covid-19's impact on mobility choices, it was also important to analyze how lifestyle and psychographic factors impact the mobility behavior of individuals, which leads to this dissertation's second specific objective. Qualitative results of this research support previous findings stating that especially residence location, but also work and family organization are the factors that more influence the choice of a car over other transportation options (Heisserer & Rau, 2015). Both of these aspects were mentioned multiple times by respondents as factors that could contribute for them to adopt more sustainable commuting behaviors, for instance: "*Greater availability of the modes to be used, bearing in mind those individuals who live in more out-of-town locations and therefore cannot choose autonomously. The use of more sustainable means of*

transport/ways of travel without compromising other factors at the professional and personal organization levels.". More particularly regarding work: "*The workplace being closer.*"; "*Changing jobs, since mine necessarily requires commuting by car.*", concerning family: "*It would involve a radical change in my life, and in my family's life, for which I am not prepared although I believe it would be quite advantageous in the medium term.*", and finally, residence location: "*Location where I live.*"; *"The fact that I do not live downtown, far from the places where I make my living, makes it difficult.*".

More in detail on the topic of the place of residence, it has also been mentioned in the literature that residents of less populated areas have less probability of using other transport modes besides the car (Quaglione et al., 2018), qualitative findings brought insights to this statement, revealing that this can be due to the lack of existence of other means: "*I live in a small village in Serra da Estrela and, apart from school transport, we have no way of getting around without our own vehicle! To have more sustainable commuting behaviors we would have to have more options, which is not easy in this area. However, whenever I can I walk.",* and a question of mentalities: "*Loss of the enormous stigma that is to do anything without a car, at least in medium-sized cities*". Now combining the work factor with the residence location, Quaglione et al., (2018) research states that working outside the residence area is related to the tendency of using fewer alternative transports, these dissertation findings corroborate this idea with many affirmations mentioning this issue, for instance: "*Possibility to work closer to home*"; "*Shorter work-home distances*", and also bringing light to other work-related issues as schedules: "*I work by shifts, often leave work at night, not being*

compatible with public transportation, I don't feel safe to use a bicycle at night", and job tasks: "*Having a job that does not require me to drive a goods vehicle*"; "*Changing jobs, since mine necessarily requires commuting by car*.".

Taking a deeper look at the family organization, the literature addressed the impact of children on the increased ratio of cars and portrayed car drivers as families with kids (Smart & Klein, 2017; Jensen, 1999). This dissertations' findings, although not having addressed a relation with the number of cars in the household, definitely proved that children do impact transport choices, especially due to affirmations like: "*Not having to drive children to school*", and "*The conciliation of school and childcare hours with employment are the most limiting factors*".

Now, addressing lifestyle and particularly daily tasks and routines, in the literature review it has been mentioned that individuals with more daily activities often use bicycles or cars, and probably just cars in case of low-cycling countries, due to the strictness and unreliability of public transports (Thorhauge et al., 2020). Such dissatisfaction with public transports was frequently mentioned in the qualitative data, for instance: "*Public transportation with quality, security, comfort, on time...anyway, a dream for the state we are in.*"; "*Means of public transport that allow on-time home-work trips and that favor soft mobility.*"; "*The existence of good public transport networks with frequent connections throughout the metropolitan area. The lack of this means that trips at night, or to very distant places have to be done by car*.", and "*Flexible public transportation.*". Furthermore, the literature also indicates that when mobility

affects routine and demands efforts, the options available need to be adapted to be able to compete with cars (Sopjani et al., 2020), qualitative results corroborate this statement as it can be seen by this response: "*It would be important for sustainable mobility options to change so that they are even more affordable in terms of cost and more convenient/practical to use. The options that currently exist are still not ideal*.".

The impacts on routine and efforts are especially visible on active modes, previous research has underline inconvenience, road safety, and weather concerns as the main reasons for individuals not riding a bicycle to go to work, while the positive aspects associated with this mode of transportation are mostly health, wellbeing, cost, and time savings (Claudy & Peterson, 2014). Qualitative results are in line with the previous observation since most of these aspects have been referred to by respondents multiple times. To make this evident, statement examples for each factor will be presented. Regarding inconvenience: "*Having a practical way to transport materials to work and the gym."; "Cycling to work means arriving sweaty, often the terrain of the city makes this difficult*.", concerning safety: "*Well-structured, connected, and well-signposted network of bike paths with safety guarantees.*", when it comes to weather: "*Accesses to schools and jobs make it difficult to use this means of transportation, especially in bad weather*". Health has been found to have two sides according to this research. Although it has also been referred to by respondents as a positive aspect, some observations also mentioned that health can prevent individuals from adopting active modes, for instance, respondents pointed health problems as factors preventing from adopting sustainable mobility options: "*Better health and fewer bone problems*";

"*Better health to do so*". Time and cost savings were some of the factors more addressed by respondents, although not particularly related to cycling. This research sample often addresses time and costs as one of the constraints preventing them from adopting sustainable commuting behaviors, as it is illustrated by these affirmations: "*Have more time.*"; "*Travel time.*", and "*More money*", "*Having more financial capacity*", "*Reduced prices for more sustainable transportation*". Thus, in opposition to previous research claiming that users opt for sustainable mobility options as a way of saving money and time (Burlando et al., 2019; Eckhardt, 2012; Möhlmann, 2015), residents in Portugal seem to perceive that adopting sustainable mobility options is more expensive and time-consuming.

Furthermore, the results of the qualitative data also supported previous findings that suggested that for causing behavior change that favors active mobility, proper information and knowledge of available mobility options, services and incentives are needed (Markvica et al., 2020, Hess et al, 2017): "*More funding in aid for the purchase of electric bicycles*", "*More incentives for bicycles and bike lanes*", "*Information on bicycle lanes*", "*Awareness programs on sustainable transport modes*", and "*More information and more accessible sustainable transports*".

Overall, due to the influence that psychographic and lifestyle factors have on mobility choices, the qualitative findings of this research support Sopjani's et al., (2019) claim that it is not enough to offer just new products and services, it is essential to address issues like travel habits: "*It depends on where we live, the*

daily obligations", cultures "*Adaptation of mentalities to soft modes*", and infrastructures "*Availability and diversity of infrastructures that allow more sustainable behaviors. For example: a greater number of bike paths spread throughout the city (not only in the busiest areas, to allow safer travels); diversity in the supply of scooters and shared bikes with features appropriate to each city rather than the same elements across the country (in a more mountainous city you need electric bikes/scooters with more power than in flat cities).".*

Now that the first two objectives have been compared with findings from the literature review, it is time to analyze the variables present in the proposed conceptual model. Recognizing that no identical models have been used in previous research, it is difficult to compare accurately with other studies the effect of the selected variables on the likelihood of choosing sustainable mobility choices. Therefore, to corroborate the hypotheses presented below, each individual variable impact on the dependent variable, the likelihood of choosing sustainable mobility options, will be discussed according to the results of the authors previously identified in the literature.

H1: "*Perceived behavior control has a positive influence on the likelihood of choosing sustainable mobility options*."

Having been established in the literature that when individuals have the resources, opportunities, and perceive that executing a certain behavior is easily attainable for them, the probability of engaging in that behavior increases (Ajzen, 1991). This dissertation was able to establish that when consumers believe that commuting sustainably causes no problems for them, is something that depends on them and that they can control, the likelihood of them choosing sustainable

mobility options increases. Although these results are addressing the mobility field, they corroborate previous findings where PBC had a significant impact on the intention of adopting a sustainable lifestyle (Rex et al., 2015). Since literature focused on particular types of sustainable mobility modes has also revealed positive connections between PBC and user's intention to start using public transports, reduce driving and car use, and purchase green vehicles (Chen & Chao, 2011; Donald et al., 2014; Semenescu & Gavreliuc, 2019), this research can emphasize the impact that this variable has on the likelihood of individuals choosing sustainable mobility options.

Furthermore, it is possible to identify in the collected qualitative data references that reveal the impact that this variable has on the adoption of public transportation, for instance, "If it was easier to use public transportation to my destinations", corroborating the findings of Chen & Chao, (2011) and Donald et al., (2014) on the effects of PBC in individual's intentions to use public transport.

H2: "*Biospheric and altruistic values have a positive influence on the likelihood of choosing sustainable mobility options*."

This dissertation has concluded that altruistic values (world peace, social justice, and helpfulness) and biospheric values (environmental protection, respect for the earth, unity with nature, and pollution prevention) do not affect the respondent's likelihood of choosing sustainable mobility options. Such findings go against previous research that related these values with sustainable mobility choices. For instance, literature has shown that values related to universalism, protecting the nature and welfare of others, inclusively social justice, and helpfulness, impacted the use of bicycles, walking and willingness to

reduce car use (Claudy & Peterson, 2014; Arroyo et al., 2020; Nordlund & Garvill, 2003).

A reason that can explain the fact that this hypothesis was not confirmed can be that in certain situations, for instance when facing time pressure, individuals might disregard an important value, decreasing the impact of this variable on their behavior (García et al., 2019). Previous studies have also shown no significant relationship between values and attitudes, thus many people do not behave in a way that expresses their values, for it to happen values need to be central for the individual (Maio & Olson, 1994; Verplanken & Holand, 2002)

Moreover, this study has provided support for the studies of de Groot & Steg, (2007) and de Groot & Steg, (2008), which also made a destination between the altruistic and biospheric values, in opposition to the original Schwartz value scale where these values belonged to the same motivational type.

H3: Egoistic values have a negative influence on the likelihood of choosing sustainable mobility options.

The results of this dissertation proved that egoistic values, more precisely social power, and authority, negatively influence the likelihood of choosing sustainable mobility options. Thus, as the sustainable mobility modes analyzed in this dissertation involved active modes, the confirmation of this hypothesis can provide support to previous findings stating that power has a negative influence on the intention to walk and cycle (Arroyo et al. 2020; García et al., 2020).

H4: "*Subjective norms have a positive influence on the likelihood of choosing sustainable mobility options.*"

Recalling that subjective norms are the perception of social pressure from significant others to act or behave in a certain manner (Ajzen, 1991; Hagger & Chatzisarantis, 2006), this dissertation proved the influence of these norms in the likelihood of choosing sustainable mobility options in their quantitative and qualitative data ("*Changing the mentality of family members*"; "*Society pressure of "you have to have a car". If the people around me, did it too, encouraging me to adopt that habit.*"; "*Generalization of the adoption of this type of behavior in the population and the people closest to me, with consequent loss of the enormous stigma that is to do anything without a car, at least in medium-sized cities*."). Even though not particularly related to the likelihood of choosing sustainable mobility options, these results corroborate preceding findings where subjective norms were positive and considerably related to the intention to engage in sustainable behaviors in general (Rex et al., 2015). As this investigation has addressed sustainable mobility options as a whole (bicycles and public transports included), results can provide strength to findings that state that subjective norms influence intentions to use public transport (Donald et al., 2014), and provide a contradictory argument for the non-influence of this variable in the future intention of using bicycles (Pojani et al., 2018).

H5: "*Environmental attitudes have a positive influence on the likelihood of choosing sustainable mobility options*"

In previous studies, environmental attitudes have affected positively sustainable consumption and green purchasing intentions (Shatnawi & Chin, 2019; Yong et al., 2017; Onurlubaş, 2019). In this research, although certain

affirmations of the qualitative data indicated that the sample respondents consider that environmental attitudes could contribute for them to adopt more sustainable commuting behaviors: "*Save money and the environment*"; "*Factors associated with health problems due to pollution*"; "*Implement environmental policies according to social contexts*". The quantitative data ultimately proved that environmental attitudes did not influence the likelihood of choosing sustainable behaviors in the context of mobility. By rejecting this hypothesis, these findings can provide support for Farjam et al., (2019) results where it is claimed that environmental attitudes do not influence behaviors where high efforts are required to the individuals, which is the case of changing mobility behaviors. Additionally, an example of the collected qualitative data also gives strength to this argument: "*It would involve a radical change in my life, and in my family's life, for which I am not prepared although I believe it would be quite advantageous in the medium term*."

H6: "*Positive attitudes regarding sustainable mobility options increase the likelihood of choosing them*"

The results of this dissertation have not only confirmed this hypothesis but have also indicated that positive attitudes regarding sustainable mobility options are the strongest predictor of the likelihood of adopting them. These findings corroborate a previous investigation that has considered that positive relations with one mobility mode are the biggest sign to predict future mobility behavior (Pojani et al., 2018). Furthermore, although addressing sustainably mobility modes as a whole, these results can also provide support for Peterson and Simkins', (2019) findings were the creation of a positive attitude with car

sharing is proven to give consumers more reasons for re-using this mode. Qualitative data collected has also referred to positive attitudes as factors contributing to the increased adoption of sustainable mobility modes, for instance, this affirmation addressing feelings of joy: "*Health, freedom, joy, taking care of myself and the planet*.".

Now that the results of the defined hypotheses have been analyzed according to the findings of the literature review, the discussion of the third and fourth specific objectives, which were to evaluate the impact of each of those independent variables on the dependent variable is also finalized. To conclude this chapter, it is only missing to address the fifth and last specific objective, which relates to the qualitative data collected. The main purpose of this last objective was to give voice to respondents and analyze what factors they consider could contribute to their increase in their sustainable mobility choices. Thus, besides the connections with the variables of the model discussed above, relevant insights related to the Portuguese context were brought, namely: the existence of public transportations outside the main urban areas, a better network of transports with a wide range of connections and schedules, more and safer infrastructures for active mobility, price of sustainable mobility options especially electric cars and proliferation of charging places, safe parks for bicycles, incentives for sustainable mobility, awareness and information regarding these options, change of mentalities especially in low-populated areas, and respect from car drivers towards bicycle users.

6. CONCLUSIONS

The elaboration process of this dissertation was focused on the research general and specific objectives defined in the early stages of the investigation. As a general objective, this dissertation aimed to analyze the perceptions of the residents in Portugal regarding sustainable mobility options, to provide a proper response to this main objective, it was necessary to define five specific objectives: (1) evaluate the impact of Covid-19 on mobility choices; (2) describe the profile of the mobility users: personality, lifestyle, and psychographic factors; (3) evaluate the influence of values, environmental attitudes, and attitudes towards sustainable mobility on mobility choices; (4) evaluate the influence of perceived behavior control and subjective norms on mobility choices; (5) analyze what factors consumers consider that could contribute to an increase in their sustainable mobility choices.

To respond to all the specific objectives, a survey was distributed in Portuguese online communities concerned with issues regarding sustainability and sustainable mobility, and, also in groups of people who do not consider these issues daily. The survey included an open question aiming to gather qualitative data that better fit the purpose of the second and fifth objectives.

After analyzing the collected data, it was possible to provide answers to all the defined objectives. Regarding the first specific objective, it was concluded that Covid-19 in Portugal, similar to what happened in other countries, did have a considerable impact on mobility choices. The regular use of car decreased 2,7%, while the use of bicycles increased 5,7% and walking 2,2%. The non-users

of car-sharing modes like uber increased by 19% and the number of non-users of public transports increased by 29,7%. Other sharing modes as rented scooters and bicycles decreased 0,6%, although even before the pandemic only 4,9% of the total sample used these modes, being bicycles the preferred one (4.7%). The fact that most of the users are using sharing modes for planned trips, for instance, to work, can be a positive sign that these modes can replace the car for daily commutes. Results also reveal positive signs regarding the increased usage of active modes in Portugal, although 56,1% of the sample uses car regularly, 31,3% already uses bicycles. The dramatic decrease in public transportation is an issue that still needs to be addressed since besides many respondents claim to have difficulties accessing this mode on the qualitative data, those who can, do not feel safe using this transportation mode during the pandemic.

Concerning the second objective, results show that 31,3% of the sample lives more than 6km away from the city center, as well as 52,9% lives more than 6km away from their study or workplace, factors that have been associated in the literature review with higher car dependency. Although qualitative research frequently mentioned lack of access to public transports, 71,8% of the sample lives less than one 1km away from the nearest transportation service, showing the importance of the frequency of schedules and a wider range of networks frequently referred to in qualitative data. Furthermore, most of the sample have a driving license, a car and uses their car regularly. It was also possible to draw important findings from the qualitative data for this specific objective, having the respondents mentioned frequently aspects related to distance to the workplace and job-related tasks, the existence of sustainable options in their places of

residence, schedules compatibility, safety at nighttime, financial capacity, having to transport children, and available time. Moreover, considering sharing modes, users tend to prefer rented bicycles over scooters, and normally use these options to travel with a purpose, for leisure, one time exclusively to try, for the experience, and on holidays.

Regarding the hypotheses tested, and thus the third and fourth specific objectives, it was concluded that positive attitudes towards sustainable mobility is the most influential variable on the likelihood of choosing sustainable nobility options, followed by subjective norms and perceived behavior control. Although to a small extent, egoistic values negatively impact the likelihood of choosing sustainable mobility options. Moreover, the scales used in this dissertation, applied to sustainable mobility in the context of Portugal indicate that environmental attitudes, altruistic and biospheric values do not impact the likelihood of choosing sustainable mobility options.

Finally, regarding the last specific objective, it is possible to conclude that factors as the existence and improvement of public transports networks and schedules (especially in smaller towns), urban planning that allows safe active mobility and discourages car use, a competitive price for the sustainable mobility options available as well as incentives for their usage, decrease the price of electric cars and proliferation of charging spots, safe parks for bicycles as well as awareness programs that can contribute for the change of car-dependent mentalities and allow more respect towards bicycle users, can, according to the respondents, contribute for their increasing use of sustainable mobility.

Overall, even though cars are the most used mode of transport, residents in Portugal do have positive attitudes regarding sustainable mobility, although especially aspects related to the lack of alternatives that meet their daily necessities, the mentalities of their closed ones, prices, and financial reasons, seem to prevent a more significant use of these options.

6.1. Theoretical and practical contributions

Considering theoretical implications, this study provides a validated instrument to measure the likelihood of choosing sustainable mobility options, especially in a pandemic context, that can be replicated to provide greater evidence of its consistency. Furthermore, as the most influent variables of this research model (attitudes, perceived behavior control, and subjective norms), are part of well-known theories like the theory of planned behavior, and the behavioral reasoning theory (Ajzen, 1991; Westaby, 2005), this dissertation brings additional support to the strong effects of these variables as predictors of consumer behavior. Moreover, the variables used in this research have not been tested before in the particular context of mobility in Portugal, which makes this dissertation a valuable contribution to the literature on mobility and sustainability.

Additionally, as most of the studies in the mobility field are quantitative, combining both quantitative and qualitative data provided a greater in-depth analysis with more solid and comprehensive findings. The richness of using a mixed data analysis has allowed the discovery of new variables that can influence sustainable mobility behavior, such as respect towards bicycle users, the adaptation of mentalities, and willpower.

This dissertation has also made contributions to the call for future research of different authors, namely, to take into consideration users' motivations on shared mobility options (Lempert et al., 2020), to consider potential users' needs in case MaaS will be developed in Portugal (Hoerler et al., 2020), contributing to the suggestion of developing a more in-depth survey on mobility habits in Europe (Colli, 2020), and also to reflect on changes on the willingness of consumers to use share options due to Covid-19 pandemic (Sands et al., 2020). Finally, this research findings contradict previous authors whose results showed an impact of biospheric and altruistic values on different sustainable mobility behaviors (Claudy & Peterson, 2014; Arroyo et al., 2020; Nordlund & Garvill, 2003), and by concluding that residents in Portugal do not consider sustainable mobility options to contribute to money and time savings (Burlando et al., 2019; Eckhardt, 2012; Möhlmann, 2015).

Regarding practical implications, this study provides relevant insights on sustainable mobility for politicians, urban planners, and marketers. Thus, when promoting the path towards zero emissions, these entities should consider the importance that individuals' attitudes towards sustainable mobility options have on consumers' choices and find ways to create a positive connection with sustainable alternatives, like bicycles and public transports. These strategies should also consider the effect of subjective norms by promoting these modes using personalities with whom individuals have positive emotional connections. This will contribute to diminishing the stigma of not using a car, and possibly the negative effects caused by the values of social power and authority. Group discounts for sustainable mobility options could also be an important step since

this can provide incentives for individuals to attract their families and friends to more sustainable commuting behaviors. Moreover, investment in safe infrastructures that encourage active mobility, as well as in broad public transport networks, accessible in small urban areas, with frequent schedules are also essential measures for consumers to adopt more sustainable mobility options. In terms of price and financial stability, it would make sense in the Portuguese context to run information campaigns on sustainable mobility options, and on the real costs of having a car, since as suggested by previous research, users tend to underestimate these costs (Burlando et al., 2019), and in the results of this dissertation, associate higher costs with sustainable options.

7. LIMITATIONS AND FUTURE RESEARCH

After presenting the main conclusions retrieved from the results of this research, it is important to state the main limitations identified so that they can create opportunities for future investigations.

The utilization of a non-probabilistic convenience sample is the first appointed limitation, as the results gathered cannot be extrapolated for the reality of the total research population, which are the residents in Portugal with more than eighteen years old. However, non-probability samples generally allow higher response rates from which is still possible to draw conclusions from a selective part of the population. Thus, especially for exploratory research, this can be a perfectly suitable strategy (Galloway, 2005). Nevertheless, a probabilistic sample, for instance, clustering, is recommended for future studies addressing this topic so the effect of variables, such as residential location can be better generalized and analyzed. Furthermore, this study was not able to prove the impact of the variables analyzed on actual behavior, thus future longitudinal studies can address this particularity.

Although the environmental attitudes have proven to have no effects on the likelihood of choosing sustainability options, future investigations could use scales that measure the effect of specific environmental attitudes, such as recycling, which have proven to have stronger effects on sustainable consumption and green purchasing behavior (Shatnawi & Chin, 2019; Leonidou et al., 2010). Additionally, the impact of another set of values as the ones used by Yin et al., (2018) could be tested in replacement of the Schwartz value frame.

Moreover, upcoming studies could adopt this model to specific modes of sustainable mobility, such as active or sharing modes, as well as including the variable of environmental concerns. Also, future research focused on sharing modes could study with more detail the consumers' motivations for using rental bicycles and scooters, evaluating the impact of the factors found in this dissertation, such as exclusively one-time use just for the experience, and during holidays, in a broader sample.

The differences in the mobility behavior of younger cohorts, identified by many authors during the literature review, Delbosc and Currie, (2013); Garikapati et al., (2016); Lavieri et al., (2017); McDonald, (2015); Bayart et al., (2020); Colli, (2020); Newbold and Scott, (2017), could also be covered by future research regarding the Portuguese context.

Furthermore, it is suggested for future studies addressing mobility in Portugal to cover with more detail the topics raised by the qualitative data of this research, namely price and location effects on opting for sustainable ways of commuting, as well as the respect of car users towards bicycle users, safety, baggage, and weather influences on the adoption of active mobility modes.

Finally, as electric mobility is not yet an option accessible for the majority of the Portuguese population, as proved by the results of the qualitative data, it was not covered in the frame of this research. Although, future studies addressing sustainable mobility in Portugal can include this topic to evaluate if private electric vehicles should be a viable solution for the environmental problems society is facing, without harming social and economic justice.

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Appendices

Preferências de mobilidade

Este questionário faz parte da investigação para uma dissertação de mestrado em Marketing Global, no IPAM Porto, que visa avaliar as perceções dos portugueses quanto a meios de mobilidade sustentável.
Caso tenha mais de 18 anos, gostaria de pedir a sua colaboração, através da resposta ao questionário que se segue.

As suas respostas serão confidenciais, sendo que os dados serão apenas utilizados para fins académicos e estatísticos.

Vamos, então, começar!

*Obrigatório

Hábitos de mobilidade

NOTA: Caso esteja a responder num dispositivo móvel, por favor, considere que deslizando para a esquerda tem acesso à opção "nunca".

Com que frequência utilizou as seguintes formas de deslocação antes da Covid-19? *

	Regularmente	Ocasionalmente	Nunca
Carro próprio	◯	◯	◯
Transportes públicos	◯	◯	◯
Bicicleta própria	◯	◯	◯
Uber ou semelhante	◯	◯	◯
Scooters alugadas através de aplicação móvel	◯	◯	◯
Bicicletas alugadas através de aplicação móvel	◯	◯	◯
A pé	◯	◯	◯

Atualmente, com que frequência utiliza as seguintes formas de deslocação? *

	Regularmente	Ocasionalmente	Nunca
Carro próprio	◯	◯	◯
Transportes públicos	◯	◯	◯
Bicicleta própria	◯	◯	◯
Uber ou semelhante	◯	◯	◯
Scooters alugadas através de aplicação móvel	◯	◯	◯
Bicicletas alugadas através de aplicação móvel	◯	◯	◯
A pé	◯	◯	◯

No caso de já ter utilizado scooters ou bicicletas alugadas através de aplicação móvel, indique o propósito da utilização.

- ◯ Lazer, passeio sem um destino em mente.
- ◯ Viagem pensada com o objetivo de chegar a algum destino específico (trabalho, restaurante, etc...)
- ◯ Outra: _____

Atitudes face a formas de deslocação sustentáveis.

Numa escala de 1 a 7, na qual 1 corresponde a discordo totalmente e 7 a concordo totalmente, avalie as seguintes atitudes quanto a formas de deslocação sustentáveis.
1= discordo totalmente; 2= discordo moderadamente; 3= discordo ligeiramente; 4= não concordo nem discordo; 5= concordo ligeiramente; 6= concordo moderadamente; 7= concordo totalmente.

Deslocar-me de forma sustentável é importante para mim. *

	1	2	3	4	5	6	7	
Discordo totalmente	◯	◯	◯	◯	◯	◯	◯	Concordo totalmente

Deslocar-me de forma sustentável é algo positivo. *

	1	2	3	4	5	6	7	
Discordo totalmente	◯	◯	◯	◯	◯	◯	◯	Concordo totalmente

Deslocar-me de forma sustentável é algo que me faria feliz. *

	1	2	3	4	5	6	7	
Discordo totalmente	◯	◯	◯	◯	◯	◯	◯	Concordo totalmente

Deslocar-me de forma sustentável faz sentido. *

	1	2	3	4	5	6	7	
Discordo totalmente	◯	◯	◯	◯	◯	◯	◯	Concordo totalmente

Utilizar opções de mobilidade sustentáveis é uma forma melhor de me deslocar. *

	1	2	3	4	5	6	7	
Discordo totalmente	◯	◯	◯	◯	◯	◯	◯	Concordo totalmente

É provável que eu escolha uma forma sustentável de viajar da próxima vez que precise de um carro. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

No futuro, eu preferiria uma forma de viajar sustentável em vez de um carro próprio. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

No futuro, é provável que eu escolha uma forma sustentável de viajar em vez de um carro próprio. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Os meus amigos mais próximos pensam que eu deveria deslocar-me de forma sustentável. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Os meus familiares mais próximos pensam que eu deveria deslocar-me de forma sustentável. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

A maior parte das pessoas que são importantes para mim pensam que eu deveria deslocar-me de forma sustentável. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Se eu quisesse, não teria problemas em adotar um comportamento de deslocação sustentável. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Eu tenho total controlo sobre se adoto, ou não, um comportamento de deslocação sustentável. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Depende totalmente de mim se adoto, ou não, um comportamento de deslocação sustentável. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Controlo totalmente

Na sua opinião, que fatores poderiam contribuir para que adotasse mais comportamentos de deslocação sustentável?

A sua resposta

IPAM

Atitudes face ao meio ambiente

Numa escala de 1 a 7, na qual 1 corresponde a discordo totalmente e 7 a concordo totalmente, avalie as seguintes atitudes quanto ao meio ambiente.
1= discordo totalmente; 2= discordo moderadamente; 3= discordo ligeiramente; 4= não concordo nem discordo; 5= concordo ligeiramente; 6= concordo moderadamente; 7= concordo totalmente.

Quando os humanos interferem com a natureza produzem-se, frequentemente, consequências desastrosas. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Apesar das suas capacidades especiais, os humanos ainda estão sujeitos às leis da natureza. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Os humanos não têm o direito de modificar o ambiente natural para o adaptar às suas necessidades. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

As plantas e os animais têm tanto direito quanto os humanos a existir. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

Se as coisas continuarem no seu rumo atual, iremos assistir a uma grave catástrofe ambiental em breve. *

	1	2	3	4	5	6	7	
Discordo totalmente	○	○	○	○	○	○	○	Concordo totalmente

IPAM

Valores pessoais

Numa escala de 1 a 7, na qual 1 corresponde a totalmente insignificante e 7 a totalmente importante, avalie a importância de cada valor na sua vida.
1= extremamente insignificante; 2= moderadamente insignificante; 3= ligeiramente insignificante; 4= não é insignificante, nem é importante; 5= ligeiramente importante; 6= moderadamente importante; 7= extremamente importante.

Igualdade (oportunidades iguais para todos) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Riqueza (posses materiais, dinheiro) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Proteção ambiental (preservar a natureza) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Paz mundial (mundo livre de guerra e conflitos) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Justiça social (corrigir injustiças, proteger os mais fracos) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Solidariedade (contribuir para o bem-estar dos outros) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Influência (ter impacto nas pessoas e eventos) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Respeito pelo planeta *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Autoridade (o direito a liderar ou comandar) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

União com a natureza (relação positiva com a natureza) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Poder social (controlo sobre os outros, domínio) *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

IPAM

Prevenção da poluição *

	1	2	3	4	5	6	7	
Extremamente insignificante	○	○	○	○	○	○	○	Extremamente importante

Dados Sociodemográficos.

Género *

- ○ Feminino
- ○ Masculino
- ○ Outra: _____

Idade *

- ○ Entre 18 e 24 anos
- ○ Entre 25 e 30 anos
- ○ Entre 31 e 40 anos
- ○ Entre 41 e 50 anos
- ○ Entre 51 e 60 anos
- ○ Mais de 60 anos

Qualificações académicas *

- ○ Ensino básico
- ○ Ensino secundário
- ○ Ensino universitário

Situação profissional *

- ○ Estudante
- ○ Trabalhador(a)-estudante
- ○ Trabalhador(a) a part-time
- ○ Trabalhador(a) a full-time
- ○ Desempregado(a)

Distrito de residência *

- ◯ Viana do Castelo
- ◯ Braga
- ◯ Vila Real
- ◯ Bragança
- ◯ Porto
- ◯ Aveiro
- ◯ Viseu
- ◯ Guarda
- ◯ Coimbra
- ◯ Castelo Branco
- ◯ Leiria
- ◯ Lisboa
- ◯ Santarém
- ◯ Portalegre
- ◯ Évora
- ◯ Setúbal
- ◯ Beja
- ◯ Faro

Quão longe mora do centro da cidade? *

- ◯ A menos de 1km
- ◯ Entre 1 a 3 km
- ◯ Entre 3 a 5 km
- ◯ A mais de 6 km

Quão longe mora do seu local de trabalho/estudo?

- ◯ A menos de 1km
- ◯ Entre 1 a 3 km
- ◯ Entre 3 a 5 km
- ◯ A mais de 6 km

Distrito de residência *

- ◯ Viana do Castelo
- ◯ Braga
- ◯ Vila Real
- ◯ Bragança
- ◯ Porto
- ◯ Aveiro
- ◯ Viseu

Quão longe mora do serviço de transportes públicos mais próximo de si? *

- ◯ A menos de 1 km
- ◯ Entre 1 a 3 km
- ◯ Entre 3 a 5 km
- ◯ A mais de 6 km

Tem carta de condução? *

- ◯ Sim
- ◯ Não

Tem carro? *

- ◯ Sim
- ◯ Não

Tem filhos(as)? *

- ◯ Sim
- ◯ Não

Número de pessoas no agregado familiar. *

- ◯ 1
- ◯ 2
- ◯ Entre 3 a 5
- ◯ Mais do que 5

Tem crianças no agregado familiar? *

- ◯ Sim
- ◯ Não

Depende de alguém para deslocações (escola, trabalho, outro?) *

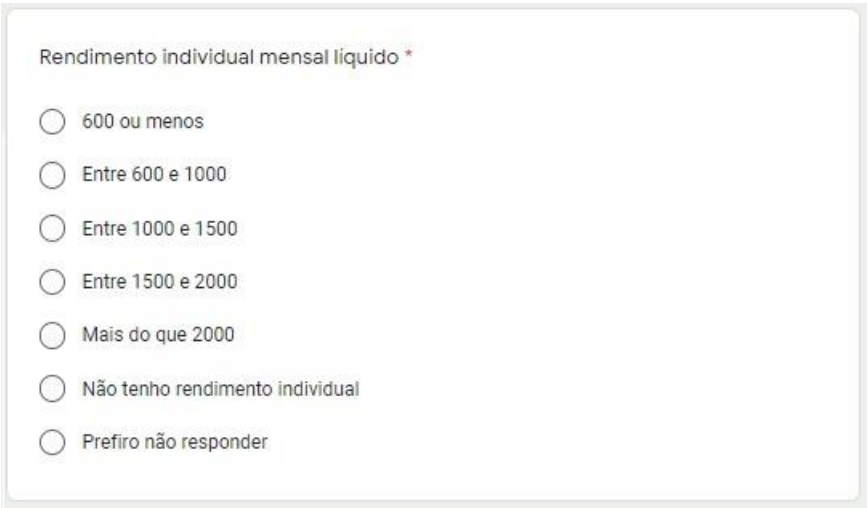
- ◯ Sim
- ◯ Não

Existe algum membro do seu agregado familiar que dependa de si para deslocações (escola, trabalho, outro)? *

- ◯ Sim
- ◯ Não

Estado civil *

- ◯ Solteiro(a)
- ◯ Casado(a)/União de facto
- ◯ Divorciado(a)/Separado(a)
- ◯ Viúvo(a)



Appendix 1: Questionnaire

Gender	Frequency (n)	Percentage (%)
Feminine	355	55,0
Masculine	289	44,8
Non-binary	1	,2
Total	645	100,0
Age	**Frequency (n)**	**Percentage (%)**
Between 18 and 24	164	25,4
Between 25 and 30	121	18,8
Between 31 and 40	103	16,0
Between 41 and 50	149	23,1
Between 51 and 60	78	12,1
Above 60	30	4,7
Total	645	100,0
Education	**Frequency (n)**	**Percentage (%)**
Basic education	4	,6
Secondary education	106	16,4
Higher education	535	82,9
Total	645	100,0
Professional situation	**Frequency (n)**	**Percentage (%)**
Student	105	16,3
Working student	69	10,7
Part-time worker	29	4,5
Full-time worker	395	61,2
Unemployed	47	7,3
Total	645	100,0
District of Residence	**Frequency (n)**	**Percentage (%)**
Viana do Castelo	10	1,6
Braga	33	5,1
Vila Real	31	4,8
Bragança	5	0,8
Porto	259	40,2
Aveiro	34	5,3
Viseu	5	0,8
Guarda	10	1,6
Coimbra	12	1,9
Castelo Branco	2	0,3
Leiria	10	1,6
Lisboa	174	27,0
Santarém	5	0,8
Portalegre	1	0,2
Évora	2	0,3
Setúbal	25	3,9
Beja	2	0,3
Faro	25	3,9
Total	645	100,0
Children	**Frequency (n)**	**Percentage (%)**
Yes	255	39,5
No	390	60,5
Total	645	100,0
Householdsize	**Frequency (n)**	**Percentage (%)**
1	102	15,8
2	159	24,7
Between 3 and 5	373	57,8
More than 5	11	1,7

Total	645	100,0
Children in the household	**Frequency (n)**	**Percentage (%)**
Yes	197	30,5
No	448	69,5
Total	645	100,0
Marital Status	**Frequency (n)**	**Percentage (%)**
Single	345	53,5
Married/ non-marital partnership	249	38,6
Divorced/separated	47	7,3
Widower	4	0,6
Total	645	100,0
Individual monthly income	**Frequency (n)**	**Percentage (%)**
Less than 600	57	8,8
Between 600 and 1000	160	24,8
Between 1000 and 1500	150	23,3
Between 1500 and 2000	93	14,4
More than 2000	52	8,1
Without individual income	90	14,0
I rather not reply	43	6,7
Total	645	100,0

Appendix 2: Complete sociodemographic characterization of the sample