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## What Drives You? A Q-Methodological Approach to Understanding People's Mobility Preferences

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# Affidavit

I hereby declare that I have authored this master thesis independently, and that I have not used any assistance other than that which is permitted. The work contained herein is my own except where explicitly stated otherwise. All ideas taken in wording or in basic content from unpublished sources or from published literature are duly identified and cited, and the precise references included.

I further declare that this master's thesis has not been submitted, in whole or in part, in the same or a similar form, to any other educational institution as part of the requirements for an academic degree.

I hereby confirm that I am familiar with the standards of Scientific Integrity and with the guidelines of Good Scientific Practice, and that this work fully complies with these standards and guidelines.

Wien, 12.09.2022

Michael Peter HINTERREITER (*manu propria*)

# Preface

The research presented in this master's thesis was conducted in the framework of the project "Sustainable mobility behaviour from niche to norm (NTN)".

# Acknowledgments

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# Abstract

Previous efforts by policymakers and scientists to reduce motorized private transport in favor of active forms of mobility, such as walking and cycling, have often been unsuccessful. This master's thesis, therefore, investigated (i) which socio-psychological variables influence people's mobility behavior and (ii) how the obtained insights may be used in a Q-methodological approach to identify inner-city mobility profiles. In a first step, established behavioral psychological models served as a theoretical framework for an extensive literature review. The multitude of socio-psychological variables discussed in mobility research was then transformed into a comprehensive list of 45 statements regarding inner-city mobility behavior—the so-called Q-sample. During guided, individual interviews, 39 residents of three Lower Austrian cities (Fischamend, Korneuburg, and Stockerau) sorted the statements according to their subjective agreement. The resulting distributions (Q-Sorts) were statistically analyzed, which yielded five mobility profiles with distinct preferences and needs concerning inner-city mobility: *"Healthy and Conscious"*, *"Purpose-Driven and Pragmatic"*, *"Flexible and Contemplative"*, *"Safe and Cautious"*, and *"Efficient and Autonomous"*. The results confirm the assumption that common segmentations based on sociodemographic characteristics or preferred means of transport fail to adequately depict the complexity of mobility as a psychological phenomenon. Moreover, the Q-methodological approach pursued in the master's thesis allowed for deriving initial target-group-specific interventions that may contribute to an effective, sustainable inner-city mobility transformation.

## Kurzfassung

Bemühungen von Politik und Wissenschaft, den motorisierten Individualverkehr zugunsten aktiver Mobilitätsformen wie Zufußgehen und Radfahren zu reduzieren, blieben in der Vergangenheit oft erfolglos. Im Rahmen der vorliegenden Masterarbeit wurde daher untersucht, (i) welche sozialpsychologischen Variablen das Mobilitätsverhalten beeinflussen und (ii) wie daraus mithilfe der Q-Methode innerstädtische Mobilitätsprofile identifiziert werden können. Etablierte verhaltenspsychologische Modelle dienten in einem ersten Schritt als theoretisches Grundgerüst für eine umfassende Literaturrecherche. Die Vielzahl an in der Mobilitätsforschung diskutierten sozialpsychologischen Variablen konnte so zusammengefasst und in eine Liste von 45 Aussagen zum innerstädtischen Mobilitätsverhalten – das sogenannte Q-Sample – überführt werden. In leitfadengestützten Einzelinterviews sortierten 39 Bewohner:innen dreier niederösterreichischer Gemeinden (Fischamend, Korneuburg und Stockerau) die Aussagen nach ihrer subjektiven Zustimmung. Die dabei entstandenen Verteilungen (Q-Sorts) wurden einer statistischen Analyse unterzogen, aus der sich fünf Mobilitätsprofile mit distinkten Präferenzen und Bedürfnissen zum Thema Mobilität ergaben: *„gesund und bewusst“*, *„zweckgebunden und pragmatisch“*, *„flexibel und reflektiert“*, *„sicher und bedacht“* sowie *„effizient und autonom“*. Die Ergebnisse bestätigen, dass frühere Segmentierungen anhand soziodemographischer Merkmale oder bevorzugter Verkehrsmittel die Komplexität von Mobilität als psychologisches Phänomen nur unzureichend abbilden können. Durch den in der Masterarbeit verfolgten, Q-methodologischen Ansatz konnten überdies erste zielgruppenspezifische Interventionen abgeleitet werden, die zu einer effektiven, nachhaltigen Mobilitätstransformation in Städten beitragen sollen.



# 1. Introduction

Climate change, with all its accompanying negative environmental and societal effects, remains one of the most pressing global issues to date (IPCC, 2022). Hence, mitigation of climate-relevant greenhouse gases is a high priority of and within the European Union, aiming to become climate-neutral by 2050 (Cifuentes-Faura, 2022). These ambitious efforts, however, require mitigation across all sectors of society.

Among the biggest polluters in terms of greenhouse gases—globally (Ritchie et al., 2020) as well as in Austria (Umweltbundesamt, 2021)—is the transport sector. Nationwide, measures to reduce mobility-related emissions have apparently been ineffective, with the transport sector continuously exceeding mitigation goals over the last few years (BMK, 2021). Passenger cars alone account for around two-thirds of total greenhouse gas emissions in Austria's transport sector (BMK, 2021). In many places, technological progress in terms of fuel efficiency has been outweighed by an increase in mileage and motorization rate (González et al., 2019).

The large-scale implications of a system too reliant on private-car-based mobility are, however, just one aspect of a multifaceted problem. First, apart from greenhouse gases, locally, air pollution from combustion engines as well as road, tire, and brake wear particles causes further concern (Brand and Hunt, 2018). Evidence suggests, that in 2015 alone, globally, 7.8 million years of human life were lost due to transport-related emissions, causing about 1 trillion U.S. dollars' worth of damages, with European cities ranking highest among deaths caused by transport-related air pollution (Anenberg et al., 2019). In the face of the ongoing COVID-19-pandemic, these numbers become even more troublesome considering that exposure to air pollution was found to increase mortality of SARS-CoV-2 infections (Hutter et al., 2020).

Second, previous research showed that the average European car spends just a tiny fraction of its lifetime in motion. It is estimated that, on average, 92-95 % of the time cars remain parked and are not moved (Barter, 2013; Nagler, 2021; Schulze, 2016). Considering that a parked car takes up about ten times more space than a bicycle—a difference that becomes even more pronounced when the car is not parked but moves at high speed—private car usage not only raises questions in terms of efficiency but also poses a major challenge for city and traffic planning (Gössling, 2020).

Third, drivers of passenger cars are a potential threat to other road users (as well as themselves). Data accumulated by Statistik Austria (2022a) reveals that cars caused more than 17,000 road accidents in Austria in 2021, which amounts to over half of all accidents recorded in this period.

With active forms of mobility, such as cycling and walking, as well as public transport (PT), viable alternatives to private cars are—at least in theory—available (Nordfjærn et al., 2016). While national and local governments have put considerable effort into promoting these types of mobility, their adoption has mostly lacked behind expectations and levels needed to reach sectoral emission targets (Markvica et al., 2020). Bamberg et al. (2020) and Bamberg and Rees (2017) suggest that this problem stems from a lack of knowledge about what exactly constitutes people's mobility behavior. Indeed, for a long time, mobility research has focused on instrumental-reasoned motives as primary determinants of mobility choices (Steg et al., 2001).

This rather simplified approach led policymakers to believe that infrastructural and economic measures were sufficient motivators for people to adapt their mobility behavior (Sarrica et al., 2019). Thereby, the significant importance of other socio-psychological factors contributing to people's mobility preferences has largely been disregarded (e.g., Passafaro et al., 2019).

To this end, psychological and behavioral sciences provide a wide range of models to explain the formation of behavior based on said socio-psychological factors, such as norms, attitudes, and intentions (Busch-Geertsema et al., 2016). The proposed theories range from rational choice models (Morris, 2012), like Ajzen's (1991) Theory of Planned Behavior (TPB), to ones specifically geared towards altruism, like Schwartz's (1977) Norm Activation Model (NAM).

More recent mobility studies operationalized these behavioral theories to gain a better understanding of the socio-psychological underpinnings of people's mobility behavior. For example, Donald et al. (2014) utilized an extended model of TPB to compare what factors made commuters in England prefer cars over PT and vice versa. Similarly, Zorrilla et al. (2019) used an extended version of TPB to assess socio-psychological variables positively contributing to the intention to commute by bicycle, specifically among infrequent and non-cyclists. Jakovcevic and Steg (2013) confirmed that the concept and elements of NAM help to explain mobility behavior in Latin American countries. Consequently, this theory-guided research uncovered a large number of socio-psychological variables possibly influencing people's mobility preferences, ranging from attitudes (e.g., Hoffmann et al., 2020) to personal norms (e.g., Jakovcevic and Steg, 2013), habits (e.g., Passafaro et al., 2014), and many more.

With such a plethora of aspects to consider, some researchers aimed to reduce complexity by creating mobility typologies and, thus, identifying vantage points for target-group-specific behavioral interventions. Segments of people sharing similar viewpoints are grouped based on common characteristics (Anable, 2005). For example, van Exel et al. (2011) uncovered four viewpoints on medium-distance travel in the Netherlands, distinguished by how intensely they pondered their mobility choices, what alternative modes they were aware of and considered, and what motives they were influenced by. Anable (2005) found that distinct groups of people could be identified, differing in their psychological attachment to the mode of transport, perceived responsibility for the environment, perceived behavioral control, actual control, age, and income. Such segmentation approaches substantiated the assumption that people with similar sociodemographic characteristics may vary in their mobility behavior (Haselsteiner et al., 2020) and that people often have differing motives for using the same mode of transport (Anable, 2005).

While these studies helped to better understand why people prefer one transport mode over another, none of them investigated which socio-psychological patterns play which role in establishing daily, inner-city mobility preferences, irrespective of transport mode choice. Further study of this topic is paramount for identifying why some people choose alternative modes to the car for their inner-city trips, and, thus, why previous policy interventions might have been ineffective. Therefore, this thesis addresses these knowledge gaps by exploring the following two research questions:

1. *“Which socio-psychological variables influence people's everyday mobility behavior?”*

2. “Which inner-city mobility profiles can be identified using a Q-methodological approach?”

To answer the first question, a systematic literature review is conducted. Three models and their frameworks are introduced to understand and disentangle the formation of behavior. Then, for each of the models’ components, findings of previous mobility research are collected. This process results in a comprehensive overview of socio-psychological variables identified as potentially having an impact on the formation of mobility behavior.

Simultaneously, these findings contribute to defining the discourse of the topic, which lays the foundation for applying Q-methodology and, thus, answering the second research question. As a “qualiquantological” approach, Q-methodology aims to identify shared viewpoints among participants (Brown, 1980). In the case at hand, the method will yield distinct inner-city mobility profiles, reflecting different mobility preferences. The uncovered socio-psychological variables will guide the development of a structured Q-sample: a list of statements about a topic to be sorted by participants to reveal shared viewpoints about inner-city mobility.

It is important to note that this study focuses solely on daily trips within a city that fulfill a certain purpose. It is assumed that these trips can theoretically be conducted by all transport modes available, of which people choose one based on their preferences. For all trips that go beyond the borders of a respective city, such as commuting to work, only those parts that are actually traveled within the city are part of the scope of this research. Additionally, mobility for the sake of mobility, i.e., cycling or running as a hobby, as well as simply going for a walk, is not relevant for the frame of analysis.

For the empirical part of the study, three cities in Lower Austria, namely, Fischamend, Korneuburg, and Stockerau, were selected. While Lower Austria exhibits a high reliance on motorized individual transport (Amt der NÖ Landesregierung, 2020; Statistik Austria, 2022b), the cities’ governments pledged to take countermeasures by promoting low-carbon mobility alternatives (Stadtgemeinde Fischamend, s.a.; Stadtgemeinde Korneuburg, 2020; Stadtgemeinde Stockerau, 2021). Additionally, the three cities share similar characteristics, which allows for uncovering comparable viewpoints (Amt der NÖ Landesregierung, 2022a, 2022b, 2022c).

The following chapter begins with a definition of the term mobility and introduces three established behavioral models. The frameworks and socio-psychological patterns of these models are then explained and guide the systematic literature review, identifying a range of variables constituting mobility behavior. In chapter 3, the Q-methodological approach—in theory as well as its specific application in the practical part of this thesis—is presented in detail. Chapter 4 then provides an overview of the results, including a detailed description of the uncovered mobility profiles. These results are discussed in chapter 5 and juxtaposed with the findings of previous mobility research, including how the results can be interpreted in the context of the presented behavioral theories. Eventually, chapter 6 deduces policy implications based on the similarities and differences of the extracted mobility profiles, before a conclusion rounds off this thesis.

## 2. Mobility Behavior

The term mobility refers not solely to the physical and spatial act of moving from one location to another but also to a highly complex social behavior (Schlaiffer et al., 2002). Mobility simultaneously entails people's desires and needs to move through space as well as the ways and alternatives available to do so (Bartz, 2015). In the case of this thesis, the research focuses on everyday physical mobility—comprised of short-term and routine trips (Bartz, 2015)—and its associated behavioral aspects.

A recurring theme in mobility research is the notion that previous literature has put disproportionate attention on instrumental-reasoned motives as predictors of mobility behavior, thereby assuming that transport mode choices are solely formed by rational deliberations (e.g., Anable, 2005; Bartz, 2015; Busch-Geertsema et al., 2016; Passafaro et al., 2014; Steg, 2005; Steg et al., 2001). These rather economic approaches, however, portray individuals merely as utility-maximizers, neglecting other socio-psychological variables possibly influencing travel behavior (e.g., Schlaiffer et al., 2002). To address this shortcoming, more recent studies have developed and applied a variety of behavioral theories to introduce new psychological concepts into this field of interest. Consequently, research has, over time, accumulated knowledge about what variables potentially influence people's mobility behavior.

This chapter introduces established theories developed to describe the formation of behavior, which have also been widely used in mobility research. Two theories frequently applied to explain (mobility) behavior are TPB and NAM, or variations of the same (Chng et al., 2018). While TPB considers behavior as a result of the interplay between attitudes, perceived behavioral control (PBC), and subjective (i.e., social) norms, NAM seeks to shed light on the moral aspect of behavior (Bamberg, 2013; Schlaiffer et al., 2002). Hence, it stands to reason to synthesize these concepts to create a more comprehensive model containing a wider range of socio-psychological factors. With the Comprehensive Action Determination Model (CADM), Klöckner and Blöbaum (2010) have developed such a model by combining and extending the concepts of TPB and NAM, thus creating a holistic perspective on the complex phenomenon of mobility behavior.

The following subchapters introduce CADM in detail, beginning with a short description of its underlying theories and their respective elements. First, Ajzen's (1991) TPB and Schwartz's (1977) NAM are presented. Then, Klöckner and Blöbaum's (2010) CADM, accounting for further behavioral aspects, is introduced. Against this theoretical backdrop findings of previous studies on mobility behavior regarding the elements of CADM are presented, thereby answering the first research question: *“Which socio-psychological variables influence people's everyday mobility behavior?”* At the same time, this process builds the foundation for the empirical part of this thesis, as it allows for the development of a structured Q-sample (see [chapter 3.2](#)).

## 2.1. Theory of Planned Behavior (TPB)

Ajzen's (1991) Theory of Planned Behavior is commonly applied in scientific research and used to explain a wide variety of human behaviors (Ulker-Demirel and Ciftci, 2020). Consequently, TPB has also provided the theoretical background for a wide range of studies related to mobility behavior (Chng et al., 2018).

TPB postulates that intention, i.e., people's motivation and willingness to perform a certain behavior, is a reliable predictor of behavior: the higher the intention to perform a certain behavior, the more probable its actual performance (Ajzen, 1991). In turn, intentions themselves are composed of and influenced by three elements: attitudes, subjective norms, and PBC (Ajzen, 1991).

Attitudes are a result of the behavioral beliefs held by an individual and form based on the subjective assessment of a certain behavior as well as its predicted outcomes (Anable, 2005; Morris, 2012). An interplay of all behavioral beliefs relevant to a certain behavior determines whether an individual deems its performance (un)favorable (Ajzen, 2020).

Subjective or social norms—as they are sometimes called (Bamberg et al., 2020)—entail the phenomena of descriptive and injunctive norms (Ajzen, 2020). Cialdini et al. (1991) refer to descriptive norms as the norms of “*ought*” and to descriptive ones as the norms of “*is*”. In other words, an individual holds descriptive normative beliefs about how peers behave and injunctive normative beliefs about whether peers would agree with a certain behavior (Ajzen, 2020). Hence subjective norms may be subsumed as the perceived social pressure of (not) performing a certain behavior.

PBC is defined as an individual's assessment of the feasibility of performing a certain behavior (Morris, 2012). According to Ajzen (2020), a wide range of control beliefs regarding a certain behavior are essential to whether a person perceives its performance to be easy or difficult. PBC, however, is not only a constituent of intention but also directly influences behavioral achievement (Ajzen, 1991). PBC affects an individual's motivation to act and, if their perceptions are accurate, their ability to act is constrained by the actual personal skills and resources available (Ajzen, 2020). Simply put, subjective assumptions about the personal resources and difficulty of a certain behavior constrain its performance, even if the motivation to act is high.

Figure 1 illustrates the main structure of TPB and the relation of its components. Findings of previous mobility research on the importance of each of the elements are presented in [chapter 2.4](#).

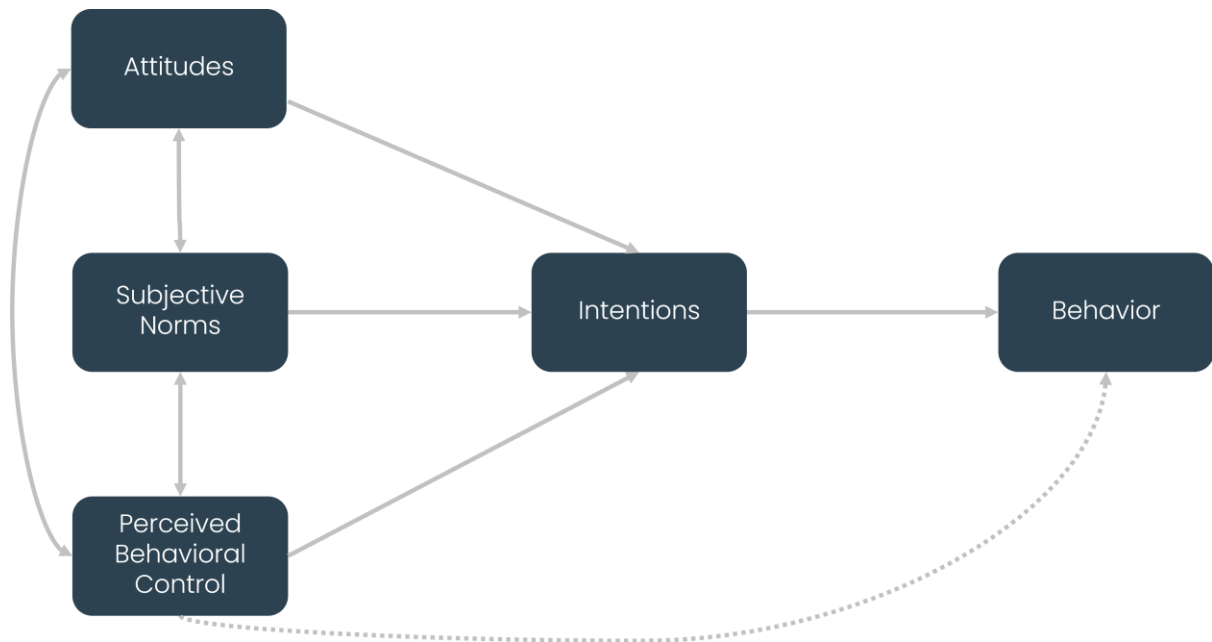


Figure 1: Theory of Planned Behavior (Ajzen, 1991)

## 2.2. Norm Activation Model (NAM)

The origin of NAM goes back to the observation that people sometimes behave altruistically, even in the absence of financial or other incentives (Schwartz, 1977). In such cases, individuals cannot be regarded solely as utility-maximizers, and, consequently, the explanatory power of rational choice models, such as TPB (Turaga et al., 2010), decreases (Schlaiffer et al., 2002). To improve understanding of prosocial behavior, Schwartz (1977) identified the stages of activation, obligation, defense, and response as essential in the development of altruistic intentions. From these stages, the central elements of NAM, namely, awareness of need (AN), awareness of consequences (AC), ascription of responsibility (AR), and activation of personal norms (PN) can be deduced (Busch-Geertsema et al., 2016).

AN, represents the starting point for altruistic behavior, as an individual's attention must be drawn to the fact that someone or something needs help in the first place (Blamey, 1998). Simultaneously, an individual must also be aware that their (in)action might have consequences on the person or object in need (AC; Blamey 1998). In some cases, researchers consolidate AN and AC: For example, de Groot and Steg (2009, p. 426) do not regard AN and AC as separate concepts, but rather define AC *“as whether someone is aware of the negative consequences for others or for other things one values when not acting prosocially.”* Similarly, de Groot and Steg (2009) introduced the term problem awareness, which includes aspects of both, AC and AN.

AR<sup>1</sup> accounts for the fact that prosocial behavior also depends on whether or not an individual feels responsible for their actions and their outcomes (Mehdizadeh et al., 2019). However, for AR to arise, an individual must believe they are capable of alleviating the need of a person or an object (De Groot and Steg, 2009). Hence, some researchers applying and operationalizing NAM have introduced an element similar to PBC into the framework, either in addition to or instead of AR (Klößner and Blöbaum, 2010; Steg and de Groot, 2010).

As opposed to subjective or social norms proposed in TPB, NAM focuses on the concept of PN. Schwartz and Howard (1984, p. 234) define PN as *“feelings of moral obligation to perform or refrain from specific action.”* While PN may be considered as social norms that have at some point been internalized (Klößner and Matthies, 2004), they clearly emphasize an individual’s self-expectation rather than his or her relation to specific reference groups (Busch-Geertsema et al., 2016; Schwartz, 1977).

Seeing as Schwartz and Howard never explicitly conceptualized the structure of NAM, different iterations of the theory have been created and applied in research (Busch-Geertsema et al., 2016)<sup>2</sup>. Over time, however, a so-called mediator model (see Figure 2) has proven successful in the analysis of prosocial behavior (De Groot and Steg, 2009). In simplified terms, the mediator model states that prosocial behavior is initiated by an individual realizing that their actions affect others or, e.g., the environment (AC; De Groot and Steg, 2009). They then assume accountability for the resulting outcomes (AR), which, in turn, activates a feeling of moral commitment (PN) to act more altruistically (Bamberg, 2013; De Groot and Steg, 2009).

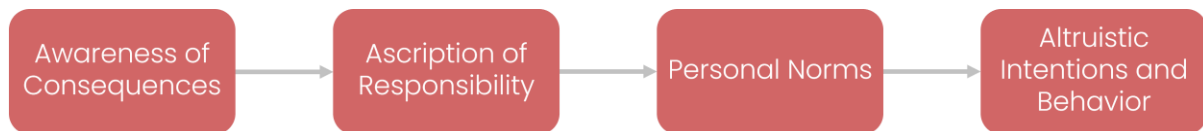


Figure 2: Mediator version of the Norm Activation Model (De Groot and Steg 2019)

Since sustainable mobility can be regarded as altruistic or prosocial behavior (Liu et al., 2017; Mehdizadeh et al., 2019; Steg and de Groot, 2010), some of the research in this area has been conducted drawing on NAM as a theoretical framework (Busch-Geertsema et al., 2016). Findings about the influence of the three central elements of the mediator model (AC, AR, and PN) on mobility behavior are presented in [chapter 2.4](#).

## 2.3. Comprehensive Action Determination Model (CADM)

TPB and NAM have individually proven successful in—at least partially—explaining transport mode choices and mobility behavior (Klößner and Blöbaum, 2010). Since elements of both

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<sup>1</sup> In his later works, Schwartz (1977) rebranded AR as responsibility denial to stress the defensive nature of denying responsibility. However, in most of the research reviewed for this thesis, the term AR has been used rather than responsibility denial.

<sup>2</sup> This lack of a structured framework might explain why not all researchers consider all elements of NAM, namely, AN, AC, AR, and PN, in their studies.



theories provide important insights into the formation of behavior, it has frequently been suggested to synthesize TPB and NAM to create a model with higher explanatory power (e.g., Bamberg, 2013). Klöckner and Blöbaum's (2010) Comprehensive Action Determination Model (CADM), which has been developed in the context of sustainable transport mode choices, represents such a model, drawing on all components of TPB and NAM, as well as expanding them by additional behavioral elements.

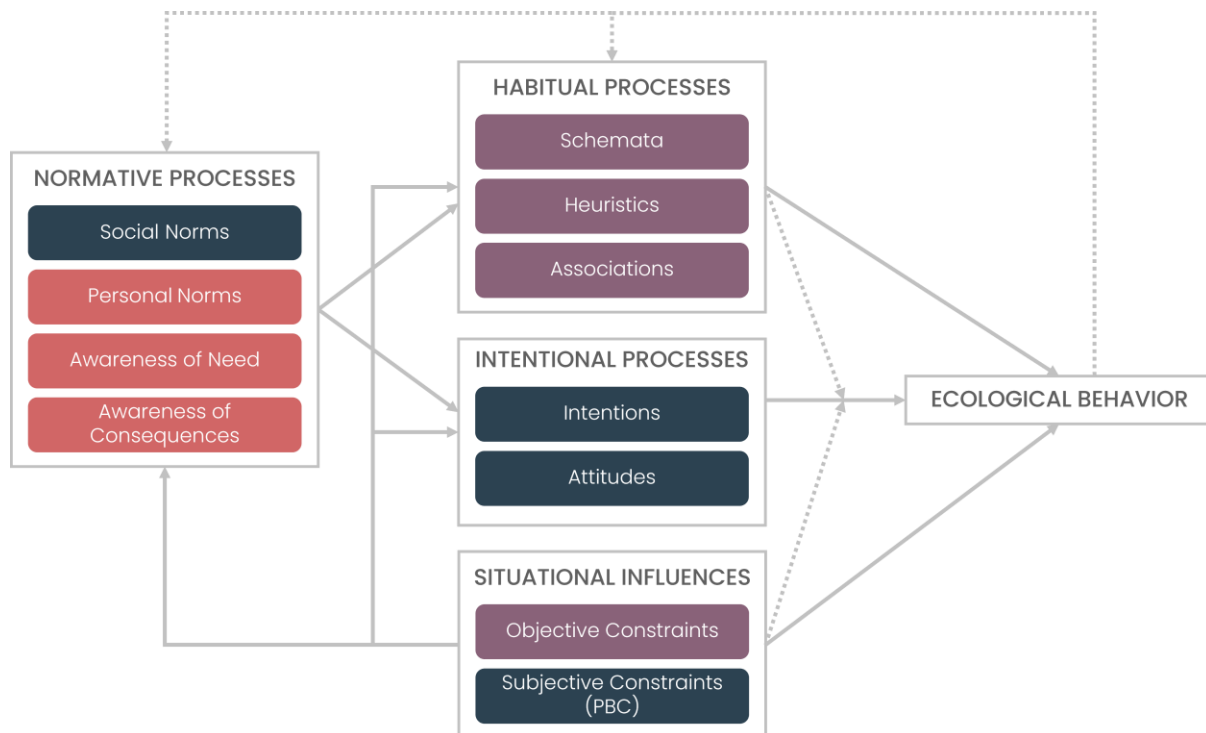
According to Klöckner and Blöbaum (2010), two main influences on behavior largely neglected by TPB and NAM are habits as well as objective constraints. It has been theorized—and empirically substantiated—that habits influence the formation of behavior, as individuals are less likely to reflect on a certain behavior, the more often it is performed with a desirable outcome (Klöckner and Blöbaum, 2010). Additionally, drawing on the ipsative behavioral theory, situational circumstances influence behavior not only in the form of subjective constraints (i.e., PBC) but also in the form of objective ones (Klöckner and Blöbaum, 2010). CADM, therefore, includes habits<sup>3</sup> and objective constraints in its framework.

Figure 3 depicts CADM as proposed by (Klöckner and Blöbaum, 2010). It can be seen that, in line with TPB, intentional processes, along with situational influences, directly contribute to the formation of ecological behavior, with habits as an additional direct predictor variable (Ofstad et al., 2017). Normative processes as antecedents of habits, attitudes, and intentions take on a more subtle role than in TPB and NAM (Klöckner and Blöbaum, 2010; Ofstad et al., 2017). It is further assumed that situational influences may affect all other processes. Finally, the resulting ecological behavior itself can cause a feedback loop that influences the formation of habits and the process of norm activation (Klöckner and Blöbaum, 2010).

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<sup>3</sup> The three components of the habitual processes as depicted in CADM are not further explicated by Klöckner and Blöbaum (2010, p. 576), since, "Some of these complex relations cannot be analysed with data from a single point in time, but require longitudinal data."





\*The colors of the elements highlight their origin: Blue boxes refer to components of TPB, red boxes to components of NAM, and purple boxes represent aspects introduced by Klöckner and Blöbaum (2010).

Figure 3: Klöckner and Blöbaum's (2010) Comprehensive Action Determination Model

## 2.4. Findings of Previous Mobility Research

After this overview of three established theories explaining the formation of behavior, the next subchapters present empirical evidence on the importance of each of their behavioral elements. The structure follows the design of the CADM model, starting with the normative processes.

### 2.4.1. Normative Processes

**Subjective or social norms** consist of people's assumptions about how a specific behavior is perceived by their peers (injunctive norms) and whether these peers perform a certain behavior themselves (descriptive norms). To account for subjective norms, studies operationalizing TPB or related theories, therefore, contain items like *"People that are important to me, want me to commute by bicycle"* (Zorrilla et al., 2019, p. 332) or *"Most people I know drive to work"* (Donald et al., 2014, p. 42).

In a study conducted in Rotterdam, Steg (2005) found that subjective norms and social comparisons rather than instrumental motives played a significant role in explaining commuting behavior. That is, participants stated to be more likely to use their car if their co-workers did so and if their family expected them to drive to work by car (Steg, 2005). According to Donald et al. (2014), the importance of subjective norms for shaping the

commuting behavior of British citizens depended on their eventual transport mode choice: While injunctive norms directly influenced intentions of commuting by cars as well as PT, descriptive norms only affected the use of PT indirectly via intentions as a mediator.

Previous research has not yet provided a definitive answer on whether cars as a status symbol influence mobility behavior. In a segmentation approach, Anable (2005) identified so-called “*Die Hard Drivers*” who exhibited a high attachment to their car and believed in being trendsetters. However, in two separate Q-methodological studies, performed in Belgium and the Netherlands respectively, neither Cools et al. (2009) nor van Exel et al. (2011) found evidence that any of their uncovered mobility profiles regarded the car as a status symbol.

Results of the evaluation of a nationwide competition aiming to promote cycling in Austria showed that the descriptive norm, “*Cycling is something that most of my friends do in everyday life,*” contributed positively to cycling behavior and increased the probability that existing participants would also take part in the program the following year (Gangl et al., 2021). While Zorrilla et al. (2019) did not find evidence for an influence of subjective norms on the intention to commute by bicycle among infrequent and non-cyclists in Mexico City, the authors discovered that a lot of respondents still thought they would appear as economically disadvantaged if they cycled. Similarly, Xing et al. (2018) analyzed data from a survey conducted across six small cities in the United States and discovered that a negative perception of cyclists (as a social group) deteriorated participants’ affection toward cycling (Xing et al., 2018). This finding is supported by Spotswood et al. (2015), who, in a reassessment of qualitative interviews conducted in the UK, found that cycling was not considered an ordinary behavior by many respondents, stating they felt irritated by cyclists and embarrassed when cycling themselves. Dill and McNeil (2013) evaluated the differences in the perception of cycling among groups of people in Portland, Oregon, based on a preexisting typology of cyclists. They revealed that non-cyclists and recreational cyclists were less likely to live or work with people who used the bicycle for routine trips (Dill and McNeil, 2013).

As mentioned above, there is some conceptual overlap between the components of NAM, specifically in the case of AN and AC. The majority of the studies reviewed for this thesis applying NAM, however, draw on some form of the mediator model, which omits AN and only accounts for AC<sup>4</sup>. Accordingly, the following section only implicitly addresses AN when the findings on the importance of AC for the formation of mobility behavior are presented.

Moreover, since NAM was intentionally developed to improve understanding of prosocial or altruistic behavior (Schwartz, 1977), the question arises, who or what the person or object “*in need*” is in the context of mobility behavior. Many of the studies analyzed for this thesis—including those not specifically applying NAM as a framework—accounted for some measure of environmental consciousness. Thus, it stands to reason that altruism in terms of mobility is

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<sup>4</sup> The reasons, as to why AN is omitted in these studies, is not specified. One possible explanation might be the fact that a person must be aware of a problem (AN) in the first place, to then be aware of the consequences of their actions (AC). Hence, AN may be regarded as an antecedent of AC. Another reason might be that, in case of surveys or interviews, it may be hard for participants to draw the line between the two concepts.

commonly regarded as any behavior reducing an individual's impact on the environment (Liu et al., 2017).

For instance, to assess people's AC regarding car use, De Groot and Steg (2009, p. 433) asked participants to indicate whether they agreed with statements like "*Car use causes exhaustion of scarce resources, such as oil.*" Likewise, to explain sustainable travel choices in China, Liu et al. (2017) incorporated four statements about the negative consequences of car use into a survey, estimating participants' AC.

Previous research suggests that many people are already aware of the negative impact of cars and their emissions on the environment and climate (or the positive contribution of using active transport modes). For example, in Steg's (2001) study, participants rated adverse environmental effects as the second most unattractive aspect of car use. Seeing as the sample only consisted of people possessing driver's licenses (Steg et al., 2001), AC might be even more pronounced among the general population. Moreover, about 90 % of cyclists believe that cycling contributes positively to the environment (Spotswood et al., 2015). Similarly, the statement, "*Cycling commuting is beneficial for the local environment,*" received the highest mean approval score among all variables in a survey conducted by Zorrilla et al. (2019, p. 332). The fact that environmental awareness has penetrated large parts of society has also been substantiated by Cools et al. (2009), who identified a consensus about the importance of environmental aspects across different viewpoints on mobility.

However, other findings suggest that high levels of AC may not be universal. For example, Ramos et al. (2020) found that AC of car use was pronounced among their study's participants but only in the context of commuting behavior. Additionally, and in contrast to Cools et al.'s mobility typology, Anable (2005) highlighted AC as one of the aspects distinguishing so-called "*Complacent Car Addicts*" from a group termed "*Die Hard Drivers*". While the former denied any impact of car use on the environment, the latter was at least aware of the consequences of their behavior (Anable, 2005). Similarly, van Exel et al. (2011) and Rajé (2007) each discovered a distinct mobility viewpoint that exhibited no regard for environmental considerations concerning car use.

Interestingly, when not prompted to answer a specific question about environmental aspects of car use, Gardner and Abraham (2007) found that none of the 19 car commuters the authors interviewed referred to such issues themselves. Whether this phenomenon was caused by a lack of awareness (AC), responsibility (AR), or feeling of obligation (PN) could, however, not be conclusively answered with the applied research design (Gardner and Abraham, 2007). Along these lines, similar findings were presented by Hoffmann et al. (2020): While car users and non-car users alike scored high on survey questions regarding environmental awareness, they did not address these aspects in a follow-up interview (Hoffmann et al., 2020).

As far as the statistical influence of AC on mobility behavior is concerned, Xing et al. (2018) revealed that the awareness of the negative consequences of driving significantly and positively influenced cycling affect. Donald et al. (2014) found that an individual's driving behavior was reduced, the higher their environmental awareness was. Additionally, Jakovcevic and Steg (2013) were able to establish the theoretically proposed link between AC and AR, i.e., the

higher AC, the more likely that people feel responsible for the problems caused by their use of cars.

Still, even in the cases when AC regarding personal mobility behavior is high, that is not to say that people behave accordingly (Haselsteiner et al., 2020). Following the structure of NAM, AC must lead to AR for PN to be activated and altruistic behavior to be implemented (Schwartz, 1977).

One instance in which the translation of AC into AR may be impeded is when trade-offs between environmental and other important personal considerations exist (Haselsteiner et al., 2020). E.g., Hoffmann et al. (2020) found that people changed their opinion on the relevance of environmental issues if they clashed with other aspects important to them, such as travel costs or positive feelings associated with driving a car. In a similar vein, Dammalage's (2021) study of factors influencing people's mobility behavior in rural parts of Austria revealed that environmental concerns were regarded as less important when participants had to prioritize between several aspects at once, even in the presence of AC. These findings are in line with the so-called low-cost hypothesis of environmental behavior, which states that ecologically sound behavior declines the more expensive it becomes (Schlaiffer et al., 2002).

To ascertain whether people perceive accountability for the potentially harmful consequences of their behavior, **AR** can be measured by participants' agreement to survey items, such as "*I feel jointly responsible for the exhaustion of fossil fuels by car use*" (De Groot and Steg, 2009, p. 433). To the same effect, statements can also be phrased invertedly to uncover a certain carelessness towards the impacts of one's behavior (e.g., Jakovcevic and Steg, 2013).

Anable (2005) identified two separate groups of non-car owners who were aware of the negative effects caused by cars but significantly differed in terms of AR. While the "*Car-less Crusaders*" felt very strongly about acting responsibly, the "*Reluctant Riders*" exhibited a rather neutral stance toward the respective statement (Anable, 2005). Accordingly, Hoffmann et al. (2020) found that the responsibility to reduce driving among car users was low, as they justified their driving with claims of acting environmentally conscious in other areas of life.

Statistically, the connection between AR, PN, and mobility behavior was substantiated by previous studies (Jakovcevic and Steg, 2013; Liu et al., 2017). For example, Jakovcevic and Steg (2013) found that AR contributed significantly to the activation of PN to reduce car use and also exhibited a mediating effect between AC and PN. The same results were obtained by Liu et al. (2017).

Some of the factors inhibiting the transgression of the boundary between AC and AR may very well also hold for the fact that a feeling of responsibility does not automatically result in the activation of PN. Additionally, many authors point to an aspect similar to PBC: Feelings of whether an own behavior can actually alleviate the problem in question are relevant for people to develop a normative conviction (Joanes et al., 2020). Especially in the case of mobility, subjective assessments of self-efficacy may be low among people, since one's contribution to solving a problem on a global scale may be inconceivable (Møller et al., 2018). Essentially, one participant in Hoffmann et al.'s (2020, p. 333) study said, "*It has to be a global change rather than just one person not using the car.*"

In contrast to social or subjective norms, **PN** are based on the value system of an individual, irrespective of how others might evaluate a certain behavior (Liu et al., 2017). Therefore, statements referring to people's perceived obligations have proven useful in assessing the importance of PN for explaining sustainable mobility behavior (e.g., Klöckner and Matthies, 2004). Mehdizadeh et al. (2019, p. 322), for example, utilized statements like *"I feel morally obliged to use the car as little as possible, regardless of what other people do,"* or *"I would be a better person if I more often used other transport modes instead of the car,"* to account for PN in the context of mobility behavior and transport mode choices.

Anable's (2005) segmentation approach revealed that, of all four car-owning and two non-car-owning mobility types identified, only two—the *"Aspiring Environmentalists"* and the *"Car-less Crusaders"*—exhibited activated PN to reduce car use and act environmentally friendly. Interestingly, though, only the latter showed high levels of AC, and AR, while the former contradicted the conceptual framework of NAM (Schwartz, 1977), exhibiting only a high score for AR (Anable, 2005). While there was consensus about the importance of environmental aspects regarding mobility across different viewpoints identified by Cools et al. (2009), only two of them agreed that one's behavior should be adapted accordingly, indicating the activation of PN (Cools et al., 2009). This finding is in line with that of van Exel et al. (2011), who also identified two of four mobility viewpoints agreeing that environmentally conscious behavior is an individual obligation. Dill and McNeil (2013) divided a group called *"Interested but Concerned"* into *"Non-Cyclists"*, *"Recreational Cyclists"*, and *"Utilitarian Cyclists"*. Thereby, the authors found that the latter exhibited a significantly higher feeling of obligation to cycle than the other two groups (Dill and McNeil, 2013). Hence, the activation of PN (or lack thereof) may be a reason why some people cycle and others do not.

Again, there is statistical evidence for the validity of NAM's mediator model, also regarding the role of PN (Jakovcevic and Steg, 2013; Liu et al., 2017). Jakovcevic and Steg (2013) found that PN contributed most to the intention to reduce the use of private cars. Furthermore, PN played a significant role as a mediator between AR and the intention to act sustainably. In a similar vein, Donald et al.'s (2014) test of an expanded TPB model substantiated the importance of PN in explaining altruistic mobility behavior. In the authors' analysis, moral norms had a significant influence on the intention to use PT but not on the intention to use cars (Donald et al., 2014).

#### 2.4.2. Intentional Processes

Previous research applying TPB in the context of mobility usually considered **attitudes** as the characteristics people ascribe to certain modes of transport (e.g., Passafaro et al., 2014; Vahedi et al., 2021; Zorrilla et al., 2019). In quantitative studies, participants were asked, e.g., how they rated the car in terms of cost efficiency (Hoffmann et al., 2020) or how useful they perceived the bicycle to be for commuting purposes (Passafaro et al., 2014). However, since not all previously conducted studies are operationalizations of TPB, there is some ambiguity and overlap between certain concepts and elements applied in earlier research. Hence, it is necessary to define which variables attitudes entail within the scope of the thesis at hand. The terms instrumental-reasoned and symbolic-affective motives are frequently used in the context

of mobility behavior (e.g., Anable and Gatersleben, 2005; Steg, 2005; Steg et al., 2001). These categories are commonly comprised of factors such as flexibility, convenience, relaxation, or excitement (e.g., Anable and Gatersleben, 2005), referring to either the subjective evaluation of a specific transport mode or the behavior itself (Han et al., 2017). The definition of attitudes as “*a general measure of the favourability a behavioural alternative has for an individual*” (Klößner, 2013, p. 1029) applies to most of the instrumental-reasoned and symbolic-affective motives discussed in previous studies. Furthermore, attitudes are assumed to be comprised of instrumental and experiential aspects (Ford et al., 2022), accounting for both symbolic-affective and instrumental-reasoned motives. Therefore, henceforth, instrumental-reasoned and symbolic-affective motives are understood as subcategories of attitudes if not otherwise specified.

Several researchers have found that the importance of different types of attitudes varies depending on the purpose of a trip. Anable and Gatersleben (2005) revealed a difference in the importance of instrumental and affective motives for work and leisure travel in the UK: While affective aspects, such as control, freedom, and a stress-free journey were considered vital for work-related trips, instrumental factors, such as flexibility, convenience, cost, and predictability, were ranked higher on average (Anable and Gatersleben, 2005). Conversely, in the case of leisure travel, instrumental and affective motives were rated almost the same in terms of importance (Anable and Gatersleben, 2005). Using factor analysis and a subsequently applied regression model, Ramos et al. (2020) revealed that, among Swedish residents, perceived outcomes were most relevant for commuting trips, symbolic motives for shopping trips and commuting trips, and instrumental motives for shopping and leisure trips respectively (Ramos et al., 2020). Gardner and Abraham (2007) also investigated the influence of affective and instrumental variables on British car commuters’ mobility behavior. Analyzing qualitative interviews, the authors found that journey time concerns and journey-based affect, minimizing effort, personal space concerns, minimizing monetary costs, and a desire for control were the most important arguments for participants’ use of the car. Moreover, Gardner and Abraham (2007) confirmed their assumption that instrumental motives sometimes translated into affective ones (e.g., perceived control over a journey can influence the enjoyment of the same).

Not only the trip purpose but also the attitude held towards a specific mode of transport may significantly influence mobility behavior and travel experience. For example, Han et al. (2017) found that functional associations with electric vehicles, such as cost, performance, and convenience, had a direct and indirect effect on the **intention** to purchase and adopt an electric vehicle. Furthermore, a quantitative study in Mexico City revealed that positive attitudes (i.e., perceiving cycling as good, enjoyable, and beneficial) and affection (i.e., associating cycling with freedom, independence, excitement, relaxation, comfort, and pleasure) towards cycling, along with the perceived importance of the bike as a means to commute, increased cycling intention (Zorrilla et al., 2019). Similarly, in an attempt to create an internationally valid mobility typology, Bartz (2015) discovered that positive and negative attitudes towards modes of transport were the main predictor of mobility behavior. That is, while general motives, such as excitement, costs, or environmental protection were important for people, they usually had strong and predefined opinions about the modes of transport at their disposal and how well they fulfilled their needs (Bartz, 2015). In a similar vein, Anable and Gatersleben (2005) found

that, no matter the purpose of a trip, the actual experience of affective and instrumental aspects during a journey depended on the transport mode chosen and its respective evaluation. However, individuals usually do not simply consider one mode of transport to be superior in every respect but exhibit more nuanced attitudes (Hoffmann et al., 2020). Comparing car users with non-car users, Hoffmann et al. (2020) found that participants held ambivalent attitudes towards the same transport modes, evaluating them both negatively and positively in terms of costs, safety, autonomy and control, comfort, stress and relaxation, travel speed, efficiency and predictability, as well as flexibility.

Attitudes towards mobility and transport modes may also be tied to the underlying influence of socio-demographic variables. For example, Steg (2005) found that symbolic and affective motives for car use seemed to be more important to people with lower household incomes compared to other groups, whereas the evaluation of instrumental functions met by cars differed much less among people. Vahedi et al. (2021) also investigated the effect of demographic, social, and infrastructural variables on commuting behavior via travel satisfaction and attitudes as mediators. The authors found that females, working students, and people facing cultural obstacles were more likely to hold negative attitudes towards active modes of transport, leading to a lower adoption rate of walking and cycling among them (Vahedi et al., 2021).

### 2.4.3. Situational Influences

Mobility researchers usually operationalize **subjective (i.e., PBC) and objective situational influences** using items that refer to the expected ease or difficulty of performing a certain behavior. Zorrilla et al. (2019), for example, asked participants whether they felt comfortable commuting by bicycle. Similarly, in Anable's (2005, p. 70) study, respondents had to rate the item, "*There are many problems and difficulties with using public transport,*" according to their agreement. It is important to note that situational influences arise not only from an individual's assessment of their skills but also from the interplay of external factors in relation to these skills. For example, infrastructure or a lack thereof, topography, travel distance, weather conditions, and safety may all influence a person's behavioral control (de Souza et al., 2014).

Nettleton and Green (2014) identified the physical and mental effort needed, the aspect of safety, and the compatibility of cycling with one's daily routine to be obstacles for cycling among ethnic minorities in the UK. Additionally, by comparing two novice cyclists the authors revealed physical ability, time, energy, a working bicycle, an infrastructurally and culturally appropriate environment, and safety aspects to be among the requirements for the long-term uptake of cycling. Accordingly, Spotswood et al. (2015) found that, while some people intended to start cycling, they perceived their knowledge and abilities as insufficient to do so. These results are backed by Gangl et al. (2021), who identified a lack of perceived safety as well as doubt about one's own cycling ability reduced general cycling intention as well as intention to take part in an Austrian cycling competition (Gangl et al., 2021). It is further assumed that concerns regarding safety and traffic are especially important for infrequent and non-cyclists (Dill and McNeil, 2013). According to Dill and McNeil (2013), a group of people

interested in cycling was concerned about traffic and safety issues as well as their cycling ability. Therefore, they cycled less frequently than both “*Enthusied*” and “*Confident Cyclists*” (Dill and McNeil, 2013). However, it is assumed that single measures to improve bicycle infrastructure may be insufficient in changing safety perceptions and, thus, in increasing control over cycling for infrequent and non-cyclists (Xing et al., 2018).

Beyond their importance in explaining cycling behavior, situational influences may also be useful in understanding a possible contradiction between people’s attitudes and actions as well as the prevailing reliance on private cars. In Anable’s (2005) mobility typology, PBC explained why so-called “*Malcontented Motorists*” used the car despite their negative attitude towards it. Simply put, this group felt that there were too many obstacles preventing them from switching to alternative modes of transport, even though they had a strong inclination to do so (Anable, 2005). Similarly, Cools et al.’s (2009) group of “*Car-Dependent Travelers*” seemed to rarely use PT for medium-distance travel due to a lack of knowledge, deeming PT as too complicated. People’s assessments regarding the ease of PT use may, indeed, be an essential predictor of transport mode choices (Hunecke et al., 2005). The consequences of a lack of PBC over alternative modes to the car were underlined by Rajé (2007), who identified four distinct mobility discourses based on variables such as rurality or perceived availability of services and goods. The author stated that a group referred to as “*The Disaffected Theorist*” faces obstacles in switching to alternative modes of transport, putting them at risk of social exclusion (Rajé, 2007).

On a more theoretical note, empirical tests of situational influences, do not always paint a unanimous picture. Contrary to the theoretical framework of TPB presented in [chapter 2.1](#), Donald et al. (2014) found that PBC contributed only indirectly to people’s commuting behavior via habit and intentions as mediators. Additionally, PBC proved to have the strongest influence on intention and habits in the case of car and PT usage respectively (Donald et al., 2014). Previous research has also produced ambiguous results regarding the influence of physical and spatial conditions as an expression of situational influences. While Vahedi et al. (2021) found evidence that inappropriate infrastructure and a hilly terrain impede the uptake of active modes of transport, Xing et al. (2018) could not establish such a link between topography and cycling affect.

#### **2.4.4. Habitual Processes**

Previous research has raised the issue that habits are neither included in TPB nor NAM (e.g., Busch-Geertsema et al., 2016; Heinen et al., 2010; Klöckner and Blöbaum, 2010). Thus, some authors altered the respective models to account for such a behavioral element (e.g., Anable, 2005; Donald et al., 2014; Passafaro et al., 2014; Zorrilla et al., 2019). Habits play an important role in explaining why certain behaviors change only slowly—if at all—as they impede the continuous evaluation of the behavior, its requirements, and outcomes (Bartz, 2015; Heinen et al., 2010). It is assumed that a window of opportunity for behavioral change only arises if the context in which a routine behavior is performed transforms, leading to a reconsideration of one’s habits (Busch-Geertsema et al., 2016; Gangl et al., 2021).



To investigate the role of habits in the formation of behavior, researchers usually include statements, such as “*I use my car without thinking about it,*” (Ramos et al., 2020, p. 309) in their surveys. Alternatively, participants may also be asked to spontaneously indicate which transport mode they would choose for specific trips (Donald et al., 2014).

A window of opportunity for behavioral change arising after contextual alterations in people’s lives was observed by Harms (2003), who qualitatively and quantitatively scrutinized the reasons for people adopting carsharing services in Switzerland. The author discovered that only if the circumstances in car users’ lives changed, did they reconsider their transport mode choices and consequently become more susceptible to instrumental-reasoned and affective motives (Harms 2003). In other words, habits may cause cognitive and motivational blindness, keeping people from seeking information about other behaviors (Harms, 2003; Heinen et al., 2010; Ramos et al., 2020). Murtagh et al. (2012), on the other hand, stated that threats to self-identity contributed significantly more to resisting behavioral change than past behavior (i.e., a proxy for habits). More specifically, if people’s self-esteem, self-efficacy, continuity, or distinctiveness are compromised by an intervention, they are more likely to oppose it (Murtagh et al., 2012).

Results of previous research indicate that strong habits and routines are often tied to the use of cars. For example, Anable (2005) found that the habitual variable “*psychological attachment to the car*” was essential in explaining to what degree the six mobility types discovered by the author reconsidered their transport mode choices. Likewise, Bartz (2015) identified so-called “*Pragmatic Car Drivers*”, who exhibited a high dependency on their cars due to their driving habits. To the same effect, van Exel et al. (2011) found that for both their uncovered car-oriented mobility viewpoints habits played a more prominent role in their transport mode choices than for the two other viewpoints. According to Cools et al. (2009), however, habits were of no real significance in distinguishing any of the viewpoints on medium-distance travel discovered by the authors.

From a statistical standpoint, there is abundant evidence that the introduction of habits increases the performance of behavioral models. For example, Donald et al. (2014) found that, along with intentions, habits increased people’s car but not their PT use. These results indicate that PT use is a more deliberate and conscious process, while car use is rather habitualized, partly due to a lack of PBC over alternative modes (Donald et al., 2014). In addition to this, Ramos et al. (2020) found that habits were not only a vital predictor of people’s car use across trip purposes but that their inclusion in a model also increased its overall explanatory power, with other variables simultaneously decreasing in importance. In a similar vein, Passafaro et al. (2014) discovered that past behavior (as a measure of habit) and positive anticipated emotions significantly influenced people’s desire to cycle. Moreover, past behavior showed to affect positive anticipated emotions, suggesting that a cycling habit enhanced people’s associations with using this mode of transport (Passafaro et al., 2014).

### 3. Q-Methodology

This chapter provides an overview of the conceptual and historical background of Q-methodology before describing its application within this thesis. Thus, the subchapter's structure follows the necessary steps to perform a Q-methodological study.

#### 3.1. Introduction to Q-Methodology

The history of the Q-method dates back to the 1930s when its basic principals were first introduced by psychologist William Stephenson (1936). Due to its unique “*qualiquantological*” nature, Q-methodology enables the systematic study of subjectivity (Watts and Stenner, 2005). Since Q-methodology is an explorative approach, it assists in making sense of and finding orientation in a complex topic and untangling its intertwined concourse into distinct points of view (Grimsrud et al., 2020).

So far, Q-methodology has been utilized in a wide range of contexts. While it originated in psychology, Q-methodology has made its way into other areas of application, such as communication or political sciences (Barry and Proops, 1999; Byrne et al., 2017). It has recently also been applied in research on environmental conservation and sustainability (Byrne et al., 2017; Curry et al., 2013). However, at the time of writing, only a handful of studies applying Q-methodology have sought to uncover perceptions, viewpoints, motivations, and their underlying socio-psychological factors in the context of sustainable mobility. Among these are the works of Foltýnová et al. (2020), who investigated the differences of opinions regarding how to reach a shared vision of a sustainable mobility future, and Cools et al. (2009), who examined the motivations behind people's transport mode choices for medium distance travel.

In any case, the execution of Q-methodology follows a clear step-by-step approach explained concisely by Brown (1993), which is applied by most researchers. First, a comprehensive overview of the concourse of the topic in question is to be developed, making use of scientific literature, government publications, newspaper articles, online resources, and/or expert interviews (Brown, 1993). Based on these insights, statements are formulated, ideally covering the whole range of the concourse, with each of the statements referring to one aspect of the topic under scrutiny (Brown, 1993). Out of all these statements, 40 to 80 are chosen to form the so-called Q-sample, which should evenly represent the full range of possibilities on the spectrum of viewpoints (Watts and Stenner, 2005).

Secondly, interview participants—the so-called P-set—are selected based on predetermined criteria, such as demographics, which may vary depending on the research question (Zabala et al., 2018). Since the goal of Q-methodology is not to make generalized statements about the frequency of the occurrence of viewpoints but merely to reveal existing ones, the P-set neither has to be representative of the whole population nor contain a large number of participants (Byrne et al., 2017).

Thirdly, the participants are individually asked to rank the statements of the Q-Sample according to their respective (dis)agreement and in such a way that the final arrangement matches a predetermined quasi-normal distribution. (Brown, 1993). Since the cognitive effort for such a sorting task increases with the number of statements, this step is usually dissected into two parts: First, the participants read through the statements and allocate them to one of three piles, representing general disagreement, agreement, and a neutral stance towards them (Brown, 1993). Then, working through each of these piles, the statements are allotted their final position within an array ranging from “-X” to “+X” in terms of agreement (Watts and Stenner, 2005). This resulting configuration is referred to as the Q-sort.

This third step is usually performed in a semi-structured interview setting, during which the participants are encouraged to verbalize their thought processes and ask questions, e.g., in case of uncertainties regarding the statements (Brown, 1993). Additional audio recordings of the interviews can later be utilized to give further context to the decision process as well as the final Q-sorts, and thus assist in painting a more concise picture of the viewpoints held by the respective participants. During such interviews, attention should be directed toward the most saliently rated statements and towards possible ambiguities to facilitate the interpretability of the results (Brown, 1993).

Fourthly, all collected Q-sorts are subjected to statistical analysis (Brown, 1993). By means of a factor analysis, Q-sorts with the highest similarity are identified and grouped into so-called factors (Watts and Stenner, 2005). These factors then represent the groups or viewpoints held by the participants (Brown, 1993). Additionally, so-called z-scores for each factor and statement are calculated, representing an average score a participant belonging to one of the factors awards each statement respectively (Zabala et al., 2018). A more in-depth description of the main procedures and intermediary steps is offered in [chapter 4](#).

Finally, all selected factors are to be interpreted (Brown, 1993). The main approach for this is to look at the z-scores and identify the most saliently rated statements of each factor as well as to compare items that have been rated significantly differently (controversial statements) or equally (consensus statements) across each factor (Byrne et al., 2017; Zabala et al., 2018). To increase comprehensibility for the readers, the factors may be given descriptive and characterizing names (Zabala et al., 2018).

### **3.2. Identifying the Concourse and Creating the Q-Sample**

The creation of the Q-sample is an important first step in Q-methodological studies, as it determines which aspects can be assessed and sorted by the participants at a later stage. Thus, the Q-sample should ideally represent a wide range of the scrutinized topic's concourse (Brown, 1980). One way to ensure a comprehensive and balanced Q-sample is to develop and choose the final statements in accordance with an existing theoretical framework (Cools et al., 2009).

For this master's thesis, Klöckner and Blöbaum's (2010) CADM provided the theoretical structure for an extensive literature review, which yielded a broad range of variables influencing people's mobility behavior (as described in detail in [chapter 2](#)). The sources used

for the literature review and the subsequent development of the statements ranged from ones already applying Q-methodology to ones operationalizing behavioral theories, explaining people's mobility in general as well as their transport mode choices specifically.

Scientific articles were screened for influencing variables until no new ones emerged from the analysis of further literature. This process resulted in about 600 items. These were then categorized to group those with the same or similar meaning. In the next step, preliminary statements were phrased so that each CADM category would be reflected by at least one statement.

For ease of handling for the participants, the statements were constructed in a way that all of them finished the same sentence, i.e., "*On daily trips within my city...*". After two rounds of pretesting and subsequent dropping, refining, and adding of statements, the final Q-sample consisted of 45 items, which were arbitrarily numbered to facilitate data input for the statistical analysis (see Table 1<sup>5</sup>).

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<sup>5</sup> For the original statements phrased in German, please refer to [Appendix A](#).

Table 1: Q-sample containing CADM categories and sources with similar statements

Model category	Statements		Sources
	Item No.	On daily trips within my city ...	
Social Norm	22	... I consider how friends and acquaintances travel.	(Anable, 2005; Cools et al., 2009; Dill and McNeil, 2013; Donald et al., 2014; Gangl et al., 2021; Han et al., 2017; Haselsteiner et al., 2020; Heinen et al., 2010; Passafaro et al., 2014; Ramos et al., 2020; Vahedi et al., 2021; Zorrilla et al., 2019)
Social Norm	43	... I think of how others perceive how I travel.	(Anable, 2005; Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013; Donald et al., 2014; Gangl et al., 2021; Han et al., 2017; Haselsteiner et al., 2020; Heinen et al., 2010; Hunecke et al., 2005; Nettleton and Green, 2014; Passafaro et al., 2014; Schlaffer et al., 2002; Spotswood et al., 2015; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Zorrilla et al., 2019)
Social Norm	1	... I want to express my social status with the way I travel.	(Bartz, 2015; Cools et al., 2009; Rajé, 2007; Ramos et al., 2020; Schlaffer et al., 2002; Spotswood et al., 2015; Steg, 2005; Vahedi et al., 2021; Zorrilla et al., 2019)
Social Norm	27	... the appearance and condition of my mode of transport are important to me.	(Bartz, 2015; Cools et al., 2009; Murtagh et al., 2012; Rajé, 2007; Steg, 2005; Steg et al., 2001; Zorrilla et al., 2019)
Awareness of negative consequences	42	... I think of the ecological impact of how I travel.	(Anable, 2005; Anable and Gatersleben, 2005; Bartz, 2015; Cools et al., 2009; Dammalage, 2021; Dill and McNeil, 2013; Han et al., 2017; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Jakovcevic and Steg, 2013; Rajé, 2007; Ramos et al., 2020; Steg et al., 2001; Vahedi et al., 2021; Xing et al., 2018; Zorrilla et al., 2019)
Perceived Responsibility	30	... I feel a responsibility to minimize my impact on the environment and climate.	(Anable, 2005; Anable and Gatersleben, 2005; Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013; Han et al., 2017; Haselsteiner et al., 2020; Hoffmann et al., 2020; Jakovcevic and Steg, 2013; Ramos et al., 2020; Xing et al., 2018)
Personal Norm	10	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions.	(Anable, 2005; Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013; Donald et al., 2014; Gangl et al., 2021; Han et al., 2017; Harms, 2003; Murtagh et al., 2012; Rajé, 2007; Ramos et al., 2020; Schlaffer et al., 2002; Spotswood et al., 2015; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Zorrilla et al., 2019)
Personal Norm	21	... I do not want to feel remorseful about the way I travel.	(Anable, 2005; Dill and McNeil, 2013; Donald et al., 2014; Han et al., 2017; Hoffmann et al., 2020; Jakovcevic and Steg, 2013)

Statements		
Model category	Item No.	Sources
Personal Norm	45 ... I want to be a role model for others with how I travel.	(Anable, 2005; Han et al., 2017; Jakovcevic and Steg, 2013)
Attitude	15 ... I appreciate being able to travel irrespective of traffic.	(Anable, 2005; Bartz, 2015; Han et al., 2017; Hoffmann et al., 2020; Rajé, 2007; Steg et al., 2001; Vahedi et al., 2021)
Attitude	26 ... I appreciate my privacy.	(Bartz, 2015; Cools et al., 2009; Gardner and Abraham, 2007; Hoffmann et al., 2020; Hunecke et al., 2005; Rajé, 2007; Schlaffer et al., 2002; Steg, 2005; Steg et al., 2001)
Attitude	11 ... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.).	(Bartz, 2015; Dammalage, 2021; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Rajé, 2007; Vahedi et al., 2021)
Attitude	17 ... I want to use my time along the way to do other things (reading, phone call, etc.).	(Bartz, 2015; Cools et al., 2009; Hoffmann et al., 2020; Steg et al., 2001)
Attitude	19 ... I want to arrive at my destination as comfortably as possible.	(Bartz, 2015; Cools et al., 2009; Dammalage, 2021; Dill and McNeil, 2013; Haselsteiner et al., 2020; Heinen et al., 2010; Hoffmann et al., 2020; Nettleton and Green, 2014; Passafaro et al., 2014; Rajé, 2007; Ramos et al., 2020; Steg, 2005; Steg et al., 2001; Xing et al., 2018; Zorrilla et al., 2019)
Attitude	12 ... I want to travel in a way that is beneficial for my health.	(Anable and Gatersleben, 2005; Heinen et al., 2010; Hoffmann et al., 2020; Nettleton and Green, 2014; Rajé, 2007; Ramos et al., 2020; Schlaffer et al., 2002; Vahedi et al., 2021; Xing et al., 2018)
Attitude	18 ... I do not want to exhaust myself physically.	(Bartz, 2015; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Nettleton and Green, 2014; Spotswood et al., 2015; Vahedi et al., 2021; Xing et al., 2018)
Attitude	28 ... I place value on hygiene and cleanliness.	(Bartz, 2015; Cools et al., 2009; Gangl et al., 2021; Heinen et al., 2010; Rajé, 2007; Spotswood et al., 2015; Steg et al., 2001; Vahedi et al., 2021)
Attitude	40 ... I favor the way of travel with the lowest risk of accidents.	(Bartz, 2015; Dill and McNeil, 2013; Gangl et al., 2021; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Jakovcevic and Steg, 2013; Nettleton and Green, 2014; Rajé, 2007; Steg et al., 2001; Vahedi et al., 2021)
Attitude	25 ... I appreciate the possibility of being able to interact with other people.	(Cools et al., 2009; Gangl et al., 2021; Hoffmann et al., 2020; Rajé, 2007; Steg et al., 2001)
Attitude	31 ... saving time is of utmost importance to me.	(Anable, 2005; Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013; Gardner and Abraham, 2007; Haselsteiner et al., 2020; Heinen et al., 2010; Hoffmann et al., 2020; Rajé, 2007; Ramos et al., 2020; Schlaffer et al., 2002; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021)

Statements		
Model category	Item No.	Sources
Attitude	4 ... I enjoy pleasant surroundings along the way.	(Bartz, 2015; Cools et al., 2009; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Rajé, 2007; Vahedi et al., 2021)
	9 ... it is important to me to feel relaxed when I arrive.	(Anable and Gatersleben, 2005; Bartz, 2015; Heinen et al., 2010; Hoffmann et al., 2020; Nettleton and Green, 2014; Passafaro et al., 2014; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Zorrilla et al., 2019)
	16 ... I want to experience a sense of joy along the way.	(Anable and Gatersleben, 2005, 2005; Bartz, 2015; Cools et al., 2009; Donald et al., 2014; Han et al., 2017; Haselsteiner et al., 2020; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Hunecke et al., 2005; Passafaro et al., 2014; Rajé, 2007; Schlaffer et al., 2002; Spotswood et al., 2015; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Zorrilla et al., 2019)
	29 ... I want to sense a feeling of freedom along the way.	(Anable, 2005; Anable and Gatersleben, 2005; Haselsteiner et al., 2020; Hoffmann et al., 2020; Hunecke et al., 2005; Murtagh et al., 2012; Schlaffer et al., 2002; Steg, 2005; Steg et al., 2001; Zorrilla et al., 2019)
	41 ... I favor the way of travel with which I feel safest from harassment and assault.	(Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013; Gardner and Abraham, 2007; Hickman and Vecia, 2016; Hoffmann et al., 2020; Hunecke et al., 2005; Rajé, 2007; Steg et al., 2001; Vahedi et al., 2021)
Intention	39 ... I travel in a way as to make the most of running and already spent cost.	(Anable and Gatersleben, 2005; Bartz, 2015; Gardner and Abraham, 2007; Haselsteiner et al., 2020; Hoffmann et al., 2020; Ramos et al., 2020; Steg et al., 2001; Vahedi et al., 2021)
	13 ... I travel in a way that allows for spontaneity and flexibility.	(Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Schlaffer et al., 2002; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Zorrilla et al., 2019)
	32 ... I compare the costs of different transport modes.	(Anable and Gatersleben, 2005; Bartz, 2015; Cools et al., 2009; Gardner and Abraham, 2007; Haselsteiner et al., 2020; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Rajé, 2007; Ramos et al., 2020; Steg et al., 2001; Zorrilla et al., 2019)
	36 ... I try to combine necessary trips along the way.	(Heinen et al., 2010; Hickman and Vecia, 2016)
	5 ... I check the weather reports beforehand.	(Dill and McNeil, 2013; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Ramos et al., 2020; Steg, 2005; Steg et al., 2001)
	33 ... I chose how I travel so as to avoid situations that might irritate me.	(Anable, 2005; Anable and Gatersleben, 2005; Bartz, 2015; Donald et al., 2014; Hoffmann et al., 2020; Passafaro et al., 2014; Ramos et al., 2020; Steg et al., 2001)

Statements			
Model category	Item No.	On daily trips within my city ...	Sources
Intention	35	... I chose how I travel so as to avoid situations that make me feel unsafe.	(Bartz, 2015; Cools et al., 2009; Dammalage, 2021; Dill and McNeil, 2013; Gangl et al., 2021; Gardner and Abraham, 2007; Haselsteiner et al., 2020; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Jakovcevic and Steg, 2013; Nettleton and Green, 2014; Rajé, 2007; Spotswood et al., 2015; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Xing et al., 2018; Zorrilla et al., 2019)
PBC	7	... I want to own the mode of transport that I use.	(Cools et al., 2009; Rajé, 2007; Spotswood et al., 2015)
PBC	8	... I want to be able to choose my own route.	(Bartz, 2015; Cools et al., 2009; Gardner and Abraham, 2007; Hoffmann et al., 2020; Rajé, 2007; Steg, 2005; Steg et al., 2001)
PBC	20	... I want to be as independent of other people as possible.	(Anable and Gatersleben, 2005; Bartz, 2015; Cools et al., 2009; Hoffmann et al., 2020; Hunecke et al., 2005; Rajé, 2007; Schläffer et al., 2002; Steg, 2005; Zorrilla et al., 2019)
PBC	23	... I appreciate being able to plan reliably.	(Anable and Gatersleben, 2005; Bartz, 2015; Cools et al., 2009; Dammalage, 2021; Gardner and Abraham, 2007; Hoffmann et al., 2020; Rajé, 2007; Steg et al., 2001)
PBC	3	... I feel there are no alternatives to how I travel.	(Anable, 2005; Bartz, 2015; Cools et al., 2009; Hickman and Vecia, 2016; Rajé, 2007; Xing et al., 2018)
PBC	24	... I appreciate the flexibility of being able to choose among different modes of transport.	(Anable, 2005; Hickman and Vecia, 2016; Hoffmann et al., 2020; Rajé, 2007)
PBC	14	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport.	(Dill and McNeil, 2013; Han et al., 2017; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Jakovcevic and Steg, 2013; Rajé, 2007; Spotswood et al., 2015; Vahedi et al., 2021; Xing et al., 2018)
Objective Constraint	6	... how I travel depends on the distance.	(Bartz, 2015; Haselsteiner et al., 2020; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Rajé, 2007; Vahedi et al., 2021; Zorrilla et al., 2019)
Objective Constraint	44	... how I travel depends on the purpose.	(Anable, 2005; Bartz, 2015; Cools et al., 2009; Donald et al., 2014; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Nettleton and Green, 2014; Ramos et al., 2020; Steg, 2005; Steg et al., 2001; Vahedi et al., 2021; Zorrilla et al., 2019)
Objective Constraint	34	... the availability of parking spots influences my transport mode choice.	(Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013; Han et al., 2017; Heinen et al., 2010; Hickman and Vecia, 2016; Hoffmann et al., 2020; Rajé, 2007; Steg et al., 2001; Vahedi et al., 2021; Xing et al., 2018)



Statements			
Model category	Item No.	On daily trips within my city ...	Sources
Habit	38	... I do not want to waste time contemplating or planning how to get to my destination.	(Anable, 2005; Busch-Geertsema et al., 2016; Cools et al., 2009; Gardner and Abraham, 2007; Harms, 2003; Hoffmann et al., 2020; Rajé, 2007; Ramos et al., 2020)
Habit	2	... I contemplate how I travel each time.	(Anable, 2005; Cools et al., 2009; Harms, 2003; Heinen et al., 2010; Rajé, 2007; Ramos et al., 2020)
Habit	37	... I mostly travel in the same way.	(Anable, 2005; Busch-Geertsema et al., 2016; Cools et al., 2009; Gangl et al., 2021; Harms, 2003; Haselsteiner et al., 2020; Heinen et al., 2010; Hickman and Vecia, 2016; Jakovcevic and Steg, 2013; Rajé, 2007; Ramos et al., 2020; Steg et al., 2001)

### 3.3. Selecting the P-Set

For the Q-methodological part of the study, three cities, namely, Fischamend, Korneuburg, and Stockerau, were selected. It was assumed that due to their similar characteristics (Amt der NÖ Landesregierung, 2022a, 2022b, 2022c), comparable viewpoints could be identified across the cities. Fischamend, Korneuburg, and Stockerau—are all part of the federal state of Lower Austria, which exhibits a higher share of motorized individual transport (52 %) compared to the average of the country (Amt der NÖ Landesregierung, 2020). This tendency toward motorized individual mobility is also manifested by the fact that Lower Austria has the second highest stock of passenger cars per capita (Statista, 2022). The governments of Fischamend, Korneuburg, and Stockerau pledged to promote low-carbon alternatives to motorized individual transport, to improve environmental and traffic conditions in their cities (Stadtgemeinde Fischamend, s.a.; Stadtgemeinde Korneuburg, 2020; Stadtgemeinde Stockerau, 2021).

The participants for the study were selected with the help of political representatives of the research area's three cities. An excel sheet was provided to these stakeholders to aid them in suggesting suitable interview partners based on predefined sociodemographic criteria and further variables (e.g., possession of a driver's license). To be eligible for the study, a prospective participant had to be able to, on the one hand, perform the sorting procedure as instructed and, on the other hand, theoretically use the most common modes of transport, i.e., driving a car, riding a bicycle, and walking. Consequently, the minimum age of 15 years for obtaining a driver's license in Austria was adopted as a presupposition to take part in the interview process.

Finally, participants were chosen in a way to ensure a diverse sample and an even distribution among the three cities. Although Q-methodology does not aim to select a representative P-set in terms of being proportional to the population, a diverse range of participants increases the possibility of uncovering divergent viewpoints (Brown, 1980). The main characteristics of the P-set are summarized in Table 2.

In total, 39 interviews were conducted. The participants' ages ranged from 22 to 80. 54 % of all participants were female. While 11 people mentioned the bicycle to be their most used mode of transport, 9 respondents mostly relied on a car, and five interviewees on walking to travel within the city. 12 participants were either unsure about their most used mode of transport or stated to change it depending on, e.g., the season. While 97 % of respondents had a driver's license and access to a bicycle each, the availability of seasonal PT passes was rather low with just 8 people owning one. Cars, on the other hand, were readily available to all but three respondents, with the average interviewee having access to 1.3 of them. 23 people were employed, 10 more self-employed, and 2 pursued their education. Consequently, 4 respondents belonged to neither of these three categories. Regarding employment and education, about one-third of respondents worked or studied within their cities. Moreover, 54 % of the sample had at least one child or grandchild to take care of, while 5 individuals looked after elderly people. All in all, apart from the level of education—the P-set skews towards people holding at least a

high school diploma (30 respondents)— the sample’s characteristics match those of the research area’s population quite well (Amt der NÖ Landesregierung, 2022a, 2022b, 2022c), and, more importantly, show a wide range of diversity.

Table 2: Composition of the P-set

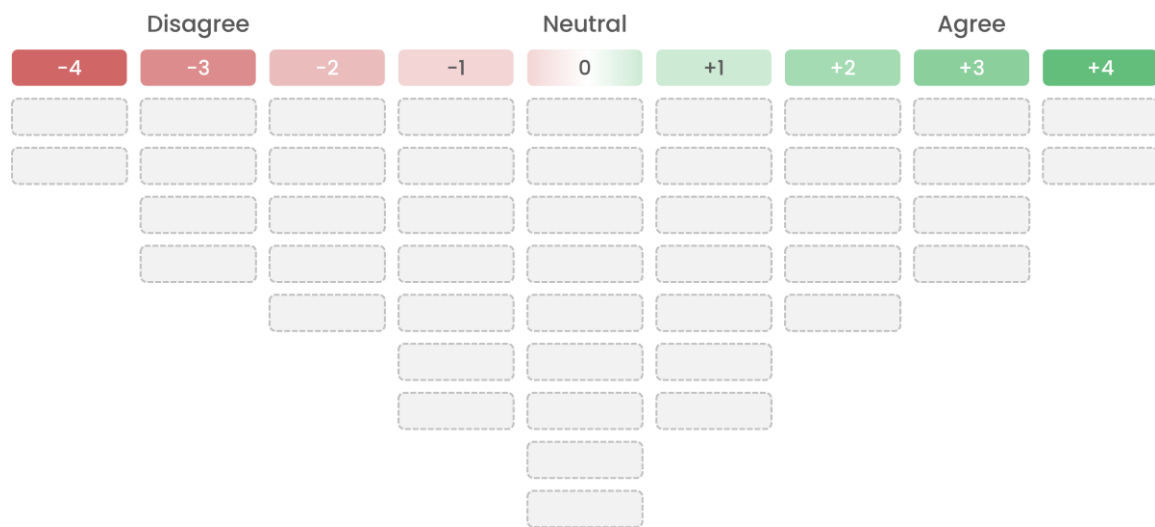
	by gender		by city			Total
	male	female	Fischamend	Korneuburg	Stockerau	
<b>No. of participants</b>	18	21	13	11	15	<b>39</b>
<b>Mean age</b>	49	49	45	51	52	<b>49</b>
<b>Mean no. of available cars</b>	1.4	1.2	1.3	1.0	1.5	<b>1.3</b>
<b>Bike availability</b>	94%	100%	100%	91%	100%	<b>97%</b>
<b>Driver's license availability</b>	94%	100%	100%	100%	93%	<b>97%</b>
<b>PT pass availability</b>	11%	29%	23%	27%	13%	<b>21%</b>
<b>People working within city</b>	28%	43%	31%	36%	40%	<b>36%</b>
<b>People taking care of children/elderly</b>	56%	76%	69%	55%	73%	<b>67%</b>

### 3.4. Conducting the Interviews and the Sorting Process

The interviews were held from November to December 2021. While the first 26 interviews were conducted in person, an abrupt increase in COVID-19 cases within this period saw the Austrian government enforcing a hard lockdown on short notice, rendering meetings in person for research impossible. To still be able to conduct the remaining 13 interviews, the process was changed to an online format using the video communication software “Zoom” as well as the online tool “*Q Method Software*” (Lutfallah and Buchanan, 2019). While the Q-sample and survey were rebuilt with the latter, the former was used to communicate with participants and guide them through the sorting process.

In both formats—offline and online—the sorting process remained the same: After answering initial questions about their personal mobility preferences and behavior within the respective cities, the sorting task was presented to the participants. By asking them to read the first part of the sentence that all statements complement (“*On daily trips within my city...*”) aloud, emphasis was put on the fact that the interviewees solely contemplate daily travel within the borders of their respective hometowns while performing the sorting task. Then, the preliminary sorting process was initiated with participants creating three piles of statements: One included

Afterward, participants were asked to rank-order the statements according to a quasi-normal distribution (Figure 4). They were advised to start with the pile of statements they initially agreed with, looking for the two most salient ones and working their way leftwards. Then, participants did the same with the pile of statements they disagreed with, this time choosing the two items they most strongly disagreed with. Finally, the remaining statements were used to fill the vacant spots in the distribution. During this sorting process and after having finished it, participants were free to change the positioning of statements within the array as they saw fit.



The sorting of the statements was incorporated into a semi-structured interview that aimed to uncover more detailed information about people's reported mobility behavior. The results of the interviews were then analyzed along with the Q-sorts to assist interpretation of the uncovered viewpoints. The interview guideline and the questionnaire can be found in [Appendix B](#) and [Appendix C](#) respectively. For instance, participants were asked about the four most saliently ranked items on each side of the distribution. By letting the interviewees explain the reasoning behind their sorting, further interpretations and conclusions could be drawn in the analysis of the eventually extracted viewpoints. Hence, all interviews were also audio-recorded and transcribed.

- their actual and preferred transport mode use within the respective cities,
- whether they wanted to change their mobility behavior,
- whether and how their mobility behavior was shaped, e.g., during their childhood,
- and what they would wish for in terms of mobility in their respective cities.

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Finally, for the face-to-face interviews, a picture of the final Q-sorts was taken for documentation and analysis purposes.

### 3.5. Statistical Analysis

The statistical analysis of the Q-sorts was performed with the built-in analysis tool of “*Q Method Software*” (Lutfallah and Buchanan, 2019), which had already been used to conduct the online interviews. The 26 Q-sorts collected in the face-to-face setting were thus imported into the software.

First, the correlation matrix between participants’ Q-sorts was calculated using the Pearson correlation coefficient “*r*”. As Brown (1980) outlined, “*Pearson’s r*” can be used, since the assumption of transitivity applies to the sorting process performed. The calculation of the correlation matrix—while merely representing an intermediary step—is necessary to highlight similarities between Q-sorts and to prepare the data for the subsequent factor analysis (Du Plessis, 2005).

Said factor analysis is performed to identify which Q-sorts are similar to one another and, therefore, constitute a distinct factor reflecting a shared viewpoint (Dziopa and Ahern, 2011). There are several types of factor analysis to choose from: Originally, Stephenson suggested the centroid factor analysis along with hand rotation of the factors due to them giving more leeway to the researchers in terms of influencing the results, according to their experiences and expertise in the subject matter (Brown, 1980, 2010a; Ramlo, 2016). However, with the emergence of computers, more studies started using PCA along with Varimax rotation, since these approaches produce mathematically more “*accurate*” results (Brown, 1980). PCA, on the one hand, “*maximizes the variance of each succeeding factor*” (Brown, 1980, p. 56), while, on the other hand, varimax rotation “*maximizes the amount of variance explained on as few factors as possible*” (Webler et al., 2009, p.10). In one of a series of lectures on Q-methodology, Brown (2010b) argued that PCA and Varimax rotation offer a viable alternative for analysis if they produce well interpretable results. Since, in this case, the results emerging from applying PCA and Varimax rotation were superior regarding interpretability compared to centroid factor analysis and hand rotation, the statistically superior approach was chosen.

Apart from the decision on which factor analysis and which rotational method to use, there is one further aspect to be considered, i.e., how many factors are to be rotated. Literature suggests various criteria by which the number of factors to rotate can be determined (Brown, 1980; Watts and Stenner, 2005; Zabala and Pascual, 2016).

Three exemplary rules to decide whether a factor is significant are explained by Brown (1980): One may rotate those factors

- whose eigenvalues exceed 1.00,
- onto which more than one Q-sort load significantly<sup>6</sup>, and/or
- that conform with Humphrey's rule<sup>7</sup>.

However, applying these criteria to the data of this study produced ambiguous results: Eight factors' eigenvalues exceeded a value of 1, six factors had more than one Q-sort loading onto them significantly, and only two factors conformed to Humphrey's rule. In such a case—in which statistical approaches oppose the researcher's hunch—Brown (1980) states that the final decision on how many factors to rotate might better be taken based on personal expertise rather than mathematical considerations. Likewise, Zabala and Pascual (2016) list interpretability as an additional criterion in choosing the number of factors to rotate.

Hence, a three-, four-, and five-factor Varimax rotation were tested respectively, yielding widely differing results. While the four-factor solution offered no reference points for interpretation, the five-factor solution was chosen over the three-factor one, since it provided a more nuanced and multifaceted look into the behavioral aspect of mobility. On the contrary, three viewpoints—notwithstanding their legitimacy—seemed to not reflect the wide spectrum of the topic under scrutiny. In the following chapter, the five-factor solution eventually chosen for interpretation is described in more detail.

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<sup>6</sup> According to Brown (1980, p. 223): “For a loading to be significant at the 0.01 level, it must exceed  $2.58(SE_r)$  [...]”  $SE_r$  equals  $1/\sqrt{N}$  with  $N$  being the number of Q-sorts. Hence, in the case of this study, a loading needed to be greater than 0.413 to be considered significant.

<sup>7</sup> According to Brown (1980, p.223) “Humphrey's rule states that a factor is significant if the cross-product of its two highest loadings (ignoring sign) exceeds twice the standard error [...]” In the case of this study, this means the cross product of the two highest loadings would have had to exceed a value of 0.32.

## 4. The Mobility Profiles

As described in the [previous chapter](#), the five-factor solution was selected as it best represented the real-world situation of the case study by offering a nuanced and multifaceted picture. Table 3 shows the correlations between the five factors and thus how similar or distinct the viewpoints are to one another. The highest correlations are between factor 1 and factor 4 (0.54), factor 1 and factor 5 (0.55), as well as factor 2 and factor 5 (0.51). While these profiles share some similarities in their viewpoints, interpretability is not impeded. Clear distinctions emerge between them upon closer inspection (see [chapter 4.6](#) for a detailed comparison).

Table 3: Correlation matrix of the five rotated factors

Factor					
1	1				
2	0.44	2			
3	0.50	0.33	3		
4	0.54	0.40	0.49	4	
5	0.55	0.51	0.45	0.37	5

Cumulatively, the five factors explain 60 % of the variance. Table 4 presents the characteristics of the five factors. In total they are defined by 32 of the 39 Q-sorts—also referred to as factor exemplars (Watts and Stenner, 2005). Seven of the Q-sorts did not meet the auto-flagging criterion of the majority of common variance at a significance level of  $p < 0.01$ , meaning they did not load significantly onto one factor and one factor alone. Hence, these confounded Q-sorts were dropped in favor of producing more clear-cut factors eventually (Zabala and Pascual, 2016).

Table 4: Characteristics of the five extracted factors

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
<b>No. of defining variables</b>	10	10	3	4	5
<b>Avg. rel. coef.</b>	0.80	0.80	0.80	0.80	0.80
<b>Composite reliability</b>	0.98	0.98	0.92	0.94	0.95
<b>SE of factor z-scores</b>	0.16	0.16	0.28	0.24	0.22

Every factor is loaded onto by at least three Q-sorts leading to high composite reliabilities, which in turn increases confidence in the calculated factor scores (Brown, 1980). Table 5 depicts the loadings of all q-sorts with the flagged significant values highlighted in bold and color.

Table 5: Factor loadings and flagging of Q-sorts

Q-sort	Factor					Confounded
	1	2	3	4	5	
F01	0.44	0.38	0.32	0.13	0.12	X
F02	0.22	<b>0.76</b>	0.11	0.08	0.12	
F03	<b>0.66</b>	0.02	-0.03	0.55	0.15	
F04	<b>0.63</b>	0.19	0.32	-0.04	-0.03	
F05	0.31	<b>0.62</b>	-0.26	0.25	0.31	
F06	0.16	0.35	0.47	0.04	<b>0.62</b>	
F07	<b>0.73</b>	0.09	0.14	0.15	0.02	
F08	0.03	0.29	0.09	-0.09	<b>0.66</b>	
F09	<b>0.57</b>	0.08	0.12	0.18	0.35	
F11	0.08	<b>0.82</b>	0.13	0.22	-0.02	
F13	<b>0.65</b>	0.25	0.50	0.01	0.04	
F14	0.45	0.15	0.54	0.29	0.32	X
F16	0.33	0.35	0.19	<b>0.58</b>	0.22	
K01	<b>0.65</b>	-0.08	0.14	0.31	0.11	
K02	0.37	-0.15	0.27	0.10	<b>0.56</b>	
K03	0.40	0.22	-0.04	0.24	<b>0.70</b>	
K05	0.23	<b>0.52</b>	0.23	0.00	0.18	
K06	0.03	0.43	<b>0.64</b>	0.24	0.13	
K11	-0.07	<b>0.67</b>	0.04	0.04	0.49	
K12	0.16	0.16	0.17	0.16	<b>0.69</b>	
K13	0.00	0.43	0.44	0.05	0.32	X
K16	-0.15	<b>0.53</b>	0.29	0.22	0.05	
K17	-0.01	0.30	-0.54	0.01	0.50	X
K18	0.37	-0.11	0.35	<b>0.60</b>	0.01	
S01	0.19	0.23	0.09	<b>0.75</b>	-0.09	
S03	<b>0.49</b>	0.09	-0.18	0.06	0.25	
S04	0.06	0.23	0.05	<b>0.75</b>	0.24	
S05	0.27	<b>0.78</b>	-0.22	-0.09	0.07	
S06	<b>0.61</b>	0.40	-0.05	0.13	0.07	
S07	0.18	0.03	<b>0.65</b>	0.08	0.18	
S08	0.28	-0.05	<b>0.60</b>	0.47	0.07	
S09	0.28	0.02	0.11	0.38	0.46	X
S10	<b>0.60</b>	0.09	0.41	0.35	0.16	
S11	0.31	<b>0.51</b>	-0.18	0.31	-0.04	
S13	<b>0.64</b>	0.27	0.17	0.02	0.46	
S14	0.09	<b>0.62</b>	0.21	-0.19	0.40	
S15	0.32	0.40	0.51	-0.07	0.26	X
S16	0.13	<b>0.52</b>	0.35	0.29	0.17	
S18	-0.07	0.50	0.10	0.31	0.38	X

While the factor loading represents the correlation between a Q-sort and a factor, so-called z-scores describe the relationship between statements and factors (Zabala and Pascual, 2016). Z-scores are an average of the rank factor exemplars assigned to a statement while putting more weight onto those Q-sorts with the highest loadings onto the factor (Brown, 1993; Zabala and



Pascual, 2016). Based on the value of these z-scores, factor scores reflecting the ranks of the initial distribution are given to every item for each of the viewpoints (Brown, 1993; Zabala and Pascual, 2016). In the present case, the statements with the highest z-score of a viewpoint obtained the factor score “+4”, and the four next highest ones received the factor score “+3”, and so forth. Subsequently, the factor scores can be used to gain a more visual comparison between the factors, as is shown in Table 6. Additionally, they can be arranged in the original array, creating so-called composite or model Q-sorts for each factor (Valenta and Wigger, 1997). The composite Q-sorts for the present study can be found in [Appendix D](#).

Table 6: Statements and factor scores

Statement		Factor scores				
No.	On routine/daily trips within my city ...	F1	F2	F3	F4	F5
1	... I want to express my social status with the way I travel.	-1	-4	-4	-4	-4
2	... I contemplate how I travel each time.	0	0	+3	-2	-1
3	... I feel there are no alternatives to how I travel.	-2	+1	-3	-3	-4
4	... I enjoy pleasant surroundings along the way.	+3	0	+2	+1	-2
5	... I check the weather reports beforehand.	0	0	+1	+3	-1
6	... how I travel depends on the distance.	+1	+4	0	+4	-1
7	... I want to own the mode of transport that I use.	+1	+3	-2	-2	+3
8	... I want to be able to choose my own route.	0	+2	0	0	+3
9	... it is important to me to feel relaxed when I arrive.	0	+1	0	0	0
10	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions.	+2	-1	0	-1	+2
11	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.).	0	+1	0	-1	+3
12	... I want to travel in a way that is beneficial for my health.	+4	+1	+2	+1	+1
13	... I travel in a way that allows for spontaneity and flexibility.	+1	+3	+2	+1	+4
14	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport.	+2	0	+1	+3	+1
15	... I appreciate being able to travel irrespective of traffic.	0	0	+1	0	+2
16	... I want to experience a sense of joy along the way.	+3	+1	-1	+1	+2
17	... I want to use my time along the way to do other things (reading, phone call, etc.).	-2	-3	-3	-3	-2
18	... I do not want to exhaust myself physically.	-3	-1	-1	-2	0
19	... I want to arrive at my destination as comfortably as possible.	-1	+3	-1	+2	0
20	... I want to be as independent of other people as possible.	+1	+2	-1	-1	+1

Statement		Factor scores				
No.	On routine/daily trips within my city ...	F1	F2	F3	F4	F5
21	... I do not want to feel remorseful about the way I travel.	0	-1	+2	+2	+1
22	... I consider how friends and acquaintances travel.	-4	-3	-2	-4	-3
23	... I appreciate being able to plan reliably.	0	+1	+1	+2	+2
24	... I appreciate the flexibility of being able to choose among different modes of transport.	+2	+1	+4	-1	+1
25	... I appreciate the possibility of being able to interact with other people.	+3	-1	0	0	-2
26	... I appreciate my privacy.	-3	0	-3	-3	0
27	... the appearance and condition of my mode of transport are important to me.	-3	-1	-2	-3	-1
28	... I place value on hygiene and cleanliness.	-1	-2	+1	0	-1
29	... I want to sense a feeling of freedom along the way.	+1	-1	0	0	0
30	... I feel a responsibility to minimize my impact on the environment and climate.	+4	-1	+3	+2	+3
31	... saving time is of utmost importance to me.	-1	0	0	0	+2
32	... I compare the costs of different transport modes.	-1	-3	-2	-1	-3
33	... I chose how I travel so as to avoid situations that might irritate me.	-3	0	-1	-1	0
34	... the availability of parking spots influences my transport mode choice.	-2	+2	+3	-1	-2
35	... I chose how I travel so as to avoid situations that make me feel unsafe.	-1	-2	+1	+3	-3
36	... I try to combine necessary trips along the way.	+3	+3	+3	+4	+4
37	... I mostly travel in the same way.	+1	+2	-4	+2	-1
38	... I do not want to waste time contemplating or planning how to get to my destination.	0	+2	-2	0	0
39	... I travel in a way as to make the most of running and already spent cost.	-1	-3	+1	-2	-3
40	... I favor the way of travel with the lowest risk of accidents.	-2	-2	-1	+3	-1
41	... I favor the way of travel with which I feel safest from harassment and assault.	-2	-2	-1	0	-2
42	... I think of the ecological impact of how I travel.	+2	0	+2	+1	+1
43	... I think of how others perceive how I travel.	-4	-4	-3	-2	0
44	... how I travel depends on the purpose.	+1	+4	+4	+1	0
45	... I want to be a role model for others with how I travel.	+2	-2	0	+1	+1

Next, so-called distinguishing and consensus statements, again, based on the values of the factor z-scores, were identified. A statement is “*distinguishing*” if it is ranked significantly differently in one factor compared to all other factors (Zabala et al., 2018). To test whether this is the case the standard error for differences in factor z-scores (SED)<sup>8</sup> must be obtained for each pair of factors and multiplied by 1.96 (significance level of  $p < 0.05$ ) respectively to obtain the thresholds at which a difference of a pair of factor z-scores is regarded significant (Zabala and Pascual, 2016). The distinguishing statements highlighted by this process are depicted in Table 7.

Table 7: Distinguishing statements for all factors with factor and z-scores

		Statement		
Factor	No.	On daily trips within my city ...	Factor score	z-score
1	12	... I want to travel in a way that is beneficial for my health.	+4	1.92
	4	... I enjoy pleasant surroundings along the way.	+3	1.45
	16	... I want to experience a sense of joy along the way.	+3	1.31
	25	... I appreciate the possibility of being able to interact with other people.	+3	1.28
	45	... I want to be a role model for others with how I travel.	+2	1.05
	7	... I want to own the mode of transport that I use.	+1	0.53
	1	... I want to express my social status with the way I travel.	-1	-0.55
	31	... saving time is of utmost importance to me.	-1	-0.56
	33	... I chose how I travel so as to avoid situations that might irritate me.	-3	-1.31
	18	... I do not want to exhaust myself physically.	-3	-1.71
2	13	... I travel in a way that allows for spontaneity and flexibility.	+3	1.01
	38	... I do not want to waste time contemplating or planning how to get to my destination.	+2	1.06
	3	... I feel there are no alternatives to how I travel.	+1	0.34
	42	... I think of the ecological impact of how I travel.	0	-0.14
	30	... I feel a responsibility to minimize my impact on the environment and climate.	-1	-0.51
	21	... I do not want to feel remorseful about the way I travel.	-1	-0.76
	45	... I want to be a role model for others with how I travel.	-2	-0.82
	43	... I think of how others perceive how I travel.	-4	-2.28

<sup>8</sup> Refer to Zabala and Pascual (2016, p. 6) for the derivation of SEDs.

		Statement		
Factor	No.	On daily trips within my city ...	Factor score	z-score
3	2	... I contemplate how I travel each time.	+3	1.29
	39	... I travel in a way as to make the most of running and already spent cost.	+1	0.61
	35	... I chose how I travel so as to avoid situations that make me feel unsafe.	+1	0.36
	38	... I do not want to waste time contemplating or planning how to get to my destination.	-2	-0.95
	37	... I mostly travel in the same way.	-4	-1.82
4	40	... I favor the way of travel with the lowest risk of accidents.	+3	1.27
	35	... I chose how I travel so as to avoid situations that make me feel unsafe.	+3	1.27
	5	... I check the weather reports beforehand.	+3	1.19
	24	... I appreciate the flexibility of being able to choose among different modes of transport.	-1	-0.29
	2	... überlege ich jedes Mal aufs Neue, wie ich mich fortbewege.	-2	-1.28
	27	... the appearance and condition of my mode of transport are important to me.	-3	-1.79
5	13	... I travel in a way that allows for spontaneity and flexibility.	+4	2.16
	11	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.).	+3	1.59
	31	... saving time is of utmost importance to me.	+2	0.89
	37	... I mostly travel in the same way.	-1	-0.56
	5	... I check the weather reports beforehand.	-1	-0.62
	4	... I enjoy pleasant surroundings along the way.	-2	-0.84
	25	... I appreciate the possibility of being able to interact with other people.	-2	-1.08

Conversely, consensus statements are items that are not ranked significantly differently among at least one pair of factors (Zabala and Pascual, 2016). The calculation method for the thresholds remains the same as for the distinguishing statements. Table 8 shows the statements that were basically ranked the same across factors.

Table 8: Consensus statements for all factors with factor and z-scores

Statement				
Factor	No.	On daily trips within my city ...	Factor score	z-score
1	36	... I try to combine necessary trips along the way.	+3	1.56
	9	... It is important to me to feel relaxed when I arrive.	0	0.12
	17	... I want to use my time along the way to do other things (reading, phone call, etc.).	-2	-1.08
2	9	... it is important to me to feel relaxed when I arrive.	+1	0.21
	17	... I want to use my time along the way to do other things (reading, phone call, etc.).	-3	-1.29
3	36	... I try to combine necessary trips along the way.	+3	1.64
	9	... it is important to me to feel relaxed when I arrive.	0	-0.20
	17	... I want to use my time along the way to do other things (reading, phone call, etc.).	-3	-1.43
	23	... I appreciate being able to plan reliably.	+1	0.42
	14	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport.	+1	0.31
	15	... I appreciate being able to travel irrespective of traffic.	+1	0.21
	29	... I want to sense a feeling of freedom along the way.	0	-0.21
	32	... I compare the costs of different transport modes.	-2	-0.76
4	9	... it is important to me to feel relaxed when I arrive.	0	-0.10
	15	... I appreciate being able to travel irrespective of traffic.	0	0.29
5	9	... it is important to me to feel relaxed when I arrive.	0	-0.28
	14	... it is important to me, that I can travel on lanes that are dedicated to a single mode of transport.	+1	0.39

In the following chapter, each factor—henceforth also referred to as “*mobility profile*”—is named and described in detail based on its defining factor scores. Additionally, quintessential quotes from the interviews are added to further increase the tangibility of the viewpoints. Finally, sociodemographic and other indicators of the respective loading participants are provided to assess whether tentative conclusions can be drawn about the characteristics of the people sharing a certain viewpoint<sup>9</sup>.

<sup>9</sup> The small sample size does not allow for statistically sound estimates but the characteristics still give a first impression of the composition of the factors.

#### 4.1. Profile 1 – “*The Healthy and Conscious Type*”

People sharing this viewpoint regard daily mobility as more than just a means to an end. They place the highest value on moving about in a way that is beneficial for their health (statement 30/factor score +4), which is why they do not refrain from physically strenuous forms of travel (18/-3). Moreover, they enjoy pleasant surroundings (4/+3) and want to feel a sense of joy on their daily trips (16/+3). Most leading participants emphasized these aspects during the interviews, with one referring to a combination of them in context: *“I have suffered a heart attack last year [...] and I have focused on having time for my body and moving on my bike. [...] And I like to combine that with pleasant surroundings.”*

The people that belong to this group do not value their privacy while traveling (26/-3), they rather appreciate the possibility of meeting people along the way (25/+3). As one participant highlighted, *“I am actually more of a sociable person [...] and I enjoy if I meet somebody I might not have seen for a while. Then, I chat a little.”*

In addition to a health-centered and emotional relationship to mobility, this viewpoint shares a feeling of responsibility to minimize one’s impact on climate and the environment (30/+4). Hence, these people contemplate the ecological consequences of the way they travel (42/+2), which is why they emphasize combining necessary trips (36/+3). One participant put it this way: *“Everyone at my age—mid-40s—perceives how the climate has changed. How it was when I was a child and how it is now. I find that absolutely terrifying. Therefore, I try, in my private domain, with the small impact I have, to contribute.”*

Consequently, people sharing this viewpoint not only want to travel in a way that is in line with their lifestyle and convictions (10/+2), but even more so, they want to be role models for inner-city mobility behavior (45/+2). In this context, a participant noted, *“It is definitely important to me to be a role model with the way I travel because I think, we all have to think about our children, and the climate won’t improve. I think this is an important aspect, especially for short trips within the city.”*

On the other hand, however, people of this group are not concerned with the way friends and acquaintances travel (22/-4), nor do they contemplate what others might think about their mobility behavior (43/-4). Accordingly, owning a mode of transport (7/+1) is not too important to them, which is also reflected by the fact that they place almost no value on its appearance and condition (27/-3). Furthermore, compared to others, this type places the least importance on saving time (31/-1) and the avoidance of situations that might annoy them during their daily trips (33/-3).

Of the ten people loading onto this factor, five are residing in Fischamend, one in Korneuburg, and four in Stockerau. 60 % are female and the mean age of this group is 52. On average, a person sharing this viewpoint has access to 1.4 cars. While all people belonging to this group have a driver’s license and a bike at their disposal, just one participant owns a seasonal ticket for PT. Five of these people take care of at least one child. About 40 % of the people sharing this viewpoint work within the city. Eight of these ten individuals claimed cycling, walking, or both to be their main mode of transport.

Compared to all other types, this group exhibits the highest mean age, with three retired people loading onto it. It seems logical that older people, who probably have more time to spare, consider their daily mobility as a means to stay healthy, both mentally and physically. This is reinforced by the fact that most of these people commonly use active modes of transport, i.e., cycling and walking. One of the factor exemplars underlined all of these aspects by stating, *“I did not really consider [daily mobility as a means of staying healthy] because I was healthy most of the time. However, one should be a little active, right? That is important to me. It does not matter if it is by bike or on foot.”*

## 4.2. Profile 2 – *“The Purpose-Driven and Pragmatic Type”*

People that share this point of view do perceive inner-city mobility as a means to an end, and, accordingly, they act more pragmatically. For them, the most important criteria for deciding how to travel are the distance (statement 6/factor score+4) as well as the purpose (44/+4) of their respective trips. A participant loading onto this factor briefly specified, *“As I said before, it depends on where I run my errands, what I buy, and with whom I meet.”*

This group usually chooses the same mode of transport (37/+2), which might be explained by the fact that they feel they have fewer alternatives than any other of the factors (3/+1) and because they do not want to think too much about how to reach their destination (38/+2). One factor exemplar made exactly this point: *“I just do not want to contemplate all the time. [...] There are no alternatives [...] but I think if there was a bus [...] that I could just hop onto [...] I would probably use it.”*

Saving time, on the other hand, is of no concern to this group (31/0). Still, deliberations about the availability of parking spots (34/+2) as well as comfort (19/+3) factor into their mobility behavior. *“I think, for me, it is mostly complacency that makes me feel without alternatives,”* said one participant.

Moreover, this group values its independence from other people (20/+2), which is reflected by the fact that they want to travel in a spontaneous as well as flexible manner (13/+3), chose their route themselves (8/+2), and own their mode of transport (8/+2). One participant summarized, *“I definitely want to be independent. [...] To have my own car is also very important to me so that I do not have to wait for my husband to get home from work.”* Consequently, people sharing this viewpoint do not care about getting in touch with others on their daily trips (25/-1).

Compared to the other factors, this viewpoint places the least importance on ecological considerations regarding their mobility choices (42/0). They neither feel responsible for minimizing their impact on climate and the environment (30/-1) nor do they want to be a role model with the way they travel (45/-2). *“I suppose, we will survive the little I drive with my car,”* noted an interviewee concerning the climate aspect of mobility.

Consistently, people with this viewpoint seem to feel less obligated to personal expectations (21/-1) as well as to those of others (43/-4) regarding their mobility behavior. One factor exemplar put it rather simply: *“I own it [my mobility behavior]. I totally own it.”*



As far as demographics go, this type seems to be uniformly distributed among the cities, with three participants residing in Fischamend and Korneuburg each, as well as four in Stockerau. People loading onto this factor are 47 years old on average, and 60 % of them are male. The mean number of cars at their disposal is 1.5. Nine of the ten participants have access to a bike, and just as many have obtained their driver's licenses. However, no one belonging to this group possesses a seasonal ticket for PT. Seven of the ten people loading onto this factor have to take care of either children or seniors. 40 % of this group work within the city. The car is the most prevalent mode of transport among this group, with eight participants stating they use it most commonly for trips within the respective city.

Based on this data and the analysis, it seems that this profile is occupied with a wide variety of tasks that require a sort of pragmatic approach. Between taking care of relatives and work, they usually rely on the same transport mode—mostly their personal car—for specific trips. *“I have to consider, how I can reach my destination. [...] I am impressed by those who cycle a lot, but I am not able to, or I cannot handle that,”* highlighted one participant.

### 4.3. Profile 3 – *“The Flexible and Contemplative Type”*

In contrast to other groups, people sharing this viewpoint regularly reconsider their mobility behavior within their respective cities (statement 2/factor score +3). They do not just choose the same mode of transport every time (37/-4) but adapt the way they travel to the purpose of their trips (44/+4). Simultaneously, they feel there are a lot of alternatives to choose from (3/-3), which is something they also highly appreciate (24/+4). Consequently, compared to other factors, these people are more open to planning their journeys beforehand (28/-2) and combining necessary trips (36/+3). These aspects were summarized by the highest loading participant: *“[...] it simply is important to me, to always have a choice [regarding how I travel], and I also try to make the right decision every time.”*

Additionally, people with this point of view feel a strong responsibility to reduce their impact on climate and the environment (30/+3), which is also represented by the fact that they want to move about with a clear conscience (21/-2). Other aspects that influence their mobility behavior are the availability of parking spots (34/+4) and—especially compared to other factors—their higher focus on making the most of already spent costs (39/+1).

However, participants loading onto this factor neither feel the need to own a mode of transport (7/-2) nor, much less, to express their social status through it (1/-4). All this, along with the fact that they place little importance on how others perceive the way they travel (43/-3), indicates that this group is more concerned with contemplating practical aspects of mobility rather than social ones. One participant shared these sentiments, reiterating her usual thought process: *“What do I need right now? What are the next trips? What about things that I need to carry?”*

Profile 3 is only represented by three participants, two of which live in Stockerau and one in Korneuburg. Two-thirds of them are female and their mean age is 50 years. This group has, on average, access to 1.7 cars. All three participants have bikes at their disposal as well as valid driver's licenses, two of them own a seasonal ticket for PT, and one of them possesses an electric moped. Two of them have (grand)children to take care of, while only one of the



participants works within the city. As far as the preferred mode of transport is concerned, one person mainly cycles, another walks or cycles, and a third one uses either a car or an electric moped depending on the season.

While inferences on the population should be considered carefully due to the small sample size of just three people loading onto this factor, the data is—at least tentatively—consistent with the analysis. This group seems to be more open to different ways of travel within the city. They exhibit a high appreciation, accessibility, and use of various modes of transport, indicating multimodal mobility behavior. In other words, one participant summarized, “[...] *I would not want to just use the car all the time or just ride the bike all the time because there are many, many aspects that influence [the way I travel], like: Is the bike safe [from theft at the destination]? Do I have a parking space there? Would I have to pay for it?*”

#### 4.4. Profile 4 – “*The Safe and Cautious Type*”

People of this viewpoint share a need for safety and control regarding their inner-city mobility behavior. They usually try to avoid situations in which they might feel unsafe (statement 35/factor score +3) and, thus, choose to travel in a way that poses the lowest accident risk (40/+3). Accordingly, they prefer if lanes are dedicated to a single mode of transport (14/+3). “*Since I am riding the bike a lot, it is just much more pleasant to have bike lanes,*” said a factor exemplar.

This group is also the only one that at least does not discount the danger of being harassed or assaulted on daily trips (41/0), which, as one person shared during the interview, might be down to a negative personal experience: “*When do I feel unsafe? [...] it is true, there was an incident.*”

People sharing this viewpoint seem to be more strongly influenced by their habits than other groups. They usually move about in the same way (37/+2) and neither reconsider their mobility choices (2/-2) nor appreciate being able to choose among different forms to travel. “*It is everyday life and in everyday life, one actually does not contemplate—it’s routine, exactly,*” reinforced one of the loading participants.

Moreover, this group of people is not concerned with owning a mode of transport (7/-2) or its appearance and condition (27/-3). That is, they do not want to express their lifestyle and convictions through their way of travel (10/-1).

Apart from their pronounced safety concerns, these people place importance on a comfortable journey to their destination (19/+2) rather than a seamless one (11/-1). This might be a reason why they not only consider the distance of their trips (6/+4) but also—much more than other groups—the possible weather conditions (5/+3). One person stated, “*I am a fair-weather cyclist. If the weather is nice, we are more likely to ride our bikes.*”

The four people loading onto this factor are distributed among all of the cities, with two living in Stockerau. All participants sharing this viewpoint are female with a mean age of 41 years. On average, these people have 1.0 cars at their disposal, with one participant stating not to have access to one. While all of them have valid driver’s licenses and at least one bike at their

disposal, 75 % also own a seasonal ticket for PT. Additionally, two people added cargo bikes to the list of modes of transport they had access to. Three of the four participants loading onto this factor take care of children, with one additionally looking after an elderly person. Only one participant sharing this viewpoint works within the city. Regarding their most used modes of transport, all of them referred to either cycling, walking, or a combination of both, with just one person claiming to conduct most trips by car and bicycle.

Even if the sample size of this group is relatively small, there are a few important aspects to note, which are reinforcing the analysis. Firstly, all the Q-sorts loading onto this factor were performed by women. Secondly, this group is on average the youngest one as well as the one with the least cars at their disposal. A close examination of the interview transcripts establishes a link of these characteristics to the aspect of safety: Three of the participants sharing this viewpoint referred to possibly dangerous situations in inner-city traffic in the context of traveling with people they take care of, i.e., their children and, in one instance, a parent. One factor exemplar went into more detail: *“It is very important to me, as a cyclist, to be sure to not be run over and that everything [lanes] is well separated. It is a recurring problem that bike lanes end suddenly, and one does not know where to go with one’s kid to not be in the thick of traffic.”* It stands to reason that this view might be prominent among relatively young mothers of children not yet independently conducting trips within their cities.

#### 4.5. Profile 5 – “*The Efficient and Autonomous Type*”

People that share this point of view regard efficiency and independence as their top priorities when traveling within their cities. They value spontaneity and flexibility (statement 13/factor score +4) as well as saving time on their trips (31/+2) much higher than all other groups. Two factor exemplars referred to this connection during the interviews. One stated, *“[...] I choose to travel in a way that allows spontaneity and flexibility also because time is a big issue for me,”* while the other one said, *“Time is a valuable resource. If one adapts one’s mobility in a flexible way, it is about doing so in a reasonable frame of time.”*

Consequently, these people want to choose their route themselves (8/+3) in a way to travel as seamlessly as possible (11/+3), which is also why they appreciate the ability to plan reliably (23/+2). *“[...] One does not want to waste ages just to cover a short distance and change seven times into some kind of regional bus,”* emphasized one participant.

While people loading onto this factor do not feel without alternatives (3/-4) and do not always opt for the same form of travel (37/-1), it is still important to this group to own a mode of transport (7/+3). These people’s desire for autonomy is further reinforced by the fact that they want to move along independently of traffic (15/+2). Accordingly, they care more about their privacy than all other types (26/0) and less about the possibility of meeting other people along the way (25/-2). Conversely, it is more important to this group how others perceive the way they travel (43/0), which might be owed to the fact that they want to express their lifestyle and convictions with their form of mobility (10/+2).

While people sharing this viewpoint do want to experience a sense of joy on their daily trips within their cities (16/+2), they care less about pleasant surroundings (4/-2) or the weather

conditions (5/-1) than all other types. Neither distances of their trips (6/-1), the availability of parking spots (34/-2), nor already spent (39/-3) or variable costs (32/-3) influence their mobility behavior.

This factor is comprised of two people living in Fischamend and three people living in Stockerau. 80 % of them are male and their mean age is 50 years. All of them own a driver's license and, on average, they have 1.2 cars at their disposal, with one participant stating not to have access to one. At least one bike is available to all of the people loading onto this factor but just one person possesses a seasonal ticket for PT. 60 % of this group have children, while two of them work at least partially within the city. The transport mode of choice is the bicycle, with four participants citing it as one of their most-used forms of travel. More precisely, three people claimed to predominantly use the bike, with one alternating between bike and car depending on the season and another one relying on the car altogether.

The descriptive statistics of this group are especially of note when comparing them to Profile 2. Both the viewpoints, as well as the characteristics show some similarities. However, there is an important difference in what they perceive to be the optimal mode of transport for fulfilling their daily mobility needs within their respective cities, with Profile 5 predominantly relying on cycling. Additionally, compared to Profile 2, Profile 5 feels much more like there are alternatives to the way they travel.

Apart from that, there is another distinguishable feature of Profile 5: Participants emphasize efficiency for the sake of saving time, with one factor exemplar going as far as stating, *"Because time is valuable, right? [...] All the time I spend on the street [...] I do so involuntarily [...]. Therefore, it is wasted time if I cannot do it all in one [trip]."*

## **4.6. Differences and Similarities across the Identified Profiles**

As briefly pointed out in [chapter 4](#), the correlation matrix of the factors (see Table 3) indicates similarities between the profiles. Specifically, the three pairs with the highest correlation values, namely, factor 1 and factor 4, factor 1 and factor 5, as well as factor 2 and factor 5, call for further explanations and differentiations.

First, when comparing Profiles 2 and 5, a common theme of independence and autonomy shared across the viewpoints emerges, which could explain the relatively high correlation value of 0.51. However, there are some statements with significantly different factor scores that help in distinguishing the two groups. For instance, people sharing the viewpoint of Profile 2 are very much influenced by the distance (statement 6/factor score +4) and purpose (44/+4) of their trip, as well as the availability of parking spots (34/+2). Additionally, they feel more without alternatives (3/+1), and less responsible for the environment and climate (30/-1) than Profile 5. All these aspects indicate that people of Profile 2 are much more concerned with getting about in a way that is practicable for them and compatible with their daily routine, whereas people sharing the viewpoint of Profile 5 are open to adapting their mobility behavior, as long as their high standards in terms of time-sensitivity and self-determination are met. Profile 2 is therefore

labeled as “*Purpose-Driven and Pragmatic*”, while Profile 5 is described as “*Efficient and Autonomous*”.

Second, Profile 1 exhibits relatively high correlations with both Profile 4 (0.54) and 5 (0.55) respectively. In these cases, however, a glance at the saliently ranked factor scores allows for a clear distinction: Profile 1 can be considered the most active (12/+4; 18/-3), social (25/+3), and emotional type (4/+3; 16/+3) with a pronounced environmental awareness (30/+4; 42/+2). The relatively high correlations might, thus, stem from similar rankings in the more “*neutral*” part of the distribution.

Similarly, Profile 3 and Profile 4 are unambiguously characterizable by their most saliently rated items, explaining why they exhibit comparatively small correlations with all other factors. Hence, Profile 3 is named “*Flexible and Contemplative*”—referring to their openness to planning and trying new ways to travel (38/-2; 2/+3; 24/+4)—while Profile 4 is labeled “*Safe and Cautious*”—referring to their pronounced safety concerns (14/+3; 35/+3; 40/+3).

Nevertheless, there are apparent similarities that exist between some or all of the uncovered profiles, which are illustrated in Table 8, depicting the consensus statements. For example, the sentiment that time spent on a trip might be used for other activities, such as reading a book or making phone calls (statement 17), seems to be of no concern across the mobility profiles. An explanation for this was given by several participants during the interviews, who stated that the travel times within the cities were simply too short to perform such activities.

Other similarities across the profiles include the importance of combining necessary trips (36), an indifference towards arriving at a destination in a relaxed state (9), and an irrelevance of being able to travel irrespective of traffic (15).

## 5. Discussion

This chapter aims to discuss the results of the empirical research as well as to put them into the context of existing literature on mobility behavior. First, the identified mobility profiles and their defining characteristics are juxtaposed with the findings of previous research. Second, the novelty and potential advantages of the theoretical approach applied in this thesis are examined. In the end, possible limitations of the study at hand are taken into consideration to infer learnings for future research. The discussion, thus, lays the foundation for chapter 6, in which target-group-specific interventions are derived from the five extracted viewpoints, serving as policy recommendations that may support a sustainable transformation of the transport sector.

### 5.1. Theories and Findings: Embedding the Extracted Mobility Profiles

Profile 1, “*The Healthy and Conscious Type*”, exhibits a pronounced responsibility to reduce the environmental impact of their mobility behavior (statement 30/ factor score +4). Following the theoretical framework laid out in chapter 2, this should speak for a high level of problem awareness and eventually translate into the formation of personal norms (Schwartz, 1977). Both can be observed for Profile 1 (42/+2; 10/+2; 45/+2). Additionally, people sharing this viewpoint place a pronounced value on conducting their daily trips in an enjoyable and healthy way (4/+2; 12/+4). The observed tendency that participants loading onto this factor often relies on bicycles to move about in their respective cities, is substantiated by previous research: Passafaro et al. (2014) identified the importance of positive emotions as antecedents of the desire to cycle in cities. Additionally, Hoffmann et al. (2020) found that fitness and environmental aspects simultaneously motivated non-car users to choose active forms of mobility over other alternatives. Similarly, Anable (2005) identified the group of “*Aspiring Environmentalists*”, who exhibited parallels to “*The Healthy and Conscious Type*”, stating that these people had previously increased their share of active mobility. According to these consistent results, it seems that the needs and preferences of Profile 1 could be met with active modes of transport, making them a particularly interesting target group for promoting walking and cycling among them. Apart from that, further investigations are needed to understand, why this viewpoint is much more influenced by normative variables (i.e., AC, AR, and PN) than any of the other extracted profiles.

The statements ranked highest by Profile 2 reflect mainly instrumental aspects (e.g., 44/+4; 13/+3; 19/+3; ), coinciding with the findings of Anable and Gatersleben (2005), who revealed that flexibility and convenience played an especially important role depending on the intention of a trip. Additionally, this “*Purpose-Driven and Pragmatic Type*” is not only significantly influenced by the distance of their respective trip (6/+4) but they also show a higher level of routine behavior compared to the other profiles (2/0; 37/+2; 38/+2). For most of the participants sharing this viewpoint, these circumstances translate into a marked dependency on their own transport mode (7/+3). As one loading participant underlined during the interview, “*I do not think that we would get by without a car.*” The results uncovered here

are in line with the framework of Klöckner and Blöbaum's (2010) CADM, in that situational influences not only affect behavior directly but also indirectly via habits. That is, the perceived and objective constraints may contribute to the formation of habitualized behavior by limiting the behavioral alternatives of an individual (Klöckner and Blöbaum, 2010). Simultaneously, the situational influences affecting this viewpoint might explain the relatively low level of personal norm activation, since *"norms to behave in a subjectively or objectively impossible way will [...] be deactivated in the long run"* (Klöckner and Blöbaum, 2010, p. 576). These findings indicate that behavioral interventions targeted at this profile may be more fruitful if they take perceived and actual control over the desired behavior into consideration.

Drawing on the factor scores, Profile 3 can be considered the most adaptable (2/+3; 37/-4) type of the five uncovered profiles. In essence, people sharing this viewpoint appreciate the possibility of choosing among different modes of transport for different trip purposes (24/+4; 44/+4). According to Busch-Geertsema et al. (2016), this openness towards multimodality may indicate that this group could be composed of relatively young people, seeing as the willingness to use a variety of transport modes is assumed to decrease with advancing age. While this supposition cannot be underpinned by data from the Q-sorts or interviews, the prevalence of the *"Flexible and Contemplative Type"* may reflect an increase in the importance of multimodality in general (Busch-Geertsema et al., 2016). Indeed, several independently conducted studies identified a multimodal mobility type, characterized by high flexibility in their mobility behavior, adapting transport mode choices according to the purposes of the respective trips (Bartz, 2015; Hickman and Vecia, 2016; Rajé, 2007). In the context of CADM (Klöckner and Blöbaum, 2010), the characteristics of Profile 3 indicate that people sharing this viewpoint have high levels of behavioral control. This stark contrast of situational influences between Profile 2 and Profile 3 might in turn explain, why the latter exhibits less routinized behavior (2/+3; 37/-4; 38/-2) and stronger feelings of responsibility to act in an environmentally friendly manner (30/+3; Klöckner and Blöbaum, 2010). To this end, further investigations of the reasons for the differences in perceived and actual control between the two profiles might support the development of behavioral interventions.

The identification of Profile 4, *"The Safe and Cautious Type"*, addresses an issue recently raised by Haselsteiner et al. (2020), who stated that the role of safety concerns in explaining mobility preferences had often been neglected by previous research. In this regard, the factor scores of Profile 4 unveil the importance of a feeling of safety during daily trips (14/+3; 35/+3; 40/+3) for a certain group of people. According to previous research, aspects concerning safety, such as lanes dedicated to specific modes of transport, are especially important for women (Heinen et al., 2010). Even though this finding cannot be statistically validated with data from the Q-study, it is interesting to note that all participants loading onto Profile 4 are, indeed, female. However, and more importantly, the interviews with said participants revealed that safety issues are given special priority when conducting daily trips accompanied by one's children. Essentially, the statement *"[...] the older the children get, the more I can ride my bicycle again,"* made by one interviewee, shows that being responsible for children constrains an individual's opportunity set. This might be an explanation, for why households with children have been found to have a higher dependency on cars than child-less ones (Bartz, 2015;

Heinen et al., 2010). Therefore, behavioral interventions should not only address people's personal preferences but also consider their respective life situations.

The importance of autonomy (7/+3; 8/+3; 15/+2; 20/+1), which is reflected by Profile 5, has already been discussed by Steg (2005), who identified these aspects as an important motive for the use of cars. However, in contrast to Profile 2, people sharing the viewpoint of Profile 5 exhibit an awareness of the adverse effects of their mobility behavior on the climate (42/+1), take ownership of their actions (30/+3), and feel at least somewhat morally obliged to behave in an environmentally sound manner (10/+2; 21/+1; 45/+1). These findings are in line with the framework of NAM (Schwartz, 1977) and should, theoretically, lead to a higher share of active mobility among people loading onto this profile compared to Profile 2. The empirical evidence of this thesis shows such a tendency but further research is needed for a statistical verification. Apart from that, the results substantiate the supposition that situational influences may play an important role in the (de)activation of personal norms (Klöckner and Blöbaum, 2010). As highlighted in the discussion of Profile 3, it would be interesting to investigate the reasons behind the differences in perceived and actual control between Profile 3 and Profile 5, seeing as both value their independence, but only the latter feels there are multiple ways to satisfy this particular need.

As far as similarities across the profiles are concerned, statement 17—was deemed irrelevant by most people in the research area across all cities. Accordingly, the analysis identified it as a consensus statement for the first three profiles with similar factor scores across all five profiles. Statement 17 was mostly perceived to be referring to long PT trips and, thus, deemed irrelevant for the respective cities. In the case of the research area, it might have been advisable to phrase the statement with a higher emphasis on “*making a telephone call*” rather than “*reading a book*”, considering the time realistically spent on a PT trip in such small towns. While this is in part true, there is still a reason for the item to remain within the Q-sample: The statements were phrased to be applicable across cities with different characteristics to allow for comparative follow-up studies. Additionally, there is evidence to support that the possibility to spend travel time productively is influencing people's mobility choices in some settings (e.g., van Exel et al., 2011).

Furthermore, analysis of the Q-sorts showed statements regarding social status (statement 1; 27) and subjective norms (22; 43) to be considered irrelevant by most participants and across all profiles. This result is in line with that of Cools et al. (2009), who also applied Q-methodology, and did not find proof of a connection between social status and transport mode choices. Similarly, Donald et al. (2014) were unable to detect a possible influence of descriptive norms (a subcategory of social norms) on travel behavior. While some research has detected a link between these aspects and mobility behavior, Bartz (2015) noted that certain interview settings as well as the phrasing of items might prevent people from rating such statements sincerely. In a similar vein, Steg et al. (2001) discovered that participants in their studies were hesitant to admit that symbolic and affective motives contributed to their decision to drive. Thus, future research may consider alternative approaches to explore the importance of social norms in the formation of mobility preferences and behavior.



## 5.2. Five Inner-City Mobility Profiles: A Novel typology?

Creating typologies is a common procedure used across a variety of disciplines, ranging from market research to political science (Bartz, 2015; Hickman and Vecia, 2016). Such segmentations prove useful in reducing complexity by discerning clusters of individuals sharing similar traits or viewpoints (Anable, 2005; Bartz, 2015; Dill and McNeil, 2013). This way, products, services, or policies can be developed with a specific target group in mind (Anable, 2005; Bartz, 2015; Cools et al., 2009; Dill and McNeil, 2013).

In the past, attempts have been made to identify groups of people with similar mobility preferences or behavior (van Exel et al., 2011). In this regard, a basic segmentation approach is to cluster people according to their most used mode of transport or their shared personality traits, e.g., sociodemographic variables (Anable, 2005; Cools et al., 2009). However, some researchers have raised the issue, that a priori segmentations based on such aspects may neglect the complex socio-psychological processes involved in the formation of behavior (e.g., Anable, 2005; Rajé, 2007). On the one hand, it has been observed that people with similar sociodemographic characteristics vary strongly in their mobility behavior (Haselsteiner et al., 2020). On the other hand, previous research has found that people often have widely differing motives for using the same mode of transport (Anable, 2005).

Some researchers have already taken on the task of creating mobility typologies guided by behavioral theories (e.g., Anable, 2005; Cools et al., 2009; Hickman and Vecia, 2016). However, most of these segmentation approaches are based on differences in individuals' attitudes toward—or the actual use of—various transport modes rather than socio-psychological antecedents of mobility behavior on a meta-level. For instance, Huneke et al. (2005) discern four of their six mobility sub-groups based on varying assessments of PT. Similarly, Cools et al.'s (2009) segmentation rests upon whether people prefer cars or PT.

The approach taken for the Q-methodological part of this thesis was different: The goal was not to assess, what people thought about certain modes of transport or which ones they preferred, but rather, what socio-psychological variables influenced their daily mobility preferences. Participants' reported behavior was then inquired about with additional questions at the end of the interviews. This way, the resulting typology should more likely allow for people to share a viewpoint about the importance of certain influencing variables, even if they preferred different modes of transport or exhibited different behaviors.

The fact that—even considering the rather small sample size—all but one of the profiles are represented across the whole research area indicates that mobility preferences may be independent of the topographic and infrastructural peculiarities of a certain city. Additionally, people with similar sociodemographic characteristics or the same preferred transport mode choices loaded onto different profiles. This corroborates that a priori segmentations based on predefined variables, such as transport mode choice, tend to neglect the complex socio-psychological processes involved in the formation of mobility preferences (eg., Anable, 2005; Haustein and Hunecke, 2013). In other words, there is no such thing as a stereotypical “*car driver*” or “*cyclist*”. These findings substantiate the value of the approach pursued by the research at hand, which extracted viewpoints on mobility, not detected in previous studies. This



thesis, therefore, provides a novel vantage point for investigating people's inner-city mobility preferences.

### 5.3. Study Limitations

With the approach adopted in this thesis proving successful in answering the research questions, potential limitations regarding its nature and implementation remain. Some of these aspects are discussed in the following, while simultaneously providing starting points for further investigations.

One of the limitations of this thesis refers to the scope of research. Participants of the empirical study were asked to contemplate only their routine mobility behavior within their respective hometowns. In practice, however, many regular trips are part of journeys going beyond city borders—especially since the cities of the research area are rather small and many inhabitants commute to other places for work or education (Statistik Austria, 2022c, 2022d, 2022e). Hence, people faced the challenge of cognitively discerning what they deemed important for one part of the journey, without being influenced by the other part. While this issue was emphasized during the interviews and brought to the attention of the participants, it cannot be ruled out completely that, at some point during the sorting process, a handful of them also deliberated aspects of their mobility behavior beyond the city borders. However, when such inconsistencies were spotted by the interviewers, they intervened to get the participants' thought processes back on track. Therefore, the overall effect should be negligible.

As mentioned above, the P-set is—compared to the mean population of the research area—skewed towards people with higher education. Apart from the fact that Q-methodology does not seek to be representative in its explorative approach (Byrne et al., 2017), Kelly et al. (2017) have shown that people who at least hold a high school diploma are more likely to engage in qualitative research. Even though the participants of the research were chosen to represent a heterogeneous P-set, future research should aspire to include more people with diverse educational backgrounds.

Another possible limitation arises regarding the assessment and measurement of actual behavior. In terms of preferred transport mode choice, the study at hand relied solely on self-reported mobility behavior inquired in a short survey after the respective interviews. The participants' behavior as performed in real life might, thus, deviate from the information provided by them. Indeed, previous research has found self-reported behavior to significantly differ from that reported by observers (Chao and Lam, 2011). Therefore, a combination of the approach applied in this thesis with observations of actual behavior might provide further information on the validity of the results presented above.

As far as the theoretical underpinnings of this thesis are concerned, CADM's framework has proven its worth in guiding the systematic development of a structured Q-sample. The extracted mobility profiles and their characteristics provided a useful starting point for the deduction of policy implications (see [chapter 6](#)). Therefore, future research operationalizing CADM, e.g., using a quantitative study design, may gather further insights into exactly what role the respective behavioral variables play in developing intention and actual behavior.

Lastly, it is important to note that there is always a temporal element to Q-methodological studies, meaning that participants' Q-sorts reflect their viewpoint on an issue at the time of completing the sorting task (Thaler, 2019). Hoffmann et al. (2020) found that study participants' attitudes were not only context-specific but also subject to change over time. While this suggests that the results of this thesis are merely a snapshot of people's viewpoints, it does not discount the value of the research at hand. Q-methodology is designed in a way that forces participants to spontaneously sort statements, which reveals viewpoints that are shared interpersonally. The aim of the method is, thus, to show points of view that exist within a community, even though they may change over time.

## 6. Policy Implications

Apart from health and safety concerns caused by high levels of car use (e.g., Brand and Hunt, 2018), internationally agreed-upon climate change mitigation goals oblige many cities around the world to reduce transport-related greenhouse gas emissions (e.g., BMK, 2021). However, over the past decades, political efforts to increase the share of active, and environmentally friendly forms of mobility, have lagged behind expectations, and therefore, failed to considerably shrink the carbon footprint of the transport sector (e.g., Bamberg et al., 2020).

Foltýnová et al. (2020) found that even if stakeholders share a common vision of a sustainable mobility future, the means and strategies needed to achieve the collectively desired outcomes are still contested. Furthermore, previous studies observed that single policies—such as the improvement of certain infrastructure—will not suffice in bringing about the expected change, especially, if they are not addressing the diversity of mindsets existing among the general population (e.g., Haselsteiner et al., 2020; Hickman and Vecia, 2016; Spotswood et al., 2015).

Hence, the purpose of this chapter is to demonstrate that the typology created in this thesis is not merely of theoretical value, but also provides substance for assessing previously suggested policy measures in the light of the new findings. Even if a quantitative analysis of the prevalence of the mobility profiles is needed, their socio-psychological characterization already allows for evaluating behavioral interventions in terms of their potential to promote active mobility.

The following subchapter discusses measures that may be regarded similarly across all uncovered profiles. These policies either address or contradict the preferences of large parts of the population. The second subchapter then introduces and discusses target-group-specific interventions that may be fruitful in increasing active mobility among people sharing the viewpoint of one of the extracted mobility profiles.

### 6.1. “*One Size Fits All*” Policies

Policymakers tend to develop and implement measures aimed at the whole population (Egmond et al., 2006). However, for such “*one size fits all*” approaches to be effective, people need to share a homogenous view of the policy’s target (Cerna, 2013). To this end, similarities across the uncovered profiles can provide valuable insights as to which behavioral interventions might be equally (in)effective when addressing large parts of the population.

Previous research revealed that, during medium-distance journeys, people appreciate the possibility to spend travel time doing something productive (Cools et al., 2009; van Exel et al., 2011). However, in the case of the study at hand, this aspect (statement 17) seems to be of no concern across all identified mobility profiles. Hence, suggestions to promote that, e.g., PT offers the possibility to get some work done while on the way to the office (e.g., Cools et al., 2009), should take the realistic inner-city journey times into account. Insights from the interviews revealed that the distances usually traveled within the research area’s cities are simply too short to take this aspect into account. This means that campaigns advertising the

advantage of spending PT travel time productively may be more efficient in a supraregional context.

Interestingly, none of the uncovered viewpoints seems to compare the expenses of different transport modes for daily, inner-city trips (32). Drawing on the findings of previous research, the underlying reason might be that people are simply unsure about the cost of existing alternatives (Hoffmann et al., 2020), rendering comparisons difficult. If that were indeed the case, information campaigns on the high costs of motorized individual transport within cities (Meschik, 2012) could prove effective in increasing shares of active mobility—even if statement 32 was universally rated negatively.

Some researchers proposed that measures geared towards “*normalizing*” active forms of mobility may aid in improving their reputation and uptake (e.g., Haselsteiner et al., 2020). For example, the initiative “*Austria Cycles*” hosts an annual, nationwide competition promoting cycling to work (WHO, 2020). Currently, one of its main objectives lies in the identification of so-called “*multipliers*”, who, with their participation, may convince others to also join the initiative (Gangl et al., 2021). In this regard, a specific contest is held among Austrian mayors to reward the ones with the most cycled kilometers (Energy Institute Vorarlberg, 2022). Following the theoretical framework of TPB, such initiatives try to influence behavior by targeting subjective norms, that is, how cycling is believed to be perceived by society (Ajzen, 1991). The results of this thesis, therefore, indicate that the effectiveness of campaigns like “*Austria Cycles*” should still be evaluated carefully, seeing as statements regarding descriptive or injunctive norms are considered unimportant across all profiles (22; 43).

In contrast, the perceived importance of combining necessary trips (36) is an aspect that all profiles agree on rather strongly. Establishing connectivity of separate parts of a journey as well as providing a solution to the last mile problem (Hickman and Vecia, 2016), thus, seem like desirable and effective political targets. In fact, during the interviews conducted for the study at hand, several participants across all profiles and cities highlighted the importance of an extensive and, especially, uninterrupted cycle network. For instance, one person said: “*[The cycle lanes] are not covering the whole area [of the city] now. [...] If they were more connected, it would be good.*” Such claims provide a possible explanation, for why previous studies found that infrastructural measures sometimes fail in rising shares of cycling (e.g., Spotswood et al., 2015). Connecting existing cycling lanes may be as important as building new ones.

## 6.2. Target-Group-Specific Policies

Due to the observed ineffectiveness of generic behavioral interventions, it has increasingly been suggested to consider the diversity of viewpoints held among people (e.g., Anable, 2005; Egmond et al., 2006). Thus, the differences across the extracted mobility profiles may aid in assessing the effectiveness of target-group-specific policies.

The theoretical underpinnings of NAM imply that the adoption of sustainable behavior depends on the interplay of awareness of a problem and its consequences, ascription of responsibility, and the eventual activation of personal norms (Mehdizadeh et al., 2019; Schwartz, 1977).

Accordingly, Jakovcevic and Steg (2013) confirmed that the intention to reduce car use is tied to PN, which in turn are affected by the AC of car use and the AR for the negative consequences of one's car use. With this in mind, the responsibility of reducing one's impact on the environment (statement 30) felt by Profiles 1, 3, and 5 provides an opportunity for policymakers to convince people, who share these viewpoints, to switch to more environmentally friendly transport modes (cf. Jakovcevic and Steg, 2013).

However, some people feel that the impact of their inner-city mobility on climate and the environment is negligible, as one person specified during the interview: “[...] *we will hopefully survive the little I drive with my car.*” Such statements indicate a lack of activated personal norms to behave in an environmentally sound manner. The results of the thesis at hand show that Profile 2 least considers the environmental effects of their mobility behavior (statement 30/factor score -1; 42/0). Hence, officials are advised to first make people sharing this viewpoint more aware of the negative consequences of motorized individual mobility, so that they start to develop a feeling of responsibility and moral obligation that can eventually be appealed to at a later stage (cf. Jakovcevic and Steg, 2013). This suggestion is in line with the findings of Ramos et al. (2020), who also identified a lack of awareness of the environmental consequences of journeys and trips with non-commuting purposes.

CADM's framework hints at another potential reason, why Profile 2 may be oblivious of the environmental impact of their mobility behavior. As Klöckner and Blöbaum (2010, p. 576) stated: “[...] *norms to behave in a subjectively or objectively impossible way will change or be deactivated in the long run.*” It may be necessary to improve the situational circumstances for people sharing the view of Profile 2, before raising awareness of the environmental consequences of their behavior. If people belonging to this group feel there is no alternative way to act (3/+1; 37/+2), they will likely continue their behavior and not start to activate personal norms (Klöckner and Blöbaum, 2010). In this case, policymakers may try to break such behavioral routines, e.g., by starting incentive programs for cycling, so that people experience firsthand that alternative ways to travel are, indeed, available (cf. Xing et al., 2018).

Passafaro et al. (2014) emphasized the importance of emotions as antecedents of the desire to cycle. Considering that Profile 1 highly values the hedonic aspect of inner-city mobility (4/+2; 16/+3; 25/+3; 29/+1), people sharing this viewpoint may be an especially susceptible target group to cycling and walking campaigns. By emphasizing the positive sensations associated with active forms of mobility, such as joy and excitement, cyclists could be reassured of their behavior, and people rarely using active forms of mobility may be encouraged to do so more often (cf. Jakovcevic and Steg, 2013). Seeing as, “[...] *positive emotions might be more linked to the personal experience of individuals who have ascertained the existence of many beneficial effects [of cycling]*” (Passafaro et al., 2014, p. 81f) local officials may also try to improve people's actual experience of using active mobility, e.g., by embellishing cycle lanes and sidewalks (c.f. Hickman and Vecia, 2016).

The term “*Mobility-as-a-Service*” has gathered moment over the past decades, in part due to the rise of various transport mode sharing models (Karlsson et al., 2020). Such schemes promote the idea that mobility needs may be fulfilled independently of owning a transport mode (Chen et al., 2020). A look at the factor scores reveals, that Profile 3, “*The Flexible and*

*Contemplative Type*” may be the main target audience for “*Mobility-as-a-service*” models, as people with this view exhibit a willingness to adapt their behavior (2/+3;37/-4) without being attached to a certain transport mode (7/-2). Political efforts to promote sharing schemes among Profile 5, on the other hand, will probably be less fruitful, as this group values their independence (8/+3; 15/+2; 20/+1), and simultaneously seems to be tied to their own transport mode (7/+3).

As far as infrastructural measures are concerned, the importance of the built environment for addressing not only objective but also subjective safety concerns of traffic participants has often been discussed in previous research (e.g., Götschi et al., 2018; Heinen et al., 2010). While Profile 3 and Profile 5 seem to place only little value on lanes being dedicated to single modes of transport (statement 14), people sharing the view of Profile 4 consider this an important aspect. Hence, to increase the latter’s walking and cycling share, it might be necessary to adjust the respective facilities and allocate more space as well as dedicated lanes to active forms of mobility (cf. Kamargianni et al., 2015). Since most participants loading onto this profile also associate aspects of safety with traveling accompanied by their children, Haselsteiner et al.’s (2020) suggestion to include children in traffic planning should be entertained by policymakers.

The factor scores of Profile 5 indicate that people loading onto this profile are mostly affected by instrumental aspects of mobility, such as efficiency (statement 31/factor score +2; 11/+3) or flexibility (13/+3), while exhibiting a pronounced urge for independence (8/+3; 15/+2; 20/+1). This characterization indicates that they are not likely to adopt active modes of transport in cases, in which they are inferior to motorized individual transport. However, communicating the comparative advantages of cycling or walking within cities to people sharing the view of Profile 5 may be effective in convincing them to change their behavior (cf. Hoffmann et al., 2020). For example, campaigns could promote the fact that cycling can be the fastest mode of transport for inner-city trips (Tranter, 2012).

To summarize, the findings substantiate that single and isolated interventions will not be sufficient in bringing about the needed mobility transformation (e.g., Sarrica et al., 2019). Instead, a well-balanced policy mix, combining a variety of target-group-specific instruments, is necessary to achieve such an unprecedented task. All the while, the participation of local citizens during the whole process of policy formation is essential for the eventual acceptance of the deduced measures (Haselsteiner et al., 2020).

## 7. Conclusion

In the face of a looming climate crisis, it is imperative to investigate the socio-psychological underpinnings of people's mobility behavior. Only if the complex cognitive processes behind people's preferences and choices are understood, can interventions be developed that effectively decrease transport-related greenhouse gas emissions.

The thesis at hand addressed existing knowledge gaps by answering the two research questions:

1. *“Which socio-psychological variables influence people's everyday mobility behavior?”*
2. *“Which inner-city mobility profiles can be identified using a Q-methodological approach?”*

To answer the first research question, established theoretical models were introduced, explaining what socio-psychological elements may influence the formation of behavior. Klöckner and Blöbaum's (2010) CADM proved useful in providing a comprehensive set of antecedents of behavior, by integrating and expanding the frameworks of TPB and NAM. Based on this theoretical foundation, an extensive literature review was conducted, to examine, which variables have previously been found to affect people's mobility preferences and choices in practice. It was shown that, in accordance with CADM's framework, normative, habitual, and intentional processes, as well as situational influences all play a crucial role in forming people's mobility behavior.

This process simultaneously laid the ground for answering the second research question, as it defined the concourse of the topic. A comprehensive list of statements—a so-called structured Q-sample—was developed by integrating at least one item of each component of CADM. These statements were then sorted by participants in a research area comprised of three Lower Austrian cities. The resulting configurations—i.e., Q-sorts—were then factor analyzed to extract five distinct viewpoints on inner-city mobility.

Profile 1, *“The Healthy and Conscious Type”*, was identified as the viewpoint that most valued the medical and emotional benefits of moving about within a city. Profile 2, *“The Purpose-Driven and Pragmatic Type”*, exhibited low levels of (perceived) control over their behavior, resulting in a rather routinized and habitualized view of inner-city mobility. In contrast, Profile 3, *“The Flexible and Contemplative Type”*, showed to have the highest appreciation for alternative ways to travel and, consequently, epitomized the most adaptable viewpoint among the profiles. Aspects of safety were identified as the main aspect constituting Profile 4's mobility preferences, who was consequently named *“The Safe and Cautious Type”*. Profile 5, *“The Efficient and Autonomous Type”* displayed similar characteristics to Profile 2 in terms of a need for independence but exhibited significantly higher levels of perceived control over their behavior and a more pronounced feeling of obligation towards acting sustainably.

Finally, first attempts to use the newly extracted profiles to assess the effectiveness of various policy measures were made. The nuanced description of each mobility profile allowed for evaluating previously suggested behavioral interventions. On the one hand, similarities shared

across the profiles were used to identify policy measures with the potential to appeal to large parts of the population. On the other hand, target-group-specific interventions were analyzed in terms of their ability to address the unique socio-psychological features of each profile.

With the Q-methodological approach applied in this thesis, a novel mobility typology was created, identifying viewpoints that have not been uncovered by previous research. The results, thus, further substantiate the assumption that people sharing certain traits may, indeed, behave differently, and that the same patterns of behavior may be influenced by different motivations.

The study at hand not only contributes to the understanding of socio-psychological influences on people's mobility preferences but also provides starting points for future research. The Q-sample created for this thesis may be applied in various settings and locations. It would be interesting to see, whether comparable patterns emerge under varying socio-economical, cultural, and infrastructural circumstances. Additionally, the actual distribution and relative frequency of the identified mobility profiles within a defined geographical region may be analyzed in a quantitative research design. Thereby, further insights for local policymakers could be gathered, to increase the effectiveness of behavioral interventions aiming to reduce transport-related greenhouse gas emissions.



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## Appendix A: Q-sample (German)

Table 9: Original statements of the Q-sample phrased in German

Statements	
Item Nr.	Wenn ich im Alltag in Fischamend/Korneuburg/Stockerau unterwegs bin, ...
1	... möchte ich mit der Art der Fortbewegung auch meinen sozialen Status zeigen.
2	... überlege ich jedes Mal aufs Neue, wie ich mich fortbewege.
3	... fühle ich mich alternativlos in meiner Art der Fortbewegung.
4	... genieße ich es, meine Wege in einer schönen Umgebung zurücklegen zu können.
5	... informiere ich mich vorab über die Wetterbedingungen.
6	... ist die Länge der Wege ausschlaggebend für meine Art der Fortbewegung.
7	... ist es für mich wichtig, mein eigenes Verkehrsmittel zu besitzen.
8	... ist es mir ein Anliegen, dass ich meine Route (Wege, Zwischenstopps) selbst bestimmen kann.
9	... ist es mir wichtig, dass ich entspannt ankomme.
10	... ist es mir wichtig, dass meine Art der Fortbewegung meinem Lebensstil, meiner Überzeugung entspricht.
11	... ist es mir wichtig, möglichst nahtlos (ohne Umstiege, Unterbrechungen, etc.) von A nach B zu kommen.
12	... möchte ich gleichzeitig etwas für meine Gesundheit tun.
13	... wähle ich eine Art der Fortbewegung, die es mir erlaubt, spontan und flexibel zu sein.
14	... ist mir wichtig, Wege nutzen zu können, die von anderen Verkehrsflächen abgetrennt sind.
15	... lege ich Wert darauf, unabhängig vom Verkehrsaufkommen voranzukommen.
16	... möchte ich durch die Art meiner Fortbewegung auch Freude empfinden.
17	... möchte ich dabei auch Zeit für andere Dinge (z.B. Buch lesen, telefonieren, etc.) haben.
18	... möchte ich mich wenig körperlich anstrengen.
19	... möchte ich möglichst bequem von A nach B kommen.
20	... möchte ich möglichst unabhängig von anderen Menschen sein.
21	... möchte ich durch meine Art der Fortbewegung kein schlechtes Gewissen mir selbst gegenüber haben.
22	... orientiere ich mich daran, wie sich Freunde oder Bekannte fortbewegen.
23	... lege ich Wert auf eine verlässliche Planbarkeit.
24	... schätze ich die Flexibilität, aus verschiedenen Optionen der Fortbewegung auswählen zu können.
25	... schätze ich die Möglichkeit, mit anderen Personen in Kontakt treten zu können.
26	... schätze ich meine Privatsphäre.
27	... sind mir das Aussehen und der Zustand des Verkehrsmittels wichtig.
28	... sind mir Hygiene und Sauberkeit ein Anliegen.
29	... möchte ich durch meine Art der Fortbewegung ein Gefühl von Freiheit spüren.
30	... spüre ich eine Verantwortung, meinen Einfluss auf die Umwelt und das Klima zu minimieren.
31	... steht Zeitsparen für mich an oberster Stelle.
32	... vergleiche ich die für die Strecke anfallenden Kosten.
33	... versuche ich durch die Wahl meiner Fortbewegungsart, Situationen zu vermeiden, die mich ärgern.
34	... beeinflusst die Verfügbarkeit von Abstell-/Parkplätzen meine Verkehrsmittelwahl.
35	... versuche ich durch die Wahl meiner Fortbewegungsart, Situationen zu vermeiden, in denen ich mich unsicher fühle.
36	... versuche ich mehrere notwendige Wege miteinander zu verbinden.
37	... wähle ich meistens dieselbe Art der Fortbewegung.
38	... will ich nicht lange überlegen oder planen, wie ich von A nach B komme.
39	... achte ich bei der Wahl meiner Fortbewegungsart darauf, laufende oder bereits getätigte Kosten auszunutzen.
40	... bevorzuge ich die Fortbewegungsart mit der geringsten Unfallgefahr.

---

**Statements**

---

**Item  
Nr.****Wenn ich im Alltag in Fischamend/Korneuburg/Stockerau unterwegs bin, ...**

---

- 41 ... bevorzuge ich die Fortbewegungsart, bei der ich mich am sichersten vor Belästigungen und Übergriffen fühle.
  - 42 ... denke ich an die ökologischen Konsequenzen meiner Art der Fortbewegung.
  - 43 ... denke ich darüber nach, was andere von meiner Art der Fortbewegung halten.
  - 44 ... entscheide ich mich je nach Fahrtzweck für eine andere Art der Fortbewegung.
  - 45 ... möchte ich durch meine Art der Fortbewegung ein Vorbild für andere sein.
-

# Appendix B: Interview Guideline (English and German)

## Interview guideline for the research project NTN

### Recall the scope of the interview and research

*How did the interview come about? Who was the contact person? ... Duration: max. 60 min*

*Project as part of a research cooperation on mobility behavior with the federal state of Lower Austria. "We are interested in your personal motives/attitudes towards mobility."*

### Explain the reason and obtain consent for the tape recording

*Reference to anonymity: How will the data be processed? Context of the interview.*

*How to proceed during the interview? open questions (no right/wrong answers, but practical experiential knowledge), sorting task, anonymized analysis, etc.*

---

### 1. Start of the interview

- 1.1. Tell us briefly about your every day, inner-city mobility behavior!
- 1.2. Which trips do you make regularly?
- 1.3. What is the purpose of your every day trips?
- 1.4. Has your mobility behavior changed over the years?

### Q - part

We have prepared statements that relate to your inner-city mobility behavior. They do not refer to a specific transport mode or the comparison of means of transport, but to attitudes/thoughts/motives that influence your way of moving about. We ask you to sort the statements according to your agreement (**there is NO right or wrong**):

- Three piles: "agree", "disagree", "neutral"
- Start with the "agree" pile and preferably put them all in front of you. Then distribute them from right to left, depending on how you intuitively feel about the statements - according to the array.
- Then it's best to continue with the "disagree" pile, this time from left to right.
- The third pile at the end: Fill the gaps of the array.
- After sorting, please check again: Does the result paint a coherent picture? Make changes if necessary.

### Reflection on the Q:

- Please tell us, why these statements were placed on the left or on the right, and how you interpreted them!
- Is there an aspect, our statements did not cover?
- Did you struggle with certain statements? Which ones? Why?

---

### 2. Mobility

- 2.1. What is your **most common way of moving about within the city**?
- 2.2. Does this also correspond to your **preferred** way of moving about?
- 2.3. How much are you thinking about **changing** your current way of moving about?
- 2.4. What/Who has **"shaped"** your mobility behavior?
- 2.5. If you could make a **wish** - what would mobility look like in your city?

### 3. End of interview – THANK YOU

- 3.1. Is there anything else you would like to add regarding mobility?
- 3.2. Collect key data via questionnaire
- 3.3. Next step: Results will be published and used for follow-up survey and action planning.

**Do not forget to take a PICTURE of the Q-sort!**

# Leitfaden für Interviews im Rahmen des Forschungsprojekts NTN

## Allgemeine Rahmenbedingungen aus dem Erstgespräch (der Kontaktaufnahme) wiederholen

*Wie kam das Interview zustande? Wer hat vermittelt? ... Dauer: max. 60 min*

*Projekt als Teil einer Forschungskooperation mit dem Land Niederösterreich zu Mobilitätsverhalten.  
„Konkret geht es um Ihre persönlichen Motive/Einstellungen zu Mobilität.“*

## Begründung der Tonbandaufnahme – einholen des Einverständnisses

*Hinweis auf Anonymität: Was passiert mit den Daten? Kontext des Interviews.*

*Wie geht man im Interview vor? offene Fragen (keine richtigen/falschen Antworten, sondern praktisches Erfahrungswissen), Sortieraufgabe, anonymisierte Auswertung, ...*

---

### 1. Gesprächseinstieg

- 1.1. Erzählen Sie uns kurz etwas über Ihren Mobilitätsalltag in der Stadtgemeinde!
- 1.2. Welche Wege legen Sie regelmäßig zurück?
- 1.3. Mit welchem Zweck sind Ihre Alltagswege verbunden?
- 1.4. Hat sich Ihre Mobilität über die Jahre geändert?

### Q - Teil

Wir haben Aussagen mitgebracht, die sich auf Ihr Mobilitätsverhalten beziehen. Es geht dabei nicht um ein bestimmtes Verkehrsmittel oder gar den Vergleich von Verkehrsmitteln, sondern rein um Einstellung/Gedanken/Motive, die Sie in Ihrer Art der Fortbewegung beeinflussen. Wir bitten Sie, die Aussagen nach Ihrer Zustimmung zu sortieren (**es gibt KEIN Richtig oder Falsch**):

- Drei Stapel: „stimme zu“, „stimme nicht zu“, „neutral“
- Mit dem „stimme zu“-Stapel beginnen und am besten alle vor sich hinlegen. Dann von rechts nach links auflegen, je nachdem wie Sie das intuitiv empfinden – der Verteilung entsprechend.
- Dann am besten mit dem „stimme nicht zu“-Stapel weitermachen, diesmal von links nach rechts.
- Den dritten Stapel am Ende: Die Lücken in der Verteilung auffüllen.
- Wenn es liegt, nochmals bitte kontrollieren: Ist das Bild so stimmig? Evtl. Änderungen vornehmen.

### Reflexion über das Q:

- Erzählen Sie uns bitte, warum diese Aussagen ganz links oder rechts angeordnet wurden, und was Sie darunter verstehen!
- Hat Ihnen etwas gefehlt?
- Haben Sie sich bei bestimmten Aussagen schwergetan? Bei welchen? Warum?

### 2. Mobilität

- 2.1. Was ist ihre **häufigste Art der Fortbewegung innerhalb der Gemeinde**?
- 2.2. Entspricht das auch Ihrer **präferierten Art der Fortbewegung**?
- 2.3. Wie sehr denken Sie darüber nach, Ihre momentane Art der Fortbewegung zu **ändern**?
- 2.4. Was/Wer hat Ihr Mobilitätsverhalten **„geprägt“**?
- 2.5. Wenn Sie sich etwas **wünschen** dürften – wie würde die Mobilität in Ihrer Gemeinde aussehen?

### 3. Gesprächsende – DANKE

- 3.1. Gibt es noch etwas, das Sie bezüglich Mobilität ergänzen möchten?
- 3.2. Eck-Daten erheben. (Fragebogen ausfüllen lassen)
- 3.3. Nächster Schritt: Ergebnisse werden veröffentlicht und für Fragebogenerhebung/Maßnahmenplanung verwendet.

**FOTO von Q-sort machen!**

## Appendix C: Questionnaire (English and German)

Table 10: Questionnaire administered after interviews (translated into English)



Location	Date	Time	No. of ppl. in household
<b>Gender:</b>		<b>Year of birth</b>	
<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Diverse			
<b>Highest level of education completed:</b>			
<input type="checkbox"/> Compulsory school <input type="checkbox"/> Apprenticeship <input type="checkbox"/> Master craftsperson <input type="checkbox"/> High school <input type="checkbox"/> College/University			
<b>Transport mode availability:</b>			
<input type="checkbox"/> No. of Cars: .... <input type="checkbox"/> Bicycle <input type="checkbox"/> PT pass <input type="checkbox"/> Driver's license <input type="checkbox"/> Other: .....			
<b>Duty of care:</b>			
<input type="checkbox"/> Children: No./Age: ..... <input type="checkbox"/> Seniors <input type="checkbox"/> Other			
<b>Place of work within the city:</b>			
<input type="checkbox"/> Yes <input type="checkbox"/> No			
<b>Occupation:</b>			
<input type="checkbox"/> Employed <input type="checkbox"/> Worker <input type="checkbox"/> Self-employed <input type="checkbox"/> Student <input type="checkbox"/> (Currently) not employed			

Table 11: Original questionnaire administered after interviews (German)



Ort	Datum	Uzeit	Personen im Haushalt
<b>Geschlecht:</b>		<b>Geburtsjahr</b>	
<input type="checkbox"/> männlich <input type="checkbox"/> weiblich <input type="checkbox"/> divers			
<b>Höchste abgeschlossene Ausbildung:</b>			
<input type="checkbox"/> Pflichtschule <input type="checkbox"/> Lehre <input type="checkbox"/> Meister:in <input type="checkbox"/> Matura <input type="checkbox"/> Studium (FH, Universität)			
<b>Verkehrsmittelverfügbarkeit*:</b>			
<input type="checkbox"/> Anzahl PKWs: .... <input type="checkbox"/> Fahrrad <input type="checkbox"/> Zeitkarte für ÖV <input type="checkbox"/> Führerschein <input type="checkbox"/> Sonstige: .....			
<b>Betreuungspflichten:</b>			
<input type="checkbox"/> Kinder: Anzahl/Alter: ..... <input type="checkbox"/> Senior:innen <input type="checkbox"/> Sonstige			
<b>Arbeitsplatz in Gemeinde:</b>			
<input type="checkbox"/> ja <input type="checkbox"/> nein			
<b>Beruf:</b>			
<input type="checkbox"/> Angestellte:r <input type="checkbox"/> Arbeiter:in <input type="checkbox"/> selbstständig <input type="checkbox"/> in Ausbildung <input type="checkbox"/> nicht aktiv berufstätig			



## Appendix D: Composite Q-sorts

Disagree				Neutral		Agree		
-4	-3	-2	-1	0	+1	+2	+3	+4
... I do not want to feel remorseful about the way I travel. (22)	... I do not want to exhaust myself physically. (18)	... I feel there are no alternatives to how I travel. (3)	... I want to express my social status with the way I travel. (1)	... I contemplate how I travel each time. (2)	... how I travel depends on the distance. (6)	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions. (10)	... I enjoy pleasant surroundings along the way. (4)	... I want to travel in a way that is beneficial for my health. (12)
... I think of how others perceive how I travel. (43)	... I appreciate my privacy. (26)	... I want to use my time along the way to do other things (reading, phone call, etc.). (17)	... I want to arrive at my destination as comfortably as possible. (19)	... I check the weather reports beforehand. (5)	... I want to own the mode of transport that I use. (7)	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport. (14)	... I want to experience a sense of joy along the way. (16)	... I feel a responsibility to minimize my impact on the environment and climate. (30)
	... the appearance and condition of my mode of transport are important to me. (27)	... the availability of parking spots influences my transport mode choice. (34)	... I place value on hygiene and cleanliness. (28)	... I want to be able to choose my own route. (8)	... I travel in a way that allows for spontaneity and flexibility. (13)	... I appreciate the flexibility of being able to choose among different modes of transport. (24)	... I appreciate the possibility of being able to interact with other people. (25)	
	... I chose how I travel so as to avoid situations that might irritate me. (33)	... I favor the way of travel with the lowest risk of accidents. (40)	... saving time is of utmost importance to me. (31)	... it is important to me to feel relaxed when I arrive. (9)	... I want to be as independent of other people as possible. (20)	... I think of the ecological impact of how I travel. (42)	... I try to combine necessary trips along the way. (36)	
		... I favor the way of travel with which I feel safest from harassment and assault. (41)	... I compare the costs of different transport modes. (32)	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.). (11)	... I want to sense a feeling of freedom along the way. (29)	... I want to be a role model for others with how I travel. (45)		
			... I chose how I travel so as to avoid situations that make me feel unsafe. (35)	... I appreciate being able to travel irrespective of traffic. (15)	... I mostly travel in the same way. (37)			
			... I travel in a way as to make the most of running and already spent cost. (39)	... I do not want to feel remorseful about the way I travel. (21)	... how I travel depends on the purpose. (44)			
				... I appreciate being able to plan reliably. (23)				
				... I do not want to waste time contemplating or planning how to get to my destination. (38)				

Figure 5: Composite Q-sort for Profile 1 "The Healthy and Conscious Type"

Disagree			Neutral			Agree		
-4	-3	-2	-1	0	+1	+2	+3	+4
... I want to express my social status with the way I travel. (1)	... I want to use my time along the way to do other things (reading, phone call, etc.). (17)	... I place value on hygiene and cleanliness. (28)	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions. (10)	... I contemplate how I travel each time. (2)	... I feel there are no alternatives to how I travel. (3)	... I want to be able to choose my own route. (8)	... I want to own the mode of transport that I use. (7)	... how I travel depends on the distance. (6)
... I think of how others perceive how I travel. (43)	... I do not want to feel remorseful about the way I travel. (22)	... I chose how I travel so as to avoid situations that make me feel unsafe. (35)	... I do not want to exhaust myself physically. (18)	... I enjoy pleasant surroundings along the way. (4)	... it is important to me to feel relaxed when I arrive. (9)	... I want to be as independent of other people as possible. (20)	... I travel in a way that allows for spontaneity and flexibility. (13)	... how I travel depends on the purpose. (44)
	... I compare the costs of different transport modes. (32)	... I favor the way of travel with the lowest risk of accidents. (40)	... I do not want to feel remorseful about the way I travel. (21)	... I check the weather reports beforehand. (5)	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.). (11)	... the availability of parking spots influences my transport mode choice. (34)	... I want to arrive at my destination as comfortably as possible. (19)	
	... I travel in a way as to make the most of running and already spent cost. (39)	... I favor the way of travel with which I feel safest from harassment and assault. (41)	... I appreciate the possibility of being able to interact with other people. (25)	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport. (14)	... I want to travel in a way that is beneficial for my health. (12)	... I mostly travel in the same way. (37)	... I try to combine necessary trips along the way. (36)	
		... I want to be a role model for others with how I travel. (45)	... the appearance and condition of my mode of transport are important to me. (27)	... I appreciate being able to travel irrespective of traffic. (15)	... I want to experience a sense of joy along the way. (16)	... I do not want to waste time contemplating or planning how to get to my destination. (38)		
			... I want to sense a feeling of freedom along the way. (29)	... I appreciate my privacy. (26)	... I appreciate being able to plan reliably. (23)			
			... I feel a responsibility to minimize my impact on the environment and climate. (30)	... saving time is of utmost importance to me. (31)	... I appreciate the flexibility of being able to choose among different modes of transport. (24)			
				... I chose how I travel so as to avoid situations that might irritate me. (33)				
				... I think of the ecological impact of how I travel. (42)				

Figure 6: Composite Q-sort for Profile 2 "The Purpose-Driven and Pragmatic Type"

Disagree				Neutral		Agree		
-4	-3	-2	-1	0	+1	+2	+3	+4
... I want to express my social status with the way I travel. (1)	... I feel there are no alternatives to how I travel. (3)	... I want to own the mode of transport that I use. (7)	... I want to experience a sense of joy along the way. (16)	... how I travel depends on the distance. (6)	... I check the weather reports beforehand. (5)	... I enjoy pleasant surroundings along the way. (4)	... I contemplate how I travel each time. (2)	... I appreciate the flexibility of being able to choose among different modes of transport. (24)
... I mostly travel in the same way. (37)	... I want to use my time along the way to do other things (reading, phone call, etc.). (17)	... I do not want to feel remorseful about the way I travel. (22)	... I do not want to exhaust myself physically. (18)	... I want to be able to choose my own route. (8)	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport. (14)	... I want to travel in a way that is beneficial for my health. (12)	... I feel a responsibility to minimize my impact on the environment and climate. (30)	... how I travel depends on the purpose. (44)
	... I appreciate my privacy. (26)	... the appearance and condition of my mode of transport are important to me. (27)	... I want to arrive at my destination as comfortably as possible. (19)	... it is important to me to feel relaxed when I arrive. (9)	... I appreciate being able to travel irrespective of traffic. (15)	... I travel in a way that allows for spontaneity and flexibility. (13)	... the availability of parking spots influences my transport mode choice. (34)	
	... I think of how others perceive how I travel. (43)	... I compare the costs of different transport modes. (32)	... I want to be as independent of other people as possible. (20)	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions. (10)	... I appreciate being able to plan reliably. (23)	... I do not want to feel remorseful about the way I travel. (21)	... I try to combine necessary trips along the way. (36)	
		... I do not want to waste time contemplating or planning how to get to my destination. (38)	... I chose how I travel so as to avoid situations that might irritate me. (33)	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.). (11)	... I place value on hygiene and cleanliness. (28)	... I think of the ecological impact of how I travel. (42)		
			... I favor the way of travel with the lowest risk of accidents. (40)	... I appreciate the possibility of being able to interact with other people. (25)	... I chose how I travel so as to avoid situations that make me feel unsafe. (35)			
			... I favor the way of travel with which I feel safest from harassment and assault. (41)	... I want to sense a feeling of freedom along the way. (29)	... I travel in a way as to make the most of running and already spent cost. (39)			
				... saving time is of utmost importance to me. (31)				
				... I want to be a role model for others with how I travel. (45)				

Figure 7: Composite Q-sort for Profile 3 "The Flexible and Contemplative Type"

Disagree			Neutral			Agree		
-4	-3	-2	-1	0	+1	+2	+3	+4
... I want to express my social status with the way I travel. (1)	... I feel there are no alternatives to how I travel. (3)	... I contemplate how I travel each time. (2)	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions. (10)	... I want to be able to choose my own route. (8)	... I enjoy pleasant surroundings along the way. (4)	... I want to arrive at my destination as comfortably as possible. (19)	... I check the weather reports beforehand. (5)	... how I travel depends on the distance. (6)
... I do not want to feel remorseful about the way I travel. (22)	... I want to use my time along the way to do other things (reading, phone call, etc.). (17)	... I want to own the mode of transport that I use. (7)	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.). (11)	... it is important to me to feel relaxed when I arrive. (9)	... I want to travel in a way that is beneficial for my health. (12)	... I do not want to feel remorseful about the way I travel. (21)	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport. (14)	... I try to combine necessary trips along the way. (36)
	... I appreciate my privacy. (26)	... I do not want to exhaust myself physically. (18)	... I want to be as independent of other people as possible. (20)	... I appreciate being able to travel irrespective of traffic. (15)	... I travel in a way that allows for spontaneity and flexibility. (13)	... I appreciate being able to plan reliably. (23)	... I chose how I travel so as to avoid situations that make me feel unsafe. (35)	
	... the appearance and condition of my mode of transport are important to me. (27)	... I travel in a way as to make the most of running and already spent cost. (39)	... I appreciate the flexibility of being able to choose among different modes of transport. (24)	... I appreciate the possibility of being able to interact with other people. (25)	... I want to experience a sense of joy along the way. (16)	... I feel a responsibility to minimize my impact on the environment and climate. (30)	... I favor the way of travel with the lowest risk of accidents. (40)	
		... I think of how others perceive how I travel. (43)	... I compare the costs of different transport modes. (32)	... I place value on hygiene and cleanliness. (28)	... I think of the ecological impact of how I travel. (42)	... I mostly travel in the same way. (37)		
			... I chose how I travel so as to avoid situations that might irritate me. (33)	... I want to sense a feeling of freedom along the way. (29)	... how I travel depends on the purpose. (44)			
			... the availability of parking spots influences my transport mode choice. (34)	... saving time is of utmost importance to me. (31)	... I want to be a role model for others with how I travel. (45)			
				... I do not want to waste time contemplating or planning how to get to my destination. (38)				
				... I favor the way of travel with which I feel safest from harassment and assault. (41)				

Figure 8: Composite Q-sort for Profile 4 "The Safe and Cautious Type"

Disagree			Neutral			Agree		
-4	-3	-2	-1	0	+1	+2	+3	+4
... I want to express my social status with the way I travel. (1)	... I do not want to feel remorseful about the way I travel. (22)	... I enjoy pleasant surroundings along the way. (4)	... I contemplate how I travel each time. (2)	... it is important to me to feel relaxed when I arrive. (9)	... I want to travel in a way that is beneficial for my health. (12)	... it is important to me that how I travel corresponds with my own lifestyle, my own convictions. (10)	... I want to own the mode of transport that I use. (7)	... I travel in a way that allows for spontaneity and flexibility. (13)
... I feel there are no alternatives to how I travel. (3)	... I compare the costs of different transport modes. (32)	... I want to use my time along the way to do other things (reading, phone call, etc.). (17)	... I check the weather reports beforehand. (5)	... I do not want to exhaust myself physically. (18)	... it is important to me that I can travel on lanes that are dedicated to a single mode of transport. (14)	... I appreciate being able to travel irrespective of traffic. (15)	... I want to be able to choose my own route. (8)	... I try to combine necessary trips along the way. (36)
	... I chose how I travel so as to avoid situations that make me feel unsafe. (35)	... I appreciate the possibility of being able to interact with other people. (25)	... how I travel depends on the distance. (6)	... I want to arrive at my destination as comfortably as possible. (19)	... I want to be as independent of other people as possible. (20)	... I want to experience a sense of joy along the way. (16)	... it is important to me to seamlessly arrive at my destination (without transfers, interruptions, etc.). (11)	
	... I travel in a way as to make the most of running and already spent cost. (39)	... the availability of parking spots influences my transport mode choice. (34)	... the appearance and condition of my mode of transport are important to me. (27)	... I appreciate my privacy. (26)	... I do not want to feel remorseful about the way I travel. (21)	... I appreciate being able to plan reliably. (23)	... I feel a responsibility to minimize my impact on the environment and climate. (30)	
		... I favor the way of travel with which I feel safest from harassment and assault. (41)	... I place value on hygiene and cleanliness. (28)	... I want to sense a feeling of freedom along the way. (29)	... I appreciate the flexibility of being able to choose among different modes of transport. (24)	... saving time is of utmost importance to me. (31)		
			... I mostly travel in the same way. (37)	... I chose how I travel so as to avoid situations that might irritate me. (33)	... I think of the ecological impact of how I travel. (42)			
		... I favor the way of travel with the lowest risk of accidents. (40)	... I do not want to waste time contemplating or planning how to get to my destination. (38)	... I want to be a role model for others with how I travel. (45)				
			... I think of how others perceive how I travel. (43)					
			... how I travel depends on the purpose. (44)					

Figure 9: Composite Q-sort for Profile 5 "The Efficient and Autonomous Type"