

# **What are the Motives for Owning an Electrical Car for an Individual in Oslo?**

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# 1. Introduction

This thesis presents a study of motivation behind ownership of electrical cars in Oslo obtained with statistical analysis of primary data. This topic was chosen because of the author's interest for environmentally friendly solutions within transportation sector and the consumer perspective on them.

Fossil-fuelled personal automobility is the current paradigm of private transportation. There are currently over 700 million cars running in the world (Urry 2004) and the majority of them run on gasoline. Norway, along with other industrialized countries, has a larger private car park than the world average. There are close to 3 million light-duty vehicles in Norway<sup>1</sup> which roughly makes a number of 0,6 cars per capita<sup>2</sup>. About 80% of all personal travel in the country is done by car<sup>3</sup>. Environmental impact, including dangerous green-house gas (GHG) emissions, is the downside of the personal fossil-fuelled mobility enjoyed by most Norwegians. The urge to reduce the human-made GHG emissions is largely recognised today (Metz et al. 2007 [Eds]), and Norway includes GHG elimination in its environmental agenda<sup>4</sup>. It is suggested that non-fossil driven cars are a part of the transport solution for the future (Sperling and Gordon 2010),

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<sup>1</sup> Statistics Norway (2013a): "Transport" in *Statistics Norway* [online], URL: <http://www.ssb.no/transport/> [accessed 22 February 2013]

<sup>2</sup> Statistics Norway (2013b): "Befolkning" in *Statistics Norway* [online], URL: <http://www.ssb.no/befolkning/> [accessed 22 February 2013]

<sup>3</sup> TEMPO (2012a): "Persontransport" in *Transport og Miljø* [online]. URL: <http://www.transportmiljo.no/tema/vei/persontransport/> [accessed 25 February 2013].

<sup>4</sup> Klima- og forurensningsdirektoratet (2013): "Klima" in *Miljøstatus* [online]. URL: <http://www.miljostatus.no/Tema/Klima/> [accessed 22 February 2013]

being a compromise between the personal mobility paradigm based on car ownership and the environmental goals.

Electrical car is one of the available technological alternatives which may contribute to the required paradigm shift. Norway is the country which has most effectively adopted electrical cars so far having the largest number of these vehicles per capita in the world. Compact cars with “EL” on their number shields have become visible in Norwegian cities. The county’s capital Oslo is broadly referred to as the electrical car capital of the world (The Independent 2011). It is interesting to look at the early adopters of the electrical car technology in Norway in order to understand their motives behind this environment-friendly choice and potentially apply the knowledge to further promotion of electrical car use as a part of the Norwegian environmental agenda.

The general objective of this thesis is to better understand the underlying motives behind acquiring and using an electrical car in Oslo. Another objective is to explore the possible relation between the motivation and the socio-demographic characteristics of the study population. A matter of special focus is the predicting potential such characteristics might have on the motives of electrical car owners. Lastly, it is of particular interest to explore the role of the environment as a motivator for owning a vehicle which is generally referred to as an environmentally friendly one. This thesis draws on previous research around electrical car ownership in Norway conducted in 2006-2011<sup>5</sup> and aims to contribute to further understanding of the reasoning behind their vehicle choice.

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<sup>5</sup> Particularly Econ Analyse (2006), Rødseth (2009) and Mathisen et al. (2010)



*Chapter two* of this paper presents an overview of the theoretical perspective on consumption and motives behind it. The overview draws on the interdisciplinary approach to the topic, addressing a number of theories from economics, marketing, sociology and social anthropology. This chapter presents rational and irrational motives behind consumption and an inquiry into the relation between consumption and sustainability.

*Chapter three* discusses the background of the topic of the current study. This chapter critically addresses the impact of private automobility on environment and development, provides an overview of the alternatives to the current gasoline car paradigm, a discussion of electrical car use in Norway and previous studies on the topic.

*Chapter four* presents the methodology of the current study. This chapter explains the choice of the survey method, introducing the research design and data collection process, an overview of the statistical tools and some consideration about ethical issues in this study.

*Chapter five* presents the output of statistical analysis and discusses the findings with respect to the theoretical background and the previous research on the topic. Descriptive statistics suggests a portrait of an average respondent in the sample. Factor analysis is used to cluster people's motives into meaningful categories following the theories explained in Ch.2. Regression analysis explores the relation between the socio-demographic characteristics of the individuals and the variation in their motivation. There is a suggestion of a certain typology of electrical car owners based on this analysis.

*Chapter six* discusses the possible applications of the study outcome, reflects about the current research's contribution to the general knowledge about motivation for owning an electrical car for an individual in Oslo and the study's limitations.

## 2. Theoretical perspective

Researching within a particular discipline can be a way of keeping a certain rigor in one's work. A sort of common language is shared within disciplinary boundaries which is easily communicated and understood. Despite this, gradually more research spreads outside disciplinary boundaries in order to combine the strengths of two or more disciplines. Development studies benefit much from interdisciplinarity (Gasper 2001:1), as interaction of two or more disciplines can give better insights for what development is and how it can be approached.

Environmental studies are naturally an interdisciplinary field as well (McNeill 2009). Potential weaknesses of interdisciplinarity are such as communication gap between representatives of single disciplines and the risk of being superficial when combining a large number of approaches in a single research. These are weighted up with potential benefits of interdisciplinary. Consulting different disciplines helps finding insights that either conflict or complement each other; comparing them helps seeing a better picture of the topic (*ibid.*).

The current research aims to understand motivations for owning and electrical car in Oslo. This is a research about consumption motives. This cannot be understood without drawing on the different social disciplines that have addressed consumption in its many dimensions.

This chapter is presenting the different approaches to consumption that can be found in the social sciences. It is discussing the approaches of economics, marketing, human needs approaches and social studies. Finally, it is presenting the sustainability perspective.

## 2.1 Economic approach

### 2.1.1 Consumption in economics

The dominating view on consumption today originates from the economic discipline. Neoclassical economics views consumption as directly related to well-being, both individually and aggregated. The growth in terms of Gross Domestic Product or consumption is seen as “a positive sign of development in spite of clear human and environmental toll” (Guillen-Royo 2007:19). For this reason economic approach is presented first in this chapter, including some of the criticism and alternative views on consumption within the same discipline.

Economics can be defined as a science of wealth, material welfare, scarcity of choice and/or growth and efficiency<sup>6</sup>, depending on the angle of a particular author. Capturing the *social* core of the discipline, economics is a study of relations between people, groups of people and their surroundings measured with money. Lionel Robbins defined economics the following way: “a science which studies human behavior as a relationship between ends and scarce means which have alternative uses”<sup>7</sup>.

While most social sciences (ex. sociology, social anthropology, psychology) study issues around consumption as one of the numerous activities humans

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<sup>6</sup> Economics Concepts (2011a): “Definition and Explanation of Economics” in *Economics Concepts* [online]. URL: [http://www.economicsconcepts.com/definition\\_of\\_economics.htm](http://www.economicsconcepts.com/definition_of_economics.htm) [accessed 23 April 2011]

<sup>7</sup> Economics Concepts (2011b): “Economics as a science of scarcity of choice” in *Economics Concepts* [online]. URL: [http://www.economicsconcepts.com/economics\\_as\\_a\\_science\\_of\\_scarcity\\_and\\_choice.htm](http://www.economicsconcepts.com/economics_as_a_science_of_scarcity_and_choice.htm) [accessed 23 April 2011]

interact with, economics has it in the very center. This discipline is based on the fact that some parties produce and sell while others acquire and consume, broadly referred to as “the exchange”. Economists have paid much attention to studying and defining the key concept of consumption and its determinants. Valentino Piana<sup>8</sup> defines consumption as “the value of goods and services bought by people” and notes that individual buying acts are aggregated over time and space, thus we can talk about consumption of a group, a country or the whole world at once.

### 2.1.2 The concept of utility in human motivation

In economic theory, a concept of utility is used to describe the outcome an individual has from the consumption act. Deriving utility is the motive behind actions, according to mainstream economics. According to Investopedia’s online economic dictionary, “the concept of utility represents the advantage or fulfillment a person receives from consuming a good or service”<sup>9</sup>. The measurement of satisfaction from consumption is relative: it is practical for comparing the outcome from different acts of the same consumer, but is not helpful for directly comparing satisfaction levels of two or more individuals. One of the pillars of the discipline of economics is that each individual actor, broadly referred to as “Homo Economicus” (Nyborg and Rege 2003, Perman et al 2003), is driven by the rational desire to maximize their utility through consumption. The “rational individual” was born in the early days of economics; his essence

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<sup>8</sup> Piana, Valentino (2001): “Consumption” in *Economics Web Institute* [online]. URL: <http://economicswebinstitute.org/glossary/cons.htm> [accessed 23 April 2011]

<sup>9</sup> Heakal, Reem (2011): “Economic Basics: Utility” in *Investopedia* [online]. URL: <http://www.investopedia.com/university/economics/economics5.asp> [accessed 23 April 2011]

was formulated by Thomas Malthus: “Man is motivated by self interest only. The desire to collect wealth never leaves him till he goes into the grave”<sup>10</sup>.

The rational man went from caring strictly for his wealth in classical economics to caring for his somewhat broader welfare in neo-classical economics, but self-interest and rationality are still present in the definition. There are three underlying assumptions of utility theory in mainstream economics, as summarized by Monica Guillen-Royo:

1. *A sovereign individual who acts in the market through given preferences and chooses what to purchase from the available information about goods and prices.*
  2. *Individuals who behave rationally, which implies that their aim is utility or welfare maximization and mostly in their own interest.*
  3. *Individuals get satiated by single goods but get ever mounting satisfaction by consuming more of different goods and services.*
- (2007:18)

According to economic theory, the general motive of a sovereign insatiable consumer is a wish to maximize one’s total utility and thus improve personal wellbeing. Such a view of utility maximizer meets criticism within the discipline.

### 2.1.3 Criticism of the rational individual

The egoistic rational man, Homo Economicus, is criticized for not being a sufficient model for human actions. Individuals do in many cases consider others than themselves when making their decisions.

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<sup>10</sup> Malthus, Thoman (1798), as quoted in *Economics Concepts* (2011c): “Economics as a Science of Wealth” in *Economics Concepts* [online]. URL:

Amartya Sen (1977) finds it reductionist to approach individuals as self-seeking egoists. Sen proposes to broaden the utility concept so that it would incorporate motives like compromise with a social, political or religious group. Such view on utility concept relates to the fact that “social interaction matters for people’s wellbeing” (Guillen-Royo, 2007:20). Similarly, Robert Frank (1987:603) states that rational choice theory “performs well much of the time, yet apparent contradictions abound”, providing examples of cases where people don’t seem to be “maximizing utility functions of the usual sort”.

There were suggested a number of models where “individuals are not only motivated by economic costs and benefits, but also have a moral or norm-based motivation” (Nyborg and Rege, 2002:398). There is an approach within economic theory which introduces a public good into the standard utility model. Nyborg and Rege (*ibid.*:401) analyze this kind of model algebraically given the budget constraint and a set of one private good and one public good. With the mainstream approach, utility maximization results in maximized consumption of private goods and underprovision of public goods. Individuals prefer their own benefits instead of contributing to everyone’s. With this analytical approach, there is no room for phenomena like charity or environmental-friendliness which in reality exist. Nyborg and Rege (*ibid.*:402) state that the mainstream view on individuals as solely maximizers of own private utility is therefore not realistic and does not explain cases of moral or norm-based motivation.

#### 2.1.4 Pure and impure altruism in motivation

With the imperfections of standard utility model, the motive of caring for others than oneself had to be included into formal expression. An example of such application of utility concept is a model of James Andreoni (1988). He defines a Pure Altruist in a public good model to be an individual with preferences for both a private and a public good. This individual cares not only about the effect the public good has on oneself, but also on other people. The Pure Altruist has both a private preference for the public good and a preference for the effect on well-being of other individuals who also have preference for the public good.

Practically, altruist is only better off if there is a real way to measure the increase in public good supply traded off for the Altruist's reduced consumption. Nyborg and Rege (2003) analyze this model algebraically and conclude that it is formally equal to Homo Economicus, despite the difference in interpretation. They discuss that the limited possibility to measure effect of individual contribution on the public good is truly the reason why the model does not hold.

Two years later, Andreoni (1990) introduced an Impure Altruist in his theory of "warm glow giving". "The idea that one's own contribution to a public good produces a private good – "warm glow" – as a by-product of contributing to the public good" (Nyborg and Rege 2003:403). This model describes the relation between utility, a private good and a public good, as in the Pure Altruist model. In addition, the new model includes a parameter which represents the individual's preference for the good feeling, or "warm glow" as a result of one's contribution. Consumers, according to the model, can be motivated by feeling a good person her or himself and by looking good in the eyes of others.

Similar idea of a private by-product of the individual's contribution to the public good was expressed by Heinz Holländer (1990). Instead of looking at "warm glow", Holländer suggested a parameter for social approval to be included in the

extended utility model. Social approval, on its turn, is depending on the contribution of other members in the society compared to the individual's contribution. The higher one's contribution is compared to the average in the society, the higher utility is derived, or perhaps, the higher approval can be expected, the more one is willing to contribute.

The underlying assumption for the social norm models of Andreoni and Holländer is that people originally have preferences for social approval. These theories are supported by the empirical research of Palfrey and Prisbrey (1997)<sup>11</sup>; Bohnet and Frey (1999)<sup>12</sup> have found experimental evidence that decreased distance between group members increases the warm glow effect. Rege and Telle (2001)<sup>13</sup> discover significance of social approval for behavior even among strangers.

The idea of “impurity” of altruism as a determinant for economic behavior has been also expressed by Serge-Christophe Kolm (2008). He distinguishes between unconditional altruism as “preference for giving in either case” and conditional altruism as “choosing to give or keep with respect to reaction of other's behavior towards oneself” (*ibid.*:213). Sen (1977) suggests a similar distinction between commitment and sympathy. His conceptualization of sympathy can be found similar to the idea of conditional altruism:

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<sup>11</sup> quoted in Nyborg and Rege (2003).

<sup>12</sup> *Ibid.*

<sup>13</sup> *Ibid.*



*If the knowledge of torture of others makes you sick, it is a case of sympathy... (...) It can be argued that behavior based on sympathy is in an important sense egoistic, for one is oneself pleased at others' pleasure and pained at others' pain, and the pursuit of one's own utility may thus be helped by sympathetic action. It is action based on commitment rather than sympathy which would be non-egoistic... (ibid.:326)*

Extending the conventional utility model of Homo Economicus with the motives of altruism, both “pure” and not, as suggested by a number of authors, helps understanding more aspects within individual’s motivation with the help of economic discipline. Taking others than the rational economic self into account brings utility theory closer to other social disciplines which will be presented further in this chapter.

## 2.2 Consumption in marketing theory

Marketing as a discipline is concerned about “making selling superfluous” (Kotler 1984:2) which is achieved by understanding customers and fitting the product, the distribution chain, and the price and promotion tools to the target group. Marketers adopted the basic assumption about rationality from economists, but they are interested in a more nuanced study of consumer behavior.

Marketing suggests a certain decision-making process behind consumption. The steps behind this process and the factors influencing purchase behavior can be summarized in the following table:

**Table 1.** Decision making process

<b>1. External Influences</b>	
Firm's marketing efforts: price, product, promotion, place	The consumer culture: religion, ethnicity, reference groups, social class
<b>2. Internal Processes</b>	
Psychological processes: motivation, perception, attitudes, knowledge	Decision-making: need recognition and problem awareness, information search, evaluation of alternatives, decision making
<b>3. Post-decision Processes</b>	
Purchase	Post-purchase behavior

*Source: Noel 2009:15*

The typical consumer, like Homo Economicus, is mostly portrayed egocentric. Hayden Noel states that the decision-making theory rests on the basic assumptions: there is a choice (more than one alternative available) and “the consumer will choose the best possible option that suits their needs” (2009:134). The latter assumption reflects the utility maximizing theory from economics. The consumer in marketing theory, however, is not isolated from the surroundings. The behavior is largely influenced by businesses’ marketing efforts on one side, and the general society and culture on the other side. For instance, opinions of reference groups – these can be family, friends or celebrities – are often consulted when evaluating the choices. This seems to be rather different from the consumer sovereignty assumption in mainstream economics presented earlier in this chapter.

When it comes to the general ideas of egoism and rationality common for mainstream economics, marketing suggests an ambiguous explanation. On one hand, there is an expectation that consumers would seek for option that best suits their needs (*ibid.*:134). On the other hand, the emerging of societal marketing

suggests that individuals have broader set of preferences than just egoism-based: they have a preference for a social welfare in the long run (Kotler 1984:18). The renewed marketing concept claims to take company's needs, customer satisfaction and social goals into consideration; this approach proves to be winning in the long run (*ibid.*:19). This is similar to the ideas of Andreoni and Holländer that individuals have preferences for the welfare of others, as presented earlier in this chapter.

Marketing studies are open for the complex range of motives individuals have when making their decisions. At the same time, they normally see the outcome of consumption as improved wellbeing for the consumer in all cases. Kotler (*ibid.*) expresses the common ambition of marketers to improve overall welfare through providing a diversity of goods and services.

Speaking about the reasons to consume, Martin Evans and Ahmed Jamal distinguish between internal and external motivation (2009:10). Internal motivation comes "from within a person" and has often physiological base. External motivation "is based on attractiveness of environmental stimuli such as products and services" (*ibid.*:11). It is stated that the internal motivation is constantly shaped by the external factors, and one cannot study individual's motives outside the social and cultural context. Marketing suggests that the motivation behind consumption is rather diverse. It is recognized that consumers are motivated by their rational egoistic considerations on one hand and by the welfare of others on the other hand.

## 2.3 Consumption and the satisfaction of human needs

Theorizing motivation for consumption is based on the fact that individuals have needs they wish to satisfy. Abraham Maslow's needs classification (1943) is

often used for explaining human motives. Maslow divided human needs into five categories: physiological needs, needs for safety, belonging, esteem and self-actualization. He presented a hierarchy in which needs emerge and get satisfied, starting with satisfying hunger:

*At once other (and 'higher') needs emerge and these, rather than physiological hungers, dominate the organism. And when these in turn are satisfied, again new (and still 'higher') needs emerge and so on. (ibid.:375)*

Guillen-Royo provides some of the criticism towards Maslow's theory (2007:38). The hierarchy, for instance, fails to capture cases when individuals place personal needs above material wealth and fails to see the importance of social, cultural, political and economic environment in shaping motivation.

Behavioral economist Manfred Max Neef studied human motives in depth and defined the nine human needs people should be able to meet to experience well-being in a given society (1991). He provided an extended classification based on Maslow's hierarchy and its criticism. Max Neef suggested a taxonomy rather than hierarchy. The basic human needs, according to his work, are following: subsistence, protection, affection, understanding, participation, idleness, creation, identity and freedom. Max Neef introduces the concept of satisfiers which, depending on their nature, can be fulfilling one or more needs or acting against fulfillment and life satisfaction. In the context of consumption, "the interrelationship between needs, satisfiers and economic goods is permanent and dynamic. If economic goods are capable of affecting the efficiency of the satisfiers, the latter will be determinant in generating and creating the former" (*ibid.*:30). Material consumption can help satisfying the basic needs for subsistence (such as food, housing and health care) and protection (such as insurance and savings). It can as well help satisfying some of the other needs described by Max Neef, for instance, understanding (education systems) and

idleness (theatre performances). Thus, consumption in economic terms can contribute to improved well-being through satisfying some of individuals' needs. Similarly, money can be exchanged to material things which are in practice *violators, destroyers or pseudo-satisfiers* of individuals' needs. A TV set can satisfy the need for idleness, but watching it often can take up the time an individual could use satisfying the needs for creativity and affection. Thinking in this key, consumption does not necessarily help improve well-being and can as well decrease it. This approach differs largely from the mainstream view on consumption as strictly positive for individuals, present in both economics and marketing.

The nine human needs, listed above, can be seen as the basis for motivation behind actions, including consumption. The ways to satisfy the needs may vary and not necessarily fulfill the expectations. The needs, and therefore, motives include both oneself and other individuals and suggest a large variety of actual reasoning behind human actions.

## 2.4 Social studies

The disciplines of sociology, anthropology and psychology have gathered broad knowledge of the role of consumption and its determinants for individuals. Researchers explain consumption as a way of communication, status display, social group belonging, hedonic pleasure, cure from anxiety and in a bunch of other ways. The common idea is that consumption act has to be studied in the context of the social, cultural and other environment, as all these are interconnected.

There is an idea, especially favored by anthropologists, that consumption is one of the ways to communicate to individuals' surroundings and it is only useful to

study in the cultural context. Guillén-Royo summarizes the cultural approach to consumption as “individuals participate by using goods to communicate social meanings, which in turn contributes to creating and keeping social relationships” (2007:28). The idea that a consumer act must carry a message was probably first expressed by Veblen far back in the beginning of the 1900s (quoted in Campbell 1995:114). Veblen equaled wealth and social status (in the light of classic economics known as “science of wealth” being in power at that time), and described an act of consumption as a declaration of one’s social status. Buying an expensive commodity for the sake of showing that one can afford it (hence is of a high status) would be the purpose of the act of consumption, according to Veblen. Economics has adopted this idea in the form of “Veblen goods” – “goods that are perceived to be exclusive as long as prices remain high or increase”, roughly opposite to normal economic goods demand curve<sup>14</sup>.

Those are often material goods that work as symbols for status, as in Veblen’s view, or other form of expression and communication because they are easier displayed than intangible goods (services) or perishable goods (as food). Social researchers suggest to look at the use of goods, not only on the acquisition process (Campbell 1995, Wilhite 2008).

Individuals spend time on “grooming” their positions: displaying, maintaining, using, repairing and such. Campbell (1995) provides an example from Moorhouse who studied owners of “hot rods”, a type of large car popular in the U.S. Those car owners don’t only feel satisfied with using a car for its direct function of transportation; they spend time in transforming, maintaining,

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<sup>14</sup> Investopedia (2011): “Veblen Good” in *Investopedia* [online]. URL: <http://www.investopedia.com/terms/v/veblen-good.asp> [accessed 23 April 2011]

modifying and displaying the cars which symbolize their identity, status and belonging to a specific group (*ibid.*). Hal Wilhite, similar to Campbell, points that house appliances are involved in all sorts of daily routines around them, and it is not just a fact of acquisition, but the practice around it that is crucial (Wilhite 2010a). According to Wilhite, consumption “is conceptualized as acquisition and use of things, including goods, products, and, increasingly, household appliance technologies” (Wilhite 2008:3). To understand its role, one is to study “how products get in people’s homes” and “how they affect and get affected by daily practices”. The way the products can be ascribed an active role of “affecting daily practices” means that consumer acts should not only been studied endogenously, but in the setting of the practices it affects – which, again, affect more consumer acts, and we see a whole mosaic of practices and consumption. Wilhite gives an example of refrigerator, purchased by a middle-class family in India for the reasons of convenience, but, nevertheless, a status item for their class. The refrigerator’s owners discover that not just the direct function of storing food is new, but also they turned to establish new routines of purchasing and cooking food as a consequence of the opportunity to store food longer. This consequently has a certain impact on lifestyle, and in the big picture the connection of consumption, practices and lifestyle goes all the ways. In the examples of appliances in India and hot rods in the U.S., the message communicated with consumption is status and belonging to a certain group. Consumption can communicate aspects of one’s self-identity, the way a consumer wants to be seen by others.

## 2.5 Consumption and sustainability

Social anthropologists Wilhite and Lutzenhiser (1999:281) introduce the concept of social loading which stands for the energy consumption<sup>15</sup> generated by the desire to meet expectations of a social group, using evidence from the U.S., Japan and Norway. Much of a household's energy footprint in developed countries of today would not be present if not for social and cultural reasons. The extensive consumption for the sake of meeting expectations is resulting in negative environmental outcome in form of wasteful emissions. The unsustainable effect of consumption is also criticized by sociologist Baumann who believes that “need” has been replaced by “desire” in the context of motivation for consumption. Middle-class consumes more than the minimum, necessary for survival (Rojek 2004). The instrumental, status-related consumption of Veblen times has been replaced by “autoletic consumption, consumption for its own sake” (*ibid.*:297). Similarly, Juliet Schor in her book “Overspent American” (1999) criticized the modern consumer culture for unsustainability. She states the urge for eliminating consumerism and suggests the strategy to work consumer's way out of it. Thus, a consumer act should be seen not only in the context of one's practices and lifestyle, but in the context of the environmental impact the consumption has.

Campbell states that understanding values is important for understanding motivations for consumption (1995:113). Tastes tend to change through life, while values change much less. Psychologist Tim Kasser has conducted research on values and their relation to individual's happiness, life satisfaction and,

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<sup>15</sup> This is relevant to all types of consumption as it subsequently involves energy use.



generally, sustainability which he presented on the lecture “A revolution of values: Psychological research and its alternatives” (Kasser 2010). Kasser believes that consumers are manipulated by advertising which tells “that we can purchase happiness”, and that materialism, embedded into consumer culture, needs an alternative. Based on research, Kasser and Ryan (1996) have developed a circular stochastic model with extrinsic vs. intrinsic values grouped.

Materialism is associated with the extrinsic values such as desire of money and prestige, and such values follow to certain costs for society. Not only those are environmental costs (such as less care about the environment and fewer pro-environmental behaviors), but also psychological (as lower life satisfaction and higher psychological problems) and social costs (such as more crimes, less pro-social and more antisocial behavior). Most interestingly, materialism is negatively associated with happiness and welfare, which opposes the view of neo-classical economics that maximizing utility through consumption, must strictly increase welfare. In the light of social research, consumption might have a negative impact on both personal well-being and socio-environmental sustainability.

## 2.6 Conclusion

This chapter has presented the approach to consumption within neo-classical economics. It rests on the main assumption of rationality of individual who maximizes his or her utility model. This model and the underlying assumptions meet much criticism for not resembling the diversity of human motives and actions. The concept of utility is widened by Sen (1977), Andreoni (1988, 1990) and Holländer (1990) in order to capture moral or norm-based motivation in addition to the neo-classical egoistic motives. Consumer behavior is explained by “pure” or unconditional altruism as well as by “impure” altruism which includes improved self-picture, social approval or commitment motives.

In marketing theory, consumers are expected to act somewhat rationally, which is similar to the mainstream economic view. However, consumers are studied in the context of social and cultural surroundings, as well as marketing efforts from businesses. Consumers, according to marketers, can as well be motivated by the general social welfare in the long run, and therefore be not solely egoistic. Both economic and marketing approaches claim that consumption is strictly positive for individual and public welfare.

Max Neef suggests a classification of nine human needs which have to be met to achieve life satisfaction. Economic goods can serve as satisfiers for one or more basic needs, but they can also result in opposite effect by being pseudo-satisfiers, violators or destroyers for the needs of the consumer. The relation between consumption and welfare is not necessarily positive for individuals' well-being. Individuals, according to Max Neef, are motivated by satisfying their basic needs, also through consumption.

Social sciences generally provide a nuanced picture of consumption and its motives. Consumers communicate messages about themselves; they obtain or confirm particular social status or particular identity. There is a raising concern about sustainability of Western consumerist culture which is believed to have environmental, psychological and social costs. Among others, Schor (1999) and Kasser (2002) urge for a change in the consumerist paradigm. Approaching consumption with a range of several disciplines helps construct a broader picture of the topic. Interdisciplinary perspective will be useful when analyzing the findings of the current research further in this paper.

### **3. Background of the topic**

The transportation sector is seen as positive for economic and social development, but also largely negative in environmental terms in its present state. This chapter is addressing the conflicting outcomes of modern private automobility and the urge for change in this sector. Special interest is paid to the situation in Norway which is the setting for this paper, and the alternatives within personal travel existing in this country. Electrical cars, which are the research's focus area, are addressed both in the sense of their environmental potential and the place they take within private automobility. This chapter is also addressing previous studies of electrical car use in Norway and explains how the current research relates to them.

#### **3.1 The dilemma of private automobility**

##### **3.1.1 Private automobility and economic growth**

Transportation has been for a long time positively associated with development. Improving transportation means has gone side by side with exploring new territories and influencing other civilizations; a nation that acquired a more progressive transport technology would have a comparative advantage against the others. As described by Rodrigue (2013), transportation is essential to mobility which “satisfies the basic need of going from one location to the other, a need shared by passengers, freight and information”. Mobility, these authors point, is a “catalyst for development” as it gives broader opportunities. Development and search for new opportunities have been the overall goal of mobility throughout the transportation history.

Efficient transport is associated with economic growth, both as the growth made transportation development possible, and because economic growth creates demand for more transportation for both private and business purposes<sup>16</sup>.

Increased personal mobility is believed to contribute to social growth as it gives equal opportunities to citizens in peripheral areas compared to those in urban areas<sup>17</sup>. For instance, in Norway, where the population is largely spread, official politics praises transportation as a basis for social and economic development<sup>18</sup>.

Transportation is defined as “an important welfare good which the whole population has as much right for no matter where one lives”<sup>19</sup>, and the state declares itself to be supportive of developing the transportation system in the country.

Private automobility is the transportation mode with much flexibility, represented mainly by the private gasoline car. This transportation mode emerged in the period of industrialization and gradually won a large share of overall travel. During 1800s there were several attempts to design a practical internal combustion engine in order to use in a vehicle. Karl Benz was the first to succeed in this task: he managed to create a practical internal combustion engine for

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<sup>16</sup> Avinor, Jernbaneverket, Kystverket og Statens Vegvesen (2012): *Forslag til Nasjonal Transportplan 2014-2023*. Nasjonal Transportplan [online]. URL: [http://www.ntp.dep.no/2014-2023/pdf/2013\\_01\\_10\\_NTP\\_2012\\_forslag\\_nasjonal\\_transportplan.pdf](http://www.ntp.dep.no/2014-2023/pdf/2013_01_10_NTP_2012_forslag_nasjonal_transportplan.pdf) [accessed 25 February 2013]

<sup>17</sup> *Ibid.*

<sup>18</sup> Nærings- og Handelsdepartementet (2009): ”Et Nyskapende og Bærekraftig Norge” in *Regjeringen* [online]. URL: <http://www.regjeringen.no/nb/dep/nhd/dok/regpubl/stmeld/2008-2009/stmeld-nr-7-2008-2009-/4.html?id=538044> [accessed 25 February 2013].

<sup>19</sup> TEMPO (2012a): “Persontransport” in *Transport og Miljø* [online]. URL: <http://www.transportmiljo.no/tema/vei/persontransport/> [accessed 25 February 2013].

gasoline and thus designed the first gasoline car in 1885<sup>20</sup>. This invention started the big history of fossil fuel energy in automobiles. Mass production started after Henry Ford developed assembly line between 1908 and 1915<sup>21</sup>. This led to a decline in production costs and product price. An affordable car combined with cheap gasoline caused by Texas oil boom around 1925<sup>22</sup> was the winning combination: car industry began to change worldwide and set the standard for personal on-land mobility. Fossil-fueled car is the technology dominating private automobility today. Gasoline car is embedded in the modern lifestyle paradigm and largely associated with mobility, opportunities and growth.

### 3.1.2 Private automobility and the international agenda for climate change mitigation

Economic growth and technical progress is related to using the planet's resources. Today there is little doubt for the fact that much of the human impact on the environment is significantly negative and that it is also significant in scale. While resources are taken from the nature for industrial use, what often returns to the nature is waste and harmful emissions. "Our common future", the report of World Commission on Environment and Development, was the milestone for

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<sup>20</sup> Bellis, Mary (2013): "The History of Transportation" in *About* [online]. URL: [http://inventors.about.com/library/inventors/bl\\_history\\_of\\_transportation.htm](http://inventors.about.com/library/inventors/bl_history_of_transportation.htm) [accessed 30 August 2012]

<sup>21</sup> History.com (2013): "Moving Assembly Line at Ford" in *History* [online]. URL: <http://www.history.com/this-day-in-history/moving-assembly-line-at-ford> [accessed 25 February 2013].

<sup>22</sup> The Depot Museum (2013): "Oil Boom" in *The Depot Museum* [online]. URL: <http://www.depotmuseum.com/oilBoom.html> [accessed 25 February 2013].

environmental awareness in 1987<sup>23</sup>. The report stated the interconnectedness of human development and the natural environment, urging for restructuring our activities in a more sustainable way. The most challenging impact our civilization has on the planet today is the undergoing climate change forced by greenhouse gasses (GHG) emitted as a by-product of human activities. A lot of the GHG emissions are caused by extraction and burning of fossil fuels. The Intergovernmental Panel on Climate Change (IPCC) in its fourth report from the year 2007 (Metz et al. 2007 [Eds.]) shows that over 50% of GHG is originate from fossil sources. The report has no or little doubt about the anthropogenic nature of global warming and states the urge for mitigation of GHG emissions (*ibid.*:28).

GHG emissions per capita vary a lot by country. The general trend is: the more industrialized countries emit more per capita than the less industrialized ones. When it comes to extensive energy consumption and human-made GHG emissions, “significant changes must happen in rich countries and among elites” (Wilhite 2010b). Most of the responsibility for the harmful GHG emissions is therefore on the developed, more industrialized, richer societies. IPCC 2007 recognizes the inequality between groups of countries and urges the industrialized ones to take major action:

*Under most equity interpretations, developed countries as a group would need to reduce their emissions significantly by 2020 (10–40% below 1990 levels) and to still lower levels by 2050 (40–95% below 1990 levels) for low to medium stabilization levels (Metz et al. 2007:90 [Eds.]).*

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<sup>23</sup> United Nations (1987): *Our Common Future*. UN Documents [online]. URL: <http://www.un-documents.net/wced-ocf.htm> [accessed 25 February 2013].

Looking at GHG emissions with respect to sectors producing them is necessary in order to develop specific mitigation plans. When it comes to GHG emissions from transportation, there clearly is a vast negative effect as a downside of all the economic and social benefits of mobility. The industrial revolution of 1800s and the oil boom of 1920s resulted in rapid and affordable means of transportation which also came out as a burden for the environment.

As of 2007, emissions from transport account globally for 15% of all GHG. They have grown 45% between 1990 and 2007<sup>24</sup>. With the current trend, as much as 30-50% of total emissions may come from this sector in 2050, as analyzed by CICERO (2013). Road transportation is the major negative contributor to the environment of the entire transport sector, emitting, for instance four times more than total air transport (*ibid.*). According to IPCC, almost 12% global GHG emissions come from road transport (Metz et al. 2007:90 [Eds.]). Over a half of these emissions come from light-duty vehicles (Asian Development bank 2009). The successful gasoline car is accountable for about 5-6% of global GHG emissions today, and might, with the current trend, be responsible for much more by the middle of the century. Transportation is, therefore, a sector that needs critical restructuring in order to reduce the large carbon footprint it has. Private automobility requires special attention. Private road transportation in highly industrialized countries has a great potential for re-structuring in a more sustainable way as one of the possible measures to mitigate further GHG emissions.

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<sup>24</sup> International Transport Forum (2010): *Reducing Transport Greenhouse Gas Emissions* [online]. URL: <http://www.internationaltransportforum.org/Pub/pdf/10GHGTrends.pdf> [accessed 21 august 2011]

### 3.1.3 Private automobility in Norway

Norway is one of the richest countries in the world in terms of gross-domestic product (GDP) per capita: it is stable in the world's top ten<sup>25</sup>. It is therefore among the countries that have most responsibility to reduce the burden on the climate. Norwegian officials recognize this urge as they declare a goal of reducing emissions in the country. According to miljostatus.no, which is an official source launched by the Ministry of Environment and the Ministry of Climate and Emissions, Norwegian aggregated emissions are to be reduced by at least 12-14 million tones CO<sub>2</sub> equivalent compared to the level of 2010. There is a potential to reduce GHG emissions from private automobility as one of the measures for achieving this climate goal.

Total road transport in Norway stands for approximately 19% of national GHG emissions<sup>26</sup> - a larger share than the world average of 12% (IPCC 2007). Private automobility accounts for much of these emissions: 80% of all personal travel in Norway is done by a private car<sup>27</sup>, which is higher than the European average of 72% of travel<sup>28</sup>. The large share of road transport in Norway can be partly explained by the socio-geographical conditions in the country. Norway is the

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<sup>25</sup> Index Mundi (2013a): "Country Comparison. GDP per capita (PPP)" in *Index Mundi* [online]. URL: <http://www.indexmundi.com/g/r.aspx?v=67> [accessed 31 August 2012]

<sup>26</sup> TEMPO (2012b): "Nøkkeltall" in *Transport og Miljø* [online]. URL: <http://www.transportmiljo.no/tema/nokkeltall/> [accessed 25 February 2013].

<sup>27</sup> TEMPO (2012a): "Persontransport" in *Transport og Miljø* [online]. URL: <http://www.transportmiljo.no/tema/vei/persontransport/> [accessed 25 February 2013].

<sup>28</sup> Harrison, Pete (2010, April 27): "Green Transport losing share to polluters. EU Study" in *Reuters* [online]. URL: <http://uk.reuters.com/article/2010/04/27/us-eu-transport-idUKTRE63Q41E20100427> [accessed 25 February 2013].



second least dense country in terms of population in Europe, after Iceland<sup>29</sup>. This has certain implications on the transportation system. Many places in Norway there is little, or even no, public transport available, which makes private transportation, and, specifically, private automobility, more important, even “vital”, compared to densely populated countries. This can possibly explain the fact that Norwegians use private automobility more than average Europeans.

A reduction of emissions from private transportation can, and should be among the methods for achieving the strict climate goal in Norway. This is recognized by Norwegian transport politics:

The Government will further develop the transportation system and the electronic infrastructure in order to reach increased efficiency, lower costs and more environmentally friendly solutions<sup>30</sup>.

The private road transportation includes mopeds and motorcycles, too, and cars with alternative fuel, but it is the conventional gasoline car that makes the absolute majority of private motor vehicles in Norway today. The conventional private car is responsible for up to 8% of the country’s aggregated emissions. The private automobility in Norway is to be seen as environmentally negative in its present state. There is a conflict between what is seen as a part of a modern well-developed society and the environmental goals on cutting GHG emissions. It is important to re-consider private automobility and its environmental impact in

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<sup>29</sup> Index Mundi (2013b): “Population Density - Europe” in *Index Mundi* [online]. URL: <http://www.indexmundi.com/map/?v=21000&r=eu&l=en> [accessed 28 July 2012]

<sup>30</sup> Nærings- og Handelsdepartementet (2009): ”Et Nyskapende og Bærekraftig Norge” in *Regjeringen* [online]. URL: <http://www.regjeringen.no/nb/dep/nhd/dok/regpubl/stmeld/2008-2009/stmeld-nr-7-2008-2009-/4.html?id=538044> [accessed 25 February 2013].

Norway taken the urge for cutting emissions in developed countries described by IPCC 2007. The 80% of on-land travel kilometers done in a private conventional GHG emitting car in Norway must be switched – at least partly – with an environment friendly, or *friendlier*, solution.

## 3.2 Alternatives to the conventional private car

There are two general approaches towards handling GHG emissions: either through changing consumption patterns or through restructuring production (Wilhite 2010b). This section focuses on production-oriented solutions for decreasing GHG emissions from private transportation in Norway. This strategy implies using more efficient technologies within private automobility which emit less GHG per km of driving thus reducing total emission level. The special interest is paid to the city of Oslo. As a capital, it is a natural testing arena for change and innovation that can later be applied to the country as a whole.

### 3.2.1 Technological alternatives

There is a strategy within the current gasoline car paradigm which aims to reduce emissions without cardinal technological change. For instance, The Global Fuel Efficiency Initiative focuses on improving and promoting private gasoline vehicles with lower emissions<sup>31</sup>. Their report states that “fuel efficiency of private cars in OECD can double” through “incremental change to conventional

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<sup>31</sup> Eads, George (2011): *50by50 – Prospects and Progress*. Retrieved from *Global Fuel Efficiency* [online]. URL: [http://www.globalfueleconomy.org/Documents/Publications/prospects\\_and\\_progress\\_lr.pdf](http://www.globalfueleconomy.org/Documents/Publications/prospects_and_progress_lr.pdf) [accessed 27 February 2013].

internal combustion engines and drive systems, along with weight reduction and better aerodynamics... and hybridization of wider range of vehicles”<sup>32</sup>. Such programs as GFEI are the “softest” change of the existing paradigm of fossil fuel private car. Perhaps, it’s the “softness” of this change which makes it real: hybrid cars are the most popular of all alternative vehicle technologies present in Norway today<sup>33</sup>. Still, hybrid electrical vehicles are bound to fossil fuels and emitting GHG<sup>34</sup> and this is a limitation for their environmental outcome in the long-run.

Many scientists believe we have to go beyond the fossil in future mobility scenarios. Stern Review (Stern 2006) states that there are overwhelming and immediate economic reasons for reducing global carbon consumption. Fossil-free vehicle technology has existed side by side with gasoline car in the early stage of automobility development and successfully competed with it before the Texas oil boom of 1925. The three basic alternatives for fossil fuels are: biofuel, fuel cell (hydrogen) technology and electrical vehicles.

Hydrogen-powered vehicle was the first innovation of the 1800s. In 1807, Francois Isaac de Rivaz of Switzerland designed the first internal combustion engine that ran inside an automobile. It was powered by hydrogen gas stored in a

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<sup>32</sup> *Ibid.*

<sup>33</sup> Toyota alone has sold over 12000 hybrid vehicles in Norway according to *Bil Norge* (2013) [online]. URL: <http://www.bilnorge.no/artikkel.php?aid=39535> [accessed 13 Februar 2013].

<sup>34</sup> Norway’s most popular hybrid vehicle Toyota Prius emits 96 gr/km, as listed in The Green Cars Website (2012) [online]. URL: <http://www.thegreencarwebsite.co.uk/green-cars/toyota/prius/> [accessed 9 September 2012]. This can be compared to the average emissions of 134 gr/km from private transport in Norway, listed in Vegvesen (2012) [online]. URL: <http://www.vegvesen.no/Kjoretoy/Fakta+og+statistikk/Kjoretoy+og+drivstoff/Miljoutslipp/Gjenomsnittlige+CO2-utslipp> [accessed 27 February 2013].

balloon and by oxygen; the ignition was electrical. It never received commercial success. In 1860, Etienne Lenoir made a substantial improvement of Rivaz's engine: he invented 1-cylinder, 2-stroke "Hyppomobile" which received its fuel from hydrolyzing water. This invention was, however, neither much spread at the time<sup>35</sup>. Throughout the 20<sup>th</sup> century, there were many successful designs of hydrogen-powered vehicles in Norway, USSR, USA and Japan motivated by practical and economic reasons. In the past two decades the interest for hydrogen as vehicle fuel rose due environmental benefits compared to burning fossil fuels. Major manufacturers have recently addressed hydrogen, among those Honda, Nissan, GM and Renault.

Another alternative is using biofuel in the internal combustion engine instead of fossil fuels. Wood was the first biofuel used ever since people started using fire. The first commercially produced biofuel car was Ford's model T in 1903. The production stopped in 1926, because of the competition from gasoline cars combined with cheap oil available<sup>36</sup>. In the end of 1900s, biofuel received some attention again, along with other alternative technologies described above.

Another technological alternative to fossil fuels is electrical car. Between 1828 and 1842 a handful constructors in Hungary, Great Britain and Holland worked independently on a vehicle which would use an electric motor for propulsion, but

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<sup>35</sup> Hydrogene Cars Now (2012): "Hydrogene Cars 1807-1986" in *Hydrogene Cars Now* [online]. URL: <http://www.hydrogencarsnow.com/hydrogencars1807-1986.htm> [accessed 31 August 2012].

<sup>36</sup> Biofuel Information (2010): "History of Biofuels" in *Biofuel Information* [online]. URL: <http://biofuel.org.uk/history-of-biofuels.html> [accessed 6 September 2012].

the practicality of vehicles was limited by poor battery technology of the time<sup>37</sup>. Around 1842 Thomas Davenport (USA) and Robert Davidson (Scotland) independently constructed electrical vehicles which used newly invented non-rechargeable electric cells. Frenchmen Gaston Plante in the 1860s and Camille Faure in the 1880s contributed to substantial improvement of battery technology. Those improvements were crucial, and electrical car started a journey of success in the 1880-90s. First in Europe, then in the US, electrical car became popular and was the best-selling personal automobility technology till the 1920s when cheap Texas oil made gasoline car the most affordable alternative of personal mobility. After that electrical cars became practically extinct in the last century. The interest rose again in 1990s. Manufacturers like Chrysler, GM, Toyota and Honda created the renaissance of electrical vehicles.

There are certain technological alternatives available within private automobility. Electrical battery vehicles, hydrogen cars and biofuel cars were outcompeted in the 1920s by the affordable gasoline car combined with cheap fossil fuels. Presently, as global awareness of the environmental impact of fossil fuel use is rising, the alternative technologies are receiving attention. Daniel Sperling, Professor in the University of California and a co-author of the book “Two billion cars: Driving toward sustainability” believes that non-fossil driven cars are a part of the transport solution for the future, including all the three alternative fuel sources (Sperling and Gordon 2010). The future scenario might be a combination of all the three alternative energy sources in private

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<sup>37</sup> Bellis, Mary (2013): “History of Electric Vehicles” in *About* [online]. URL: <http://inventors.about.com/od/estartinventions/a/History-Of-Electric-Vehicles.htm> [2 September 2012]

automobility. This thesis focuses particularly on electrical cars as the alternative most developed at the time being in Norway.

### 3.2.2 Electrical car as an alternative

There is a discussion whether electrical car is a reasonable technological solution for private automobility in the long run. Whether electrical car is cleaner than a gasoline one, and to which extent, depends on the energy source used to produce electricity in the area. Much of the world's electricity production relies on fossil fuels, and an electrical car would be subsequently using those and thus emitting GHGs. Calculations around GHG outcome of an electrical car's operation seem to vary. Bjart Holtsmark criticizes electrical vehicles for emitting much GHG in the current world energy mix (2012). For instance, he states that an electrical car which derives energy from a coal power plant is emitting more GHG than a fuel-efficient gasoline car. Advocates of electrical cars provide two counter-arguments for this statement. First, an electrical engine is more efficient in principle than an internal combustion engine, thus requiring less energy per kilometer driving. According to Erik Skjelbred, Director in Energy Norway (*Energi Norge*), the energy efficiency of a petroleum car is 15% while that of an electrical car is 80% (2009). This leads, he states, to lower total GHG emissions per kilometer, even if the power plant is running on coal. Figerbaum and Nørbech (2012) suggest accounting on regional, rather than global energy mix and argument for cleaner GHG outcome of an electrical car in Europe today compared to a conventional car in this region. Second, there is an in-built possibility for a change towards cleaner energy in the system: if coal is replaced by renewable energy, the electrical car is no obstacle for this positive system change; it will operate in any case. Figerbaum and Nørbech (ibid.) refer to gradual de-carbonization plans in Europe in the coming years as an argument in support for electrical car as the cleaner solution in this region in the long run.

### 3.3 Electrical car in Norway

While in many places electrical car would only become a real zero emission vehicle if the power system becomes renewable (as discussed above), all the power produced in Norway is virtually renewable already<sup>38</sup>. It is stated that Norway has enough renewable power to potentially run all the personal cars in the country on electricity (Hagman et al. 2011). This makes Norwegian electrical cars close to emission-free vehicles in operation. This makes Norway's position in terms of automobility electrification rather unique. Another feature of Norwegian electrical car market is that this country has both the largest electrical car fleet in Europe in absolute value and most electrical vehicles per capita in the world. Oslo is often referred to as the electrical capital of the world (The Independent 2011). Although the market share of electrical vehicles in Norway is the largest in the world, it is still small. According to Statistics Norway, there were there were 2.9 million cars in the country in 2010<sup>39</sup>. The number of electrical cars is modest, but rapidly growing: there were 3392 electrical vehicles at the time the current research was set in 2010<sup>40</sup> and a little over 10.000 in February 2013<sup>41</sup>. With the current statistics, Norway and especially the city of

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<sup>38</sup>Statkraft (2013): "Vannkraft" in *Statkraft* [online]. URL: <http://www.statkraft.no/energikilder/vannkraft/> [accessed 22 February 2013]

<sup>39</sup> Statistics Norway (2013a): "Transport" in *Statistics Norway* [online], URL: <http://www.ssb.no/transport/> [accessed 22 February 2013]

<sup>40</sup> Energi Norge, Transnova, Kommunenes Sentralforbund and ZERO (2010, February 2): "3.392 Elbiler i Norge" in *Grønn Bil* [online]. URL: <http://gronnbil.no/nyheter/3-392-elbiler-i-norge-article113-239.html> [accessed 10 September 2012]

<sup>41</sup> Energi Norge, Transnova, Kommunenes Sentralforbund and ZERO (2013, February 2): "10.000 Elbiler i Norge" in *Grønn Bil* [online]. URL: <http://www.gronnbil.no/nyheter/over-10-000-elbiler-i-norge-article319-239.html> [accessed 22 February 2013]

Oslo, is an interesting case to study in terms of use of electrical vehicles in order to further promote the technological change in the country and potentially transfer the experience to other countries in Europe.

In the report on Norway's Commitment to Electrical Cars, Hydrogene Cars and Plug-in Hybrid Cars (*"Norges satsing på elbiler, hydrogenbiler og ladbare hybrider"*), Andreassen and colleagues (2011) underline the importance of incentives from the state in order to support the establishment of the electrical car in the private mobility system. Currently, the state-provided incentives for electrical car owners in the city of Oslo are following:

- tax discounts,
- free road toll,
- possibility to drive in the collective lane,
- free municipal parking.

Grin, Rotmans and Schot address the issue of transition towards sustainability (Grin et. 2012). Their idea is that in order to ensure the transition towards sustainability, attention is to be paid to "frontrunners" and the energy is to be put in them, "not in the pack" (ibid.). These "frontrunners" are the progressive members of the society who are the first to adopt sustainable practices. In order to help the frontrunners in their striving, a long-term agenda must be developed. In the context of private transportation, the frontrunners are the few thousands owners of electrical cars in Norway who took the challenge of testing out the emission-free technology in their practices. The state incentives correspond to the energy which scientists encourage to put in environmental frontrunners. The favorable incentives for electrical car ownership in Norway are truly among the reasons for country's strong position in the total electrical car market.

Electrical cars require an infrastructure for charging the batteries. Oslo Municipality (*Oslo Kommune*) is supportive of this technology; they are investing into development of infrastructure for electrical cars, specifically the quick



charge points<sup>42</sup>. The state-provided incentives and infrastructure development are truly working for their purpose since Oslo has the most electrified public transportation in the world.

With all the incentives, the number of electrical cars in the city of Oslo was about 2.000<sup>43</sup> out of 313.714 cars in the city in total<sup>44</sup> in the end of 2012. This suggests there is a room for further electrification. This research's background is the current situation in with electrical cars in Oslo and the view that electrical car technology is one of the measures for meeting environmental goals in Norway in the long run. It is therefore interesting to study the owners of electrical cars – “the frontrunners” (Grin et al. 2012) – in terms of their motivation and socio-demographic characteristics and seek the ways to apply the findings in order to maintain and further increase the current electrical car market.

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<sup>42</sup> Trafikketaten (2010): ”Etablering av Ladestasjoner” in *Trafikketaten* [online]. URL: [http://www.trafikketaten.oslo.kommune.no/elbil/etablering\\_av\\_ladestasjoner\\_/](http://www.trafikketaten.oslo.kommune.no/elbil/etablering_av_ladestasjoner_/) [accessed 12 august 2010].

<sup>43</sup> Energi Norge, Transnova, Kommunenes Sentralforbund and ZERO (2010, February 2): ”Ladbare Biler i Norge. Nøkkeltakk pr. Desember 2011” in *Grønn Bil* [online]. URL: <http://www.gronnbil.no/elbiluniverset/kart.php#zoom=4&tr=72.14173187862764,56.444476074218755&bl=55.70293210778397,-30.567242675781244&m=1&reg=0> [accessed 10 September 2012]

<sup>44</sup> Statistics Norway (2012c, April 26): “Bilbestand of Folkemengde, etter fylke, 2011” in *Statistics Norway* [online], URL: <http://www.ssb.no/bilreg/tab-2012-04-26-01.html> [accessed 22 February 2013]

## 3.4 The academic perspective

### 3.4.1 Previous studies of the topic

There is generally much research on mobility in Norway conducted or initiated by actors like The Norwegian Public Roads Administration (Statens Vegvesen), The Institute of Transport Economics (Transportøkonomisk institutt, TØI), and Zero Emission Resource Organization (ZERO). A handful of studies have chosen to investigate issues around electrical car use in Norway. These studies were illuminative in terms of their findings and inspiring for the current research.

Centre for Innovation and Economics of the University in Norland (SIB AS) has published a series of papers in 2009-2010 regarding their study of a sample of companies that chose electrical car for their business operations in Norwegian county Norland. The project's name is "Ready for electrical car?" (*"Klar for elbil?"*). The study focuses on economic and behavioral aspects of using an electrical car by a company, through questions about economy, performance of the car and environment and reputation. The findings show that the attitude towards electrical changed positively among the employees who used them in operation; the companies generally argument "for being trendy and being front running companies with respect to new solutions, technologically and methodologically" (Solvoll and Smith 2009). The economic analysis based on this research showed the importance of the state regulations. The resulting report (Mathisen et al. 2010) suggests the five most appealing aspects around electrical car use for the sample of companies: environmental friendliness, easy parking, little noise, positive effect on reputation and economy.

There have been a few studies of private drivers of electrical cars as well. Ministry of Transport and Communications (*Samferdsdepartementet*) conducted a study on the travel habits of both electrical car private owners and companies

(ECON Analyse 2006). The study's objectives were to explore what makes private persons and businesses to choose electrical cars and which alternatives they would have chosen otherwise. The research concerned the owners' perception of various car performance aspects, state regulations that aim to stimulate electrical car use and the travel patterns where electrical cars are involved. It has specifically focused on the role of state-provided incentives. The paper provides descriptive statistics of the population of electrical car owners as of 2006. This report didn't make conclusions concerning environment as a potential motivator for the sample because "the survey had too few questions to be a robust study of values and attitudes towards the environment"<sup>45</sup> (Econ Analyse 2006:40). The suggestion in the paper is that electrical car owners name the environment as an important motive at the same time as they don't seem to share stronger environmental values than the general population in Norway.

The Norwegian Public Roads Administration conducted a study among private electrical car owners in the Norwegian cities and matching general population sample (Rødseth 2009). This study was a part of a bigger project on registering the transport in the collective lane, and the electrical cars came into the picture because the privilege to use this lane is one of the incentives the state provides for electrical car owners. The objective for the research of electrical car owners was testing two hypotheses: 1. Electrical car owners drive this car type in order to avoid using public transportation; 2. Much change in public regulation around car use would follow to negative reactions among the groups who chose transport types which are today allowed in the collective lane [electrical car owners in this particular report] (Rødseth 2009:4). The study provides descriptive statistics and

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<sup>45</sup> Own translation from Norwegian.

portrays “the typical electrical car owner”: it is an earlier collective transport user; younger, but also richer and with a higher education than average; with a big family and another car in addition to the electrical car. The research confirms both hypotheses. The suggestion is that electrical car owners have mostly switched to driving those from using collective transportation. The research concludes that driving in the collective lane is highly important for the sample and therefore the group would react negatively if this regulation is abandoned. It is as well suggested that other state-provided incentives for electrical car owners are of high importance for supporting electrical car as a category (*ibid.*:44). The author considers the issue of motivation for buying an electrical car in the first place as being “practically not of importance for the transportation system” arguing that the market share is marginal at the present state (2009:5).

Zero has published a report on their study on Norwegian politics towards promoting use of electrical cars, hydrogen cars and plug-in hybrid vehicles (Andreassen et al. 2011). The overall research question of the study was: “How should the incentive policy be shaped in order to support the Norwegian consumers who are interested in zero-emission vehicles and plug-in hybrid vehicles?”<sup>46</sup> (*ibid.*:12). Andreasson and colleagues studied a sample which was assumed to be potentially interested in the new technology zero-emission vehicles and hybrid vehicles represent; the sample was chosen among the members of Tekna, The Norwegian Society of Graduate Technical and Scientific Professionals. The report gives recommendations to the official policy which would help to promote motivation of the potential buyers of the chosen car types. The recommendations which concern electrical car promotion are mostly

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<sup>46</sup> Own translation from Norwegian.

focusing on continuing state support in form of tax discounts, free parking, free toll and use of collective lane and further development of infrastructure for quick charging of electrical vehicles (*ibid.*:59).

Hagman et al. (2011) in their report Electricity for Road Vehicles (“*Strøm for biler*”) analyze the development potential for zero emission vehicles in Norway up to the year 2020. Hagman and colleagues identify which technologies will be available in the coming years, give recommendations in order to promote energy efficient vehicle technologies and discuss business strategies for developing new products and services. It is suggested that the most importance issues for the future of electrical car in Norway are relative performance within the market segment, safety, life cycle expectations and battery prices. Electrical cars are suggested most suitable as short-distance city cars in the perspective up to year 2020.

### 3.4.2 Room for further research

Previous research on the topic of electrical car use in Norway has both focused on individuals and businesses that chose this car type. Potential electrical car buyers have been also studied in order to explore how official policy may promote their motivation to choose this car type in the future. When it comes to individuals who already own electrical cars, there is a vast descriptive statistics available (Econ Analyse 2006, Rødseth 2009). In terms of their motivation for owning an electrical car, the role of state-provided incentives in general and collective lane use specifically were the main focus in previous research.

Electrical car is an environment-friendly solution for private transportation. The role of environment as a motive for owning an electrical car for an individual in Norway hasn't previously been a particular research focus. There is a suggestion that environment has a certain importance for choosers, but they, however, don't seem to be more environmentally conscious than the population in general (Econ

Analyse 2006). Environmental issues are highly important for businesses which chose to acquire electrical cars (Mathisen et al. 2010).

It may be suggested that motivation of electrical car owners hasn't been fully researched previously as it hasn't been a particular focus. It is especially the environment as a potential motive for private electrical car owners that would be interesting to look at. Rødseth argues that it is practically unimportant for the transportation system which motives lie behind the choice [of electrical car] in the current situation (2009:5). It could be argued that the various aspects of motivation of electrical car owners in Norway have an importance for achieving the country's environmental goals. With the current market share of electrical cars, each of the drivers does matter for the overall electrical car use and promotion. It is important to follow up "the frontrunners" in terms of environmental and technological change (Grin et. 2012). The current research is focusing on the motivation for choosing electrical cars and aiming to contribute to the academic knowledge previously acquired on the topic.

## 4. Methodology of the study

This chapter is introducing the research questions, the research design and the methodology used to investigate the motivations of electrical car owners in Oslo. This study is mainly based on and inspired by the social disciplines of sociology, economics and social-psychology (as discussed in Ch.3 of this paper). In social research, there is a distinction between two types of epistemological orientation which are positivism and interpretivism (Bryman 2008). The position of positivism advocates the application of the methods of the natural sciences to the study of social reality and beyond (*ibid.*:13). Interpretivism, in contrast, shares a view that the subject matter of the social sciences – people and their institutions – is fundamentally different from that of the natural sciences and aims to grasp the subjective meaning of social action (*ibid.*:16). Positivist approach is generally related to quantitative research, while interpretivist approach uses qualitative methods; the main difference is that “quantitative researchers employ measurement and qualitative researchers do not” (*ibid.*:21). The current study aims to explore patterns in motivation of a group of electrical car owners which could be generalized and possibly applied for a larger population. It has been chosen to employ positivist approach using quantitative methods in a study of primary data. With this approach, the study is opting to provide results which might be generalized over larger population with similar characteristics.

### 4.1 Survey method

The current study’s objectives are exploring the motives of electrical car owners in Oslo, studying their relative importance and suggesting an application of the findings in a broader context. Individuals’ motives for choosing a specific transportation mode are a kind of phenomena which cannot be directly observed

by a researcher. For this reason, the methodology had to be based on accessing the particular group with direct questions relevant to the research. The current research has preferred a quantitative approach and a method of survey. “Survey is a method of gathering information from a number of individuals, a “sample”, in order to learn something about the larger population from which the sample is drawn” (May 1997:65 quoting Ferber et al 1980:3). It is used by sociologists, market analysts, psychologists, politologists and sometimes anthropologists because it is relatively rapid and inexpensive (May 1997:65). A correctly conducted survey is strong with “a particular logic of data collection and analysis for drawing a conclusion about social world” (de Vaus ed. 2002:IX). Solid data volume, logic and structure are what contributes to generalizability of this type of research.

This study used mail as a mean of accessing the respondents with the questionnaire. The list of electrical car owners in Oslo, the population for the current research, was obtained from the Norwegian Public Roads Administration. Postal addresses were the only contact information available to use; for that reason a mail survey was a natural choice. A matter of concern was the fact that response rates are relatively poor compared to e-mail or telephone surveys (de Vaus (Ed.) 2002:XXVI), but it is documented that surveys of specific groups give on average 10% higher response rate than surveys on general public (Dillman 2000:28). A mail survey makes a longer waiting time for the data to be gathered, but this is weighted by the absence of interviewer-bias: self-administrated questionnaires let the respondent be on his or her own with the reply options.



## 4.2 Research design

*“A survey question is more than a general inquiry. It is a surveyor’s tool for gaining responses from subjects in a survey sample that will make it possible to determine the distribution of a characteristic” (Dillman 2000:34)*

There is a debate whether a survey should be based on a particular research hypothesis. A research hypothesis is “a statement about the expected outcome of a study... a prediction made prior to the actual study”, - as L.G.Grimm explains in his book (1993:6). According to statistician Grimm, a hypothesis has to be central in one’s study and the analysis is to be conducted by testing it. Centering a research on “accept or reject” problem is not always seen as a useful tool. According to Bertaux (1981), “sociological thinking should be present throughout the research process but hypotheses should be formulated only towards the end of it”. Bertaux warns against becoming positivistic and forgetting the “more humble level” of social relations of humans behind the data. This study has considered the criticism against following the scientific method in a social research. It was chosen to formulate a series of research questions instead of one or several hypotheses which is often used in quantitative analysis.

The main research question of this study is: *What are the motives for owning an electrical car for an individual in Oslo?* This was further specified in the following partial research questions:

- What are the most important motives for owning an electrical car in Oslo?
- Do they vary by socio-demographic characteristics of the individuals?
- What is the role of environment as a motivator?

This research is focusing on the central motives of the respondents and the relation of those to personal characteristics of the individuals. This approach may

be a basis for reflections upon increasing motivation in an efficient way and approaching the electrical car owners with respect to the variation there might be between different groups within this population. The role of environment in terms of motivation of electrical car owners is emphasized because this area hasn't been previously addressed in detail. It is interesting to explore interest towards environment among the choosers of the vehicle type which is considered environment-friendly.

Questionnaire design has been based on these research questions, earlier studies of electrical car owners in Norway and theories on consumption. The theoretical background from various social disciplines suggests that the relevant motives behind consumption might be personal utility maximization, "pure" or "impure" altruism, a product's relative performance, communicating a message or expressing one's status. Reported level of happiness is possibly connected with consumption patterns as well. Previous studies on this topic have suggested a few areas that might be motivational for electrical car owners. These are costs, state-provided incentives, car's overall performance, feeling of modernity and environmental impact (ECON Analyse 2006, Mathisen et al. 2010 and Rødseth 2009). The relevant motivational aspects were considered when designing questions of the survey. The questionnaire can be found in the appendix of this paper.

The majority of questions were related to motivation, and it was natural to use opinion questions (May 1997:77). Mostly it was chosen to use questions about the degree of agreement with various statements measured with a Likert scale "which places people's answers on attitude continuum" (*ibid.*:79). A few factual questions were added: the respondents were asked whether they were familiar with the state regulations in favor of the electrical cars when acquiring those. The personal section, classification questions, was set in the end of the survey. Most questions were closed to make the process of coding and analysis easy. This

corresponds to Fowler's recommendations: "self-administrating questions should be restricted to close answers" (2002:111); this helps to avoid incomplete, vague and even missing replies. The questionnaire included one open-ended question about other motivation than named in the survey; the obtained data was not used in the statistical analysis due to time limitations of the research. The respondents were also asked if they agree to participate in an interview later if necessary for the study; in this case they were asked to write their name and a phone number. This left a possibility to gather more data at a later point of study. At later stage, the data from the closed questions in the survey was found sufficient for a statistical analysis, and it was not necessary to contact the respondents by phone in the context of the current study.

The formulation of questions attempted to follow Tailored Design Method (Dillman 2000) which can be summarized as using clear and short formulations, avoidance of bias and avoidance of hypothetical questions. It was chosen not to use a "don't know" reply option for most of the questionnaire. Only the personal questions contained this option so that the respondents would not feel pressured to reveal their private information. Some of the questions were formulated in an inverted way: agreement would mean low interest and vice versa. This was done in order to neutralize the tendency towards agreement common for Likert design (Johns 2010).

## 4.3 Data collection

### 4.3.1 Sampling of the study population

The study population includes the private owners of electrical cars in Oslo. In summer 2010, I addressed The Norwegian Public Roads Administration (*Statens Vegvesen*) with an inquiry about contact information of electrical car owners in

Oslo. They provided this study with a list of all vehicles with electrical engines registered in the city of Oslo, both private and owned by companies, in an Excel file. The list contained 920 registering numbers, owner's names and addresses and car brands. I manually worked through the list, deleting all the lines that looked like organizations or companies and a few electrical two-wheel mopeds. Finally, there were 536 owners of electrical cars left in the netto list, which corresponds the data obtained from the resource *Grønn bil* at the time the list of respondents was accessed.

The survey was decided to be conducted by mail. I had to choose a sample of the population to which I would send the questionnaires. The sample could be equal to the population since bigger sample increases the analysis' reliability. Taken postage expenses and limited funding, I preferred to choose a smaller sample. The estimation was that a number of respondents between 100 and 150 persons would be sufficient for drawing descriptive statistics and conducting factor analysis and regression analysis which were chosen for this study (de Winter et al. 2009, Green 1991). Expecting the response rate of at least 50%, I decided to send out 200 questionnaires. In case of low response rate, there was an option to send reminders, as they are generally proved to increase the response rate (Dillman 2000:10).

In order to choose 200 individuals from the list, I used an AbleBits add-on for Microsoft Excel which drew a random sample based upon statistical probability theory. This sampling design "ascertains the extent to which the sample is representative of the wider population" (May 1997:68). This was a simple random sampling that did not aim to choose a group in proportion to certain characteristics (age, income or city area); this is seen as a reliable method if done correctly (May 1997:70).

### 4.3.2 Piloting

Dillman (2000:140) recommends pre-testing of one's questionnaire before conducting a survey. So does Fowler (2002): "the best way to pre-test a self-administrated questionnaire is in person, with a group of potential respondents". Two electrical car owners I am familiar with kindly agreed to be in my pilot survey. They filled out the questionnaires and gave me their feed-backs. The discussion of the questionnaire with electrical car owners helped me improve it in terms of wording and design. After recommendations, a few questions were added, such as whether the electrical car was the only car in the household. Some categories were broadened: total household income's higher edge changed from "over 500.000" to "over 1.000.000". The pilot respondents criticized the inverted question design as they seemed harder to understand. Despite of the criticism, these formulations were chosen to keep in the survey despite of the feed-back because of the evidence of acquiescence bias in the methodology literature (Johns 2010).

### 4.3.3 Accessing the sample

Dillman states, "People must be motivated to go through the process associated with understanding and answering each question and returning the questionnaire to the survey sponsor" (2000:13). May suggests that "the cover letter explaining the purpose of the questionnaire, stressing the need for co-operation and the anonymity of replies" improve the response rate of a survey (May 1997:72). A cover letter on a separate page would be an additional expense for the project; it was reduced to a "cover paragraph" in the beginning of the questionnaire and my thanks in the end of it.

The questionnaire, including introduction and concluding thanks, made two double-sided A4 pages. I used envelopes with logos of the University and The

Centre for Development and the Environment (SUM) to send out the forms and enclosed stamped return envelopes. To be able to trace back those who haven't replied, I put the ID numbers of the people in the sample list to the reply envelopes. This gave me a possibility to contact the rest of my sample with a reminder if the response rate would be low. 199 forms were sent out in November 2010. When the responds arrived, I noted the ID numbers, took the questionnaires out of the envelopes and thus ensured anonymity – unless the respondent provided the personal data for the possible interview. Three letters were returned by post, and 121 questionnaires were returned by the respondents. This makes 61% response rate in the sample which can be seen as positive for the current research. The resulting dataset of 121 cases was suitable for statistical analysis.

#### 4.3.4 Ethical issues

The current study has considered a range of ethical issues. Such issues, according to Alan Bryman (2008), “cannot be ignored as they relate directly to the integrity of a piece of research”. Bryman lists four main areas of ethical concern which exist in social sciences:

1. *whether there is harm to participants;*
2. *whether there is a lack of informed consent;*
3. *whether there is an invasion of privacy;*
4. *whether deception is involved (2008 quoting Diener and Grandall 1978).*

Mail survey is a method involving no personal contact between researcher and respondents which might reduce the risk of unethical treatment of the latter. The questionnaire's cover paragraph presented the purpose of the study and the potential use of the outcome and provided the detailed contact information of the researcher, suggesting that no deception was involved or could potentially seem to be involved. The setting of the research was also ensuring informed consent since only the persons who agreed to fill out the questionnaire were studied. The

potential harm to participants of a survey can be made by third parties accessing the sensitive information. The current research gathered some personal information which was treated with respect and cautiousness. The returned questionnaires, including those which contained the contact information for potential interview contact, were kept safely in a place with no access to third parties. In the cover paragraph of the questionnaire, I ensured the respondents about confidentiality and anonymity of the data, and I did my best effort to follow this promise. The dataset is completely anonymized and is therefore not seen as a potential threat for anonymity. There was a risk that the respondents would see personal questions as invasion to their privacy. The personal questions contained a “don’t want to reply” option so that the respondents wouldn’t feel pressured to give out sensitive information. The persons who possibly believed that the current research was generally invading their privacy had an opportunity to disregard the survey. It can be believed that the ethical concerns behind the current research were carefully addressed.

## 4.4 Analysis

The data obtained from the survey was coded and manually transformed into a SPSS 19.0 data set for statistical analysis. As a preparation for analysis, the data was partly transformed. For example, the inverted questions were transformed into the standard Likert scale form so that higher number would mean higher level of agreement with a statement.

Descriptive statistics was the starting point of SPSS analysis of the data set. This paper presents the descriptive outcome in several groups according to the types of data obtained. Demographic variables, motives related to the electrical car purchase and attitudes towards some vehicle-related issues will be presented in

Ch.5.2 in order to provide a portrait of a typical electrical car owner from the current sample.

Exploratory factor analysis was used in order to study underlying motives of the sample. This is a technique for identifying groups or clusters of variables (Field 2005:619) which helps to measure latent motivation of individuals in the current sample. Factor analysis was a tool of exploring motivation of electrical car owners which is one of the objectives of this research. The resulting variables will be discussed in relation to the theoretical background in Ch.5. Descriptive statistics was used to measure relative importance of the resulting motivational factors which was as well among the objectives of this study.

Regression analysis was used in order to explore the possible predictors of the motivational factors suggested by the factor analysis. Various socio-demographic characteristics were tested as regressors for the motives. This technique was a mean of mapping the electrical car owners in accordance with their motives and their background information. The outcome of regression analysis suggests a way to segment the market of electrical cars and access the existing and potential owners according to their preferences which will be presented in Ch.5 and discussed in Ch.6.

The statistical techniques applied in the current research were a tool for meeting the study objectives. The outcome of descriptive statistics, factor analysis and regression analysis was the basis for discussion of the motives for owning an electrical car for an individual in Oslo and the suggested applications of the findings presented in Ch.6.



## 4.5 Concluding remarks

Conducting a quantitative study of primary data was a valuable learning experience on sampling, survey design and statistical analysis. The response rate of 61% on a mail survey supports the opinion that samples of respondents with particular characteristics (like ownership of an “unusual” car) tend to be more interested in being studied than general population. Marking the questionnaires with University logos and adding stamped return envelopes can be as well seen as contribution to the sufficient response rate. In terms of questionnaire design and wording, my experience with the current research suggests that both inverted questions and “don’t know” options might result in more confusion than help. Respondents seldom used the option “don’t know” which was left in the personal section in the end of the questionnaire; the inverted questions seemed to irritate a few persons who even took time to comment about it on the margins of the questionnaire. I appreciated the piloting with two electrical car owners as this was eliminating in terms of wording and general outline. The statistical analysis in SPSS gave me some insight into the techniques of exploratory factor analysis and multiple regression analysis which were chosen in order to explore the motivation of the electrical car owners. The findings, analysis and discussion which follow from this methodological framework are presented in Ch.5 and Ch.6.

## 5. Analysis and findings

### 5.1 Introduction to the chapter

The paper's overall research question is: *What are the motives for owning an electrical car for an individual in Oslo*. This suggests certain analytical challenges of discovering individuals' motives. In order to capture and summarize motivation for owning a particular vehicle, this research is attempting to identify it with the help of exploratory factor analysis and use the results to test the relationship with socio-demographic characteristics of participants with the help of regression analysis.

This chapter is presenting the descriptive statistics for various groups of variables in order to summarize the data and portray an average respondent of the sample. The motives are presented according to their importance which suggests a certain hierarchy in motivation of the respondents. Answers to the question about happiness level are also described, and the answers are compared with previous research in Norway.

This chapter is suggesting an overview of the respondents' underlying motivations using the outcome of exploratory factor analysis. The findings are discussed in accordance to interdisciplinary theoretical background. The suggested motivational factors are used as dependent variables in regression analysis with the aim of understanding the socio-economic determinant of each group of motives. The results outline a typology of electrical car owners that differs across motivations. These typologies are discussed with respect to previous research.

## 5.2 Portraying the electrical car owners

Descriptive statistics summarizes key properties of distributions of quantitative variables (Stern 2010:131). The uses of this procedure include:

- Description of the sample's characteristics;
- Checking the variables for any violations of assumptions underlying the techniques one is planning to use in the research;
- Addressing specific research questions (Pallant, 2007:53).

This study uses descriptives mainly for the purpose of summarizing the sample's characteristics and, to less extent, to check for violation of further techniques' assumptions.

### 5.2.1 Demographic data

The descriptives for demographic questions are shown in the table below:

**Table 2.** Socio-demographic data

Variable	Description	Median	Mean	Std.Deviaton
Age	Age Group: 1=<29, 2=30-39, 3=40-49, 4=50-59, 5=60-69, 6=70-79, 7=>80	3	3,3	1,08
Gender	Gender: 1=female, 0=male	0	0,38	0,487
Household	Total number of persons in the household	4	3,4	1,17
Children	Does the respondent have children? 1=yes, 0=no.	1		
Education	Education: 1=secondary, 2=upper secondary, 3=<4 years of higher education, 4=>4 years of higher education	4		
Occupation	Occupation: 1=student, 2=full-time job, 3=part-time job, 4=pensionist, 5=home working.	2		
Job	Professional sphere: 1=construction, 2=economic, finance, real estate, 3=farming, fishing, 4=law, 5=church, 6=health sector, 7=office job, 8=transport, 9=sales, service, 10=education, 11=research.	7		
Only car	Is the electrical car the only car in the household? 1=yes, 0=no	0	0,1	0,3
Income	Total income of the household: 1=0-250000, 2=250000-500000, 3=500000-750000, 4=750000-1000000, 5=>1000000	5	4,3	0,97
	Sample size	121		

The table has nominal and ordinal variables. Because of the demographic nature of the variables, it was attractive to use median, “the value of middle score in a distribution” (Stern 2010:117) , as a measure of central tendency. The medians tell us that a “typical” case in the sample is a male<sup>47</sup> between 40 and 49, who lives in a household with 3 other people, has children, over four years of higher education, an office job and annual household income of over 1.000.000 kroner. It is typical that electrical car is not the only car in the household. This data to a big extent corresponds to previous research of the population of electrical car drivers in Norway. According to the data from Econ Analyse’s survey on electrical car drivers’ travel patterns (Econ Analyse 2006), 85% of electrical car owners were between 30 and 59 in 2006, 65% of them were males, 78% per cent had higher education and 89% were employed. The income was higher than average in Norway, with 24% of the sample having over 1.000.000 kroner as their annual household income. The variable indicating whether there is another car in the household matches the previous studies: the current sample has 10% cases with only electrical car in the household while the previous research found 15%. The fact that this sample does not significantly differ from previous research supports the current study’s validity. This suggests that the data is suitable for further analysis.

### 5.2.2 Motives

The focus of the questionnaire was to explore people’s motivations to buy electrical cars, and look at the most important ones. The respondents were given 12 statements of the type “I liked the idea of contributing the society when

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<sup>47</sup> The sample consisted of 75 males (62%) and 46 females (38%).

acquiring the electrical car” with answer options “agree” to “disagree” one-to-seven on a Likert scale. Four was the midpoint for “neither agree nor disagree”. Four other motivational questions, all related to state-provided incentives, were placed separately in the questionnaire and they demanded the participants to rate the importance of certain incentives such as free toll. The answer options were “very important” to “not important” coded as a one-to-five Likert scale, with three as the midpoint. In order to provide overview over general tendencies for these variables, some transformations were made in the scale one-to-three. For one-to-seven scale, the midpoint four was replaced by two, all tendency to disagree replaced by one and all tendency to agree replaced by three. For one-to-five scale, similarly, midpoint three was replaced by two, the non-importance of the motivational incentive by one and the importance by three.

The following table shows frequencies of agreement, disagreement and midpoint answers and means in the scale from one to three (three is highest). The means are in descending order.

**Table 3.** Average evaluation of the motives for owning an electrical car

	Frequencies, percent			Mean
	Disagree	Neither agree nor disagree	Agree	
Environment-friendly car	5	4,1	90,9	2,86
Tax reduction	4	13,1	82,8	2,79
Free toll	5,3	14	80,7	2,75
Free parking	11,5	7,1	81,4	2,7
Local pollution	12,4	6,6	81	2,69
Low costs	10,7	9,9	79,3	2,69
Contribution	10,7	14,9	74,4	2,64
Time saving	10,7	16,5	72,7	2,62
Collective lane	14,7	9,2	76,1	2,61
Social approval	12,4	23,1	64,5	2,52
Good feeling	15,7	23,1	61,2	2,45
Modern technology	18,2	31,4	50,4	2,32
Global pollution	38	15,7	46,3	2,08
Design	35,5	24	40,5	2,05
Comfort	41,3	25,6	33,1	1,92
Safety	55,8	15,8	28,3	1,73
<i>Sample size</i>				121

Among the five most important motives, there are environment-related ones (environment-friendly car and reducing local pollution) and economy-related ones (reduced tax, free toll in Oslo and free parking in Oslo). The least important motives are electrical car's design, comfort and safety features. On average, there is a mixture of environmental and economic motives which were strongest among the respondents when making the purchase decision. This might be related to electrical cars' relative advantages – state-provided economic incentives and the positive environmental profile. Lower importance of the technical features of the vehicle suggests that these have been less appealing in the purchase decision.

In the question 5.5 of the survey respondents were asked to rank 10 motivational aspects according to their importance when purchasing the electrical car on the scale from one to 10 (10 was most important). This resulted in 10 interconnected

ranking variables. The question suggested to use each number once and to use all numbers from one to 10 when ranking. Despite of this, some respondents chose to give same evaluation to more than one motive. The result is therefore different from the one intended, but still interesting for comparison of motives of the sample. The table below shows the relative evaluation of the variables. It shows the percentage of the first (score 10), the second (score nine) and the last (score one) places each of the variables received. The variables are arranged by descending means which are also included in the table.

**Table 4.** Ranking of the motives

	Frequencies			Mean
	% 1st place	% 2nd place	% last place	
Reduce pollution	25,6	12,4	3,3	7,01
Free toll	29,8	10,7	6,6	6,88
Lower costs	18,2	17,4	5	6,87
Save time	28,1	11,6	7,4	6,85
Parking in Oslo	17,4	13,2	5	6,83
Collective lane	25,8	10	10,8	6,52
Environment friendly	18,2	6,6	7,4	5,99
Change society	10,7	17,4	5	5,98
New technology	7,4	4,1	23,1	4,36
Design	1,7	2,5	34,7	3,45
Samplpe size				121

The ranking variables generally support the average evaluation of motives in the Table 3 above. The highest mean, both independently and compared to other motives, is that of the car's relative environmental qualities. Economic motives are next most important: free toll in Oslo, lower maintenance costs and free parking in Oslo are just a decimal behind the environment-related motivation. In the ranking table, the motivation by the vehicle's characteristics is relatively lowest, similar to the results showed in the Table 3. These findings reinforce the

internal validity of the current research. The findings suggest that electrical car owners are most driven by two underlying motives: rational money-saving and environmental concern. The environmental reasoning is related to the vehicle's features compared to a conventional car today: electrical cars are proved polluting less both locally and globally and are seen as a part of the climate solution in the transportation sector (as discussed in Ch.3). The economic reasoning is related to the relative benefits a driver of an electrical car gets from the authorities. The origin of the two most important motives is very different, but they however combine and make the overall motivation strong enough for the particular car choice.

### 5.2.3 Attitudes

A number of questions in this study were related to attitudes of the respondents. Similarly to the questions in the previous section, these were using Likert scale one-to-seven. The variables were transformed into one-to-three scale (three is highest) in order to provide a descriptive summary which can be found below:

**Table 5.** The attitudes of electrical car owners

	Frequencies, percent			Mean
	Disagree	Neither agree nor disagree	Agree	
Environment is important	2,6	6	91,4	2,89
Like to contribute	2,5	5,9	91,6	2,89
Electrical car contributes to the society	5,8	5	89,3	2,83
Society approves electrical car use	18,2	12,4	69,4	2,51
Interested in technology	23,1	19	57,9	2,35
Believes that electrical car has lower costs	17,5	5,8	76,7	2,59
Sample size				121



The table above tells us about general attitudes of the respondents. On average, an owner of electrical car likes to contribute to the society and environment, believes that society approves electrical car use and that electrical cars have lower maintenance costs than conventional alternatives. The average respondent is also interested in new technologies. Together with demographic variables, the attitudinal parameters create a portrait of a respondent from the sample.

#### 5.2.4 Subjective well-being

Studies suggest there is a connection between individual's consumption and subjective well-being (Guillen-Royo 2007). It is interesting to look at wellbeing, or happiness reported by the current sample in the light of this study.

Subjective well-being is a term broadly used in academic literature to discuss individual's overall life satisfaction (Easterlin 1974); it is defined as "a person's cognitive and affective evaluations of his or her life"<sup>48</sup>. This study included a question about respondents' perceived happiness<sup>49</sup> in order to measure the sample's subjective well-being. The question 7.1 suggested the respondents to describe themselves as very happy, rather happy, not so happy or not happy at all which is identical to numerous studies of Norsk Monitor (1985-2007, listed in Hellevik 2008). The similarity of wording gives an opportunity to compare the output of "happiness" in this study with that of broader population. The

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<sup>48</sup> Albuquerque, Brian (2012): "Subjective Well-Being" in Positive Psychology [online]. URL: <http://positivepsychology.org.uk/pp-theory/happiness/106-subjective-well-being.html> [accessed 30 October 2012].

<sup>49</sup> The study uses the Norwegian "lykke" for "happiness" and "lykkelig" for "happy", following wording of Hellevik (2008).

descriptive statistics for this variable in the current research is summarized in the table below:

**Table 6.** Subjective well-being

Subjective well-being	Frequency, percent
Very happy	34,7
Rather happy	64,4
Not so happy	0
Not happy at all	0,8
<i>Sample size</i>	121

Hellevik (2008) measures the “level of happiness” the following way: the percentage of “not so happy” and “not at all happy” respondents is subtracted from the percentage of the “very happy” ones. Using his formula, the result for the current sample is +33,9. The happiness level for the whole population measured by Norsk Monitor has been between +9 and +11 in the past two decades (*ibid.*). This gives a significantly higher level of subjective well-being in the current sample of electrical car owners than on average in the country. It is interesting to look at the possible reasons for the high level of happiness found in this study. The result might be influenced by the respondent’s affective evaluation of their well-being: the questionnaires were mostly filled out around Christmas time which is associated with free time and family gatherings. However, with over 20 points difference from the average results, it is likely that there are other factors than Christmas holiday which are related to the sample’s reported well-being.

Norsk Monitor broadly explores well-being with respect to various demographic characteristics of the population. Findings show that one’s family situation has a high influence on the happiness level. Having a family is positive: the happiness level for persons who have a family they live with is between 12 and 33 points. In the current research, the average number of persons in the respondents’ households is 3,4. This makes electrical car drivers likely to have a higher

happiness level. One of the distinguishing features of the current sample is that 94% of the respondents have higher education which can be compared to the general 27% of the Norwegian population who do<sup>50</sup>. According to Norsk Monitor, persons with university level education have 6,1% higher subjective well-being than those who don't have one (*ibid.*). Thus, high level of reported happiness might be related to the sample's education level. The median household income of the sample is very high compared to the rest of population: "over 1.000.000" compared to "400.000-499.000" listed by Hellevik (*ibid.*). High income is positively associated with subjective well-being in Norway; the average happiness level for persons in the households with median income like in the current sample is 36 (*ibid.*). With the measured 33,9% happiness level, a typical electrical car owner is just as happy as a typical person with compatible income in Norway.

The demographic characteristics of electrical car owners, like family situation, high income and higher education might explain why they are happier than the average in the country. It is possible that, in addition, the persons in the sample of electrical car owners share values and attitudes which are associated with positive emotional state. In various studies, Kasser and colleagues have been exploring how people's values and goals relate to their well-being (described in Kasser 2002). They distinguish between extrinsic values, such as financial success, popularity and attractive appearance, and intrinsic values, such as self-acceptance, close relations and belonging to community (described in Ch.2). Psychological research shows that individuals who share intrinsic values report

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<sup>50</sup> Tuhus, Per T. (2010): "En av Tre tar Høyere Utdanning" in Statistics Norway [online]. URL: <http://www.ssb.no/ssp/utg/201005/04/> [accessed 31 October 2012].

“enhanced happiness, greater psychological health, better interpersonal relationships, more contribution to the community, and more concern for ecological issues” (Kasser, 2002:98). The current data suggests that the respondents report on average high concern with environmental issues and interest in contributing to the society which Kasser and colleagues define as intrinsic values (*ibid.*). Preferences for intrinsic values may be also a part of explanation of the respondent’s high level of subjective well-being measured in this study.

The findings suggest that electrical car owners are happier than an average person in Norway. It would be interesting to explore for statistical determinants for happiness in this study. Testing for correlations with other variables and regression analysis did not find significant relation between the variable “happiness” and other variables within the sample. Thus, this study cannot conclude that electrical car owners are happier because of their decision of purchasing a particular vehicle. However, their socio-demographic characteristics (higher education, high income and living with their family) and their attitudes (concern with intrinsic values like environmental contribution) may explain their high level of subjective well-being compared to the average results in Norway (Hellevik 2008).

### 5.3 Exploring the underlying motivational categories

*“Several egoistic and altruistic motives may combine in a global motivation to help” Bierhoff 2002:192*

This study uses exploratory factor analysis to simplify the data and group it into meaningful categories. Variables, based on the “motivational” questions were picked for this purpose. Exploratory factor analysis is intended to discover

commonalities that may exist among subsets of variables. It tends to be used when discovering underlying processes is valuable (Stern 2010:353). Factor analysis is a technique for identifying groups of latent variables which has the following main uses:

- *To understand the structure of a variable set;*
- *To construct further study based on the underlying concept which is hard to measure directly;*
- *To reduce the amount of variables while retaining the original information. (Field 2005:619)*

All the points above were the aim of factor analysis in this case. The analysis was used to search for latent motivational variables which could be problematic to discover directly in a survey. The analysis also aimed to reduce the group of diverse motivational variables to a smaller number of factors which can be used further using demographic variables from the dataset.

### 5.3.1 Extracting factors from motivational variables

16 variables in the data set are based on questions around the motivation for owning the electrical car and thus suited for a factor analysis. Complete SPSS output for this analysis may be found in the appendix. For the current analysis, the variable loadings above 0,44 were kept, as recommended by Action and colleagues (2002:179). Opinions vary about at which point loadings become important to a factor (*ibid.*), but generally the higher the more important. In order to measure sampling adequacy, a Kaiser-Meyer-Olkin (KMO) test was conducted. The KMO equals 0,593 for the current analysis, which is sufficient according to some sources (Stern 2010:366) and marginal according to the others (Pallant 2007:181).

With the number of desired factors not pre-determined, the analysis suggested extracting six factors with 65% total variance explained. The six factors,

however, were rejected because they lacked qualitative strength, a criterion that authors like Chakrapani (2004:18) find of most importance. After a few attempts, a four factors forced solution was chosen. The four factors explain 52,6% of cumulative variance in the sample. High component loadings (the majority over 0,600), a sufficient number of variables per factor (“at least three”, after Stern 2010:366) and a certain logic observed in the structure of the factors made the outcome strongest possible.

Rotation, a way to simplify the initial solution (Landau and Everitt, 2004:284), was conducted for the components. There is a correlation between two of the four factors, as Pearson’s *r* suggests (the output for Pearson’s test may be found in the appendix). Since the factors are correlated, the rotation type PROMAX was chosen. The output after rotation is presented below:

**Table 7.** Motivational categories

	Component			
	1	2	3	4
Importance of free toll Oslo	0,793			
Importance of collective lane use	0,624			
Importance of free parking	0,746			
Importance of tax discounts	0,704			
Importance of low maintainance costs	0,512			
El.car more env. friendly than conventional		0,59		
Contribution was motive when acquired the car		0,682		
Direct local contribution		0,648		
Direct global contribution		0,748		
Like design of el.car			0,548	
Like comfort			0,859	
Like safety			0,829	
Sociaty approves the respondent because of the				0,719
Like the idea of being approved because of the car				0,64
El. car makes respondent modern				0,753
El. car saves time				0,545
<i>Sample size</i>	121			

The four factors forced solution suggests the following motives of the respondents. Factor 1 captures economic motives, mainly around saving money with the help of the particular car choice. Factor 2 summarizes altruistic motives of saving the environment and contributing to the society. Factor 3 describes practical, vehicle-related motives: comfort, safety and design. Factor 4 is embracing an intuitive self-picture of an owner of electrical car as a modern, quick and socially-approved person. Factor scores generated by SPSS are saved as standartized values which does not allow to compare the means of the factors, as they all equal zero by definition. The comparison of motivational factors is, however, of a big interest, as it allows to discuss relative importance of the motives for the respondents. In order to be able to compare the scores, four alternative factor variables were constructed. Each of the variables equals the mean vallue of the variables which clustered together in the factor analysis, on the scale from one to seven.

**Table 8.** Motivational factors listed by importance<sup>51</sup>

	Motives	Mean	Std.Deviation
Factor 1: Economy	Low maintenance costs, free parking*, free toll*, collective lane use*, tax reduction*	5,78	1,05
Factor 2: Altruism	Environmental friendliness, contribution, reducing global pollution, reducing local pollution	5,29	1,09
Factor 4: Self-picture	Social approval, enjoy the feeling of being approved, saving time, being modern	5,01	1,02
Factor 3: Practicality	Design, comfort, safety	3,82	1,41
<i>Sample size</i>			121

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<sup>51</sup> Variables, marked with “\*” were originally scaled one through five. They were transformed into the one through seven scale by multiplying the scores with a factor of 7/5.

This table shows a hierarchy of motives for owning an electrical car in the sample with respect to the four general motivational factors explored in the analysis. Economic motives have the highest mean value and altruistic motives are coming close and rank second most important. Self-picture comes next in the hierarchy, and the practical aspects of the vehicle are last and ranked sufficiently poorly compared with others. This hierarchy can be compared with the descriptive statistics of single motives presented earlier in this chapter. As shown in the table 3, the highest ranked motives are environmental friendliness, a few economic motives and reducing local pollution, which is similar to the high importance of both economic and altruistic motives dicovered in the classification of the four factors above. Table 4 shows ranking of motives; environmental friendliness has the highest mean with free toll having the next highest mean, at the same time slightly more respondents place free toll on top of their ranking than those who placed the motive of environment on top. The relative importance of motives for owning an electrical car in Oslo, illustrated by the tables 3, 4 and 8 suggests that the environment and personal economy are the strongest motivators and are relatively close in the evaluation of the respondents. The output also suggests that practical vehicle-related aspects were of the least importance when aquiring the electrical car by the current sample. Below follows the discussion of these particular factors in more detail arranged by the descending importance suggested by the table 8 above.



### 5.3.2 Economy

The variables which clustered in this factor are: importance of free toll in Oslo, importance of collective lane use, importance of free parking, importance of tax discounts and importance of low maintenance costs. The variables were tested for internal consistency with the help of Cronbach's alpha which has a value of 0,712. This value is considered acceptable (George and Mallery 2003), and therefore the factor's potential to measure a latent variable through five original variables is reliable.

These variables are describing importance of directly saving money by choosing the electrical car instead of a conventional one. Using collective lane gives a benefit of saving time, but it can as well help to save fuel by avoiding the traffic jams and thus reduce one's costs. In addition, "time is money" in the high tempo of today<sup>52</sup>, and using the collective lane can have a positive indirect economic effect by, for example, letting the individual work extra half hour which would be otherwise spent on longer way home.

It is interesting to look at these economy-related egoistic motives in the light of academic theories. Earlier in this paper Homo Economicus was presented (Ch.2). This rational individual, in short, is mainly occupied by own benefit which makes him maximize his personal utility every step he takes. Factor 1 is satisfying the rational choice theory as it was born in the early days of economics: an electrical car owner minimizes his costs and thus maximizes his wealth. According to economic theory, increased wealth means improved welfare, or subjective well-

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<sup>52</sup> This attitude towards time is a part of the mainstream consumerist approach presented – and criticized – by Reisch (2001).

being (SWB). Owners of electrical cars possess some features of Homo Economicus: the economic motivation is ranked among highest when comparing the factor variables (output is presented in Table 8). Other aspects in the motivation which don't fit in the narrow frames of rational choice theory are described by the other factors as presented below.

### 5.3.3 Altruism

This factor is constructed from the following variables: choice of electrical car because it is more environment-friendly than conventional; motive of contribution to the society; motives of direct local and direct global contribution. Chronbach's alpha for this factor is 0,613 which means marginal internal consistency of this group of variables (George and Mallery 2003).

This factor unites motivation of protecting the environment and contributing to the society. It can be seen as a latent variable of altruistic motives in this research.

While factor 1 is related to neo-classical rational behavior, factor 2 resembles another economic model called Pure Altruist which was presented in Ch.2 of this paper. This individual is opposite to the egoistic and "rational" one who "wishes to maximize his wealth": Pure Altruist is better off when the outside world is better off. Pure Altruist would sacrifice his personal benefits for the sake of social benefits. These can be the components of factor 2 – decrease in local and/or global pollution with the help of a particular consumer choice of the individual (in this case, a car with certain comparative environmental characteristics).

The Pure Altruist would solely base his consumer behaviour on the motives described by factor 2: the more environment friendly choice of a transport would automatically mean the preferred choice. Practically, altruist is only better off if there is a real way to measure the increase in public good supply traded off for

the Altruist's reduced egoistic consumption. According to critics of Andreoni's 1988 model, pure altruism cannot capture motivation of environment-conscious consumers "in its complexity" because, among others, it is nearly impossible to see the direct improvements. Alike Factor 1: Economy, Pure altruism is not an explanation alone, but a part of a complex motivational picture for the sample of electrical car owners.

Pro-social, pro-environmental behavior has been recognized and studied by a range of social disciplines. While the economics of "pure altruism" considers that the model does not hold because it is not possible to see the direct improvement of the public good supply (ex. cleaner air), psychologists believe that altruism makes the actor, to use the language of economics, better off per se. After Kasser (2002), "humanistic and existential psychologists tend to place qualities such as (...) contribution to the community as the core of their notions of psychological health" (Kasser 2002:3). When looking at factor 2 in the context of Kasser's aspirational index, the components of this factor correspond to intrinsic values. Scoring high on such values, as contribution to the community or environment, is positively associated with the individual's wellbeing as well as positive for the society. Altruism is an important component in the complex motivation of the sample in this research.

#### 5.3.4 Self-picture

Variables which clustered in this factor are following: social approval of the car choice, positive self-picture because of the approval, feeling of modernity and saving time. Chronbach's alpha for this factor is 0,595 which indicates lower internal validity than the other factors, but still within an acceptable range (George and Mallery 2003). This motivational factor shows the desire to use the car as an instrument to place oneself in the society or among other drives. Respondents are motivated by having a positive self-picture as socially approved,

quick and modern citizens. As shown in the Table 8, this factor has lower importance than economic and altruistic motives. It can, however, significantly contribute to the overall picture of motivation for owning an electrical car in Oslo.

Positive self-picture as a result of contribution to the society is representing the social norm based economic theories of “Warm-glow giving” (Andreoni 1990) and “Social approval” (Holländer 1990). These two theories capture the increased utility of an individual through a positive self-picture acquired with his or her social contribution – either from the good feeling independently of others or through approval of other members of society (or both). The individual is called Impure Altruist for this kind of behaviour as he or she socially contributes for the sake of increased personal welfare. The assumption is that the individual has preferences for these goods (good feeling or social approval), and this makes one do the contribution. The current research suggests that Factor 4: self-picture was motivating when the respondents acquired their cars and thus supports the presented social norm based economic models.

The utility an Impure Altruist derives from the specific car choice in this research may as well be discussed in the light of the theory of basic human needs by behavioral economist Max Neef. The suggested needs an individual satisfies as a by-product of a contribution are identity (making a statement about oneself as a modern environmentally-minded person) and participation (feeling a part of positive change). Electrical vehicle might as well be a pseudo-satisfier of these needs: the satisfaction might be temporarily so that the owner has to take other actions (or make other purchases) in order to maintain his or her image. Relation between a consumption act and self-picture is a generally known phenomenon in social sciences. “People present themselves through their material possessions, which are used to make statements about who they are or who they want to be” (Guillen-Royo, 2007:28). Electrical car drivers might communicate that they are

modern persons who care about the environment and thus belong to a group of socially concerned citizens.

Much academic research has been dedicated to the concept of altruism in human motivation and its “purity” or “impurity”. Quoting psychologist Abelson,

*“The fundamental issue is whether promoting the welfare of others is ever our ultimate goal – our final selfless aim – or whether it is always and only an instrumental goal – a means to an end that satisfies some selfish desire on our part” (Abelson et al 2004:234).*

Testing for Pearson’s  $r$  suggests a small positive correlation between Factor 2: Altruism and Factor 4: Self-Picture,  $r=0,276$ ,  $p<0,01$  (the detailed output is presented in the appendix). This finding is supportive of the view that “pure” and “impure” altruism are connected as motivators of an individual. In this perspective, there is no certainty that Factor 2: Altruism would hold alone without Factor 4: Self-Picture in the motivation of the electrical car drivers. The improved self-picture associated with an electrical car choice might be crucial for making a final decision. A socio-psychological study by Ciadini et al (1973) concludes that the desire to make yourself feel better can lead you to perform good deeds (as quoted in Abelson et al 2004). Similarly, Frank refers to altruistic behavior as a matter of avoiding anxiety or guilt, conforming an internalized ideal, and thus gaining self-reward (1995:23). Despite the seeming selfishness of the motivation, the result of the particular choice can bring benefits for the society and environment. The psychologically complex preference for obtaining certain self-picture as a result of a purchase is present in the motivation of the current research sample.

### 5.3.5 Practicality

Design of the car, comfort and safety clustered together into this factor.

Chronbach’s alpha for this factor is 0,656 which means marginal internal validity

of this group of variables (George and Mallery 2003). Practical motives were of the least importance compared with other determinants, as suggested by the output in the Tables 3, 4 and 8. This factor is however interesting to look closer at, as it is broadening the complex picture of motivation for owning an electrical car in Oslo.

Factor 3: Practicality might be related to the model of Homo Economicus which has the egoistic motivation of maximizing personal utility by purchasing the best option given a budget constraint. This motivational set can, along with Factor 1: Economy, be seen as egoistic, in the sense that it expresses the individual's concern about own satisfaction with the vehicles, and not, for example, the society's needs.

The relatively low score of practical issues about electrical car might be linked to the way it is presented in the media, including advertising from producers. Mainstream marketing is highly aware of the role a sales object's practical characteristics play in a customer's decision-making. According to marketing literature, physical features of a durable economic good like size, design, functionality and durability, are among the core aspects to consider when making a purchase decision. The essence of Factor 3: Practicality corresponds to the expectations of marketing discipline around car ownership decision based on the broad economic assumption of rationality and marketing assumption that individual chooses "the best possible option that suits their needs" (Noel 2002:134).

Practicality is also related to social practice theory. Wilhite (2008, 2010b) maintains that products can be ascribed an active role of "affecting daily practices" means that consumer acts should not only been studied endogenously, but in the setting of the practices it affects – which, again, affect more consumer acts. This creates a whole mosaic of practices and consumption. In the current

example, the electrical car owners are affected by lifestyle appealing for car ownership in general, such as having to commute between several places during the day. They involve the vehicle in daily routines and have the routines changed because of the vehicle being available, for example, they might make more impulsive travels during the week. Similar idea was expressed by Shove: cars, have the “unintended consequence of tying people into an ever denser network of inter-dependent, perhaps even dependent, relationships with the very things designed to free them from just such obligations” (Shove 2003: 178, as quoted in Miller 2011).

## 5.4 Addressing socio-economic determinants of motives

Previously in this chapter, various motives were united in broader groups, or factors, related to economy, altruism, practicality or self-picture of the respondents. The motives were as well compared in terms of their relative importance for the car owners – both individually and as broader motivational factors. Thus, the analysis above suggests which motives are important for the sample and to which relative extent.

Regression analysis was chosen in order to explore whether the personal attributes of the respondents may predict the score (hence the relative importance) of the four motivational factors suggested in the Ch.5.3. This study uses multiple linear regression for this purpose, with a factor score being dependent variable and a range of personal attributes being checked as predictor variables. The result of the analysis is an equation of the general form

$$\tilde{Y} = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots b_kX_k \quad \text{Equation 1}$$

where  $\tilde{Y}$  is the predicted value of the dependent variable,  $a$  is the  $\tilde{Y}$  value when all  $X_i$  values are zero, and each  $b_i$  is a regression coefficient that shows how the

predicted value of the dependent variable changes in the context of the other independent variables for each unit change of independent variable  $i$  (After Stern 2010:177). This thesis presents four regression models. Each of the models was tested with all the personal attributes as independent variables in different combinations in order to explore which combination has best predicting potential. The core demographic characteristics of gender, age and income are present in each model. The table below summarizes the outcome of regression analysis with best fit. The complete SPSS output for each of the models may be found in the appendix.

**Table 9.** Summary of the regression analysis of socio-demographic characteristics in the context of motivation

	Factor 1: economy	Factor 2: altruism	Factor 4: self-picture	Factor 3: practicality
Constant	-0,397	0,493	-1,239	1,147*
Age	-0,164*	0,107	-0,128	0,05
Gender: female	-0,212	0,540**	0,048**	-0,340*
Income	0,062	-0,085	0,310**	-0,079
Education	0,153			
Type of job:				
Full-time job	-0,593*	0,398		
Construction and transport		-1,070**		
Economics and law		-0,016		
Health sector		0,401		
Administration and service		0,101		
Education and research		0,321		
Persons in the household			-0,142	
Profession group			0,061	
Children		-0,656*		-0,588*
Little free time	0,143***	-0,093*	0,092*	-0,085*
Happiness			0,105	
The only car	0,545			
R squared	0,131	0,22	0,162	0,092
Model's significance level	0,043	0,009	0,033	0,071
Sample size	121			

Note: \*\*\* – significant at  $p < 0,01$ ; \*\* – significant at  $p < 0,05$ ; \* – significant at  $p < 0,1$ .



The regression analysis output for the four motivational factors is presented according to the decreasing relative importance as previously explored. The analysis attempts to portray the typical individual motivated by each particular factor.

#### 5.4.1 The economy-minded car owner

Factor 1: Economy has the strongest overall evaluation. It was of special interest to explore what characterizes the typical economy-minded electrical car owner. The model is significant at the level  $P < 0,05$ , as showed by the F-test result. There are three significant predictors of factor 1: economy, as suggested by regression analysis: reported lack of free time ( $p < 0,01$ ), younger age ( $p < 0,1$ ) and not having full-time job ( $p < 0,1$ ).

Lack of free time is a highly significant predictor for economic motivation. Age and full-time job have marginal significance and may be evaluated in qualitative terms. The variable full-time job is binary, with one for working full-time and zero for other answers. The lack of full-time job unites part-time workers, pensionists and students. This group is so essentially diverse that it was chosen to disregard the marginal significance of not having full-time job for the current regression model. Age was chosen to remain in the current model, since there is vast previous research on age, values and decision-making which support the variable's relevance for economic motivation of an individual. The suggested regression model for factor 1, based on Equation 1, is as follows:

$$\text{Factor 1} = 0,143 \times \text{Little free time} - 0,164 \times \text{Age}$$

Thus, younger electrical car owners and those who have little free are more likely to be motivated by economic reasoning when making the purchase decision. Both time constraint and age have been previously studies in the context of values and decision-making.

Being motivated by economic reasoning can mean that younger people have more materialistic values. Some previous research, however, predicts the opposite. In his book on materialism, Kasser refers to the work of Inglehart related to materialistic and post-materialistic values in the society (Kasser 2002:34). Inglehart's vast research in several European countries<sup>53</sup> suggests that younger people are less materialistic<sup>54</sup> than older people due to a cohort effect: older people of today were raised in harsher times of World War II and post-war instability, and that insecurity in younger days predicts materialistic values. Hellevik (2008) presents quite different results for Norway with respect to materialistic values and age. Measured with Inglehart's index in 2003-2005, the difference in values between age groups is little, with younger people scoring somewhat higher in materialism. The most materialistic group was 25-29 years old and the least materialistic was 40-60 years old. Other findings from Norsk Monitor show that younger people are more oriented towards consumption and possessing things they like than older people, and this is described by Hellevik (*ibid.*) as supermaterialism. Hellevik argues that the difference from Inglehart's findings may be due to different definition of materialism: Norsk Monitor includes short-term consumption and pleasure in the research which is not present in Inglehart's index. The current study's finding that younger electrical car owners are more economy-minded is corresponding to Hellevik's conclusion about younger people having more materialistic values than older people in Norway.

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<sup>53</sup> The study was conducted in West Germany, France, Britain, Italy, The Netherlands and Belgium.

<sup>54</sup> Inglehart defines materialistic values as strong economy, national security and social stability.

Time-saving is often seen as related to economic motivation. Behavioral economist Frank states that “time constraint present in consumer choices” (1995:23). In her book, Reisch presents time in the context of mainstream economic theory and discusses the implications of the “time is money approach and the development of the non-stop society” (2001). Reisch is critical to the fact that mainstream economics sees time as mainly an asset for wealth-maximization. She believes that the modern consumerist culture is largely influenced by this view on time. Time stress as a predictor of economic reasoning in the current sample can be related to the consumerist culture Reisch describes: being convinced that the end-goal is material progress and growth, individuals offer their free time for the sake of economic motives.

#### 5.4.2 The altruistic car owner

The Factor 2: Altruism has the second highest comparative evaluation among electrical car owners. The regression model exploring this factor is significant at  $P < 0,01$ . There are three significant predictor variables for altruistic motivation: being a female ( $p < 0,05$ ), reported lack of time ( $p < 0,1$ ), having another profession than in transportation or construction field ( $p < 0,05$ ) and not having children ( $p < 0,1$ ). Not having children has marginal significance as a regressor in this model; it was chosen to disregard as it is not reflected in previous research on the topic. The marginally significant variable of time stress was kept in this model because it is discussed in earlier studies of values and motivation. The suggested regression model, based on Equation 1, is following:

$$\text{Factor 2} = 0,540 \times \text{Gender} - 0,093 \times \text{Little free time} - 1,070 \times \text{Transp.\& Constr.}$$

The typical altruistic electrical car owner is a female who has enough free time and works in the spheres other than transportation and construction.

Issues around gender and altruism have been largely studied in social sciences. Social psychologist Hans-Werner Bierhoff, in line with other social researchers, proclaims females the “prosocial, more empathic gender”, a difference that can be observed already with toddlers (Zahn-Waxler et al. 1992, as quoted by Bierhoff 2002:26). Research suggests that at least partly this can be explained with the differences in socialization of girls and boys according to the prescribed norms for gender roles in the society: girls are encouraged to suppress aggression and show consideration and interest in others to a larger extent than boys. Females are slightly more likely to express altruism in everyday circumstances in the form of showing personal empathy to family members, neighbours or community. This tendency might explain the significantly higher factor score of altruistic motives among female respondents of the sample. The idea of women considering the society’s interests when making a purchase more often than men do, is supported by the study of purchase likelihood of organic food conducted by Byrne et al (1991) and a marketing overview of female consumer choices which states that females “want green choice” to a larger extent than males<sup>55</sup>. Female as a predictor variable for altruistic motivation in the current model is corresponding to previous research.

The positive relation between having relaxed time frames and expressing socio-environmentally friendly motivation has been previously noted in academia. As mentioned earlier, Reisch (2001) is critical of the modern “non-stop society” and states that re-considering the value of time per se and relaxing the time stress of individuals is the necessary condition for achieving sustainable consumption. It

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<sup>55</sup> Holland, Stephanie (2013): “Marketing to Women. Quick Facts” in Sheconomy [online]. URL: <http://she-economy.com/report/facts-on-women/> [accessed 18 october 2011]

can be suggested that relaxed time constraint makes the particular group of individuals in the sample opt for altruistic motives when purchasing a vehicle.

Choice of profession, the current study suggests, may have a relation with one's motivation. The respondents who work within transportation or construction spheres are less likely to be motivated by altruism than the rest of the sample. It is not possible to conclude further what makes the transportation or construction workers less altruistic than average. A suggestion might be that these professional spheres are characterized by tougher work environment, harder time stress or other stress factors which for some reason don't promote altruistic thinking. This result should be taken with caution.

#### 5.4.3 The image-concerned car owner

The regression model for Factor 4: Self-Picture is significant at the level  $P < 0,05$ , as showed by the F-test result. There are three significant predictors of this factor, as suggested by regression analysis: being a female ( $p < 0,05$ ), having little free time ( $p < 0,1$ ) and higher income ( $p < 0,05$ ). The marginally significant variable of time stress was chosen to remain in the model because of its relevance to previous studies on the relation between socio-environmentally friendly behaviors in relation to individual's self-picture. The suggested regression model, based on Equation 1, is following:

$$\text{Factor 4} = 0,415 \times \text{Gender} + 0,092 \times \text{Little free time} + 0,310 \times \text{Income}$$

The typical image-concerned electrical car driver is a busy female with high income.

Earlier in this chapter impure altruism theory was discussed in relation to Factor 4: Self-Picture. As suggested by a number of theorists, improved self-picture is the actual aim of some (if not all) social contributions (Frank 1995, Abelson

2004). Researchers believe that the pure and impure types of altruistic motives are interconnected and not always easy to distinguish. The fact that female gender is a significant determinant of both the altruistic model, presented earlier, and the motives related to self-picture may be supporting the idea of such motives lying close to each other. Another explanation for females being more motivated by self-picture than males can be that they are more concerned with aspects like social approval (Sarason et al 1983). Generally, psychologists believe, “even in childhood, girls appear more interpersonally oriented than boys, and this gender difference increases in adolescence (Zahn-Waxler, 2000, as quoted in Nolen-Hoeksema, 2001).

The lack of free time predicts the importance of motives around one’s self-picture, or the “impure altruism” discussed above. The “pure altruism”, on the contrary, requires having enough free time (Ch.5.4.2). Time stress seems to prevent an individual in the current sample from expressing genuine concern with environment and society and makes her stay at the “impure” level of self-reward seeking behavior. This can be linked to the mainstream consumerist view on time as economic asset and the resulting “non-stop society” (Reisch 2001). This paradigm is related to materialism, which, on its turn, is negative for expressing altruistic values (Kasser 2002).

The model suggests that high income is a predictor for being motivated with improved self-picture as a by-product of choosing an electrical car. This idea might correspond with the argument of Nyborg and Rege (2003) that the very richest members of the economy are more likely to contribute to the public good. It may be argued that richer people feel more responsibility caused by the material resources they possess as they have theoretically more power to make a change by investing in the socio-environmentally friendly alternatives. Wilhite urges that the most significant changes are to be made among the elites (Wilhite 2010b) and this can correspond to the overall expectations. The impure altruistic

motivation of richer electrical car owners might be explained by the kind of expectations they meet.

#### 5.4.4 The practical car owner

The regression model for Factor 3: Practicality is only significant at the level  $P < 0,1$ , as showed by the F-test results. Marginal level of significance of this model suggests that there might be other predictors which are not included in the current analysis. The model is, however, suggested for closer discussion since it may give an approximation to the ideal model and add some characteristics to the portrait of the practical electrical car owner. There are three predictors of this factor, as suggested by regression analysis: being a male ( $p < 0,1$ ), not having little free time ( $p < 0,1$ ) and having no children ( $p < 0,1$ ). The significance level of regression coefficients suggests the role of the particular variables in the model is a matter of additional evaluation. Both gender and family situation have been previously studied in relation to choosing transportation mode and practical preferences around it. The role of having enough free time in the context of practical motivation can be seen as more vague. In addition to marginal significance, the regression coefficient is fairly low. The variable was chosen to be excluded from the current model. The suggested regression model, based on Equation XX, is following:

$$\text{Factor 3} = -0,348 \times \text{Gender} - 0,585 \times \text{Children}$$

The typical practical electrical car driver is a male who has no children.

Family situation has influence on the choice of transportation mode, as was studied by Miller (2011). Families with children are more likely to use a car

rather than public transportation in a number of situations (*ibid.*). Massive marketing of larger cars as “family cars” from the production side suggests that there is a demand for bigger car size from families<sup>56</sup>. However, the majority of the current sample own one of the following alternatives: KEWET Buddy, Think PIV4 or Reva which only have two doors and space for two or three persons including the driver. Two of these models (Buddy and Reva) are registered as four-wheeled mopeds, because of their technical characteristics, primarily insufficient safety features for today’s car<sup>57</sup>. This standard is different from the typical family preference, and this explains the findings of the model above. It can be assumed that the current market of electrical cars in Norway is not appealing to persons who have children in terms of the vehicles’ features. These characteristics are more accepted by drivers who don’t have children. Since the majority of the current sample owns one of the smaller electrical cars with room for two or three passengers, it seems logical that the vehicle’s practical characteristics are most meeting the needs of drivers who don’t have to account for transporting children.

The regression model above shows that males are more motivated by car’s technical characteristics than females. This finding might support the stereotype about males being the technical, practical gender, found, for instance, in popular psychology (Gray 1992). Academic research is also supporting this view on males. Weber and Custer, in their paper on gender-based preferences towards

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<sup>56</sup> “Family car” is a commonly used term; a brief research shows virtually any large manufacturer marketing a few models. To name some, Hyundai i40 STV and Citroën C5 are among conventional big sellers in Norway.

<sup>57</sup> Trygg Trafikk (2012): ”Tenk Sikkerhet Når Du Velger Elbil” in *Trygg Trafikk* [online]. URL: [http://www.tryggtrafikk.no/Tenk+sikkerhet+n%C3%A5r+du+velger+elbil.b7C\\_wJi0T.ips](http://www.tryggtrafikk.no/Tenk+sikkerhet+n%C3%A5r+du+velger+elbil.b7C_wJi0T.ips) [accessed 13 November 2012]



technology and activities, discovered significantly higher interest for technological activities among males, being clear already in middle school (Weber and Custer 2005). Male as a predictor of practical motivation is in accordance with previous research.

## 5.5 Closing remarks

The motivations for owning an electrical car for an individual in Oslo are complex and can be defined by four underlying categories with the help of factor analysis of the statistical data. Interdisciplinary analysis is helpful for understanding the variation of consumer motivation compared to a single discipline. A bunch of approaches prove applicable for different aspects within motivation of the same group. Mainstream assumption of rationality proves sustainable when discussing Factor 1: Economy and Factor 3: Practicality. Electrical car owners are to some extent motivated by maximizing their utility in the classic economic sense when opting for a particular car choice. The rational explanation does not hold, however, for all the complexity of motivation explored in the study. Individuals are as well driven by motives which correspond to Andreoni's work on both "pure" (1988) and "impure" (1990) altruism. Both types of altruism have been broadly studied in social science. Splitting motivation for owning an electrical car in Oslo in four branches can help understanding how this motivation can be supported and potentially increased, which will be addressed in Ch.6.

Motivational factors for owning an environment-friendly car alternative include both altruistic and egoistic motives. "The fact is that prosocial behaviour is elicited by multiple motives, making it difficult to infer which motive is dominant" (Bierhoff 2002:193).

The current regression analysis resulted in three models of high and one model of marginal significance. Interpretation of the models suggests four portraits of electrical car owners according to the type of motives they prefer stronger than others in the sample. The typical economy-minded car owner is young and busy. The typical altruist is a female who has relaxed schedule and works in the spheres of education, research, economics, law, administration or health care. The typical respondent concerned with image is a busy rich female. The typical car owner motivated by the car's technical characteristics is a male without children. The implications of the findings will be discussed in Ch.6.

## 6. Closing discussion

### 6.1 Outcomes of the study

#### 6.1.1 Summary of the research

This thesis has presented a study on the motivation for choosing an electrical car in Oslo. It has used primary data from a sample of 121 electrical car owners in Oslo which was obtained by mail survey and analyzed statistically in SPSS.

Electrical car owners in the current sample generally match samples in previous studies in terms of their age, gender, income, and education level. The outcome of the descriptive statistics has suggested that a typical electrical car owner in Oslo is a male between 40 and 49, who lives in a household with three other people, has children, over four years of higher education, an office job and an annual household income of over 1.000.000 kroner. It is typical that electrical car is not the only car in the household.

Factor analysis of 16 variables addressing motives for purchasing an electrical car has suggested dividing the motivations into categories. The analysis extracted four factors which were labeled the following way: *Economy*, *Altruism*, *Self-picture* and *Practicality*. On average, economy and altruism are the most important reasons for owning an electrical car for an individual in Oslo.

Regression analysis has been conducted in order to explore predictors for the four factors above. It is suggested that younger people and people who lack free time are those who prioritize economic motives significantly higher than the rest of respondents in the sample. Females, persons who have enough free time and those who work in spheres other than transportation and construction are most

motivated by altruism in their car choice. Males and persons who don't have children are the group which is motivated by practical aspects of the electrical cars to a higher extent than the rest of the sample. Persons with high income, those who lack free time and generally females more than others care about the self-picture obtained by the particular car choice.

It has also been found that electrical car owners are on average much happier than general population in Norway. This can be possibly explained by the particular demographic characteristics which positively correlate with happiness as previously found (Hellevik 2008) or with the intrinsically oriented value set of the respondents. Despite of these assumptions, a statistically significant explanation for the "happy" electrical car drivers has not been discovered in the current study.

### 6.1.2 Suggestions for answering the research questions

The main research question of this study has been: *What are the motives for owning an electrical car for an individual in Oslo?* The following partial research questions are specifying the main one:

What are the most important motives for owning an electrical car in Oslo?  
Do they vary by socio-demographic characteristics of the individuals?  
What is the role of environment as a motivator?

This thesis has presented findings which suggest answers to the questions above. The motives for owning an electrical car for an individual in Oslo, explored with factor analysis, may belong to one of the following categories: *Economy*, *Altruism*, *Practicality* or *Self-picture*. The main motives are the first two of the suggested categories, both of about equal, very high average importance to the respondents. Individuals are motivated by the comparative economic advantage of owning an electrical car instead of a conventional car, such as lower

maintenance costs of the vehicle, state-provided tax discounts and free parking in Oslo. They are also highly motivated by the socio-environmental benefits the particular car choice might bring in comparison to owning a conventional car. The second research question can be answered positively, as the statistical analysis has suggested that a range of socio-demographic characteristics is influencing the motivation of individuals. The output has suggested that age, gender, income, family situation, occupation and time stress are predicting one or more motives, while there is no significant correlation between motivation and education level of the respondents.

The third research question has concerned the role of environment as a motivator for owning an electrical car for an individual in Oslo. This question has aimed to contribute to the overall research on the topic because the environment wasn't previously addressed in detail in this context. The findings have suggested that the environment is a significant aspect motivating the electrical car owners. Environmental friendliness of electrical car owners can be presented in two dimensions with the help of the suggested analysis of the motives. The environment is both related to the motive of *Altruism* and the motive of *Self-picture*. In the context of *Altruism*, it is the environment itself, locally and globally, that is considered when making a decision concerning the particular car purchase. This corresponds to the theories about pure or unconditional altruism which reflect upon motivation with the contribution itself (Andreoni 1988, Kolm 2008). In the context of *Self-picture*, the individuals are motivated by the by-product of environmental contribution in form of the good feeling and/or social approval because of the environment-friendly car choice. This kind of motivation resembles the theories of impure or conditional altruism (Andreoni 1990, Holländer 1990, Kolm 2008). Motivation by one's self-picture follows to the environmental contribution for the sake of improved personal welfare, not for the sake of the contribution itself. The research suggests that the environment has a

complex role in the motivation of electrical car owners: it is both motivating per se and as a mean of building one's own self-picture of an environmentally friendly person. The two motives have statistically a small positive correlation between them suggesting that there is a connection between the "pure" and "impure" altruism. The suggested combination of "purity" and "impurity" of altruistic motivation among electrical car owners may remind of the academic discourse on whether or not the ultimate goal of altruism is achieving a form of self-reward (Abelson et al. 2004, Frank 1995). It is argued that the precise distinction cannot necessarily be made (Abelson et al. 2004).

The motives for owning an electrical car for an individual in Oslo may be labeled as *Economy*, *Altruism*, *Self-picture* and *Practicality*. Out of those, *Economy* and *Altruism* are suggested to be the main motives for the individuals in the sample. These motives statistically vary by the socio-demographic characteristics of the individuals, such as age, gender, occupation and reported lack of free time. The environment is suggested to be a strong motivator for electrical car owners, both in terms of making a contribution to global and local environment and in terms of gaining a positive self-picture through the environmentally friendly car choice.

## 6.2 Applications of the findings

### 6.2.1 Acting upon motivation for owning an electrical car in Oslo

This study is following the opinion that electrical car technology contributes to Norwegian environmental goals as discussed in Ch.3. Replacing conventional gasoline cars with electrical vehicles is a desired measure in Norwegian transportation sector in terms of both local and global pollution reduction. It is therefore important to further promote electrical cars, both keeping up the interest of current drivers and attracting more individuals to shift from gasoline to electric

next time they are to make a choice. Knowledge about consumers' motives is helpful when accessing promotion of a durable good. The current research has explored motivation of present electrical car owners. Factor analysis suggested four underlying motives which summarize the reasoning behind purchase decision: *Economy*, *Altruism*, *Practicality* and *Self-picture*. Addressing each of the motives is the way to increase overall motivation for purchasing electrical vehicles further. Following is the suggestion for positive influence of each of the four motivational factors in order to ensure general interest of consumers.

*Economy* summarizes rational motivation. The electrical car owners are better off when preferring their electrical vehicles to conventional alternatives. This is related to competitive pricing of new cars and their maintenance service and to the state economic policy regarding support of electrical vehicles in Norway. Producers can address economic motivation of the potential new electrical car owners by competitive pricing of the vehicles compared to conventional cars of the same class. The prices are however not fully competitive at the current stage due to high production costs in a relatively new and small-scale industry. There is an opinion that production scale growth and further technological improvement will decrease the costs resulting in lower prices (Figerbaum and Nørbech 2012). Until the consumer price is competitive, the economic motives can be met by continuing state support of electrical car owners which includes today's tax reduction, free municipal parking and free toll in Oslo. Competitive and predictable economic situation around electrical car use will attract individuals who prioritize rational motivation.

*Altruism* captures genuine motives of environmental and social awareness which are either hard or not efficient to promote through economic stimuli. There are academic examples for crowding out effects of reward for altruistic behavior (Nyborg and Rege 2003; Kasser 2002) which suggests that economic incentives alone don't promote electrical cars sufficiently. Altruistic motivation can be

promoted through raising public awareness about environmental impact of transport sector on one hand and the positive environmental effect of electrical car as an alternative to a gasoline car on the other hand. Following Noel (2009:20), it can be argued that “increased consumer awareness shifts attitudes”.

*Practicality* can be positively influenced by improved technical characteristic of electric vehicles. This motivational set can be expected to strengthen its position further due to rapid development of electrical cars. The models which entered the Norwegian market between 2010 and 2012 (for example, Nissan Leaf and Mitsubishi MiEV) are targeting broader segment with size, design and safety characteristics closer to conventional car average (Figenbaum and Nørbech 2012). This kind of motivation can be mainly met by producers, but also influenced by regulation demanding certain explicit standards of such aspects as safety in the vehicle.

*Self-picture* is resembling the wish to feel and be seen in a certain way with the help of a particular choice of car. This can be promoted by raising awareness, in the same way, as with the factor 2: altruism. In addition, the motivation by improved self-picture from choosing an electrical car can be promoted by creating a positive picture in the media, including social media<sup>58</sup>. Respondents are motivated by feeling and being perceived as “modern, quick and socially approved” citizens; promoting this picture in the society is a way of stimulating this kind of motivation.

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<sup>58</sup> Social media has growing influence on car purchase decisions, as by Dealer (2012): “Auto Purchase Cycle” in *Dealer* [online]. URL: <http://www.dealer.com/auto-purchase-cycle.htm> [accessed 15 October 2012]



### 6.2.2 Continuing the state-provided support

The current analysis has suggested that the underlying motive of economy is highly important for the sample of electrical car owners. It is interesting to look at the economic motivation in the light of the official policy.

High importance of the economic aspects was earlier discovered in the study of electrical car owners from 2006 (ECON 2006): over half of the respondents found state-provided incentives like tax reduction and free parking important or very important when making their decisions to purchase electrical cars. ZERO report (Andreassen et al 2011) stated as well that price is highly important when making purchase decision for or against an electrical car. There is an on-going discussion whether economic incentives for electrical car owners are reasonable from the state perspective. There is an opinion that benefits like tax discounts are too costly for Norway. Ministry of Finance has suggested cutting these subsidies because they are seen as a high economic cost for the society (Olsen 2011).

However, last year's cross-Party climate compromise declares that current tax benefits for purchase and use of zero-emission vehicles will be continued until 2017 provided the number does not exceed 50.000 (Det Kongelige Miljøverndepartement 2012). Other benefits (such as free municipal parking and possibility to drive in collective lane) are not defined in the document. It can be seen as positive that electrical car owners enjoy some predictability regarding tax benefits, since various studies suggest high importance of economic reasoning.

In the light of product life cycle theory (Cox 1967), electrical car in Norway can be characterized as a product category in the stage of introduction. This stage is

defined by low market share<sup>59</sup>, high production costs and high marketing costs. Companies choosing to produce electrical cars take a certain risk and typically lose profits on this stage. According to Collins (2010), “most products never make it past the introduction stage; they die an early death”. Taken the vulnerable product life stage of electrical car and the importance of the motive of economy for the consumers, state support is essential to ensure “survival” of this car technology in Norway and growth to a sufficient market share. The Norwegian Electrical Vehicle Association is sharing this view on the private car market in Norway: they believe that state support is crucial until electrical cars gains around 4% market share (Merg and Hattrem 2012). This corresponds to 100.000 electrical cars in Norway which is twice as much as the Government targets (Det Kongelige Miljøverndepartement 2012).

In summary, the high importance of economic motives for electrical car owners, suggested by the current research and earlier studies in the field, underlines the necessity of state-provided incentives in the current market conditions.

### 6.2.3 Understanding electrical car market segmentation

This study has suggested a typology of electrical car owners with respect to their motivators as discussed in Ch.5. Analysis has suggested the predictors for each of the four discussed motives, labelled as *Economy*, *Altruism*, *Self-picture* and *Practicality*. This suggests four “types” of drivers. This typology can be used as a basis for market segmentation in the stage of growth of this product category.

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<sup>59</sup> While Norwegian sales of new electrical cars in 2012 passed 5% for the first time (Figerbaum and Nørbech 2012), the overall market share at the end of 2012 is roughly 0,41% ([www.vegvesen.no](http://www.vegvesen.no) and [www.gronnbil.no](http://www.gronnbil.no)).

Segmentation is useful for developing strategies for approaching groups of consumers more efficiently (Dickson and Ginter 1987). It is generally seen as relevant for automobile market (ibid). Market segmentation can be both relevant to commercial actors in their business marketing and to regulators in their social marketing.

The first segment, the economy-minded car owner, can be defined as young and busy drivers who are concerned with money. This segment might be most sensitive to the state-provided incentives discussed above; they could be the first electrical car owners “to lose” when benefits like tax discounts and collective lane use are taken away unless electrical cars become much more competitive in economic sense.

Next suggested segment, the altruistic car owner, is typically a female who does not lack free time and works in spheres other than transportation and construction. The gender-based difference in terms of altruism is interesting, as it suggests that females would more likely make a purchase decision based on social or environmental reasoning alone. If we see economic incentives for electrical car owners removed in the future, females might gradually make a larger share of electrical car market, as their altruistic motives would still be valid. On a larger scale, females may be the target group when promoting pro-social, pro-environmental behaviours which don’t bring additional rewards, this applies to other areas than transportation as well. Quoting Bierhoff, “People who feel more responsibility for the environment will contribute less to environmental damage than people who feel less responsible”, as shown by various studies (2002:165).

Another segment, the image-concerned car owner, is most likely a rich and busy female. This type is an “Impure Altruist” as somewhat opposed to the “Pure” one. These individuals are motivated by being looked at as a modern and socio-

environmentally responsible persons. The particular car choice is an instrument for obtaining a certain image for this group. Promoting electrical cars as environmentally friendly, modern and special may be a strategy for attracting this segment further.

Finally, there is a practical car owner, a male who does not have children. This person is attracted by the car's overall performance. He is content with the small size of the electrical car<sup>60</sup> since he does not have to transport a family with kids. Instead the person is curious about the new technology in the car industry and is motivated by technical aspects of the vehicle when making a purchase decision. Further development in electrical car technology is most appealing to this segment.

The suggested segments exist within a relatively small group<sup>61</sup> of electrical car owners in Norway which demographically differs quite a lot from an average Norwegian person. Electrical car owners are generally richer, happier and more educated than average population. As market share of this vehicle type grows, the segments might expand and further diversify. With a range of new models in the market<sup>62</sup>, electrical cars might be able to attract more conservative individuals who are motivated by family-size and conventional look of the car. Market segmentation is a tool which may help producers, distributors and regulators to

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<sup>60</sup> The majority of the current sample owns one of the smaller electrical cars with room for two or three passengers, like Buddy, Reva or Think.

<sup>61</sup> About 10000 individuals owned electrical cars in Norway in the end of 2012, according to Energi Norge, Transnova, Kommunenes Sentralforbund and ZERO (2013, February 2): "10.000 Elbiler i Norge" in *Grønn Bil* [online]. URL: <http://www.gronnbil.no/nyheter/over-10-000-elbiler-i-norge-article319-239.html> [accessed 22 February 2013]

<sup>62</sup> A number of 4- and 5-seat models were launched in Norway in 2011-2013.

communicate to potential and existing electrical car owners in a more efficient way. In the further diversifying market, different models of electrical cars may be targeting different segments according to their preferences. It will be interesting to follow this development and study the motives and attitudes of “newer” electrical car owners in the future and see the formation of new segments of the market.

#### 6.2.4 Reflecting upon the role of time stress and motivation

Almost half of the respondents report that they have little free time. Time stress is a significant predictor in three of the four regression models presented in Ch.5. Lack of free time is a common problem of a modern person. Lucia Reisch is critical about the “non-stop society” and the dominating view on time as a linear input variable of economic function which, she argues, are resulting in both social and environmental costs (2001). It is interesting to look at the meaning of time stress in terms of individuals’ motivation in the current sample in the light of academic research of the *time* concept.

The motive of *Altruism* is predicted by not having a time stress; this motive stands for the “pure” concern about environmental and social needs. Two other motives, *Economy* and *Self-picture*, are predicted by reported lack of free time. Both of these concern the individual’s personal interest, either in relation to economy or personal image achieved through a particular consumption choice. This finding might suggest that time stress pushes an individual towards more egoistic self-seeking motives while having relaxed time frames promotes socio-environmentally oriented motives among the respondents. Relation between time stress and motivation behind consumption has been previously studied in academia. Reisch argues that imposed time stress forces consumers to “adopt lifestyles which are unsustainable” (*ibid.*:374); in order to achieve a change towards sustainable consumption, individuals have to “have enough time at the

right time and feel comfortable with one's time frames and institutions" (*ibid.*). In the context of altruistic motivation in the current research, the time stress is predicting the difference between "pure" and "impure" concern about society and the environment. The findings of the current study support the opinion that relaxed time constraints open for more sustainable motivations among individuals.

## 6.3 Limitations of the study and final conclusions

### 6.3.1 The limitations of the research

This thesis has presented my first attempt to conduct an independent empirical study. This has been a valuable learning experience which also implies certain academic limitations.

Firstly, there are limitations related to the sample. The sample size consisted of 121 electrical car owners in Oslo. Although it was technically sufficient for the conducted analysis, a bigger sample would contribute to more reliable results. The response rate of 61% may be also called sufficient, but there is a possible limitation in terms of the nonresponse error that could be present in the study. It is defined as "the result of people who respond to a survey being different from sampled individuals who did not respond in a way relevant to the study" (Dillman 2000:11). It can, for instance be assumed that the individuals who didn't choose to respond did so because they experienced more time stress than the respondents of the survey. This type of sampling error is hard to observe and eliminate.

Secondly, certain limitations are related to the questionnaire design. Both the general outline and the wording of the questions may be criticized for somewhat lack of clarity. Most of the questions about motives and attitudes were asking for

evaluation on a one-to-seven Likert scale. However, a few questions about motives were placed on a one-to-five scale which makes the analysis potentially less reliable. The outline of those questions might have encouraged respondents to answer in a similar manner which questions the independence of the resulting variables. This might have been negative for the reliability of exploratory factor analysis conducted using those variables. The scores of the variables obtained with one-to-five scale were multiplied by a factor of 7/5 in order to make them compatible with the rest of the variables originating from one-to-seven scale questions. However, it is not certain that the resulting scores were perfectly compatible when they were originally obtained through different scales. The wording of the questions could have a negative effect on reliability of some of them as well. A few formulations were inverted in the manner that a respondent had to agree with a statement about disagreement and vice versa. Such questions may have been irritating or confusing for some of the respondents and carried the risk of misinterpretation, as if the “not” was overseen. This potential measurement error may have resulted in some inaccurate or uninterpretable answers (Dillman 2000:11). I would avoid this risk if designing another social survey in the future.

Thirdly, there were some limitations related to the analysis of the data. The study chose to conduct exploratory factor analysis and regression analysis in order to identify motivational categories and explore the relation of those towards personal attributes. However, using other statistical tools in addition to those could potentially provide more elaborate results. For instance, cluster analysis is

used to group the cases of similar kind into respective categories<sup>63</sup>. This tool could potentially help segmenting electrical car owners in accordance to their motives and socio-demographic characteristics in a more precise manner than the combination of the tools used in the current study. The sample size limitation was the reason for not using cluster analysis method in the current study.

### 6.3.2 Final remarks

This thesis has aimed to contribute to the overall research of the issues around electrical car ownership in Norway. Individual electrical car owners were previously studied twice (Econ Analyse 2006, Rødseth 2009). Previous research gathered descriptive statistics; there was much focus on motivation by state-provided incentives in general and collective lane use specifically. Electrical car is often seen as an environment-friendly solution for private transportation; however, the motive of environment has not previously been a particular focus of research of electrical car owners.

The current study has started exploring the variety of motivations of electrical car owners. The motivations are diverse and important. This research has suggested that *Altruism*, a motive of environmental and social concern, is highly important for electrical car owners in line with the motive of *Economy*. The environment is suggested to be an important motivator, both in terms of concern for local and global pollution reduction and in the context of deriving self-reward from feeling and being perceived as an environmentally friendly person.

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<sup>63</sup> Electronic Statistics Textbook (2013): “How to Group Objects into Similar Groups – Cluster Analysis” in *Statsoft* [online]. URL: <http://www.statsoft.com/textbook/cluster-analysis/> [accessed 27 February 2013].



The conventional gasoline car is strongly embedded into the modern paradigm of personal mobility (Urry 2004). The electrical car technology may have a potential to become a part of the new paradigm with less environmental footprint. In this light, the existing electrical car owners are the frontrunners of the technological shift (Grin et al 2012). These agents of change should be encouraged to further make their impact at the same time as new electrical car owners should be recruited. Studying electrical car owners academically may contribute to better understanding of their motives and attitudes and help to promote further electrification of the private car fleet in Norway. A suggestion for further research might be to study motives and attitudes of electrical car owners qualitatively. This would be a valuable source of more nuanced knowledge of this group. It would be most interesting to conduct a new quantitative research of a bigger sample of electrical car owners in the future as the market develops and includes more diverse models.

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# Appendix

## Exploratory factor analysis output, four factor forced solution

**Descriptive Statistics**

	Mean	Std. Deviation	Analysis N
El.car more env. friendly than conventional	6.23	1.177	120
Contribution was motive when acquired the car	5.39	1.605	120
Sociaty approves the respondent because of the car	4.94	1.380	120
Like the idea of being approved because of the car	4.79	1.517	120
Direct local contribution	5.60	1.642	120
Direct global contribution	4.01	1.849	120
El. car makes respondent modern	4.80	1.586	120
Importance of free toll Oslo	4.04	1.393	120
Importance of collective lane use	3.72	1.696	120
Importance of free parking	3.79	1.460	120
Importance of tax discounts	3.45	1.860	120
Importance of low maintainance costs	5.71	1.563	120
Like design of el.car	4.08	1.875	120
Like comfort	3.83	1.812	120
Like safety	3.54	1.814	120
El. car saves time	5.50	1.619	120

**Correlations – four factors**

	Factor1	Factor2	Factor3	Factor4
Factor1 Pearson Correlation	1	-,094	,033	-,063
Sig. (2-tailed)		,303	,716	,489
N	121	121	121	121
Factor2 Pearson Correlation	-,094	1	,033	,276**
Sig. (2-tailed)	,303		,723	,002
N	121	121	121	121
Factor3 Pearson Correlation	,033	,033	1	,072
Sig. (2-tailed)	,716	,723		,433
N	121	121	121	121
Factor4 Pearson Correlation	-,063	,276**	,072	1
Sig. (2-tailed)	,489	,002	,433	
N	121	121	121	121

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Correlation Matrix

	El.car more env. friendly than conventional	Contribution was motive when acquired the car	Society approves the respondent because of the car	Like the idea of being approved because of the car	Direct local contribution	Direct global contribution	El. car makes respondent modern	Importance of free toll Oslo	Importance of collective lane use	Importance of free parking	Importance of tax discounts	Importance of low maintainance costs	Like design of el.car	Like comfort	Like safety	El. car saves time
El.car more env. friendly than conventional	1.000	.251	.143	.172	.203	.281	.141	-.072	-.018	.150	-.047	-.069	.240	.199	.053	.077
Contribution was motive when acquired the car	.251	1.000	.162	.248	.283	.271	.077	-.128	-.150	.039	-.164	-.024	.163	-.084	-.169	-.034
Society approves the respondent because of the car	.143	.162	1.000	.436	.212	.198	.375	-.209	-.273	-.010	-.098	-.035	.067	-.011	.023	.197
Like the idea of being approved because of the car	.172	.248	.436	1.000	.206	.210	.311	-.139	-.186	.052	-.151	.006	-.012	-.016	-.053	.197
Direct local contribution	.203	.283	.212	.206	1.000	.422	.247	-.103	-.107	.137	-.095	-.033	.084	.065	.017	.022
Direct global contribution	.281	.271	.198	.210	.422	1.000	.069	.055	-.131	.125	-.138	.091	-.046	-.045	-.114	-.024
El. car makes respondent modern	.141	.077	.375	.311	.247	.069	1.000	-.027	-.227	.109	-.123	.176	.194	.047	-.123	.147
Importance of free toll Oslo	-.072	-.128	-.209	-.139	-.103	.055	-.027	1.000	.578	.438	.395	.260	-.149	-.107	-.059	-.084
Importance of collective lane use	-.018	-.150	-.273	-.186	-.107	-.131	-.227	.578	1.000	.275	.326	.086	-.197	-.067	-.108	.070
Importance of free parking	.150	.039	-.010	.052	.137	.125	.109	.438	.275	1.000	.415	.201	.147	.073	.103	.012
Importance of tax discounts	-.047	-.164	-.098	-.151	-.095	-.138	-.123	.395	.326	.415	1.000	.297	-.065	-.082	.126	-.089
Importance of low maintainance costs	-.069	-.024	-.035	.006	-.033	.091	.176	.260	.086	.201	.297	1.000	-.033	-.106	-.113	-.055
Like design of el.car	.240	.163	.067	-.012	.084	-.046	.194	-.149	-.197	.147	-.065	-.033	1.000	.323	.191	.095
Like comfort	.199	-.084	-.011	-.016	.065	-.045	.047	-.107	-.067	.073	-.082	-.106	.323	1.000	.662	.074
Like safety	.053	-.169	.023	-.053	.017	-.114	-.123	-.059	-.108	.103	.126	-.113	.191	.662	1.000	.139
El. car saves time	.077	-.034	.197	.197	.022	-.024	.147	-.084	.070	.012	-.089	-.055	.095	.074	.139	1.000

**KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.593
Bartlett's Test of Sphericity    Approx. Chi-Square	440.096
df	120
Sig.	.000

**Communalities**

	Initial	Extraction
El.car more env. friendly than conventional	1.000	.438
Contribution was motive when acquired the car	1.000	.481
Sociaty approves the respondent because of the car	1.000	.568
Like the idea of being approved because of the car	1.000	.507
Direct local contribution	1.000	.467
Direct global contribution	1.000	.553
El. car makes respondent modern	1.000	.553
Importance of free toll Oslo	1.000	.677
Importance of collective lane use	1.000	.519
Importance of free parking	1.000	.648
Importance of tax discounts	1.000	.534
Importance of low maintainance costs	1.000	.336
Like design of el.car	1.000	.366
Like comfort	1.000	.739
Like safety	1.000	.708
El. car saves time	1.000	.319

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
		% of	Cumulati		% of	Cumulative		% of	Cumulative
	Total	Variance	ve %	Total	Varian	%	Total	Varianc	%
1	2.926	18.290	18.290	2.926	18.290	18.290	2.389	14.931	14.931
2	2.157	13.482	31.771	2.157	13.482	31.771	2.059	12.871	27.802
3	1.981	12.380	44.152	1.981	12.380	44.152	2.016	12.601	40.403
4	1.347	8.417	52.569	1.347	8.417	52.569	1.947	12.166	52.569
5	1.121	7.006	59.575						
6	1.006	6.285	65.859						
7	.828	5.174	71.033						
8	.757	4.733	75.767						
9	.731	4.568	80.335						
10	.676	4.223	84.558						
11	.589	3.681	88.239						
12	.534	3.340	91.579						
13	.454	2.838	94.418						
14	.382	2.390	96.807						
15	.303	1.892	98.700						
16	.208	1.300	100.000						

Extraction Method: Principal Component Analysis.



**Component Matrix<sup>a</sup>**

	Component			
	1	2	3	4
El.car more env. friendly than conventional				
Contribution was motive when acquired the car	.462			
Sociaty approves the respondent because of the car	.596			
Like the idea of being approved because of the car	.556			
Direct local contribution	.487			
Direct global contribution		.451		
El. car makes respondent modern	.468			.474
Importance of free toll Oslo	-.583	.578		
Importance of collective lane use	-.621			
Importance of free parking		.701		
Importance of tax discounts	-.527			
Importance of low maintainance costs		.466		
Like design of el.car			.501	
Like comfort			.818	
Like safety			.819	
El. car saves time				.475

Extraction Method: Principal Component Analysis. a. 4 components extracted.

**Pattern Matrix<sup>a</sup>**

	Component			
	1	2	3	4
El.car more env. friendly than conventional		,590		
Contribution was motive when acquired the car		,682		
Sociaty approves the respondent because of the car				,719
Like the idea of being approved because of the car				,640
Direct local contribution		,648		
Direct global contribution		,748		
Importance of free toll Oslo	,793			
Importance of collective lane use	,624			
Importance of free parking	,746			
Importance of tax discounts	,704			
Importance of low maintainance costs	,512			
El. car makes respondent modern				,753
Like design of el.car			,548	
Like comfort			,859	
Like safety			,829	
El. car saves time				,545

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

**Component Correlation Matrix**

Component	1	2	3	4
1	1,000	-,069	-,020	-,141
2	-,069	1,000	,020	,329
3	-,020	,020	1,000	,065
4	-,141	,329	,065	1,000

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

## Regression analysis output for Factor 1: Economy

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,362 <sup>a</sup>	,131	,071	,94239058

a. Predictors: (Constant), Only car?, Age group, 1-7, Gender, Education group, Little free time, Income group, Full-time job?

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13,525	7	1,932	2,176	,043 <sup>a</sup>
	Residual	89,698	101	,888		
	Total	103,223	108			

a. Predictors: (Constant), Only car?, Age group, 1-7, Gender, Education group, Little free time, Income group, Full-time job?

b. Dependent Variable: REGR factor score 1 for analysis 1

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,397	,759		-,523	,602
	Age group, 1-7	-,164	,095	-,178	-1,717	,089
	Gender	-,212	,200	-,105	-1,059	,292
	Income group	,062	,118	,059	,527	,599
	Education group	,153	,155	,095	,982	,328
	Full-time job?	-,593	,311	-,226	-1,910	,059
	Little free time	,143	,053	,279	2,687	,008
	Only car?	,545	,384	,137	1,419	,159

a. Dependent Variable: REGR factor score 1 for analysis 1

## Regression analysis output for Factor 2: Altruism

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,469 <sup>a</sup>	,220	,131	,94979213

a. Predictors: (Constant), Children? , Income group, adm. and service?, educ. and research?, Gender, Little free time, health?, Age group, 1-7, transp. and constr?, Full-time job?, econ.,fin. and law?

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24,636	11	2,240	2,483	,009 <sup>a</sup>
	Residual	87,504	97	,902		
	Total	112,140	108			

a. Predictors: (Constant), Children? , Income group, adm. and service?, educ. and research?, Gender, Little free time, health?, Age group, 1-7, transp. and constr?, Full-time job?, econ.,fin. and law?

b. Dependent Variable: REGR factor score 2 for analysis 1

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,493	,775		,636	,526
	Age group, 1-7	,107	,103	,111	1,045	,299
	Gender	,540	,208	,257	2,597	,011
	Income group	-,085	,141	-,077	-,600	,550
	Full-time job?	,398	,314	,146	1,268	,208
	Little free time	-,093	,054	-,174	-1,707	,091
	transp. and constr?	-1,070	,450	-,275	-2,377	,019
	econ.,fin. and law?	-,016	,399	-,007	-,041	,967
	health?	,401	,447	,119	,898	,371
	adm. and service?	,101	,379	,047	,267	,790
	educ. and research?	,321	,411	,099	,781	,437
	Children?	-,656	,364	-,169	-1,804	,074

a. Dependent Variable: REGR factor score 2 for analysis 1

## Regression analysis output for Factor 3: Practicality

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,303 <sup>a</sup>	,092	,048	,90586559

a. Predictors: (Constant), Children? , Income group, Gender, Age group, 1-7, Little free time

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8,640	5	1,728	2,106	,071 <sup>a</sup>
	Residual	85,342	104	,821		
	Total	93,981	109			

a. Predictors: (Constant), Children? , Income group, Gender, Age group, 1-7, Little free time

b. Dependent Variable: REGR factor score 3 for analysis 1

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,147	,637		1,800	,075
	Age group, 1-7	,050	,086	,057	,578	,564
	Gender	-,340	,186	-,178	-1,826	,071
	Income group	-,079	,102	-,079	-,779	,438
	Little free time	-,085	,050	-,177	-1,723	,088
	Children?	-,588	,340	-,165	-1,729	,087

a. Dependent Variable: REGR factor score 3 for analysis 1

## Regression analysis output for Factor 4: Self-Picture

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,402 <sup>a</sup>	,162	,095	,93930332

a. Predictors: (Constant), happinX, Income group, Proffestion group, Gender, Age group, 1-7, Little free time, Persons in the household

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11,692	5	2,338	2,546	,033 <sup>a</sup>
	Residual	93,688	102	,919		
	Total	105,380	107			

a. Predictors: (Constant), Persons in the household, Gender, Little free time, Age group, 1-7, Income group

b. Dependent Variable: REGR factor score 4 for analysis 1

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1,239	,787		-1,574	,119
	Age group, 1-7	-,128	,105	-,134	-1,216	,227
	Gender	,415	,207	,202	2,006	,048
	Income group	,310	,126	,268	2,462	,016
	Proffestion group	,061	,082	,074	,742	,460
	Little free time	,092	,056	,172	1,648	,095
	Persons in the household	-,142	,107	-,152	-1,328	,188
	happinX	,105	,204	,052	,515	,608

a. Dependent Variable: REGR factor score 4 for analysis 1

*God dag kjære elbileier,*

*Dette spørreskjemaet er en del av en masteroppgave om motivasjon bak elbilbruk i Oslo. Prosjektet utføres av en student på Senter for Utvikling og Miljø på UiO. Målgruppen for undersøkelsen er private eiere av elbiler i Oslo. Hvis det har oppstått en feil og du ikke eier en elbil, trenger du ikke å svare. Dine svar vil være anonymisert. Det er viktig at så mange som mulig sender svarene sine – da blir forskningen mer til å stole på. Jeg setter en stor pris på din hjelp! Vedlagt finner du en frankert konvolutt for å returnere det besvarte skjemaet i.*

*Med vennlig hilsen Nina Zelenkova, [ninaze@student.ikos.uio.no](mailto:ninaze@student.ikos.uio.no)*

*Vennligst marker i hvilken grad du er enig eller uenig med følgende påstander i skala 1 til 7, hvor 1 står for "helt uenig" og 7 står for "helt enig". Sett ring rundt svaret som passer deg.*

	Svært uenig			Verken enig eller uenig			Helt enig
<b>1.1. Miljøspørsmål er viktige for meg</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1.2. Jeg mener at en elbil er <i>ikke</i> mer miljøvennlig enn en konvensjonell bil	1	2	3	4	5	6	7
<b>1.3. Jeg liker å kunne bidra til samfunnet</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1.4. Elbiler forandrer ikke samfunnet positivt	1	2	3	4	5	6	7
<b>1.5. Tanken på jeg kunne bidra til miljøet var motiverende da jeg skaffet meg elbilen</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1.6. Samfunnet ser ikke på elbilister som mer miljøvennlige enn "vanlige" bilister	1	2	3	4	5	6	7
<b>1.7. Andre ser meg som en miljøvennlig person fordi jeg har en elbil</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1.8. Jeg liker tanken at jeg kan bli sett som en miljøvennlig person pga. elbilen	1	2	3	4	5	6	7
<b>1.9. Jeg mener at mitt direkte bidrag til redusert lokal forurensning med å kjøre en elbil framfor en konvensjonell bil er ubetydelig</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1.10. Jeg mener at mitt direkte bidrag til redusert global forurensning med å kjøre en elbil framfor en konvensjonell bil er betydelig	1	2	3	4	5	6	7
<b>2.1. Jeg er generelt interessert i nye teknologier i bilsektoren</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
2.2. Å kjøre elbil gjør meg ikke spesielt moderne	1	2	3	4	5	6	7

3.1. Før du skaffet deg elbilen, visste du om følgende ordninger?

Gratis bomplassering	ja	nei
Gratis parkering	ja	nei
Mulighet å kjøre i kollektivt felt	ja	nei
Fritak fra engangsavgift og redusert årsavgift	ja	nei

Vennligst marker i hvilken grad følgende faktorer var viktige når du kjøpte elbil i skala 1 til 5, hvor 1 står for "veldig viktig" og 5 står for "ikke viktig". Sett ring rundt svaret som passer.

	Veldig viktig				Ikke viktig
	1	2	3	4	5
<b>3.2. Gratis bomplassering</b>					
3.3. Gratis parkering på kommunale parkeringsplasser	1	2	3	4	5
<b>3.4. Mulighet å kjøre i kollektivt felt</b>	1	2	3	4	5
3.5. Fritak fra engangsavgift og redusert årsavgift	1	2	3	4	5

Vennligst marker i hvilken grad du er enig eller uenig med følgende påstander i skala 1 til 7, hvor 1 står for "helt uenig" og 7 står for "helt enig". Sett ring rundt svaret som passer.

	Svært uenig				Verken enig eller uenig			Helt enig
	1	2	3	4	5	6	7	
<b>4.1. Bilens driftkostnader var en viktig aspekt når jeg valgte å skaffe meg elbilen</b>								
4.2. Elbilen min har ikke lavere drifts- og vedlikeholdskostnader enn en bensin-/dieselbil	1	2	3	4	5	6	7	
<b>5.1. Jeg likte designet til elbilen da jeg valgte å kjøpe den</b>	1	2	3	4	5	6	7	
5.2. Jeg er ikke fornøyd med kjørekomforten av elbilen	1	2	3	4	5	6	7	
<b>5.3. Jeg er ikke fornøyd med sikkerheten under kjøringen av elbilen</b>	1	2	3	4	5	6	7	
5.4. Jeg er generelt fornøyd med elbilen	1	2	3	4	5	6	7	



5.5. Vennligst ranger følgende aspekter i forhold til deres viktighet til deg når du skaffet deg elbilen i skala 1-10, hvor 1 er viktigst og 10 er minst viktig i listen.

Gjør meg miljøvennlig	
Gratis bompassering	
Mulig å kjøre i kollektivt felt	
Liker designet	
Bidrag til samfunnets forandring	
Relativt lave driftkostnader	
Lettere å parkere i Oslo	
Sparer meg tid	
Reduserer forurensning	
Ny og spennende teknologi	

5.6. Er elbilen eneste bil som husstanden disponerer?

Ja, elbil er vår eneste bil	Nei, det er flere biler eid av husstanden
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5.7. Er det noe som motiverte deg å kjøpe en elbil som ikke var dekket av spørsmålene øverst? \_\_\_\_\_

6.1. Jeg har lite fritid

1 - uenig	2	3	4 verken eller	5	6	7 - enig	Vet ikke
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6.2. Elbilen hjelper meg å spare tid

1 - uenig	2	3	4 verken eller	5	6	7 - enig	Vet ikke
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7.1. Du kan beskrive deg som:

1 - meget lykkelig	2 - ganske lykkelig	3 - ikke lykkelig	4 - slett ikke lykkelig
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8.1. Hva er din alder?

<29	30-39	40-49	50-59	60-69	70-79	>80
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Vær vennlig å svare på noen spørsmål om deg selv:

8.2. Er du

Kvinne	Mann
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8.3. Hvor mange personer, inkludert deg, er i din husstand?

8.4. Har du barn?

Ja	Nei
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8.5. Hva er din høyeste fullført utdanning?

1 Grunnskole	2 Videregående skole	3 Høyere utdanning <4 år	4 Høyere utdanning >4 år	5 Vet ikke /vil ikke svare
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8.6. Hva er din hovedbeskjeftigelse?

1	Student
2	Yrkesaktiv heltid
3	Yrkesaktiv deltid
4	Pensjonist
5	Hjemmeværende
9	Vet ikke / vil ikke svare

8.7. Hvilken type yrke har du?

1	Bygg og anlegg
2	Eiendom, økonomi og finans
3	Jordbruk, fiskeri eller lignende
4	Juridisk yrke
5	Kirkelig arbeid
6	Helse
7	Kontoryrke
8	Transport, logistikk og lager
9	Salg og service
10	Undervisning
11	Forskning
20	Jobber ikke
30	Vet ikke/vil ikke svare

8.8. Hva er husstandens samlede årlig bruttoinntekt?

0 – 250000 1	250000- 500000 2	500000- 750000 3	750000- 1000000 4	>1000000 5	Vet ikke / vil ikke svare 9
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**Tusen takk for dine svar!**

9.0.

Det kan være av interesse å intervju noen elbilister i en mer åpen form for å undersøke temaet dypere. Kan jeg ved behov kontakte deg og spørre om en uformell samtale? (Svarene fra samtalen vil også holdes anonyme)

☐ Ja, her er navnet og telefonnummeret mitt:

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