

Strategies for Increasing the Acceptability of Sustainable Transport Policies

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持続可能な交通政策の
受容性を高めるための
戦略に関する研究

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Abstract

A number of sustainable transport policies, such as road pricing, have not been implemented due to a lack of public acceptability. The aim of this thesis is therefore to suggest strategies to improve the effectiveness of such policies. Four empirical studies are conducted for this in which the role of government trust, personality traits and education is explored on road pricing as well as environmental taxation. Moreover, the effects of these factors have been compared among samples from Japan, the US and the UK. Environmental taxation is studied because it is considered as an extension of fuel taxes and may thus be viewed as transport pricing. Related to this taxation, environmental concern is suggested as additional psychological determinant to influence public acceptability. The results demonstrate that some personality traits such as arrogance and agreeableness are correlated with acceptability. Based on this, some marketing strategies are suggested for the successful implementation of transport policies, which can be applied without distinction of culture. For long term plans for sustainable policy it is further suggested that the effects of university environmental education on acceptability should be taken more serious.

Key words: Acceptability, Travel Demand Management, Transport Policy, Road Pricing, Taxation, Environmental concern, Sustainable transportation.

Preface

Parts of this thesis have been published in the following five papers and these will be referred to by their roman numerals throughout the thesis.

- I. Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii, Robert B. Noland (2011) A comparative study of the acceptance of congestion charges in the UK and the US. Transport dynamics: proceedings of the international conference of the Hong Kong Society for Transportation Studies (HKSTS), pp.255-262.
- II. Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii (2012) Influence of Arrogance on Acceptance of TDM Policy. Journal of Human Environmental Studies, 10(2), pp.71-77.
- III. Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii, Robert B. Noland (2013) Attitudes towards Road Pricing and Environmental Taxation among US and UK Students. Transportation Research Part A: Policy and Practice, 48(1), pp.50-62.
- IV. Junghwa Kim, Jan-Dirk Schmöcker, Cecilia J. Bergstad, Satoshi Fujii, Tommy Gärling (Accepted for publication.) The Influence of Personality on Acceptability of Sustainable Transport Policy. Transportation (springer).
- V. Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii (Manuscript submitted for publication.) Can Sustainable Transport Attitudes be taught?. International Journal of Sustainable Transportation (IJST).

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Chapter 1

1. Introduction

1.1. Background

The environmental externalities of transportation such as air pollution, climate change and global warming are well known. Sustainability has become an issue all over the world and there is ample research how to promote a sustainable transport system. As a result, various transportation policies have been suggested and designed. To achieve sustainable transport, in general three measures can be distinguished; these are 1) pricing measures and other forms of traffic management, 2) promoting alternatives to car based transport such as the improvement of public transport systems, 3) new technologies and alternative energies, for example dissemination of hybrid/electric cars. Due to the common situation of “*Too much congestion, not enough funding*”, many decision makers in the transport field are increasingly turning to the “pricing solution”. In the US, three of the five most expensive transport infrastructure related projects recently completed or planned, have considered tolling measures (Swanson and Hampton, 2013). Most transportation experts

agree that pricing policies are a potential solution to reduce car traffic and control for externalities caused by car traffic. Since pricing schemes could be a perfect measure from an economic standpoint of demand/supply theory, therefore road pricing has been suggested as general transport policy with long history. Toll roads were used in India in the 4th century, in Europe in 14 and 15th centuries and also in US from 18th centuries (Walker, 2011).

Although there are a number of successful road pricing implementations, for example in London and Stockholm, where the public supports these policies, in some other cities proposals have been rejected because of a lack of public support. For example, the 1.8 million-signature petition against road pricing on UK Prime Minister's website, has prompted many authorities to reconsider their proposals (Walker, 2011). In Edinburgh the discussion of possible economic effects of a proposed scheme raised many concerns, leading to its rejection in a referendum (Gaunt et al., 2007). Also the recent 'NO' voted in a referendum on road pricing in Edinburgh in 2005 by margins of 3:1, in case of votes in Manchester in 2008 is 4:1 (Walker, 2011). Most pricing scheme proposals in the US have faced political opposition. The most-well known example is a planned scheme for road pricing in Manhattan, New York City, which eventually was rejected, largely because of a lack of public acceptability (Schaller, 2010). Figure 1.1 also illustrates the often significant public opposition towards pricing schemes and other TDM measures with a survey in 22 European cities.

In this thesis it is argued that low population acceptability has led to failure cases like in above. It is proposed that considering acceptability is crucial due to various reasons: Firstly, if acceptability is low this means high enforcement is needed leading to significant costs for the scheme operator, thus it stresses the people's direct

influence on the success of a scheme (Bartley, 1995). Furthermore, low acceptability may lead to irrational resistance from the public and finally to the failure of policy implementation (Schade, 2007). Moreover, protest might be exhibited in the form of public demonstrations or boycotts, which are influenced by negative media attitudes to the scheme. Finally, this strong public resistance may lead to fear of politicians about not being re-elected. Schade (2007) indicated low acceptability by the public as well as politicians are regarded as the barriers to successful implementation of pricing scheme. Therefore it is expected that the more people accept pricing measure the more effective the transport policy will be.

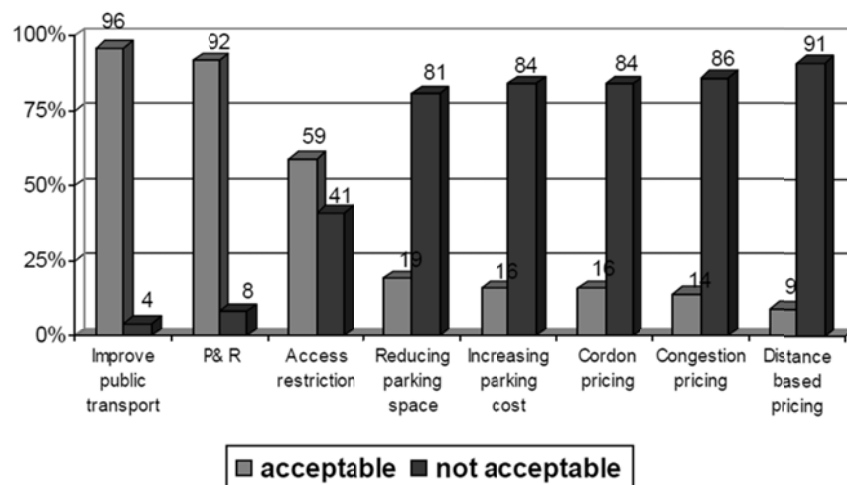


Figure 1.1 Acceptability of TDM measures in Europe (Schade, 2007)

In this thesis, the term of “sustainable policies” is used to describe policies such as road pricing that are designed to penalize undesirable behavior and have possibility to be subject to public opposition. Some people may not accept sustainable policies because overall they believe they will be net losers. Alternatively, some people

may be more willing to accept sustainable policies because society as a whole is better off. These perspectives may deeply influence individuals' propensity to accept and support these types of policy initiatives (Bonsall et al., 1992). One of the main barriers to the implementation of sustainable policies is the need to design schemes that are acceptable to the public and still effective in achieving their objectives (Jones, 1998). This is made more complex because it is not clear whether the public perceives the benefits and how they evaluate and respond to different sustainable policies features. Pridmore and Miola (2011), referring partly to Goodwin (2006), noted that acceptability changes over time and that there appear to be three stages as shown in Figure 1.2. Firstly, it is a step of person's recognition about the problem which leads to an increase in public support for the proposed mitigation policy. This is followed by a reduction of public support as detailed information about the proposed policy is revealed. In a final step, acceptability increases again after a successful introduction, once people have experience of the scheme.

However, Goodwin and Lyons (2010) mention also that it needs further research to identify these types of attitude changes to transport policy more broadly and over longer time periods. To solve this problem factors aiming to explain public acceptability* (before implementation) and acceptance (after implementation) have been extensively studied. For example, a number of recently published papers demonstrate how the use of psychological theories and methods contribute to an increased understanding of the determinants of acceptability and an increased effectiveness of sustainable transport policies (Eriksson et al., 2008; Gehlert et al., 2011; Schmöcker et al.,

* The term *acceptability* should be used for hypothetical or not yet implemented schemes whereas for implemented schemes the term *acceptance* should be used (see Gärling et al., 2008; Schuitema et al., 2010)

2012). Moreover, it has been demonstrated that judgments on acceptability might be influenced by psychological determinants, which are well established by research in psychology (Gärling et al., 2008; Jakobsson et al., 2000; Ittner et al., 2003; Bartley, 1995). Generally, it is found that the acceptance or rejection of sustainable policies can often be better explained with psychological determinants such as perceived fairness or perceived effectiveness than with utility based concepts (Schade and Schlag, 2003a).

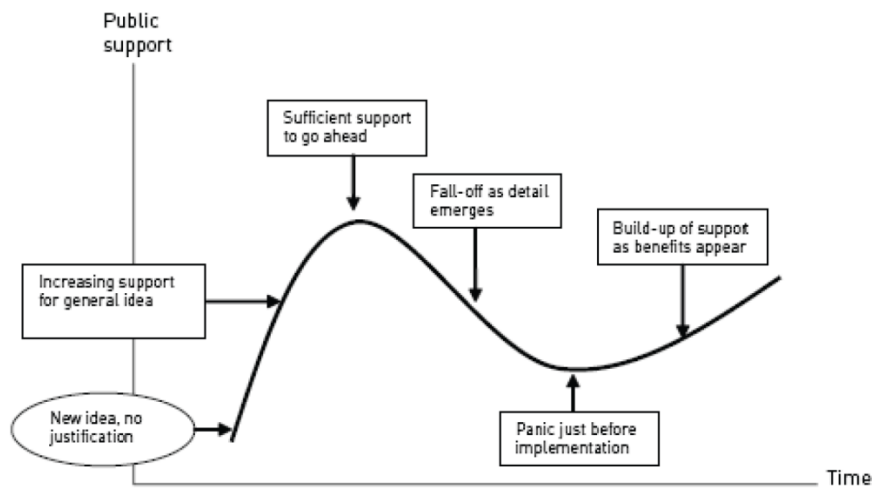


Figure 1.2 Goodwin's cycle of public acceptability (Goodwin, 2006)

Source: Pridmore and Miola (2011) Public Acceptability of Sustainable Transport Measures, Discussion paper for International Transport Forum

1.2. Research Objective

The major objective of this thesis is to understand what psychological factors influence acceptability and to suggest ways to increase the public acceptability of sustainable transport policies.

Gärling and Schuitema (2007) noted how to change behavior, such as car usage, has been the focus of much empirical psychological research. Following various psychological theories such as the Theory of Planned Behavior (Ajzen, 1991), a person's behavior is effected by psychological factors such as their own attitudes and belief etc. In case of soft transport measures* often referred to as “mobility management” (MM) and “travel feedback program”, such psychological approaches have been used to increase public car use reduction.

Moreover it can be applied to hard transport measures. As shown in Figure 1.2, public acceptability varies during the pricing policy implementation process. It should also be considered that some people might be supportive towards the policy before implementation but do not reduce their car use in line with predictions of demand forecasting models.

Although it is not necessarily the case that road pricing leads to car use reduction, however, in general high acceptability leads also to behavioral changes including car use reduction. Therefore this research aims to explain acceptability with concepts taken from social psychology. As mentioned, recently various researchers considered psychological aspects for this. In the same vein, also this thesis aims to explain acceptability with concepts taken from social psychology. The more detailed objectives would be as follows:

- 1) To confirm previously found determinants of acceptance and acceptability

* Transport policy measures to reduce car use are referred to as “travel demand management” (TDM) measures. These are divided into “hard” and “soft.” Hard transport policy measures include physical improvements of infrastructure for public transport, increased costs for car use, and control of road space. While soft transport policy measures include the methods for voluntary behavior change, psychological and behavioral strategies. (Gärling et al., 2009; Bamberg et al., 2011)

- 2) To investigate the potential importance of additional psychological determinants which influence the process of accepting transportation measures.
- 3) To demonstrate the differences in effects of psychological determinants on acceptability by different culture or social background.
- 4) To find specific psychological determinants correlated with acceptability independent of cultural differences.
- 5) To suggest strategies to improve acceptability that can be applied to various cultures.

To achieve these objectives previous studies in various fields are reviewed. Moreover, for statistical analysis data on psychological attitudes are gathered several times by survey among students in Japan as well as other countries.

1.3. Thesis Structure

This study is organized into 7 chapters as shown in Figure 1.3. Considering the previously mentioned five objectives, Chapters 3 to 6 are the core of this thesis and investigate how a range of additional determinants can explain acceptability.

Before this, Chapter 2 contains the main part of the literature review regarding factors found to influence acceptability of transport policy. Moreover the positive influence of *Problem awareness* on acceptability is discussed as well as its relationship to environmental concern including environmental problem awareness, responsibility and norm. In Chapter 3, determinants of public acceptability of two sustainable policies are investigated, congestion pricing and

environmental taxation. The acceptability of these policies is measured with survey data from students in New Jersey, London and Tokyo. Moreover the relationship between *Trust in government* and acceptability is demonstrated in the three counties and for both policies. Following Hatori et al. (2008) who in turn refer to the Spanish philosopher Jose Ortega y Gasset (1883-1955), it can be assumed that *Arrogance*, is correlated to *Trust in government*. Therefore in Chapter 4, this study demonstrates the correlations between specific forms of *Arrogance* and the psychological determinants of public acceptability considered in Chapter 3. Moreover, in Chapter 5, *Environmental concern (Awareness and Personal Norm)* is investigated as an additional determinant. This can be considered as an extension from Chapters 3 and 4 where the importance of *Problem awareness* has been investigated. In this chapter, the main focus is on the role played by personality traits. The objective of in Chapter 6 is then to demonstrate the impact of environmental education on the support for sustainable transport policies among civil engineering students. 524 students from Kyoto University, are surveyed about their attitudes towards environmental issues, their attitudes towards various transport policies as well as the number of environment related classes they have taken. After 1 year from this survey, attitude changes are also measured with panel data (176 students). Finally Chapter 7 presents a general summary of studies in this thesis. The implications of this thesis are discussed and some areas requiring further research are suggested.

In Appendix A, Structural Equation Modeling is explained which is generally used to verified relations among psychological factors in this thesis. Finally, in Appendix B the two language versions (Japanese and English) of the two questionnaires used for data collection are attached.

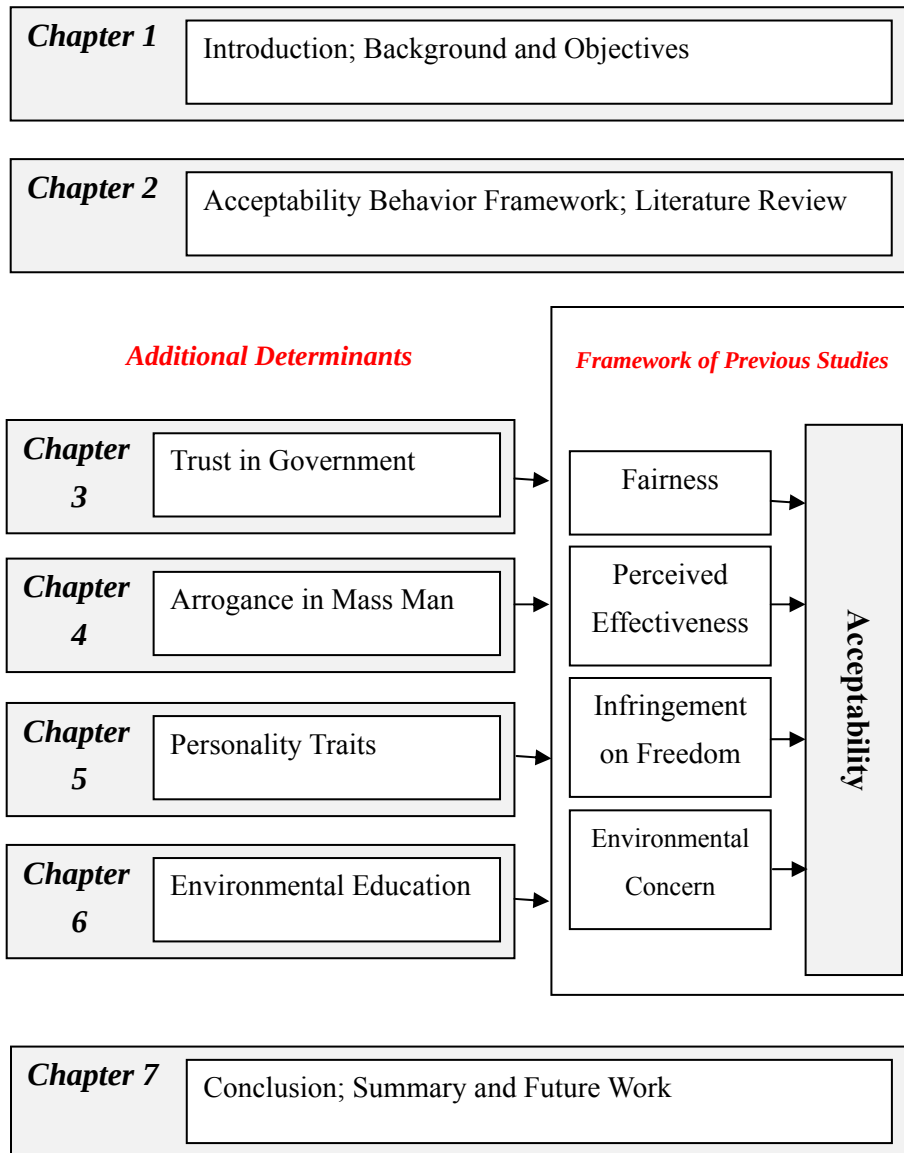


Figure 1.3 Structure of thesis

Chapter 2

2. Acceptability Framework

2.1. Introduction

For acceptability of general taxation, Kirchler (2007) indicated that the subjective knowledge, attitudes, perceived fairness of the scheme, and norms are important indicators in the individual cognitive process for positive behavior to accept the taxation. There is by now quite an extensive body of literature attempting to understand general factors that make sustainable policies acceptable to the public. Several studies have shown that determinants relating to the scheme itself (“proximal” factors) may explain acceptability fairly well. For example, Gärling et al. (2008), Schade (2003), and Jakobsson et al. (2000) found that *Fairness*, *Infringement on freedom*, and *Perceived effectiveness* are direct determinants of acceptability. These three main scheme specific determinants appear in various literatures as the main determinants of transport policy acceptability. These are discussed in detail in the following section 2.2.

Factors related to the proposed scheme (“distal” factors) also influence acceptability. For example, primarily *Problem awareness* of

the issues as well as general *Environmental concern* can be distal factors. These are discussed in this chapter (section 2.3 and 2.4). While other additional factors can be *Trust in government*, *Arrogance*, and *Personal traits*. The results of Schmöcker et al. (2012) indicate that *Trust in government* is an important determinant. As trust and other further distal factors are the main research topic of this thesis they are discussed in more detail in the following chapters.

2.2. Scheme Specific Determinants of Acceptability

2.2.1. Fairness

A policy needs to be perceived as “fair” in order to be acceptable (Ittner et al., 2003). Especially in the case of taxation policy, fairness concerns are the most frequently mentioned topics when citizen are questioned what they think about the scheme (Breathwaite, 2003; Rawlings, 2003; Taylor, 2003, Kirchler, 2007). What is perceived as fair clearly differs between people. In general if people perceive that most people will benefit from a policy it is more likely to be perceived as fair and the more likely the policy is to be accepted (Jakobsson et al., 2000; Schade, 2003).

The term fairness can be further divided into *Scenario fairness*, *Distributional fairness* and *Procedural fairness*, all of which have a significant relationship to government policy (Lin and Tyler, 1998). *Scenario fairness* relates to the perception of the scheme’s consequences for oneself. *Distributional fairness* relates to the perceived fairness of the distribution of the costs and benefits within society, for example whether some population groups might be disadvantaged compared to others (Eriksson et al., 2008; Schuitema et

al., 2010). *Procedural fairness* relates to the way the scheme was introduced, for example a scheme that was introduced without sufficient public consultation might not be acceptable.

2.2.2. *Infringement on Freedom*

“Freedom of choice” is often seen as an important value and has become a political slogan. It is a term that can have several connotations and in the context of road pricing, it is most often associated with the financial burden of road pricing potentially restricting mobility. Some people appear to be less willing to accept transport pricing because this infringes their freedom, which is perceived to be unfair (Jakobsson et al., 2000).

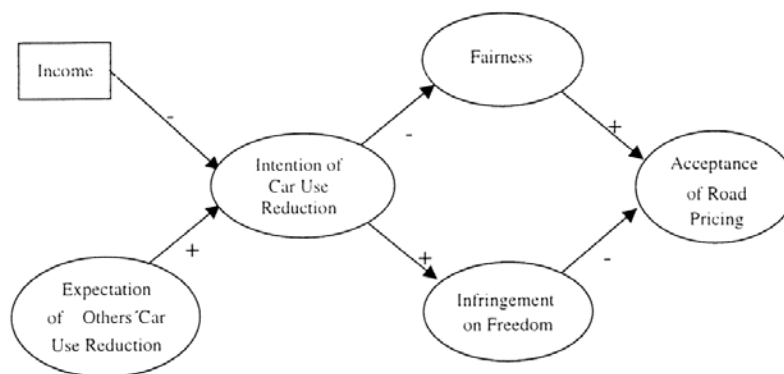


Figure 2.1 Acceptability model of Jakobsson et al. (2000)

To the extent that transport pricing threatens people’s individual freedom of choice, “psychological reactance”, that is a motivational reaction to threats to perceived behavioral freedoms, may occur. As a consequence, these measures may have no effect, or even opposite effects to what was intended (Brehm, 1966; see also Steg,

1996; Tertoolen et al., 1998). Clearly, higher *Infringement on freedom* is expected to reduce acceptance; that is the higher the charge, the higher the infringement

2.2.3. *Perceived Effectiveness*

Many studies have shown that the *Perceived effectiveness* of travel demand management measures is an influential predictor variable for their acceptability (Bartley, 1995, Schade, 2003). Schade and Schlag (2003) and Gärling et al. (2008) obtained similar results in their regression analyses using problem perception and *Perceived effectiveness* as explanatory variables for road pricing acceptability (Piriyawat et al, 2009).

It is usually hypothesized that a high level of *Perceived effectiveness* depends on how well the policy is known and this then influences on the acceptability (Schade and Schlag, 2003b). It is hence very important that citizens have perceptions of the policy issue including what it is as well as what is for, because it can makes citizens how to accept the policy. Bamberg and Rölle (2003) indicated that inclusion of *Perceived effectiveness* as a direct effect on acceptability significantly increased the explained variance from 71% to 81% (Piriyawat et al, 2009). If citizens fully understand the policy scheme and that the measure is regarded as effective, e.g. for reducing traffic problems, acceptability of the measure is greater, and vice versa. A lack of *Perceived effectiveness* is possibly one reason for the failure of a number of proposals. Jones (1998) describes that in general respondents state that they do not believe that pricing and taxation measures would solve transport-related problems such as air pollution and congestion. Taylor et al. (2010) review recent proposals for road pricing schemes in the US and suggest that a clear definition of the

goals, be it revenue collection or congestion reduction, as well as making a clear case whether this is going to be achieved, are key to gain acceptability (cf. Barron and Jurney, 1993; Jakobsson et al., 2000).

2.3. Problem Awareness and Acceptability

Schade and Schlag (2003b) indicate high problem awareness will lead to increased willingness to accept solutions for perceived problems. Moreover several studies found a relationship between perception of transport related problems and acceptability of various pricing measures. Policies are more acceptable if the public perceives the negative impacts associated with car use and they understand the need for policies to solve these impacts. For example, acceptability of transport pricing is dependent on problem awareness (Schade and Schlag, 2000; Bird and Morris, 2006; Oehry, 2010; Pridemore and Miola, 2011). Steg and Schuitema (2007) reported that acceptability of road pricing in Switzerland appeared to be rather high with 57% because the public was aware of the problems caused by car traffic and this policy could be a solution for these problems. Similar results were found in a study conducted in the Netherlands: transport policies are more acceptable for people high in problem awareness of the negative impacts of car (Steg and Vlek, 1997; Steg and Schuitema, 2007).

In case of acceptability of transport policies, especially awareness of congestion and environmental problem has a significant influence. Schuitema et al. (2010) noted that public perceptions that pricing measures are ineffective at reducing congestion and environmental problems are responsible for the lack of acceptability,

rather than the negative effects of the measures on personal car use. Piriawat et al. (2009) asked respondents about their awareness as to the seriousness of traffic problems in the study area including traffic congestion, air pollution from vehicles and traffic noise. They measured *Problem awareness* on two scales: self and society (See Figure 2.2). Stern et al. (1999) indicated *Problem awareness* can be considered at two different scales, self and social problem awareness. For example, *Self problem awareness* refers to the perception that traffic congestion and pollution have direct and personal impacts on individual life, and *Social problem awareness* is defined as the perception that those problems affect a wider community. In addition, *Problem awareness* appears to be related to *Perceived effectiveness* as mentioned in subsection 2.2.3. This means the more people are aware of environmental problems caused by car traffic, the more they think transport pricing will be an effective instrument to reduce car use (Steg and Schuitema, 2007).

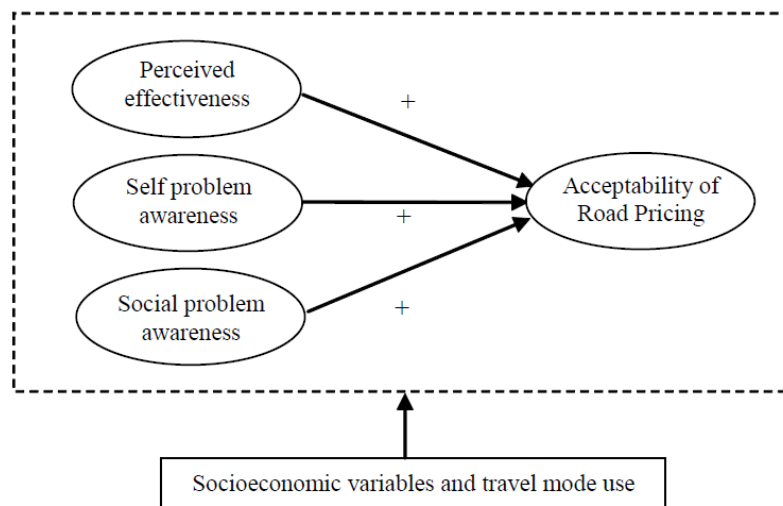


Figure 2.2 Causal model of Piriawat et al. (2009)

In this thesis, *Problem awareness* is separated into three factors as following, although Stern et al. (1999) and Piriawat et al. (2009) only considered as two factors. These are *Social problem awareness*, *Self problem awareness* and *Personal problem awareness*. Firstly, *Personal problem awareness* describes whether a person perceives the problem to be significantly related not just to the public in general but to him/her personally. As mentioned in above, *Social problem awareness* is an important factor when discussing road user charging acceptance in Sweden (Gärling et al., 2008). In contrast to *Social problem awareness*, *Self problem awareness* relates to the awareness that “my own behavior is part of the problem” as discussed for example by Choocharukuland and Fujii (2007).

2.4. Environmental Concern and Transport Attitudes

2.4.1. Scheme of Environmental Concern

The Norm Activation Model (NAM; Schwartz, 1977) is often used for explaining pro-social behavior. It has been successfully applied in predicting pro-social intentions and behavior, such as volunteering and helping in emergency situations. Moreover, since pro-environmental behavior was believed to be a special case of pro-social behavior, it has been increasingly used for measuring general pro-environmental behavior, such as energy conservation, willingness to pay for environmental protection and recycling (Groot and Steg, 2009).

The NAM includes three types of variables *Awareness* (Awareness of consequences), *Ascribed responsibility* (Ascription of responsibility), and *Personal norms*. Groot and Steg (2009) noted that *Awareness* is defined as perceiving a specific problem and it's

influence on pro-social acting, and *Ascribed responsibility* is described as feelings of responsibility for solving the perceived problem. Finally Schwartz and Howard (1981) indicated *Personal norms* is a “moral obligation to perform or refrain from specific actions”. As shown in Figure 2.3, *Personal norm* is assumed to mediate the relationship between *Ascribed responsibility* and pro-social intentions and behaviors, and *Ascribed responsibility* is assumed to mediate the relationship between *Awareness* and *Personal norms*.



Figure 2.3 NAM of pro-social behavior (Groot and Steg, 2009)

This interpretation of the NAM has been supported in several studies. Especially Gärling et al. (2003) verified the sequence, *Awareness* → *Ascribed responsibility* → *Personal norms* → *Pro-environmental behavior* (see Figure 2.4). In their study *Awareness* was measured with 6 questions such as “The effects of pollution on public health are worse than we realize”. “Every citizen must take responsibility for the environment” is one of the questions for *Ascribed responsibility*, and *Personal norm* was measured with four questions, such as “I feel that I should protect the environment”. They found that pro-environmental behavior intentions are causally related to *Personal norm* which in turn are causally related to *Ascribed responsibility* and *Awareness* of environmental consequences.

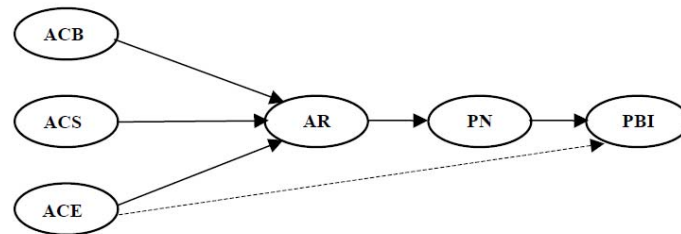


Figure 2.4 Structural model of Gärling et al. (2003)*

2.4.2. Environmental Concern and Travel Decision

A number of studies demonstrated environmental concern, including environmental attitudes, knowledge and problem awareness, is correlated with travel decisions and transport attitudes. Environmentally minded persons have a tendency to travel also more environmentally friendly, such as more frequently using public transport or being more likely to reduce their car use.

Johansson et al. (2006) verified their hypothesis that differences in people's attitudes to environmental considerations influence on the individuals' choice of transport mode. They measured environmental attitudes through the indicator "recycling habit" and found that this habit is correlated with more environmentally friendly mode usage such as travelling by public transport instead of private car. Also Shen et al. (2008) examined whether individual environmental consciousness has a significant effect on his/her choice of transport mode. Using simulation for predicting the change in modal share between monorail, car and bus, they verified that

* ACE : Awareness of consequences for oneself, ACS : Awareness of consequences for others, ACB : Awareness of consequences for the biosphere, AR : Ascribed responsibility, PN : Personal norm, PBI : Pro-environmental behavior intention (Gärling et al., 2003).

individual environmental consciousness is positively related to the share of a relative cleaner mode. Hunecke et al. (2001) showed evidence that “ecological norm” is the strongest predictor of travel mode choice. They indicated that responsibility for environment and perception of the ecological problem, which are the initial steps in the process of developing environmentally relevant behavior, simultaneously influence the travel mode choice in a direct way.

Flamm (2006) analyzed environmental knowledge and found that attitudes are correlated with vehicle ownership and car use. He demonstrated that environmental knowledge and attitudes are correlated with the number of household vehicles and the fuel efficiency of household vehicles. Gardner and Abraham (2010) found that environmental concern has some impact on car usage and it is associated with “no-car attitudes”. Fujii (2006) investigated the relationship between environmental concern and the perceived ease to engage in four different types of pro-environmental behavior. Among the four types, was car use reduction and it was demonstrated that environmental concern had a positive effect on this behavior (Figure 2.5).

Taniguchi and Fujii (2007) reported that willingness to reduce car use might be influenced by information about CO₂ emission from cars, advice on how to reduce car use, and individualized information on public transportation. Kim et al. (2011, 2013) investigated whether *Awareness of environmental problems* influences the attitudinal change toward reduction in car use. They concluded that the provision of information and knowledge about environmental problems, effects people to reduce their car use and to move to public transport use. A study by Nordlund and Garvill (2003), showed environmental values (eco-centrism) and *Problem awareness* (perceived environmental threat to biosphere) affect on *Personal norm*, which in turn influenced

willingness to reduce personal car use. They suggested that strategies aimed to increase the willingness to reduce personal car use, should emphasize eco-centrism and clarify the negative environmental consequences of car use.

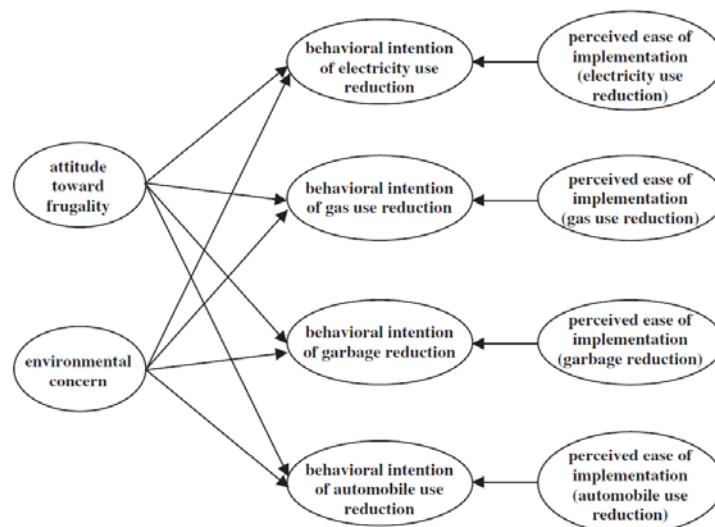


Figure 2.5 Path model of Fujii (2006)

2.4.3. Environmental Concern and Acceptability

As in above literature, environmental concern is generally correlated with various travel behavior. Also acceptability of transport policy can be regarded as one of these, therefore it can be assumed that there is some correlation between environmental concern and acceptability.

Section 2.3 showed that various types of transport related problem awareness (congestion, negative impact of car use, and environmental pollution) are correlated with policy acceptability.

However several studies show that those who perceive traffic congestion as one of the biggest problems have lower acceptability than those perceiving environmental issues to be the main problem (Harsman et al., 2000; Schade, 1999; Schade and Schlag, 2003b). Therefore, in here, mainly *Problem awareness* of environmental issues, such as global warming and climate change, is considered. Schade and Schlag (2000) demonstrated that acceptability further depends on environmental problem awareness. If people are aware of the current as well as future environmental problems caused by car use and if they are convinced of the need for policy measures to solve these problems, they may be more willing to accept the policy measures (Steg, 2003).

Schade and Schlag (2003) noted that environment-preserving behavior is increased if persons perceive damaging consequences of their own actions on the environment, and at the same time ascribe the responsibility for the consequences to themselves. In case of policy acceptability, therefore *Ascribed responsibility* can be seen as the next step after recognizing (the extent of) environmental problems caused by traffic. In this thesis, it is hence assumed that higher *Ascribed responsibility* should lead to increased acceptability of transport policy. Gärling et al. (2003) also demonstrated *Ascribed responsibility* is a mediation factor for pro-environmental behavior located between *Awareness* and *Personal norm*.

Personal norms, the feeling of a moral obligation to act, in particular to act environmentally friendly, have been shown to explain acceptability of transport pricing (Eriksson et al., 2006). In reference to the value-belief-norms theory of Stern et al. (1999), it is indicated that *Personal norms* to take pro-environmental action (in here, acceptability) are also activated by perspectives of environmental conservation as well as awareness of environmental problems. Eriksson et al. (2006, 2008) noted that personal norms have both a

direct effect on the acceptance of various travel demand measures as well as an indirect effect through the impact of norms on the willingness to act environmentally friendly (Figure 2.6). Finally, also Nilsson and Küller (2000) demonstrated that environmental attitudes and knowledge are strongly related to acceptability of various traffic restrictions for private cars such as road tolls, petrol taxes, and lack of parking areas.

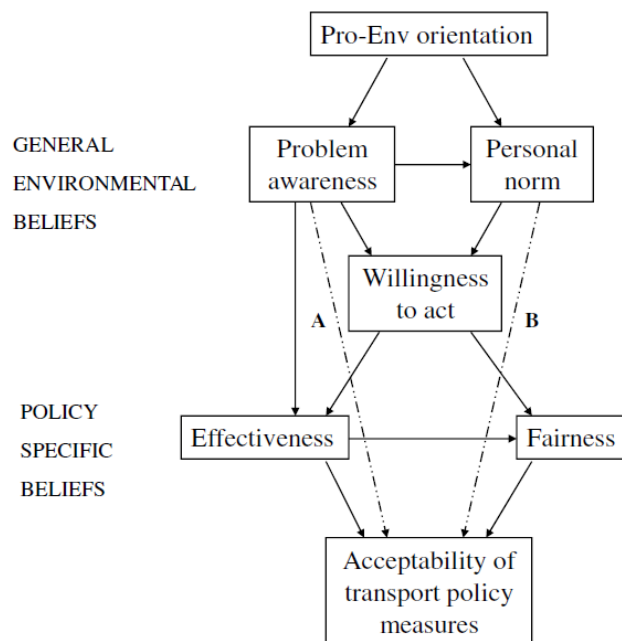


Figure 2.6 Acceptability model of Eriksson et al. (2008)

Chapter 3

3. Government Trust and Policy Acceptability*

3.1. Introduction

This chapter is partly based on data used in the study by Schmöcker et al. (2012). This study is extended in two ways: Whereas they discussed the acceptability of environmental taxation only, this study focuses primarily on an analysis of the acceptance of congestion pricing, in addition to environmental taxation. Fullerton et al. (2008) note the close relationship between environmental taxation and transport policies such as fuel taxation since both aims at reducing carbon emissions. They note that a number of European countries (Denmark, Finland, Netherlands, Norway, and Sweden) have

* Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii, Robert B. Noland (2013) Attitudes towards Road Pricing and Environmental Taxation among US and UK Students. *Transportation Research Part A: Policy and Practice*, 48(1), pp.50-62.

* Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii, Robert B. Noland (2011) A comparative study of the acceptance of congestion charges in the U.K. and the U.S. *Transport dynamics: proceedings of the international conference of the Hong Kong Society for Transportation Studies (HKSTS)*, pp.255-262.

introduced carbon taxes as an extension of fuel taxes. Therefore, environmental taxation scenario is regarded as sustainable transport policies in this study.

Moreover, sample size is extended to include students from three locations in three different countries, Tokyo, London and New Jersey (the former study did not include the New Jersey sample). The objectives are to answer the following questions: Firstly, are the determinants for the acceptability of a policy that addresses city specific problems (such as congestion) similar across different countries? The data from London and New Jersey (near the proposed unsuccessful implementation of congestion pricing in New York City) are suited to address this question. Note that there is no congestion pricing in Tokyo, which meant the former sample could not be used to address this question. Secondly, do determinants differ for city specific issues compared to global issues such as global warming? Therefore it includes a comparison to the environmental taxation data analyzed before. Thirdly, can general awareness of environmental issues be predictors for specific policies such as road pricing? Therefore it takes some of the determinants used for the environmental taxation scenarios as determinants for road pricing. Fourthly, do the results regarding *Trust in government*, a main result in the former study, also hold true in road pricing scenarios and for the New Jersey sample? Schmöcker et al. (2012) argued that *Trust in government* is linked to “belief in absolute values” and might be connected to religious beliefs and cultural values. In this study therefore the role of *Trust in government* is investigated in more detail, distinguishing between “specific” and “general” trust as discussed in the following.

The sample is limited to students, in New Jersey students with varying majors participated in the survey including some graduate

students, with the common point being their enrollment in classes focusing on environmental issues, whereas in London and in Tokyo the sample was drawn from students majoring in civil engineering, and all were undergraduate students. Clearly the sample is not representative of the general public, and this limitation is recognized; however the results provide useful insights for further exploration.

The remainder of this study is organized as follows. The first section describes psychological determinants based on a review of the literature. It is examined some psychological determinants that are important for acceptability of a sustainable policy. Then the survey method and the questions posed to the students are described. In the following section, the results of a descriptive analysis of the mean and standard deviation of each factor are described. The correlation of determinants to acceptability and the results of Structural Equation Model (SEM) estimation are shown in section 3.4 and 3.5. Finally section 3.6, summarizes the findings of this study and discusses the implications for strategies planners might use to promote sustainable transport policies.

3.2. Determinant of Trust in Government

In here, it suggests that higher levels of perceived trust are positively related to citizens' intentions to accept the policy measure, though here are few studies which well been investigated about this determinant. Hardin (1999) noted that "trust" has a cognitive concept with knowledge, therefore saying "I trust you" means that I know you and relevant things about you. Hardin (1999) and Hardin et al. (2005) discussed "trust" influences on cooperation behavior and noted *Trust in government* is related to how good policy will be. Therefore, if

public acceptability is considered as same meaning of cooperation in society, the role of *Trust in government* would be very important. Following on from Fujii (2007), acceptability probably depends partly on whether the government in general is trusted and whether public trust way to propose the policy by government before. Moreover, Carter and Belanger (2005) demonstrated citizens' perceptions of the trustworthiness of government positively effects on intention to accept the service by government. The aforementioned Schmöcker et al. (2012) proposed *Trust in government* as a deeper psychological determinant of acceptability. They showed that "trust" is also an important determinant for the acceptability of sustainable policies (i.e. environmental taxation) in the UK and in Japan. Through correlation analysis they confirmed the importance of government trust in gaining acceptability in both countries. Path analysis also showed its effect on acceptability is mediated through scheme specific determinants in both samples (Schmöcker et al., 2012). In this study, it is continued this line of research on the importance of trust by exploring whether *Trust in government* can be separated into "specific" and "general" trust. *General trust in government* is defined as a motivation to obey government authorities independent of their specific performance, whereas *Specific trust in government* will be related to the perception of the government that would be implementing the pricing policy. The hypothesis is that individuals who have a greater *General trust in government* will also be more likely to trust specific governments.

3.3. Methodology

3.3.1. Survey

The US data was collected via an online version of the survey

tool described in Schmöcker et al. (2012) and students in three classes were the target respondents. An undergraduate class on Climate Change was surveyed in the autumn 2009 and 2010 semesters, while a graduate class on Transportation and the Environment was surveyed in the spring 2010 semester. The London survey was conducted in November 2008 and the Tokyo survey in October 2008. These were administered in paper form to undergraduate students majoring in Civil Engineering at the end of a lecture period. With regards to the analysis of this study it was gathered a valid sample for SEM analysis of 96 students from Rutgers University in New Brunswick, New Jersey and 72 students from Imperial College London. The Japanese sample consists of 139 students from Tokyo Institute of Technology. The average age of respondents is similar at 20.4 years in the US sample, 21.1 years in the UK sample and 22.6 years in Japan. The proportion of males is 73% in the US sample, 58% in the UK sample and 92.8% in the Japan sample.

As shown in Table 3.1, there are two components to the questions on the survey for two sustainable policies. In the first part it is asked questions aimed at measuring the psychological attitude of students in all three countries after providing information on a hypothetical environmental taxation scenario to be implemented (see Figure 3.1). The second part was designed to elicit students' attitudes in the US and UK toward the previously rejected Manhattan road pricing scheme and the ongoing congestion pricing scheme in London. No specific information was given about the London charging scheme as the students surveyed were familiar with it; for the non-implemented Manhattan scheme description was provided as some students were likely unaware of the proposal (see Figure 3.2). The questions were designed to measure acceptability and its 10 psychological determinants. Information on car ownership and gender

were also collected. In the case of determinants for *Awareness* and *General government trust*, common questions were used to measure attitudes toward both policies (congestion pricing and environmental taxation).

It is also included questions about environmental problems such as climate change to verify that persons associate environmental problems with transportation policy when they decide whether to accept sustainable policies. This also served to confirm whether perception of environmental problems affects their acceptability, for the determinants of *Perceived effectiveness*, *Social problem awareness*, *Self problem awareness*, and *Personal problem awareness*. These questions, which are related to CO₂ emissions and global warming rather than congestion problems, are used to examine whether perceptions of environmental problems may affect acceptability of sustainable policies. The hypothesis is that those who are aware of climate change problem, will also be more aware that car usage is contributes to climate change and therefore be more likely to accept the pricing policy.

With the exception of personal information variables, all questions were asked on a 7 point Likert scale. Ratings were obtained on this 7 point numerical scale with verbally defined endpoints and midpoints. (“Not at all” – “Neutral” – “Yes, strongly agree”). To increase reliability of the determinants for acceptability of an environmental tax, *Social problem awareness* and *General trust in government* were measured with two or three questions. A Cronbach’s alpha reliability analysis was carried out for the US, UK and Japan samples and showed acceptable values for all constructs and in all samples; (acceptability of environmental tax; 0.89, 0.86, 0.91), (*Social problem awareness*; 0.76, 0.90, 0.73), (*General trust in government*; 0.91, 0.86, 0.81).

The UK government has decided to introduce an environmental tax of £50 per month to be paid by all UK residents including all university students.

The decision was made after a long debate with several economists and scientists through which the government got convinced that this additional tax is needed to influence greenhouse emission.

The tax will be used for environmental research and to sub-sidise the introduction of new technology that emits less CO₂. The government accounted that they justified the amount by scientific research referring to the carbon footprints.

Figure 3.1 Hypothetical environmental taxation scenario for UK

New York City Mayor Bloomberg proposed that a congestion charge be levied on traffic in Manhattan. This would have priced traffic south of 60th Street, with exemptions for some through routes. Drivers using toll crossings to enter Manhattan would have paid only the difference between their toll and the congestion charge. The charge would apply on weekdays from 6:00 a.m. to 6:00 p.m. The proposed fees would be \$8 for cars and commercial vehicles and \$21 for trucks entering from outside the zone. Transit buses, emergency vehicles, taxis and for-hire vehicles, and vehicles with handicapped license plates would not be charged the fee. Taxi and livery trips that begin, end or touch the zone would have a \$1 surcharge. Vehicles would be charged only once per day. Charges would have been collected electronically, for example through EZ Pass or license plate cameras. Revenue from the congestion charge would have contributed to accelerating capital investments in public transit.

Figure 3.2 Information given about Manhattan congestion pricing proposal

Table 3.1(1) Questions used to measure the determinants

Determinants		Questions	
		Congestion Pricing	Environmental Tax
Acceptability		Do you support the congestion charge?	Do you support this government decision to implement an environmental tax?
			Are you willing to accept this government's decision to implement an environmental tax?
Established Psychological Determinants	Scenario Fairness	Do you think the congestion charge is fair?	Do you think this environmental tax fair?
	Procedural Fairness	Do you think the process how congestion charge was introduced is fair?	Do you think the process of government decision making that lead to an environmental tax is fair?
	Distributive Fairness	Do you think the congestion charge is impartial?	Do you think this environmental tax is equitable?
	Infringement on Freedom	Do you think the congestion charge "infringes on your freedom"?	Do you think environmental tax "infringes on your freedom"?

Table 3.1(2) Questions used to measure the determinants

Determinants		Questions	
		Congestion Pricing	Environmental Tax
Established Psychological Determinants	Perceived Effectiveness	Do you think the congestion charge helps to eventually reduce the effect of global warming?	Do you think a tax like this can help to eventually reduce the effect of global warming?
	Social Problem Awareness	How serious do you believe the problem of climate change is?	
		Do you think climate change will seriously damage our society?	
	Self Problem Awareness	Do you think the CO ₂ that you produce in your daily life will contribute to climate change and this will negatively influence society?	
	Personal Problem Awareness	Do you think global warming will serious damage yourself ?	
Proposed Distal Determinants	General Trust in Government	I respect the government.	
		In general I trust the government.	
	Specific Trust in Government	Do you trust the government that made the decision to introduce the congestion charge?	Do you trust the federal government to make a decision to introduce this tax?
Personal Information	Car ownership	Do you own a car?	
	Gender	Please mark your gender.	

3.3.2. Summary Statistics

It is compared the mean values for the acceptability and determinants questions in Table 3.2. For the environmental taxation scenario, the US sample tends to have larger mean values compared to the UK and Japan sample (see Table 3.2). In case of *Social problem awareness* and *Self problem awareness* the differences are statistically significant between all three samples. There are further significant differences between two countries in six determinants (*Acceptability*, *Perceived effectiveness*, *Personal awareness*, *Scenario fairness*, *Distributive fairness* and *General trust in government*). For these eight determinants with the exception of *Scenario fairness* and *General trust in government*, the means of the US sample are the highest. Whereas *Scenario fairness* is higher in Japan, *General trust* is higher in the UK this suggests that Japanese consider the scenario itself as fairer with no influence of trust toward government. Alternatively, the UK sample trusts their government more but do not consider the environmental tax to be fair. For congestion pricing, the analysis shows that almost all mean values of the US sample are slightly higher than in the UK sample with the exception of *Infringement on freedom* and *General trust in government* (see Table 3.2). However, the differences are only significant for three measures of *Problem awareness* and *Perceived effectiveness*. The difference in *Perceived effectiveness* is particularly interesting. It suggests that students in New Jersey had fairly high expectations that the proposed Manhattan congestion pricing scheme would be effective. The higher level on the possible effects of climate change on society might be due to the sample composition as the US sample is composed of students attending classes on the environment and thus may have a greater interest in environmental issues. As students did not answer the

questionnaire at the beginning of the course one might also hypothesize that the knowledge gained in the course increased their alertness to the possible effects of climate change. Similar conclusions might be drawn regarding *Self problem awareness*, i.e. students who have taken the course might understand better the possible impact of their own actions. To further understand these relationships it turns to statistical analysis in the next section.

3.4. Analysis

3.4.1. Correlation Analysis

Before considering the more complex path (SEM) analysis, the direct correlation between acceptability and its proposed determinants are shown in Table 3.3 and Table 3.4. In the case of congestion pricing, the determinants for *Fairness*, *Infringement on freedom*, *Perceived effectiveness*, *Self problem awareness* and *Specific trust in government* are all significantly related to acceptability for both the UK and US samples. The highest correlation with acceptability is *Scenario fairness* in both samples. However, there are also some differences between the results for the two samples. In the UK sample *Social problem awareness*, *Personal problem awareness*, *General trust in government* and car ownership are highly significant but not at all in the US sample. The three forms of *Fairness*, *Infringement on freedom* and *Self problem awareness* are also statistically significant for the environmental taxation scenario. Also for this policy the highest correlation between acceptability and any determinant is found to be *Scenario fairness* for all countries, suggesting there are few country-specific differences in the importance of fairness.

Table 3.2(1) Mean and Std.dev. of acceptability and its determinants

Determinants	Congestion Pricing			Environmental Tax					
	Mean and (Std.dev.)		t-test (p-value)	Mean and (Std.dev.)			t-test (p-value)		
	US	UK		US	UK	Japan	US vs.UK	US vs.JP	UK vs.JP
Acceptability	4.92 (1.81)	4.46 (2.14)	-1.49 (0.14)	3.73 (1.88)	3.06 (1.75)	3.22 (1.62)	-2.37 (0.02)	-2.25 (0.03)	0.65 (0.52)
Scenario Fairness	4.40 (1.84)	4.08 (2.10)	-1.02 (0.31)	3.30 (1.84)	2.68 (1.73)	3.49 (1.63)	-2.23 (0.03)	0.82 (0.41)	3.35 (0.00)
Procedural Fairness	4.26 (1.56)	3.93 (1.91)	-1.23 (0.22)	3.85 (1.68)	3.04 (1.65)	3.45 (1.53)	-3.13 (0.00)	-1.93 (0.06)	1.77 (0.08)
Distributive Fairness	4.41 (1.60)	3.97 (1.59)	-1.76 (0.08)	3.58 (3.58)	3.57 (4.63)	2.88 (1.53)	-0.05 (0.96)	-3.25 (0.00)	-3.05 (0.00)
Infringement on Freedom	3.40 (1.76)	3.74 (2.14)	1.13 (0.26)	3.23 (3.23)	3.90 (1.81)	3.58 (1.78)	2.44 (0.02)	1.48 (0.14)	-1.26 (0.21)
Perceived Effectiveness	4.62 (1.67)	3.22 (1.92)	-5.01 (0.00)	4.47 (4.47)	3.32 (1.80)	4.27 (1.52)	-4.27 (0.00)	-0.96 (0.34)	4.04 (0.00)

(bold: significant on 5% level)

Table 3.2(2) Mean and Std.dev. of acceptability and its determinants

Determinants	Congestion Pricing			Environmental Tax					
	Mean and (Std.dev.)		t-test (p-value)	Mean and (Std.dev.)			t-test (p-value)		
	US	UK		US	US	Japan	US vs.UK	US vs.JP	UK vs.JP
Social Problem	6.14	5.32	-4.18	6.14	5.32	5.75	-4.18	-2.74	2.28
Awareness	(0.98)	(1.54)	(0.00)	(0.98)	(1.54)	(1.14)	(0.00)	(0.01)	(0.02)
Self Problem	5.61	4.37	-5.72	5.61	4.37	5.19	-5.72	-2.50	3.74
Awareness	(1.04)	(1.74)	(0.00)	(1.04)	(1.74)	(1.38)	(0.00)	(0.01)	(0.00)
Personal Problem	4.95	3.57	-5.13	4.95	3.57	4.56	-5.13	-1.82	4.07
Awareness	(1.62)	(1.86)	(0.00)	(1.62)	(1.86)	(1.58)	(0.00)	(0.07)	(0.00)
General Trust in	4.03	4.23	0.89	4.03	4.23	2.88	0.89	-6.19	7.26
Government	(1.54)	(1.26)	(0.37)	(1.54)	(1.26)	(1.28)	(0.37)	(0.00)	(0.00)
Specific Trust in	4.11	3.92	-0.80	3.38	3.22	3.34	-0.67	-0.19	0.56
Government	(1.53)	(1.64)	(0.42)	(3.38)	(1.43)	(1.41)	(0.51)	(0.89)	(0.57)

(bold: significant on 5% level)

Table 3.3 Correlation between acceptability of congestion pricing and its determinants

Determinants	UK	US
Scenario Fairness	0.91*	0.82*
Procedural Fairness	0.80*	0.77*
Distributive Fairness	0.42*	0.67*
Infringement on Freedom	-0.74*	-0.41*
Perceived Effectiveness (Climate)	0.56*	0.51*
Social Problem Awareness (Climate)	0.25	0.11
Self Problem Awareness (Climate)	0.36*	0.27*
Personal Problem Awareness (Climate)	0.37*	0.20
General Trust in Government	0.2	0.07
Specific Trust in Government	0.63*	0.66*
Car ownership	-0.42*	0.10
Gender	-0.16	-0.19

(bold*: significant on 1% level, bold: significant on 5% level)

Table 3.4 Correlation between acceptability of environmental taxation scenario and its determinants

Determinants	US	UK	Japan
Scenario Fairness	0.70**	0.73**	0.56**
Procedural Fairness	0.59**	0.66**	0.43**
Distributive Fairness	0.58**	0.28*	0.39**
Infringement on Freedom	-0.44**	-0.45**	-0.32**
General Trust in Government	0.28**	0.14	0.09
Specific Trust in Government	0.59**	0.51	0.61**
Perceived Effectiveness (Climate)	0.43	0.69**	0.36**
Social Problem Awareness (Climate)	0.32**	0.38**	0.22*
Self Problem Awareness (Climate)	0.23*	0.04	0.15
Personal Problem Awareness (Climate)	0.04	0.16	0.13

(bold*: significant on 1% level, bold: significant on 5% level)

3.4.2. SEM Analysis

The standardized coefficients of the SEM analysis for both policies are illustrated in Figures 3.3 to 3.7 for the US and UK and Japan samples respectively. From right to left the determinants of acceptability are ordered in accordance with decreasing proximity to acceptability. On the far right is acceptability itself. Based on previous literature determinants directly related to the pricing schemes are considered to be *Fairness*, *Infringement* and *Perceived effectiveness*. The three determinants related to problem awareness are hypothesized to have an effect on the more scheme specific determinants and hence an indirect as well as direct effect on acceptability. Further, *General trust in government* is a more distal factor compared to *Specific trust*. Car ownership might be influenced by *Problem awareness*, and is hence located in between the *Problem awareness* and prominent factors. The models only include paths from left to right that are significant at the 5% level as well as significant correlations between determinants (thick arrows indicate paths significant within the 5% level; thin two-way arrows indicates correlation; dotted arrows indicate negative path and correlation).

3.5. Result

3.5.1. Results of Congestion pricing

The SEM models for congestion pricing acceptability were estimated for the US and UK samples. The fit for both the US and UK samples is acceptable though the former is better, possibly because of the larger sample size (US: GFI=0.93, Adjusted GFI=0.90, RMSEA=0.03, CFI=0.99; UK: GFI=0.89, Adjusted GFI=0.82,

RMSEA=0.11, CFI=0.91¹).

Figures 3.3 and 3.4 illustrate the central role of *Specific trust in government* with significant paths to all direct determinants of acceptability in both samples. This result regarding the influence of *General trust in government* is less clear. Whereas a significant path can be found in the UK sample, this path is not confirmed in the US sample. In the UK, the national government exercises substantial control over transport policy, although London has substantial autonomy. In the US there are more distinct and varied levels of government (i.e., federal versus state, as well as more autonomous local governments) meaning that a correlation between *General trust* and *Specific trust in government* is more difficult to define. Furthermore, the fact that we asked for trust in a past government that proposed a policy which was not implemented, might be another reason for the lack of statistical significance. Also in London the government has changed since the introduction of congestion pricing, but at least the effects can still be observed meaning that respondents might have a clearer memory of the government. All of this might contribute to the fact that London respondents associate *Government in general* more with the congestion pricing implementing government.²

¹ Goodness-of-Fit-Index (GFI): GFI varies from 0 to 1, but theoretically can yield meaningless negative values. By convention, GFI should be near or greater than 0.9 for the model to be accepted; Root Mean Square Error of Approximation (RMSEA): There is adequate model fit if RMSEA is less than or equal to 0.08.; Comparative Fit Index (CFI) is equal to the discrepancy function adjusted for sample size. CFI ranges from 0 to 1 with a larger value indicating better model fit. Acceptable model fit is indicated by a CFI value of 0.90 or greater.

² Another possible distinction between the US and UK samples is in the understanding of the term “government”. In the UK, this is strongly associated with the party in power that is running the government. In the US, the term “government” is more strongly associated with the structure of power which is designed to balance various party’s that might control different elements of that structure, and thus the term may have a different connotation.

Perceived effectiveness is significantly influenced by *Self problem awareness* in the UK sample, meaning that those who understand that their own behaviour is part of the problem are more likely to understand that effective policies need to be introduced to solve the problem. There is, however, no continuing path from *Perceived effectiveness* to policy acceptability. In the US sample it is instead *Social problem awareness* that has a direct effect on *Perceived effectiveness* and an indirect effect on acceptability. In general the analysis therefore confirms the importance of *Problem awareness* as a factor associated with acceptability. This is particularly noteworthy as *Problem awareness* and *Perceived effectiveness* measures are less directly related to the scheme. Previous studies on acceptability of road pricing all consider awareness of congestion problems and *Perceived effectiveness* to solve congestion problems whereas we ask about problem awareness and perceived effectiveness regarding “global warming”.

Acceptability is further determined by *Scenario fairness*, *Infringement on freedom*, car ownership and *Specific trust in government* in the UK sample, all with the expected sign. In particular *Scenario fairness* has the strongest direct effect on acceptability. This is also the case for the US sample, where the importance of the fairness aspects are highlighted as all three aspects of fairness are found to be significant. The non-significance of car-ownership in the US sample (where 61.3% of sample own a car) might be explained by the greater need to eventually own a car in the US, i.e., there may be little attitudinal difference between car owners and non-car owners in this sample of students. UK car owners (52.8%) are further found to find the congestion pricing less fair and also to trust less in the London government, possibly reflecting the importance of the congestion pricing scheme as a political topic within London over the

last few years. The minus sign for gender to *Specific trust in government* (UK sample) and *Perceived effectiveness* (US sample) indicates that it is more difficult to gain acceptability from women than men for congestion pricing policies in both countries. Furthermore it is found that *Personal problem awareness* affects car ownership in UK sample. However, as it cannot be verified this with US sample this result does not be emphasised but leave it as topic for further research.

3.5.2. Results of Environmental Tax

For environmental tax scenarios acceptable models for all three samples are estimated (US: GFI=0.93, Adjusted GFI=0.86, RMSEA=0.08, CFI=0.95; UK: GFI=0.91, Adjusted GFI=0.85, RMSEA=0.08, CFI=0.94; Japan: GFI=0.93, Adjusted GFI=0.89, RMSEA=0.06, CFI=0.94;). It is found that in general the congestion pricing model and environmental tax scenario models are similar. Also for the environmental tax policy the results illustrate that *Specific trust in government* significantly effects all three forms of fairness, as well as *Infringement on freedom* and *Perceived effectiveness* in all three samples with the expected sign. This demonstrates the importance of trust toward government for acceptability of sustainable policies, extending the results of previous studies. It is also confirmed in the environmental tax model that the relationship between well-established psychological determinants and acceptability is very stable. However, *Procedural fairness* and *Infringement on freedom* are shown to be less important in Japan than in the US and UK samples. From this, it is speculated that “personal freedom” may be a more important concept within Western cultures than in Japan. In the environmental tax models, further it is found that *General trust* is

more significant in all countries. Therefore it is expected that *General trust in government* may be more important for less tangible problems such as climate change. For problems such as congestion, that are experienced in daily life, it seems reasonable to assume that the daily performance of the government is more important whereas for the acceptability of more abstract, long term problems general attitudes might be more important.

Acceptability of the environmental tax is also determined by *Problem awareness*. Specifically, *Social problem awareness* influences acceptability in all countries. *Personal problem awareness* shows significant paths in the US sample whereas *Self problem awareness* is not significant in any country.

3.5.3. General Results

Table 3.5 shows the explained variance (R^2) of estimated five models and its total effects are shown in Table 3.6. The highest R^2 is 0.53 on acceptability of UK for the congestion pricing model. For the other four models the R^2 for acceptability is around 0.3. The results in Table 3.6 confirm the importance of *Specific government trust* and *Scenario fairness* in both policies, in all locations surveyed. This result is noteworthy as it is obtained despite the differences in the samples, the locations and the details of the sustainable policies. As in particular the path *Specific government trust* $\rightarrow$ *Scenario fairness* $\rightarrow$ *Acceptability* is significant in all models the t-tests is used to understand whether there are significant differences in the path determinants (see Table 3.7). Interestingly it is found that the coefficients are statistically significantly different in the congestion pricing scenario addressing local problems but none of the path coefficients is statistically different in the environmental tax scenarios

addressing global warming. Furthermore, the factor loadings are fairly constant across countries when the problem is the same. The level of significance for this path can differ, however, depending on local specific issues and scheme specifics such as the differences in the London and the proposed Manhattan road pricing scheme. Finally, Table 3.6 further shows that *Self problem awareness* does not influence acceptability for both sustainable policies in any of the three countries in sample. This possibly suggests that the importance individual life style decisions have on environmental problems is not sufficiently appreciated.

Table 3.5 Explained variance (R^2)

Determinants	Congestion Pricing		Environmental Tax		
	US	UK	US	UK	Japan
Acceptability	0.32	0.53	0.29	0.29	0.31
Scenario Fairness	0.49	0.21	0.15	0.18	0.31
Procedural Fairness	0.48	0.49	0.18	0.37	0.24
Distributive Fairness	0.18	0.29	0.07	0.15	0.04
Infringement on Freedom	0.21	0.31	0.05	0.10	0.13
Perceived Effectiveness	0.18	0.21	0.07	0.19	0.20
Specific Trust in Government	-	0.37	0.10	0.13	0.04
Car Ownership	-	0.02	-	-	-

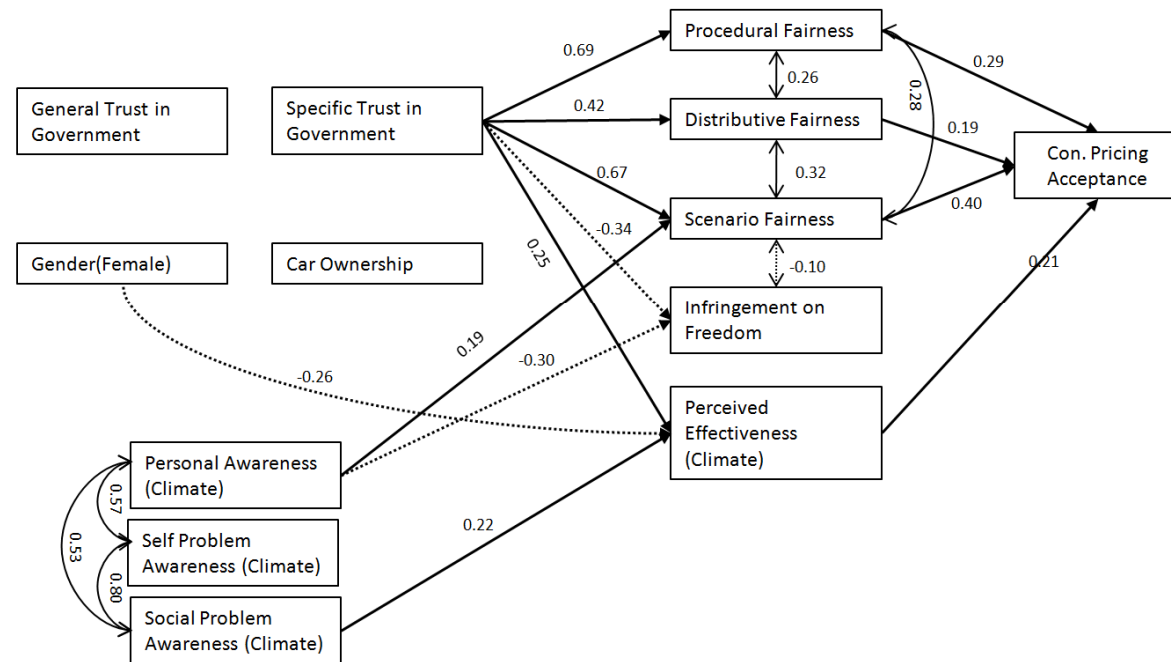


Figure 3.3 SEM analysis results of US sample for congestion pricing ($n=93$)

(Thick arrows: paths significant within the 5% level; Thin two-way arrows: correlation; Dotted arrows: negative path and correlation)

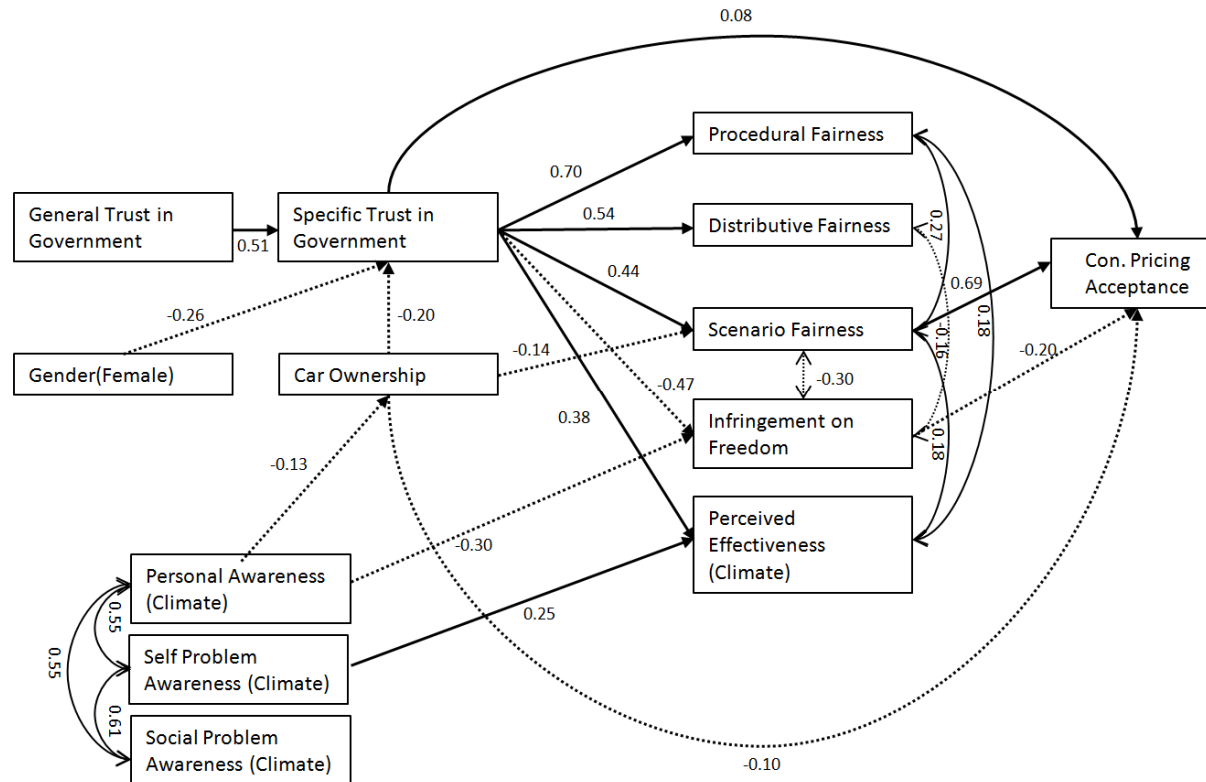


Figure 3.4 SEM analysis results of UK sample for congestion pricing ($n=72$)

(Thick arrows: paths significant within the 5% level; Thin two-way arrows: correlation; Dotted arrows: negative path and correlation)

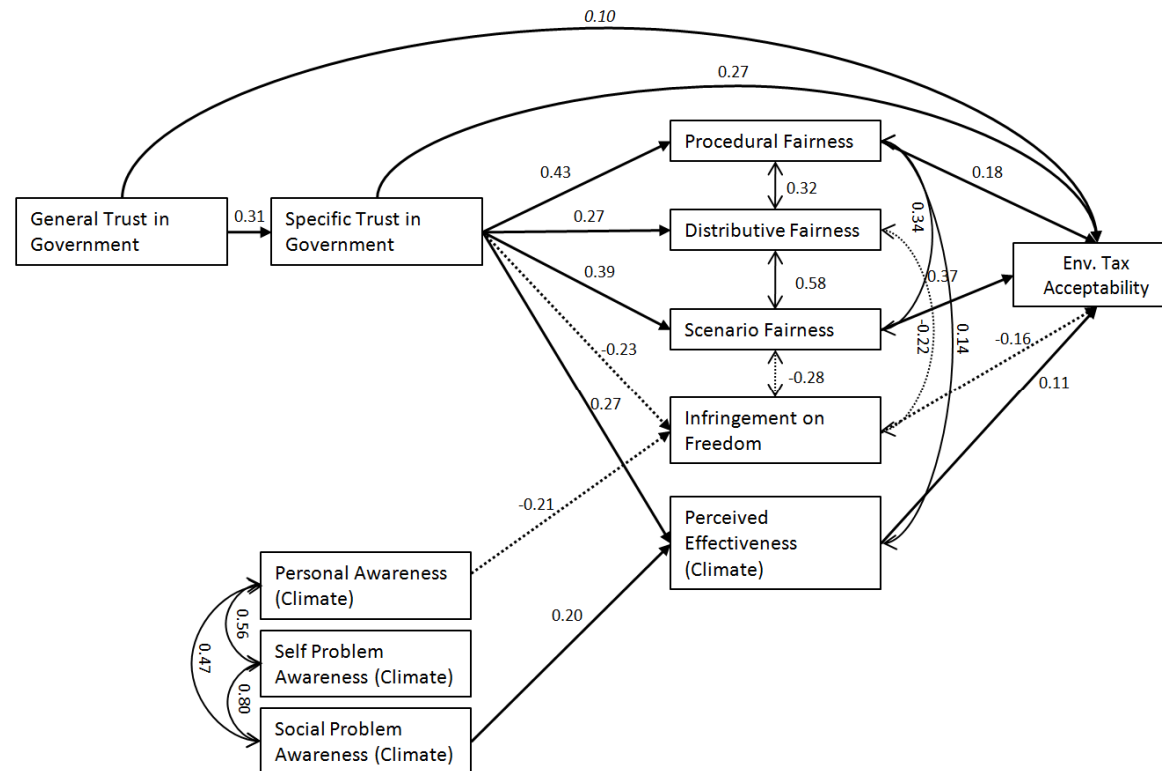


Figure 3.5 SEM analysis results of US sample for env. tax ($n=93$)

(Thick arrows: paths significant within the 5% level; Thin two-way arrows: correlation; Dotted arrows: negative path and correlation)

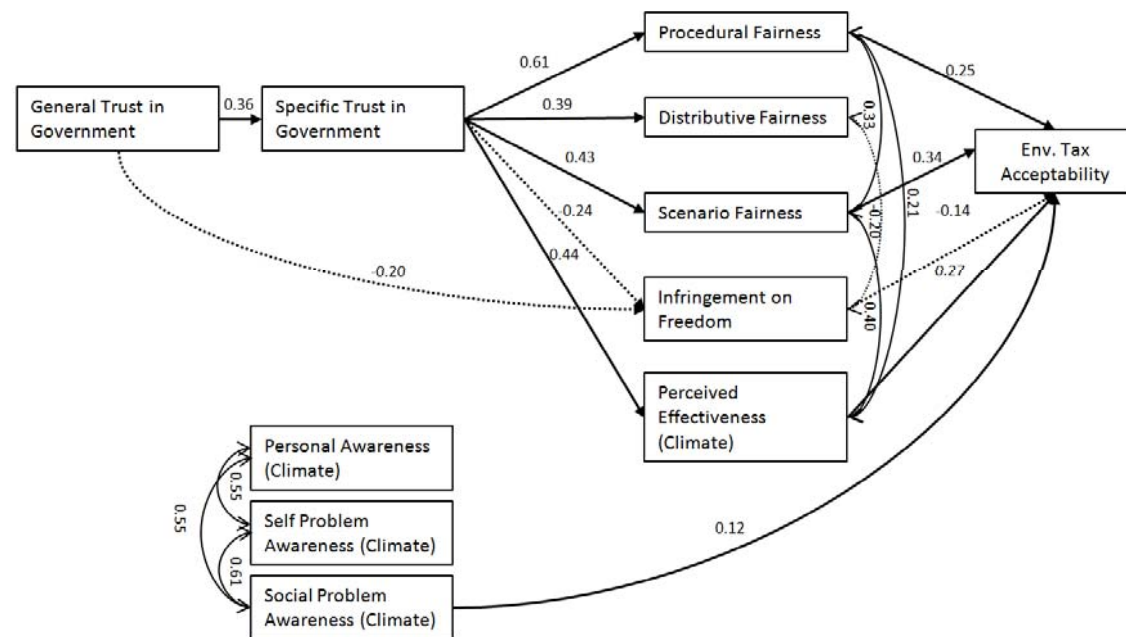


Figure 3.6 SEM analysis results of UK sample for env. tax (n=72)

(Thick arrows: paths significant within the 5% level; Thin two-way arrows: correlation; Dotted arrows: negative path and correlation)

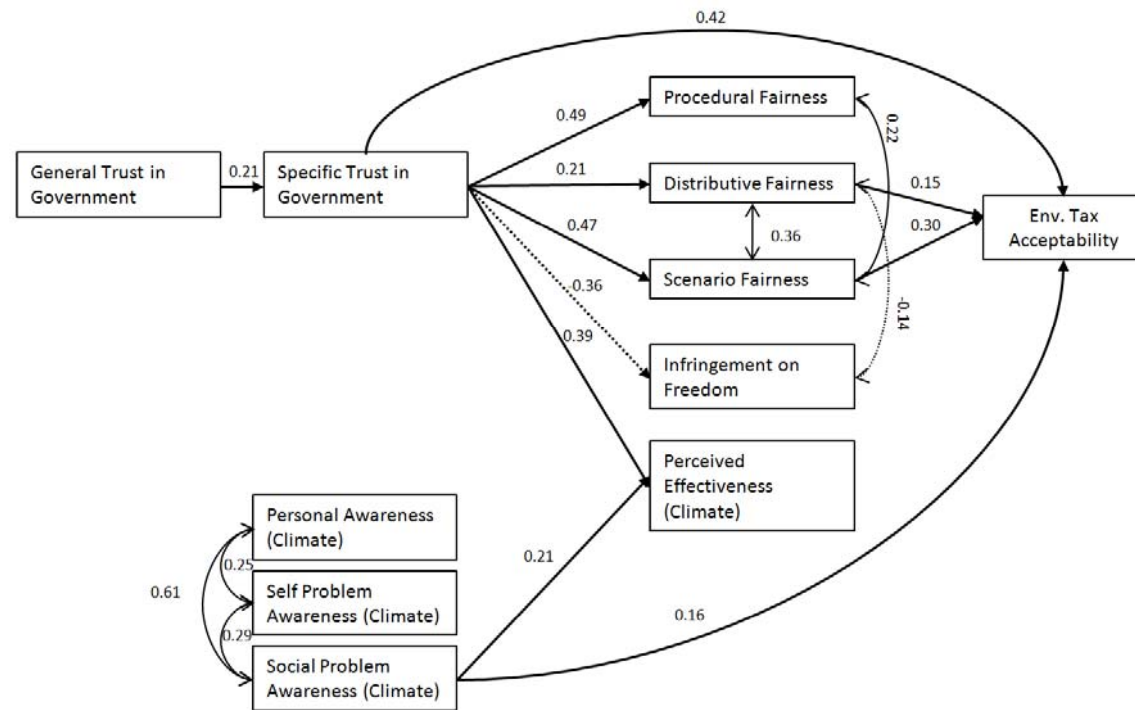


Figure 3.7 SEM analysis results of Japan sample for env. tax (n=139)

(Thick arrows: paths significant within the 5% level; Thin two-way arrows: correlation; Dotted arrows: negative path and correlation)

Table 3.6 Total effects (Indirect effect) of determinants on acceptability

Determinants	Congestion Pricing		Environmental Tax		
	US	UK	US	UK	JP
Scenario Fairness	0.40 (0.00)	0.69 (0.00)	0.37 (0.00)	0.34 (0.00)	0.30 (0.00)
Procedural Fairness	0.29 (0.00)	-	0.18 (0.00)	0.25 (0.00)	-
Distributive Fairness	0.19 (0.00)	-	-	-	0.15 (0.00)
Infringement on Freedom	-	-0.40 (-0.21)	-0.16 (0.00)	-0.14 (0.00)	-
Perceived Effectiveness	0.21 (0.00)	-	0.11 (0.00)	0.27 (0.00)	-
Social Problem Awareness	0.05 (0.05)	-	0.02 (0.02)	0.12 (0.00)	0.16 (0.00)
Self Problem Awareness	-	-	-	-	-
Personal Problem Awareness	0.08 (0.08)	0.16 (0.16)	0.03 (0.03)	-	-
General Trust in Government	-	0.29 (0.29)	0.27 (0.17)	0.20 (0.20)	0.12 (0.12)
Specific Trust in Government	0.60 (0.60)	0.57 (0.49)	0.56 (0.28)	0.46 (0.46)	0.59 (0.17)
Car Ownership	-	-0.32 (-0.21)			

Table 3.7 t-test results for significantly different between estimated coefficients

Congestion Pricing		Environmental Tax			
Path	p value for t-statistics (%)	Path	p value for t-statistics (%)		
	US vs. UK		US vs. UK	US vs. JP	UK vs. JP
Specific Trust in Government → Scenario Fairness	0.47	General Trust in Government → Specific Trust in Government	62.87	39.47	18.24
Scenario Fairness → Acceptability	0.02	Specific Trust in Government → Scenario Fairness	65.51	23.20	46.01
-	-	Scenario Fairness → Acceptability	76.15	46.31	64.79

3.6. Discussion

Gaining acceptability for road pricing is often difficult and certainly depends in many cases on the specifics of the proposed scheme. This is confirmed with this study which emphasizes the importance of determinants such as *Perceived fairness* (distributive, procedural, scenario), *Perceived infringement of freedom* and *Perceived effectiveness*. In addition to these scheme-specific factors there seem to also be a number of more general or distal factors that determine acceptability. It is shown that *Perceived effectiveness* and *Problem awareness* might not necessarily have to be determined by scheme-specific aspects but can also relate to a more general awareness of environmental issues. Further it can be stated that the most influential factor in all locations for both sustainable policies is *Scenario fairness*. *Fairness* in turn is influenced the most by *Specific trust in government* also in all locations and for both sustainable policies. Therefore, regardless of the sample, it is concluded that those who trust the governmental implementer of the sustainable policy tend to perceive the scheme is fair, and those who perceive it is fair tend to accept it. The results of this study therefore highlight that the public's trust in its government (and those running the government) is crucial to obtain acceptability. The results are very stable across three countries for both policies. How this trust can be gained will depend in turn on a number of factors, in particular UK results suggest partly through a general belief that governments should be obeyed. According to Schmöcker et al. (2012) such a general trust might be encouraged by aiming to uphold values that avoid beliefs that all judgments are up to a public's own preferences. Since the path for *Specific trust in government* → *Scenario fairness* → *Acceptability* is of such importance we suggest that giving enough information about

the policy's effect on the wider population is an effective strategy.

Drawing further firm conclusions from this study is partly hindered by the different sample compositions. In the UK and Japan civil engineering students were surveyed while in the US there was a mix of different disciplinary backgrounds. As the results indicated that the role of *Social problem awareness* is important in the US sample it is tentatively suggested that there is an influence of knowledge about "climate change" on student attitudes toward environmental problems and transportation policy. An alternative explanation relates to different attitudes of engineering students versus those students who select other disciplines. Duff et al. (1982) reported that social science students were more anti-industrial in their social values than students of engineering and accordingly also preferred non-industrial jobs. Similarly, the results also show that US students are more aware of the environmental problems and are more aware of the correlation between environmental issues, car usage and perceived effectiveness of congestion pricing. However, the US students who took the class surveyed had self-selected to take the class, therefore they might have been more interested in environmental issues prior to taking the class and this would affect their attitudes. Nevertheless, independent of the causal relationship (environmental interest → social problem awareness or vice versa), the results might be important as those students studying civil engineering, who show lower social problem awareness, are more likely to end up in policy making positions such as transportation professionals, and will need to be fully aware of environmental impacts. It is further stressed again that despite the differences in sample composition not only regarding country of origin but also regarding students' interests, the results regarding *Specific trust* and *Scenario fairness* are stable.

Therefore this study has some important implications,

highlighting the importance of more general education and trust in institutions to be considered by decision makers in order to introduce sustainable policies. Even if the scheme specifics have been determined carefully a scheme might not gain much support if citizens do not trust their government or are not aware of wider environmental social problems. Effective public consultation and communication strategies are probably needed to both educate the public, but also to formulate policies that take their concerns into account.

In future work it would be preferable to survey the general populace. Other distal determinants that might have significant effects on acceptability, for example personality determinants such as *Arrogance* and “autistic tendency” should also be considered. Hatori and Fujii (2008) proposed a measure of these factors that can explain a person’s willingness to co-operate in social dilemmas. It is also expected distal determinants can explain a person’s political bias, for instance “utilitarian” and “libertarianism”, which in turn could affect public acceptability towards sustainable transportation policies, in particular if proposed by a government close to one’s political preference (Hårsman and Quingley, 2010). Finally further work should examine whether there is a correlation between level of acceptability and reductions in car usage.

Chapter 4

4. Arrogance and Policy Acceptability*

4.1. Introduction

Social dilemmas result from situations in which a group shares a common output and in which each individual must decide to contribute or not. Pollution, depletion of natural resources, and intergroup conflict, can be characterized as examples of urgent social dilemmas. Dawes (1980) reviewed the social dilemma literature and concluded that people can cooperate even when no coercive authority is present and attributed cooperative behavior to utilities which are distinct from material payoff. In other words, people stressed the role of utilities associated with altruism, norms, and conscience in eliciting cooperative behavior. Actions like “people voluntarily save energy”, “buy environmental friendly goods”, “visit the polls to vote”, and “use

* Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii (2012) Influence of Arrogance on Acceptance of TDM Policy. *Journal of Human Environmental Studies*, 10(2), pp.71-77.

public transportation” are typical examples of cooperative behavior that can be found in the real world. And cooperative behavior has become a major issue in this day suffered by resource depletion, pollution, and overpopulation. In the same way, people today face more frequent choices between cooperation or not. The mass man is a concept proposed by the Spanish philosopher Jose Ortega y Gasset and also he studied a type of human known as the mass man that had emerged during the modern era. In his article “the Rebellion of the Masses”, he discussed *Arrogance* personality can be one traits of mass man. Moreover he noted that the mass man acts directly, outside the law, imposing its aspirations and its desires by means of material pressure and such personality can be described as indicative of “vulgarity”. From above literature, it can be hypothesized that people who have the arrogant traits of the mass man are more likely to show non-cooperative behavior compared with others. Therefore in this study, acceptability of sustainable policies, as a type of social dilemma, is measured and it is hypothesized that a person who has a vulgar personality specially *Arrogance*, shows defection behavior in the form of lower acceptability.

4.2. Considered Determinants

4.2.1. Related Determinants

In here, the study in Chapter 3 is extended with the same data, therefore in the following the questions that were designed to measure acceptability of “environmental taxation scenario” and its influence on psychological determinants (see Table 3.1 and scenario description in Figure 3.1) are referred to. As a reminder, these ten determinants of acceptability of hypothetical environmental taxation scenario are:

Scenario fairness, Procedural fairness, Distributive fairness, Infringement in freedom, Perceived effectiveness, Social problem awareness, Self problem awareness, Personal problem awareness, and Specific and General trust in government.

4.2.2. Determinant of Belief in Absolute

Based on psychological determinants mentioned in above, *Belief in Absolute* is considered as extended factor. This includes one's religious belief and cultural background, and perception of "god" and "absolute" which are generally seen as superior. Schmöcker et al. (2012) hypothesized government also can be seen as superior and they demonstrated Belief in Absolute is connected to *Trust in government* as deeper determinants of policy acceptability across the culture. In this chapter it is verified whether a vulgar disposition is influenced by one's cultural background through using the determinant of *Belief in absolute*. The questions shown in Table 4.1 were asked on a 7 point Likert scale with verbally defined endpoints and midpoints. Also Cronbach's alpha reliability analysis is carried out and its result is 0.595. This is not a fully satisfactory result but generally acceptable level.

4.2.3. Arrogance in Mass Man

The term "mass man" was first proposed by Jose Ortega y Gasset (1883-1955) in 1932. According to Ortega's article "the Revolt of the Masses", this human trait was also mentioned as "indocility". Hatori et al. (2008) noted these as "contumelious" tendencies and he summarized features of the trait based on Ortega's article in his study. He noted that the mass man believes that his own opinion, whatever it is, should be accepted over those of others. As a consequence, the

mass man exhibits intolerance for others with different opinions and tastes and is particularly disdainful of superior persons who are very different from himself: “the mass man crushes beneath it everything that is different, everything that is excellent, individual, qualified, and select. Anybody who is not like everybody, who does not think like everybody, runs the risk of being eliminated” (Ortega, 1932, pp. 18-19). Moreover he also argued that Ortega discussed that mass men cut themselves off from outside world. As a result they avoid assuming any responsibility: “the mass man is scarcely conscious to himself of any obligations.” (Ortega, 1932, pp. 112; Hatori et al., 2008). Furthermore, Ortega mentioned that mass men act directly, outside the law, imposing their aspirations and desires by means of material pressure. Hatori et al. (2008) interpreted this as they abolish the old standards and establish their own tastes and desires in society. In above, such personality of mass man was described as indicative of “vulgarity” by Ortega and it used in study of Hatori et al. (2008). Therefore in this study, it is also used to describe the trait of mass man and mentions this as *Arrogance*.

As shown in Table 4.2, there are questions to measure the vulgarity trait, specially *Arrogance*, of mass man. To divide some groups from respondents by tendency of their personalities, the questions are used that were suggested by Hatori et al. (2008) who developed a mass man scale based on Ortega’s “the Revolt of the Masses” to measure the defective aspect of *Arrogance* that was associated with masses. They independently extracted sentences describing characteristics of the masses from the article and listed all statements then converted these statements into questions. It was the process to promote understanding of respondents because the article was written in a literary style. Actually They came up with 12 questions for *Arrogance* but in analysis 4 questions are only used to

measure according to the results of a Cronbach's alpha analysis. The original descriptions of Ortega's article for 4 questions used in this study are presented. All questions were asked on a 7 point Likert scale. Ratings were obtained on this 7 point numerical scale with verbally defined endpoints and midpoints ("Totally disagree" – "Neutral" – "Fully agree"). A Cronbach's alpha reliability analysis was carried out with showing acceptable value as 0.739.

Table 4.1 Questions for belief in absolute

Belief in Absolute	I think there is an objective truth in the world.
	I think there is an "authentic beauty" (in society and nature which is true for all nations and all times.
	I think there is "true justice" which is true for all nations and all times.

Table 4.2 Questions for arrogance attitudes

Arrogance	I think my opinion is always right.
	I feel that I will win all the time.
	I am sure my preference should be reflected by society.
	In any case, I should believe in me and should not listen to others' opinion.

7 point Likert scale: 1= "Not at all", 4= "Neutral", 7="Yes, strongly agree"

4.3. Cluster Analysis

4.3.1. Results of Cluster

For understanding the correlation between *Arrogance* as vulgarity trait of mass man and policy acceptability better, the data are split into groups through two-step cluster analysis³ by level of *Arrogance*. To determine the proper number of clusters using SPSS and through BIC⁴ values are used (Table 4.3). It appears appropriate to check the optimal number of clusters. The results showed that as the number of clusters increases, BIC value increased, except in the case of two clusters, when the BIC value decreased. A comparison of BIC values indicated that 2-clusters could be identified for psychological characteristics of each clusters, therefore 2 is regarded as optimal number of clusters. As shown in Table 4.4, the sample size is 236 and 71 in both clusters respectively which equates to 76.9% and 23.1% of the samples. Note that this unequal balance in cluster size does not

³ The two-step cluster analysis developed by Chiu et al. (2001) has been specifically designed to handle this problem. Like k-means, the procedure can also effectively cope with very large datasets. The name two-step clustering is already an indication that the algorithm is based on a two-stage approach: In the first stage, the algorithm undertakes a procedure that is very similar to the k-means algorithm. Based on these results, the two-step procedure conducts a modified hierarchical agglomerative clustering procedure that combines the objects sequentially to form homogenous clusters.

⁴ Roeder et al. (1999) and Greene and Hensher (2003) suggested using Bayesian Information Criteria (BIC). One advantage of the BIC over traditional hypothesis testing is that it has good properties under conditions of weaker regularity compared with the likelihood ratio test (Roeder et al., 1999). Keribin (1998) demonstrated that under certain conditions, the BIC consistently determines the right number of components in the mixture model (Lee and Timmermance, 2007). Therefore, in this paper, determination of the appropriate number of cluster is based on BIC. The formulas are:

$$BIC = -2LL + \frac{\ln N}{K},$$

where $-2LL$ is the value of the log-likelihood function at convergence, $\ln N$ is the number of parameters in the model, and K is the total sample size (Wen and Lai, 2010).

matter if each cluster's characteristic can be shown clearly.

Table 4.3 Result of two-step cluster analysis

Number of Cluster	BIC	Decrement in BIC
1 cluster	4557.056	
2 clusters	4408.554	-148.502
3 clusters	4445.317	36.763
4 clusters	4517.888	72.571
5 clusters	4626.527	108.639
6 clusters	4784.585	158.057
7 clusters	4942.702	158.117

Table 4.4 Number of samples in each cluster

Cluster	Number of Sample	Composition %
1	189	61.6%
2	118	38.4%
Total	307	100.0%

4.3.2. Compositions of Cluster

From the grouped two clusters, the average age of respondents is similar at 21.52 years (std. 2.89) in the Cluster 1, and 21.63 years (std. 3.48) in Cluster 2. The proportion of males is 80.4% in Cluster 1 and 72.0% in Cluster 2. For having drive licence and car ownership proportion, 82.0%, 33.33% in Cluster 1 and 87.29%, 42.37% in Cluster 2. In these social factors, actually remarkable differences could not be found between clusters. When the compositions of each countries to clusters are checked, it is shown that

almost all US and Japan samples belong to Cluster 1 (66.67%, 69.78%) and over of half of the UK samples belong to Cluster 2 (61.11%). Besides it is also shown that about half the size of Cluster 1 are Japanese samples while there are similar proportions of data from three countries in case of Cluster 2.

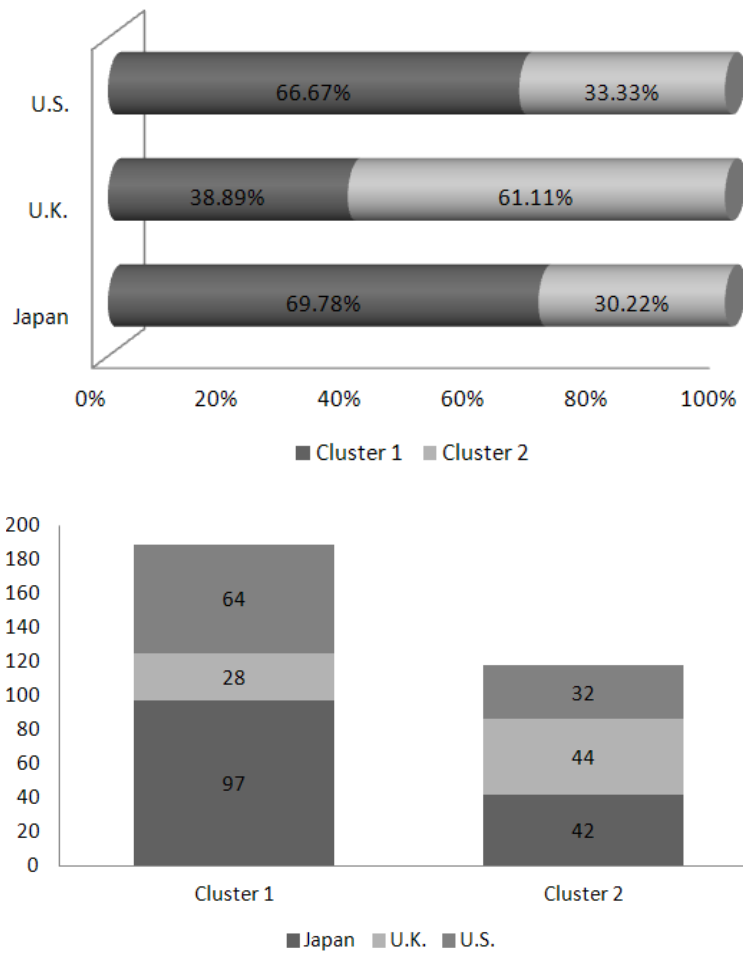


Figure 4.1 Statistical composition of data

4.3.3. Definitions of Cluster

Considering Table 4.5, the meaning is interpreted from result number of mean and t-test. There are significant differences in *Arrogance* between clusters. Therefore it is possible to regard that two clusters have difference features in *Arrogance* trait.

Therefore the two clusters could be defined and these are tagged using the remarkable feature is shown in *Arrogance*. Since Cluster 2 is significantly higher value than Cluster 1, Cluster 2 is considered as arrogant people regarding literature reviews. Moreover the Cluster 1 is considered as relative non- arrogant people.

Table 4.5 Mean and std.dev. of arrogance

Vulgarity Traits of Mass Man	Mean (Std.dev.)		t-test (p-value)
	Cluster 1	Cluster 2	
Arrogance	2.65 (1.06)	3.01 (1.28)	-2.691 (0.008)

4.4. Analysis for Acceptability

4.4.1. Summary Statistics

The mean values are compared for the acceptability and determinants in Table 4.6. For the environmental taxation scenario, the Cluster 1 tends to have larger mean values significantly (within 99%) compared to the Cluster 2 (*Infringement on freedom* is reverse item). However, *General trust in government* determinant did not show significant differences between the two. It means two clusters have similar trust and respects toward their government (Its questions are “I

respect the government.” and “In general I trust the government.”). From this result, it can be considered that *General trust* is not influenced by vulgarity trait such as *Arrogance*.

Also Figure 4.2 shows the results of Table 4.6 as diagram. In the same way, it is shown that there are the higher values of Cluster 1 than Cluster 2 in diagrams. This means that those in Cluster 1 have a higher acceptability and understand about *Fairness* of environmental taxation scenarios, *Perceive its effectiveness*, show high level of *Trust* to their government action related to transportation policy with recognizing the environmental problems like global warming or climate change. Since Cluster 1 was defined as non-arrogant people in previous session, it can be written as non-arrogant people show high acceptability of policy with positive attitudes to related psychological determinants. These results coincide with the hypothesis “arrogant people show defection behaviour to accept the policy”.

Moreover the results in *Infringement in freedom*, and its reverse pattern means that *mass man*, who have arrogant tendency, usually are sensitive to violation of their freedom and it is one of hindrance to policy acceptability. Besides through the differences of *Perceived effectiveness*, all of *Awareness* determinants, it can be re-confirmed that arrogant attitude of mass man: Ortega (1932) noted *mass man* establish their own taste in society. And from the difference results of three *Fairness*, mass man does not have positive views toward *Fairness* of policy and it means a lack of morality in mass man: Ortega (1932) suggested the masses lack morality by at the center of mass man’s scheme of life there is precisely the aspiration to live without conforming to any moral code.

Table 4.6 Mean and std.dev. of acceptability and its determinants

Determinants	Mean and (Std.dev.)		t-test (p-value)	difference (A-B)
	Cluster 1 (A)	Cluster 2 (B)		
Acceptability	4.14 (1.62)	2.08 (1.05)	12.24 (0.00)	2.06
Scenario Fairness	3.89 (1.64)	2.19 (1.35)	9.24 (0.00)	1.70
Procedure Fairness	4.15 (1.41)	2.42 (1.40)	10.45 (0.00)	1.73
Distribution Fairness	3.70 (1.61)	2.52 (1.50)	6.39 (0.00)	1.18
Infringement on Freedom	2.97 (1.59)	4.42 (1.73)	-7.51 (0.00)	-1.45
Perceived Effectiveness	4.84 (1.29)	2.89 (1.56)	11.81 (0.00)	1.95
Social Awareness	6.08 (0.92)	5.25 (1.48)	6.09 (0.00)	0.83
Self Awareness	5.46 (1.20)	4.60 (1.65)	5.33 (0.00)	0.86
Personal Awareness	4.81 (1.68)	3.86 (1.68)	4.79 (0.00)	0.95
Specific Trust	3.85 (1.33)	2.47 (1.17)	9.19 (0.00)	1.38
General Trust	3.57 (1.45)	3.54 (1.56)	0.15 (0.88)	0.03
Absolute in Belief	4.69 (1.18)	4.17 (1.17)	3.77 (0.00)	0.52

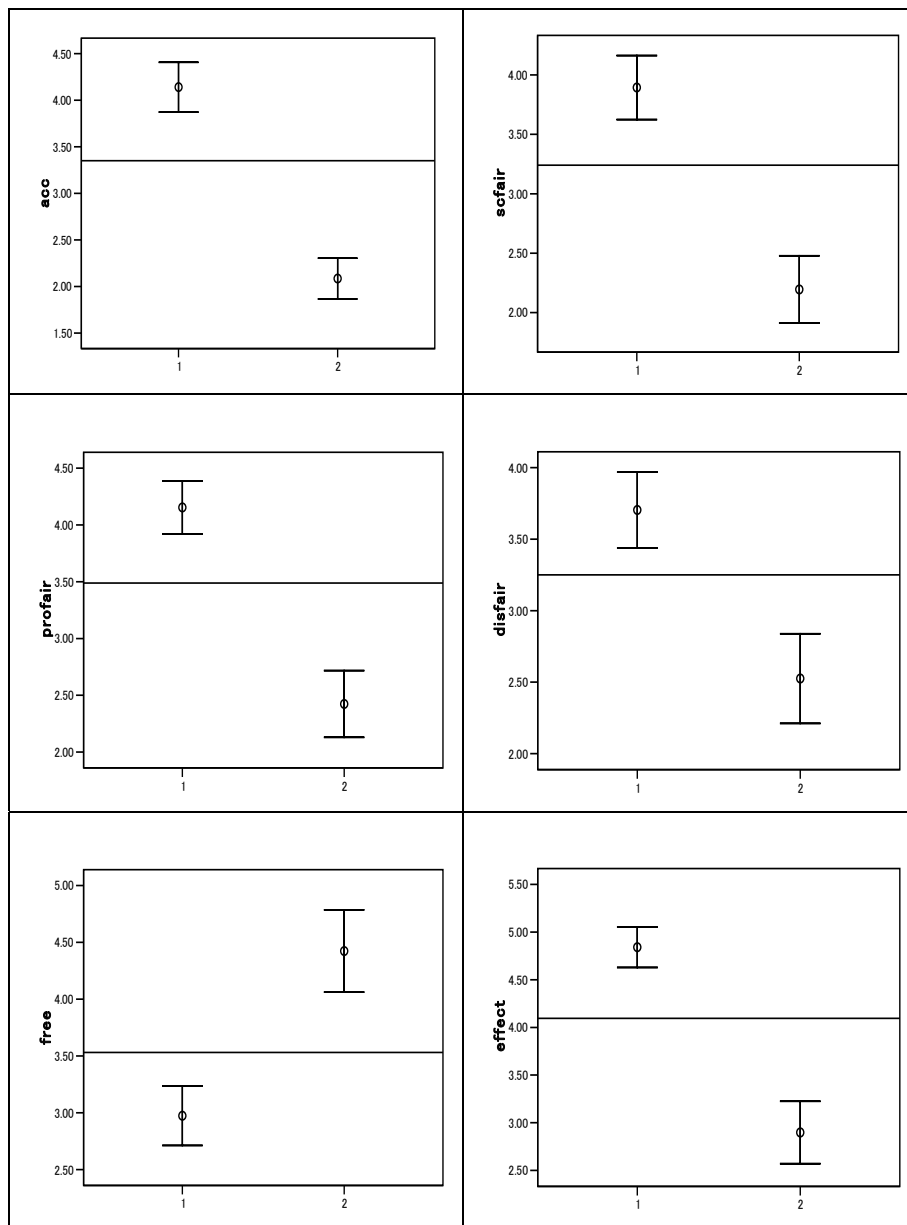


Figure 4.2(1) Mean of acceptability and its determinants by clusters
(vertical axis; determinants, horizontal axis; cluster 1 and 2)

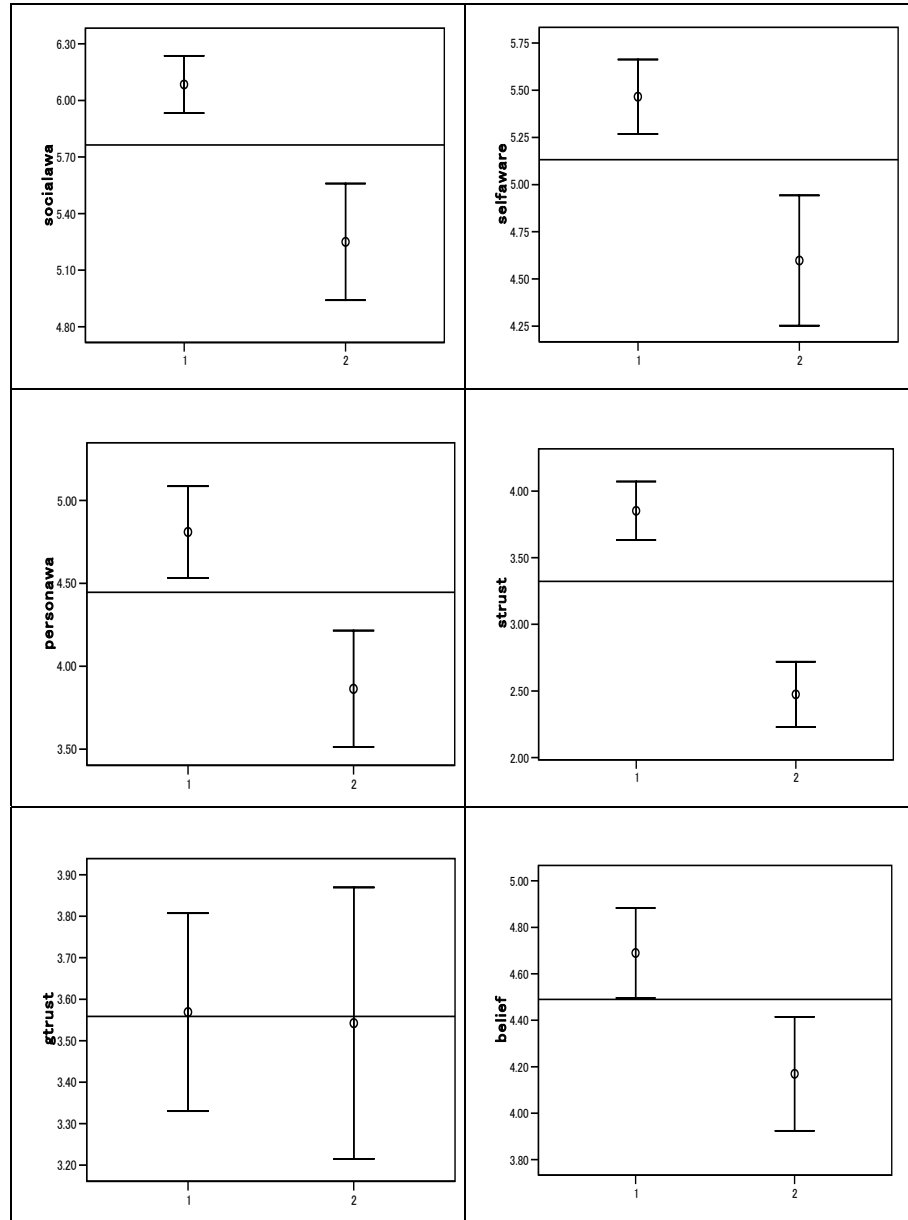


Figure 4.2(2) Mean of acceptability and its determinants by clusters
(vertical axis; determinants, horizontal axis; cluster 1 and 2)

4.4.2. Correlation Analysis

The direct correlation between acceptability and its proposed determinants are shown in Table 4.7. Through this session, it is tried to verify what psychological determinants effect on high acceptability of Cluster 1, low acceptability of Cluster 2. In the determinants for three of *Fairness*, *Infringement on freedom*, *Perceived effectiveness*, and *Social awareness* are all significantly related to acceptability in both clusters. It means these psychological determinants affect on acceptability regardless of vulgarity trait.

However *Self awareness* for environmental problem has correlations only in Cluster 1, non-arrogant people. Besides there are significant correlations to policy acceptability in *Personal awareness*, two of *Trust in government*, and *Absolute in belief* in case of Cluster 2, arrogant people. It means non-arrogant people shows that they decide to accept from self recognition about environmental problem trough questions to themselves like “do you think the CO₂ that you produce in your daily life will contribute to climate change and this will negatively influence society?”, while arrogant people considers their daily life with isolations. In other words, *Personal problem awareness*, which can be measure by “do you think global warming will serious damage yourself?”, is used as one of judgment tool to arrogant people to decide accepting or not, and it can be considered it is based on their sense of hubris and self-sufficiency.

4.4.3. Regression Model

Additional regression analysis with the determinants as explanatory variables shows that the model is acceptable with $R^2=0.73$, $R^2=0.85$ as shown in Table 4.8. *Scenario fairness*, *Procedure fairness*, *Specific trust in government* and *Perceived effectiveness* are common

significant variables in both cluster. However *Distribution fairness* and *Social awareness* are significant only in case of Cluster 1, non-arrogant people. Also *Infringement on freedom* and *General trust in government* are shown as meaningful explanatory variables in the model of Cluster 2, arrogant people.

Table 4.7 Correlation between acceptability and its determinants
(bold**:1%, bold *:5%)

Determinants	Cluster 1	Cluster 2
Scenario Fairness	0.609**	0.689**
Procedure Fairness	0.482**	0.643**
Distribution Fairness	0.443**	0.416**
Infringement on Freedom	-0.271**	-0.576**
Perceived Effectiveness	0.547**	0.622**
Social Awareness	0.395*	0.569**
Self Awareness	0.178*	0.138
Personal Awareness	0.008	0.233*
Specific Trust in Government	0.074	0.409**
General Trust in Government	0.134	0.242**
Absolute in Belief	0.016	0.294**

Table 4.8 Estimated regression models for acceptability (**:1%, *:5%)

Independent Variables	Cluster 1			Cluster 2		
	β	t-value	p-value	β	t-value	p-value
constant	-0.348	-1.122	0.263	-0.018	-0.035	0.972
Scenario Fairness	0.331**	5.420	0.000	0.310**	4.190	0.000
Procedure Fairness	0.136*	2.065	0.040	0.210**	2.791	0.006
Distribution Fairness	0.161**	2.714	0.007	.		
Infringement on Freedom	.			-0.216**	-3.796	0.000
Perceived Effectiveness	0.342**	4.736	0.000	0.242**	3.105	0.002
Social Awareness	0.130*	2.115	0.036	.		
Self Awareness	.			.		
Personal Awareness	.			.		
Specific Trust in Government	0.352**	5.516	0.000	0.190**	3.943	0.000
General Trust in Government	.			0.193**	2.999	0.003
Absolute in Belief	.			.		
R ²	0.732			0.847		
adj R ²	0.535			0.717		

4.5. Discussion

In this study, through the cluster analysis and some statistical approach, it was demonstrated that mass man has attitudes of defect to accept the environmental taxation scenario because of one's personalities such as lack of feeling of trust in authorities, willingness to voluntarily, accept the authority's decisions, and feeling of obligation to follow rules that authorities implement. Besides it is also shown low acceptable attitudes to psychological aspects which effect on acceptability of policy.

First of all, it is used the personality of "indocility is one of vulgarity traits" based on Ortega's study, although these were stated as terms of *Arrogance* in here, to clarify masses in public. And the result of cluster analysis show that *Arrogance* can be a major vulgarity trait to explain special case of social dilemmas that mass man who is hypothesized as they do not show high acceptability toward environmental policy based on a lack of feeling is *Fairness* aspects and *Social awareness* of environmental problems like global warming or climate change.

Moreover, this is reconfirmed with analysis and previous studies which emphasizes the importance of determinants such as *Fairness* (distributive, procedural, scenario), *Infringement of freedom*, *Perceived effectiveness* and *Social awareness*. These are verified as common psychological determinants influence on acceptability irrespective of arrogant people or not. The results of the analysis highlight that there are different determinants which influence on acceptability depending their traits. Cluster 1, the group far away from an attitude of superiority show the tendency they consider *Self awareness* is closely connected with acceptability. While *Personal awareness* which is determinant closer to selfish was considered by

Cluster 2, tag as arrogant people in here, to decide acceptability of environmental tax scenario or not.

These findings show that sustainable policies also can be regarded as a social dilemma and cooperation or defection, in the form of acceptability or rejection, are influenced by the public's *Arrogance*. Therefore, it can be suggested some early education for student to prevent having arrogant attitudes for sustainable transport policy. Moreover this study poses a question to government; how to deal with the vulgarity traits of masses to promote sustainable transport policy effectively. From the results, it can be suggested that government should contemplate the way to deal the arrogant people, who can disobey against policy, to increase effects of new sustainable transport policy before its introduction. In other words, when the government introduces new policy through some campaigns, they can consider the features of arrogant people. For example, generally arrogant people want to be held in respect with politely words. Therefore politely asking can encourage them to follow in campaigns s through putting one small sentence such as “would you feel concerned about global warming seriously?”. There might be other good ways to deal with arrogant people to accept sustainable policies and it is a matter for more consideration in future work.

Chapter 5

5. Personality Traits and Policy Acceptability*

5.1. Introduction

It is also important to understand whether individuals' personality can explain differences in acceptability of transport pricing. It is hypothesized that personality traits are related to acceptability, primarily via *Problem awareness* and *Personal norm* as determinants of environmental concern. If it is verified that there is a correlation between personality, environmental concern, and acceptability of transport pricing, it might be necessary to design different appeals to different population segments for increasing their acceptability of transport pricing. The same environmental taxation scenario as in previous chapters to allow better comparability of results concerning the role of government trust for acceptability. As a measure of

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personality traits the Big-Five personality scale is chosen that has been found to be universally applicable (McCrae and Allik, 2002). Differences between population groups and regions have still been found, suggesting that it is possible to characterize groups with this scale. Moreover, due to a worldwide interest in the scale (and the underlying Five-Factor model of personality), numerous translations exist and the scale is known to a wide audience.

The remainder of the chapter is organized as follows. The next section reviews the research that shows a correlation between personality traits and environmental concern. Specific hypotheses are proposed regarding the role of personality traits for environmental taxation acceptability. In the third section then it is described the survey method and questionnaire with which it was measured the personality traits, environmental concern, and acceptability. In the fourth section it presents correlations between measured variables before conducting a path analysis to assess the direct and indirect effects of personality traits and proximal determinants of acceptability. The fifth section discusses the findings, and the sixth section discusses the implications for transport policies.

5.2. Determinant of Personality Traits

5.2.1. *Personality Traits*

Allport (1937) argued that individuals vary in different personality traits defining “what a man [or woman] really is”. Although scholars differ in their views on personality traits, they all agree that they reflect a person’s behavioral characteristics, thought patterns, and emotional expressions. All of these can be used to distinguish the person from others (Tsao and Chang, 2010). To assess

personality traits, several scales have been proposed. An early one is the sensation-seeking scale (SSS), first developed by Zuckerman et al. (1964). It has the four factors Thrill and Adventure seeking (TAS), Experience (ES), Disinhibition (Dis), and Boredom susceptibility (BS). SSS has been used for decades, for example “SSS form V” introduced in 1978 has continued to be the version used in most studies.

In contrast, Eysenck and Eysenck (1975) and Eysenck et al. (1985) developed questionnaires measuring the three factors *Extraversion*, *Neuroticism*, and *Psychoticism*. Partly as a result of these various efforts, the Big-Five personality-trait theory is currently the most widely adopted (Costa and McCrae, 1986). The method of measuring the “big-five” is referred to as the Big-Five personality scale. It is seen as a compromise between the aforementioned scales. Alternative scales are found to be either too complex or too limited in scope.

5.2.2. Big-Five Personality Scale

The Big-Five personality scale consists of the subscales *Neuroticism*, *Extraversion*, *Openness to experience*, *Agreeableness*, and *Conscientiousness*. Evidence for the validity of these specific factors has been growing over the past 50 years, beginning with the research of Fiske (1949) and later expanded upon by other researchers including Norman (1967), Smith (1967), Goldberg (1981), and McCrae and Costa (1987).

Neuroticism includes lower-level traits such as depression, anxiety, anger, and insecurity, and can be defined as the number and intensity of stimuli needed to spur a person’s negative emotions. The more neurotic a person is, the harder it is for the person to control his or her emotions, the more likely the person purchases products “on a whim”, the easier the person feels inferior complexes, is sensitive to

other people's reproaches and ridicules, and is able to handle stress.

Extraversion refers to the degree of "at ease feeling" that a person perceives about his relationship with others. The more extroverted a person is, the more sociable he or she is, tends to be more lively, vocal, action-oriented, enthusiastic, and more inclined to seek sensory excitements and gratifications.

Openness to experience is characterized by intelligence, imagination and engagement in idea-related endeavors, because the person values external images more and is more receptive to innovations, ideas and changes. *Openness* to experience refers to the number of interests and the extent to which the person pursues those interests.

Agreeableness is the degree with which a person complies with rules established by others. The more agreeable a person is, the more polite he or she is, the more people trust him, the more friendly he treats others, and the better people get along with him or her. Those who score high on the *Agreeableness* scale easily maintain friendly relationships with others, believe that all people are born righteous, like to help others and are considerate. Persons with high *Agreeableness* scores tend to show tendencies to be compliant, pleasant, cooperative, and to care strongly about the well-being of family and friends.

Conscientiousness usually embodies carefulness, responsibility, and organization. The more conscientious a person is, the more individualistic, detail-oriented, efficient, responsible, highly organized and self-controlled he or she is. Therefore, this dimension tends to reflect a greater investment in long-term planning, which would maximize benefits in situations where long-term planning leads to better outcomes (Costa and McCrae, 1989, 1992; Milfont and Sibley, 2012).

5.2.3. Personality and Environmental Concern

Primary determinants of pro-environmental attitudes and behavior include values, beliefs, and norms (Gardner and Stern, 2002). In some studies environmental attitudes have also been found to be influenced by various personality traits. Pettus and Giles (1987) showed that there is a relationship between attitudes toward environmental issues and certain personality characteristics. They argued that self-controlled, well-organized, and goal-oriented persons are more likely to display favorable environmental behaviors.

Furthermore, persons who view themselves as having more control over events are less likely to favor laws or restrictive measures designed to preserve or improve environmental quality. Balderjahn (1988) found that the three personality variables alienation, emotional expression, and “ideology control” explain environmental attitudes which in turn are determinants of consumption patterns in a proposed causal model. The concept of “ideology control” was defined as perceived power of changing adverse social conditions. It was hypothesized that the ecologically concerned consumer believes in the power of changing perceived adverse social conditions.

Moreover, in Balderjahn (1988) the three personality variables were found to affect attitudes toward ecologically conscious living and ecologically responsible use of cars. Ideology control also influences attitudes towards pollution, energy curtailment, and buying and using eco-friendly products. Fujii (2006) investigated the relations between attitude towards “frugality” and behavioral intentions to engage in four different types of pro-environmental behavior, reduction of electricity, gas, garbage, and automobile usage. Frugality is best described as an attitude towards a resource being consumed as a result of specific behavior and subsequent motivation to reduce consumption of these resources. Fujii (2006) found that frugality is

positively correlated with the behavioral intention to reduce electricity and gas usage. Oluyinka (2011) examined the influence of altruism, environmental self-efficacy, locus of control, self-concept, and self-monitoring on environmental attitudes among people in Nigeria. It was demonstrated that the ability to respond to social cues and to tailor one's attitude and behavior to social expectations had the most significant influence on environmental attitudes.

A number of studies have specifically used the Big-Five personality scale to explain pro-environmental attitudes. In a sample of 106 undergraduate students from the University of Toronto Hirsh and Dolderman (2007) demonstrated that *Agreeableness* and *Openness* are significantly correlated with pro-environmental values. They measured the degree to which participants are concerned about environmental issues, their sense of a personal connection to the environment, and the degree to which they engage in pro-environmental behaviors. It was found that *Neuroticism* has a significant negative correlation with a person's connectedness to the natural environment and how much the person feels his or her personality is connected to the natural environment ("I am part of nature").

Hirsh (2010) expanded this initial study by analyzing longitudinal data from Germany to assess the relationship between personality and environmental concern. It was shown that greater environmental concern was significantly associated with higher levels of *Agreeableness*, *Openness*, *Neuroticism*, and *Conscientiousness*, but not significantly associated with *Extraversion*. It was also found that persons with neurotic tendencies display significantly higher levels of environmental concern. Hirsh (2010) posited that neurotic individuals tend to be more worried about environmental problems as they are in general more concerned about possible negative outcomes including

environmental degradation. Further, *Conscientiousness* was significantly positively related to environmental concern. Hirsh (2010) noted that conscientious persons are expected to follow social norms for environmental behavior. Milfont and Sibley (2012) assessed the correlations between the Big-Five personality scale's subscales and different indices of environmental engagement and behaviors. For New Zealand population-based samples they showed that *Agreeableness*, *Conscientiousness*, and *Openness* are the three personality traits that have the highest correlations with environmental engagement, while *Extraversion* does not have a strong correlation. However, *Extraversion* is related to an emphasis on high subjective well-being, disbelief in the role of fate, which are variables that in the past have been linked to environmental sustainability and environmental protection. They further showed that *Neuroticism* is negatively related to environmental engagement in contrast to the previous study of Hirsh (2010), where *Neuroticism* was positively related to environmental concern.

Nisbet et al. (2009) examined the relationships between the Big-Five personality traits and their measure of nature relatedness (NR) which they define as an individual's connectedness with the natural world. They separated NR into three components, NR-self, NR-perspective, and NR-experience. NR-self represents feelings about one's personal connection to nature, whereas NR-perspective measures the perceived relationship between individual human actions and environment. NR-experience measures physical familiarity with the natural environment. They demonstrated that *Agreeableness* is related to NR-self and NR-perspective, whereas *Openness* is related to NR-self and NR-experience. Moreover, it was shown that *Neuroticism* has a weak negative correlation with NR-self and NR-experience.

5.3. Hypotheses

In transportation research, personality has been considered mainly in connection with driving behavior and mode choice (Prevedouros, 1992; Choo and Mokhtarian, 2004; Johansson et al., 2006; Rozario et al., 2010; Classen et al., 2011; Jovanović et al., 2011; Franke and Krems, 2012). In contrast, in the present study it is aimed to test the relationship between personality and acceptability of environmental taxation. It is expected the Big-Five personality traits to be linked to *Environmental problem awareness* and *Personal norm* and therefore to correlate with determinants of acceptability. Based on the reviewed previous research, it is hypothesized that *Agreeableness*, *Conscientiousness*, and *Openness* are indirectly associated with higher acceptability through environmental problem awareness (Hirsh and Dolderman, 2007; Hirsh, 2010; Milfont and Sibley, 2012). It is also investigated the role of two other personality traits, although there is no clear hypotheses about them since previous research is inconclusive. *Extraversion* appears to be related to environmental concern in some studies, while in others it is not. It further investigates whether personality traits are related to *Trust in government* and if this forms another path for influencing acceptability. All determinants of acceptability are ordered from right to left by decreasing proximity to acceptability.

5.4. Methodology

5.4.1. Respondents and Procedure

A total of 640 students at Kyoto University, Japan, both undergraduates and post-graduates, were surveyed in spring 2012. The

surveys were administered in paper form at the end of a lecture period. The average age of respondents was 20.3 years and the proportion of men 89.5%. The dominance of men is accounted for by the fact that all were engineering students. 43.9% stated they had a driving license whereas 4.2% owned a car. 1.9% used a car for commuting, whereas 61.6% of the students commuted by bicycle and 23.3% by public transport. These percentages are in line with expectations as many students live in the vicinity of the university and cycling is in general a major mode within central Kyoto. The survey consisted of four sections. The first section contained questions to measure the Big-Five personality traits. Section B consisted of 7 questions to measure environmental concern. In section C, determinants of acceptability were measured for the environmental taxation scenario (see Figure 3.1). Finally, students were asked some personal information such as age, gender, and car ownership. All personality and attitudinal questions were responded to on a 7-point Likert scale with the end points “totally disagree” and “fully agree”.

5.4.2. Personality Measures

Since time was limited to survey the students, employing the full NEO-FFI framework consisting of 60 items (Costa and McCrae, 1986) was excluded. Instead it includes in the survey the shortened 20-items form used by Tsao and Chang (2010). As explained in the following, 6 items were dropped that did not fit within a Japanese context, leaving 14-items.

To measure *Neuroticism*, the following four items were used: “I have frequent mood swings”, “I dislike myself”, “I seldom feel blue”, and “I panic easily”. For *Agreeableness* Tsao and Chang (2010) used the four questions “I respect of others”, “I insult people”, “I get

back at others,” and “I cut others to pieces”. The latter two it was judged to be inappropriate and omitted them, the remaining two had a very low reliability (Cronbach’s $\alpha=0.17$), leaving us with the choice between one of the former two questions. It was judged “I respect others” to be closest to capturing the concept of agreeability. To measure *Extraversion* the following three questions were asked: “I think of life as a party”, “I am skilled in handling social situations,” and “I make friends easily”. For *Conscientiousness* the items “I am always prepared”, “I make plans and stick to them”, “I carry out my plans,” and “I never put off till tomorrow what I can do today” were used. Finally, to estimate *Openness*, the two statements are included “I have unlimited creative ideas” and “I have rich imagination”. Descriptive statistics and reliabilities measured by Cronbach’s alphas are presented in Table 5.1. The reliability of the multiple-item measures of the four personality traits are acceptable (Cronbach’s $\alpha > 0.60$).

Table 5.1 Descriptive statistics and reliability of the measures of the Big-Five personality traits

Big-Five Personality Traits	N	A	E	C	O
Mean (Std)	4.00 (1.11)	5.07 (1.21)	3.81 (1.14)	4.03 (1.07)	4.15 (1.26)
Cronbach’s Alpha	0.62	-	0.67	0.71	0.74

N: Neuroticism, A: Agreeableness, E: Extraversion, C: Conscientiousness, O: Openness

Correlations between the Big-Five personality traits are reported in Table 5.2. *Extraversion* is significantly positively correlated with *Conscientiousness* and *Openness*. *Agreeableness* is significantly positively correlated with *Extraversion* and *Conscientiousness*. In contrast, *Neuroticism* significantly negatively correlates with *Agreeableness*, *Extraversion*, and *Conscientiousness*. Yik et al. (2002) found a correlation pattern between the traits in line with these results. Specifically, they reported that *Neuroticism* was not significantly correlated with *Openness* in surveys conducted in various countries.

Table 5.2 Correlations among Big-Five personality traits

Personality Traits	A	E	C	O
N	-0.07*	-0.34***	-0.16***	-0.03
A	-	0.15***	0.18***	0.09**
E	-	-	0.25***	0.31***
C	-	-	-	0.22***

N: Neuroticism, A: Agreeableness, E: Extraversion, C: Conscientiousness, O: Openness

***p< 0.01, **p<0.05, *p<0.1

5.4.3. Measures of Environmental Concern and Acceptability

In the second part of the survey, the 7 questions were used as shown in Table 5.3 to measure environmental concern. The respondents indicated their agreement to the statements using 7-point Likert-type scales ranging from “disagree fully” to “agree fully”. Following Choocharukul and Fujii (2007) and Gärling et al. (2008), an index of *Problem awareness* related to climate change is constructed

from the ratings by averaging. The resulting Cronbach's alpha of 0.76 is satisfactory.

Moreover, it is included four statements (see Table 5.3) related to *Personal norm* which are known to be a determinant of intentions to act environmentally friendly (Eriksson et al., 2006, 2008; Gärling et al., 2003, 2008). In this study therefore four questions were taken from Gärling et al. (2003) to measure *Personal norms* to environmental problems. *Personal norm* is likewise measured by soliciting 7-point Likert-type agreement ratings. An index was constructed by averaging the ratings. A resulting Cronbach's alpha of 0.77 is acceptable.

As shown in Table 5.4, following Schmöcker (2012) and Kim et al. (2013), students were asked nine questions related to the environmental taxation scenario (see Figure 3.1) and how they perceived the government. The respondents answered each question by ratings on 7-point scales ranging from "Fully disagree" to "Fully agree". The dependent variable is acceptability ($M=3.25$, $SD=1.56$, Cronbach's $\alpha=0.93$) and in line with the literature review, the indexes for the determinants *Fairness* was formed ($M=3.16$, $SD=1.32$, $\alpha=0.83$), *Infringement on freedom*, ($M=3.99$, $SD=1.60$), *Perceived effectiveness* ($M=3.87$, $SD=1.69$), and *Trust in government* ($M=2.85$, $SD=1.21$, $\alpha=0.73$).

In this study it is simplified some determinants for clear interpretation of analysis result from a lot of determinants, like *Fairness*, *Trust in government*. In here, three of *Fairness* (scenario, procedural, distributive) in Chapter 3 are regarded as *Fairness* and two of "trust" (general and specific) are combined as *Trust in government*.

Table 5.3 Questions to measure environmental concern

Problem	Do you think climate change will seriously damage our society?
Awareness of Climate Change	Do you think the CO ₂ that you produce in your daily life will contribute to climate change and this will negatively influence society?
	Do you think global warming will serious damage yourself ?
Personal Norm toward Environmental Problems	I feel a moral obligation to protect the environment
	I feel that I should protect the environment
	I feel it is important that people in general protect the environment
	Our environmental problems cannot be ignored

Table 5.4 Questions to measure the determinants of acceptability

Acceptability	Do you support this government decision to implement an environmental tax?
	Are you willing to accept this government's decision to implement environmental tax?
Fairness	Do you think this environmental tax fair?
	Do you think the process of government decision making that lead to an environmental tax is fair?
	Do you think this environmental tax is equitable?
Infringement on Freedom	Do you think environmental tax “infringes on your freedom”?
Perceived Effectiveness	Do you think a tax like this can help to eventually reduce the effect of global warming?
Trust in Government	In general I trust governments.
	Do you trust the Japanese government to make a decision to introduce this tax?

5.5. Analysis

5.5.1. Statistical Description

Correlations between the personality traits and the determinants related to acceptability and environmental concern are reported in Table 5.5. Acceptability of environmental taxation correlates with *Agreeableness* and *Extraversion*, and *Agreeableness*, *Extraversion* and *Conscientiousness* have significant positive correlations with both determinants of environmental concern. *Trust in government* is correlated with *Neuroticism*, *Extraversion*, and *Openness*. *Perceived effectiveness* shows only some weak correlations with *Extraversion*. *Extraversion* has the strongest correlation with acceptability among the personality traits. The personality traits with the weakest correlations with both acceptability and environmental concern are *Neuroticism* and *Openness*.

5.5.2. Model Estimation

Structural Equation Modeling (SEM) is used to estimate the paths between personality traits and acceptability. The equations reflect the hypothesized model, where endogenous variables are denoted η and exogenous variables ξ , β , and γ are the estimated coefficients of the endogenous and exogenous variables, respectively. For each latent variable an error term is defined.

The AMOS 21 software was used for the analysis. The estimated coefficients of the model in Figure 5.1 are given in Table 5.6. All determinants related to acceptability and environmental concern are endogenous variables, while the Big-Five personality traits are treated as exogenous variables. From right to left the determinants related to acceptability are ordered in accordance with decreasing

proximity to acceptability. On the far right is acceptability of environmental taxation. The models only include paths from left to right that are significant at the 5% level (except for the path from *Personal norm* to *Infringement on freedom* which is significant at the 5.5% level). The model fit was found to be acceptable (GFI=0.94), Adjusted GFI=0.89, RMSEA=0.09).

All hypothesized paths are significant with the expected sign. To facilitate interpretation of the results, it is reported both standardized and un-standardized coefficients. The three determinants directly related to acceptability of environmental taxation - *Fairness*, *Infringement on freedom*, and *Perceived effectiveness* - are the proximal determinants that directly influence acceptability. *Trust in government* and *Personal norm* affects all these three determinants, while *Problem awareness* only affects *Perceived effectiveness* as well as *Personal norm*. Moreover, acceptability is determined by all three proposed direct determinants as well as the distal factors *Trust in government* and *Problem awareness*. It was not found any significant influence of the traits *Neuroticism* and *Openness* on any of the determinants included in the model. *Trust in government* is related to *Extraversion* and *Personal norm* to *Agreeableness*. Further, *Agreeableness* and *Conscientiousness* are associated with *Environmental problem awareness*.

It was also estimated the total effects of the personality traits as the sums of direct and indirect effects (see Table 5.7). All indirect paths are found to be significant at the 5% level. The results show that *Trust* and *Fairness* have by far the largest effect on acceptability even considering differences in standard deviations. Among the personality traits, *Extraversion* affects acceptability almost four times as much as *Agreeableness* and *Conscientiousness* do.

Table 5.5 Correlations between Big-five personality traits and determinants of acceptability

Determinants		N	A	E	C	O
Acceptability		0.02	0.08**	0.08**	0.02	-0.03
Determinants of Acceptability	Fairness	-0.01	<0.00	0.06	0.01	-0.05
	Infringement on Freedom	.001	-0.03	-0.01	<0.00	-0.01
	Perceived Effectiveness	-0.04	0.04	0.07*	0.02	0.02
	Trust in Government	-0.14***	<-0.00	0.20***	<0.00	0.08*
Determinants of Environmental Concern	Problem Awareness	0.01	0.13***	0.09**	0.18***	0.01
	Personal Norm	-0.02	0.21***	0.09**	0.15***	0.07

N: Neuroticism, A: Agreeableness, E: Extraversion, C: Conscientiousness, O: Openness

< less than, Bold*** p< 0.01, ** p< 0.05, * p< 0.1

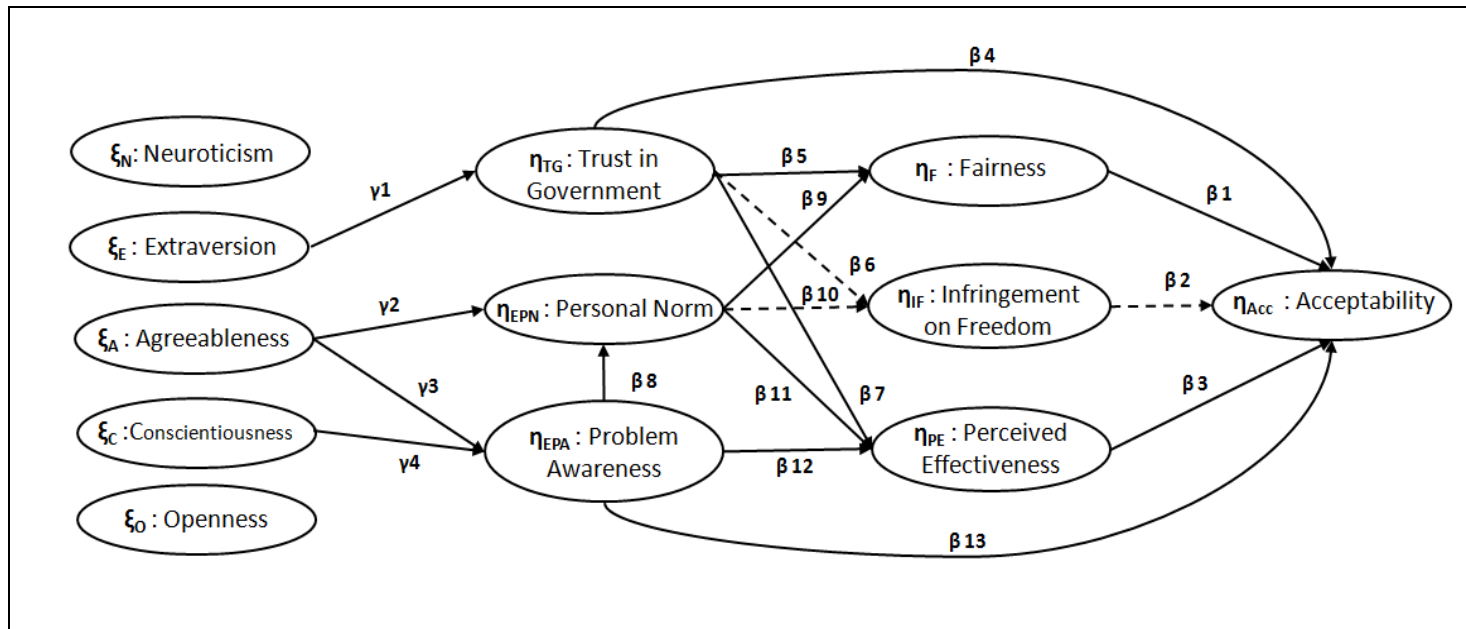


Figure 5.1 Estimated SEM

Table 5.6(1) Estimated coefficients

Link	Path	Estimated Un-standardized Coefficients	Std Error	Estimated Standardized Coefficients
β_1	Fairness $\rightarrow$ Acceptability	0.53***	0.04	0.46
β_2	Infringement on Freedom $\rightarrow$ Acceptability	-0.15***	0.03	-0.16
β_3	Perceived Effectiveness $\rightarrow$ Acceptability	0.12***	0.03	0.14
β_4	Trust in Government $\rightarrow$ Acceptability	0.24***	0.04	0.20
β_5	Trust in Government $\rightarrow$ Fairness	0.49***	0.04	0.45
β_6	Trust in Government $\rightarrow$ Infringement on Freedom	-0.37***	0.05	-0.28
β_7	Trust in Government $\rightarrow$ Perceived Effectiveness	0.51***	0.05	0.37
β_8	Problem Awareness $\rightarrow$ Personal Norm	0.37***	0.03	0.45
β_9	Personal Norm $\rightarrow$ Fairness	0.11**	0.05	0.08
β_{10}	Personal Norm $\rightarrow$ Infringe on Freedom	-0.11*	0.06	-0.07
β_{11}	Personal Norm $\rightarrow$ Perceived Effectiveness	0.22***	0.07	0.13
β_{12}	Problem Awareness $\rightarrow$ Perceived Effectiveness	0.18***	0.05	0.14
β_{13}	Problem Awareness $\rightarrow$ Acceptability	0.13***	0.04	0.11

*** p< 0.01, ** p< 0.05, * p<0.1

Table 5.6(2) Estimated coefficients

Link	Path	Estimated Un-standardized Coefficients	Std Error	Estimated Standardized Coefficients
γ_1	Extraversion $\rightarrow$ Trust in Government	0.21***	0.04	0.20
γ_2	Agreeableness $\rightarrow$ Personal Norm	0.13***	0.03	0.15
γ_3	Agreeableness $\rightarrow$ Problem Awareness	0.10**	0.04	0.10
γ_4	Conscientiousness $\rightarrow$ Problem Awareness	0.19***	0.05	0.16

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5.7(1) Total effect on acceptability

Determinants		Total effect	Direct effect	Indirect effect
Determinants of Acceptability	Fairness	0.53** (0.46)	0.53** (0.46)	-
	Infringement on Freedom	-0.15** (-0.16)	-0.15** (-0.16)	-
	Perceived Effectiveness	0.12** (0.14)	0.12** (0.14)	-
	Trust in Government	0.62** (0.50)	0.24** (0.19)	0.38** (0.31)
Determinants of Environmental Concern	Personal Norm	0.10** (0.07)	-	0.10** (0.07)
	Problem Awareness	0.19** (0.16)	0.13** (0.11)	0.06** (0.05)

*** $p < 0.01$, ** $p < 0.05$ (standardized coefficients in parentheses)

Table 5.7(2) Total effect on acceptability

Determinants		Total effect	Direct effect	Indirect effect
Determinants of Personality Traits	Neuroticism	-	-	-
	Extraversion	0.13** (0.10)	-	0.13** (0.10)
	Agreeableness	0.03** (0.03)	-	0.03** (0.03)
	Conscientiousness	0.04*** (0.03)	-	0.04** (0.03)
	Openness	-	-	-

5.6. Model Results

5.6.1. Direct Links to Acceptability

First of all, in line with previous research (Kim et al., 2013), it notes that the SEM model fit without personality traits is generally acceptable except that the RMSEA is too high (GFI=0.95, Adjusted GFI=0.84, RMSEA=0.14). *Trust in government* directly influences acceptability and *Problem awareness* has a stronger direct effect on acceptability than *Personal norm*. Also Kim et al. (2013) found the path *Trust in government* → *Fairness* → *Acceptability* to be the most important path influencing acceptability of transport pricing. Hence it is suggested that for an effective implementation of a taxation policy it is important that a government is trusted and that it provides enough information about the policy's effect to the wider population. In addition it was found that *Neuroticism* and *Openness* do not influence acceptability, while *Extraversion*, *Agreeableness* and *Conscientiousness* do. *Extraversion* is found to be the most influential personality trait, because it is correlated with *Trust in government* and

Fairness which both in turn significantly influence acceptability directly.

5.6.2. *Extraversion Related to Trust in Government*

Based on previous research it was hypothesized a link between personality traits and environmental concern. It was demonstrated that *Trust in government* is positively determined by *Extraversion*. This may be explained by the finding reported by Ashton et al. (2002) that social attention is the cardinal feature of *Extraversion*. Herzog and Morgan (1993) noted that extroverts get to know more people and join more clubs and associations, and this in turn increases the chances that they will volunteer. Experiments also show that extroverts are more cooperative than introverts (Hirsh and Peterson, 2009). Koole et al. (2001) described that *Extraversion* and *Agreeableness* are related to cooperative behavior. It is further reasonable to assume that cooperative behavior is correlated with trust in government. Thus, Gambetta (2000) noted that trust enables cooperative behavior and cooperation frequently makes some demand on the level of trust, particularly of mutual trust. Moreover, Hiraishia et al. (2008) found significant correlations between *General trust* and *Extraversion*. They further verified that among the five personality sub-scales, *Extraversion* has the strongest correlation with general trust. Hence, the effect of *Extraversion* on trust is a plausible result.

5.6.3. *Personality Traits Related to Environmental Concern*

Previous research has shown that environmental concern is influenced by personality traits. In this study it is shown that *Agreeableness* and *Conscientiousness* are the personality traits with the highest correlations with environmental concern, thus confirming

the results of other studies (Hirsh, 2010; Hirsh and Dolderman, 2007; Milfont and Sibley, 2012). Further it is demonstrated that *Agreeableness* is related to *Personal norm*. Furthermore, *Environmental problem awareness* is related to *Agreeableness* and *Conscientiousness*. When total effects on acceptability are assessed, both traits appear to have a similar level of influence. *Agreeableness* is related to higher levels of selflessness, morality, empathy, and greater concern for others. Therefore, individuals who show high *Agreeableness* scores are also more likely to be concerned about the environment (Hirsh, 2010; Hirsh and Dolderman, 2007; Milfont and Sibley, 2012). Agreeable individuals tend to withdraw from social conflicts, avoiding situations that are inharmonious. They prefer harmonious social interactions and a cooperative life, which are features supporting environmental attitudes (Jensen-Campbell and Granziano, 2001). Similarly, Swami (2010) noted that *Agreeableness* is likely to be related with environmentalism because this trait is most associated with empathetic concern and agreeable persons tend to be “warm and altruistic”.

It is concluded that acceptability depends to some degree on the level of *Conscientiousness*. The results suggest that when conscientious persons become aware of environmental problems and feel some obligation to behave environmentally friendly, they tend to exhibit cooperative behavior. The interpretation is that *Conscientiousness* is related to attributes investigated by Hirsh (2010) such as self-discipline, competence, and perfectionism which have been shown to be related to environmental concern. Furthermore, Duckworth et al. (2007) showed that those with high *Conscientiousness* scores also display more passion and perseverance for long time goals (Duckworth et al. 2007). Also, other studies have shown that this trait is positively related to a “future awareness” while

being negatively related to a present-time perspective (Kairys, 2010; Zimbardo and Boyd, 1999; Milfont and Sibley, 2012). These relations suggest that conscientious individuals tend to be more aware of environmental issues which lead them to perceive obligations for sustainable environmental behavior considering the longer term future.

5.7. Discussion

The results highlight that acceptability of environmental taxation is influenced by scheme-specific determinants such as *Fairness*, *Infringement on freedom*, and *Perceived effectiveness*. In addition, a number of distal factors determine acceptability. *Trust in government* is found to have the largest effect on acceptability among all determinants. Furthermore, *Environmental problem awareness* and *Personal norm* towards environmental problems are found to influence acceptability although less than trust.

This study also shows that personality traits correlate with environmental concern and acceptability. An unexpected but explainable finding is that personality affects acceptability far more via trust. Thus it means that extraverted individuals demonstrate significantly higher trust in government and hence higher levels of acceptability.

There are a number of limitations in this study. Firstly, it was measured the Big-Five personality traits by only 14 items. This prohibits analysis of lower-order personality traits and in particular measure of *Agreeableness* is limited. Secondly, it was surveyed university students only. This means it could not be estimated the influence of socio-demographic factors of interest for transport-related

policies such as, for instance, car-ownership status. One needs to keep these limitations in mind in the following discussion of possible implications for the design and implementation of effective transport policies.

The Big-Five personality trait scale is suggested as an indicator for the level of transport policy acceptability in various (sub-)cultures. It is known that people show patterns of local within-group similarity in their behavior and thought, accompanied by profound intergroup differences. Tooby and Cosmides (1992) noted that the existence of separate streams of transmitted informational content can explain these group patterns. “cultures” can be defined as these sets of similarities. There has been a rise in research to support the “local similarity of personality” as well as research on applications of this scale to demonstrate the variation across cultures (McCrae and Allik, 2002).

In particular, McCrae (2002) examined cross-cultural variations in the standard deviations of the Big-Five personality traits from 36 cultures. Schmitt et al. (2007) documented the worldwide distribution of personality traits as measured with the Big-Five personality trait scale. Translated survey versions in 29 languages were administered to 17,837 individuals from 56 nations. They showed mean-level differences of traits across American, European, Middle Eastern, African, Oceanian, and Asian cultures. It was concluded that the differences in personality structure were small and should probably be ignored in the majority of cross-cultural comparisons. In some cases, however, the differences in patterns between cultures deviated. Based on these results it is speculated that the effectiveness of the same policy may differ across cultures, even if all other circumstances are the same. In some cases, culture-specific strategies of implementing transport policies would therefore be

appropriate. Combining the results of Schmitt et al. (2007) and this study's leads to the conclusion that, for example, in Europe environmental aspects should be emphasized as reasons why a policy is necessary, especially among Southern Europeans due to their higher scores on *Agreeableness* and *Conscientiousness*. As another example, in Oceanian countries, it would be particularly important to find ways to increase *Trust in governments* for an effective implementation of policy since in Oceania high levels of *Extraversion* are reported.

Possibly more important differences in personality are often observable among population groups within a country including the target group which one hopes to impact with a specific transport policy measure. Similar to marketing of products, therefore it can be suggested that the implementation of transport policies may need to be customized for different population segments. If this is done successfully, the failure of proposed implementations of sustainable transport policies may be avoided.

Chapter 6

6. Environmental Education and Policy Acceptability*

6.1. Introduction

Transport engineers and transport planners in the majority graduate from engineering departments. Academics as well as professionals alike have understood that engineering, and in particular civil engineering, must undergo major changes. Not only do major universities change the name of civil engineering departments but also professional bodies redefine the tasks of civil engineering. In the year 2007, the American Society of Civil Engineers (ASCE) for example published their “Vision for Civil Engineering 2025” as a statement that describes a new role for the profession, “a bright, ambitious goal that would guide civil engineers around the globe to a new level of leadership and professionalism”. They described future civil engineers

* Junghwa Kim, Jan-Dirk Schmöcker, Satoshi Fujii (Manuscript submitted for publication.) Can Sustainable Transport Attitudes be taught?. International Journal of Sustainable Transportation (IJST)

as “master planners, designers, and constructors; lead stewards of the natural environment; master innovators and integrators; managers of risk; and leaders in shaping public policy.”

If this is true for civil engineering in general it is in particular true for students focusing on urban and transport planning. Planners have more influence on the relationship between nature, humans and the build environment than those being in charge of managing and maintaining infrastructure. In particular in transport planning the close relationship between changes in the infrastructure, human behavior and environmental impacts has been studied. For example this journal as well as a large number of contributions in other transport journals is devoted to the topic of “sustainable transport”. Impacts of “micro-changes” such as changing speed limits on emissions have been studied as well as increasingly attempts are made to model short- and long term impacts of “macro-changes” such as the road network layout. Further, the inseparable relationship between transport and land-use is well known. Infrastructure changes, in terms of e.g. shopping, work or leisure location, will have impacts on demand patterns and required transport services. However, the causality between these three items can change in all possible directions over long time periods. This means, especially planning students will need to gain a wider understanding regarding the complexity of environmental system.

“Understanding” of the issues alone is not enough though. Few graduates of planning courses would probably deny that they are aware of the environmental effects caused by traffic. In order to become “lead stewards of the natural environment” students will need to be convinced of the importance of the issues at stake as well as be able to voice their opinion effectively. Ideally education should prepare future decision makers to take a position for the common

good in various “dilemma situations”. Newhouse (1990) wrote “Ultimately, people need to be able to make their own moral decisions about environmental matters. The job of educators is to ensure that everyone has all the tools necessary to make responsible environmental decisions.” Similarly, Hyde and Karney (2001) concluded that engineering education should not only consider “understanding” but also whether students “care” for the environment.

6.2. Education and Environmental Attitudes

This firstly leads to the question in how far universities can deliver such an education and, more fundamentally, if education can actually change students’ attitudes. This appears to have been not much studied specifically for transport planning education. There is though evidence for the impact of university education in more general on students’ attitudes, in particular on the impact of economic education. For example Frank et al (1993) study the difference between students majoring in economics and those from other disciplines. They found not only that economic students are less co-operative but also provide some evidence that the difference to students majoring in other subjects increases with length of education. Also Marwell and James (1981) found differences in the co-operative behavior of economic students, whether this is due to their education is though not clear.

Hess-Quimbita et al. (1996) reported evidence that science education appears to help the development of environmental evidence. Using a sample of 18,887 students, they demonstrated that human ethical/social values as well as the number of science modules play important roles in the development of environment concern. Therefore

students' academic and social integration appears to indirectly influence the development of environmental-friendly attitudes.

Smith-Sebasto (1995) reported changes in students' perceived environmental responsibility through education. He noted that students completing an environmental studies course showed significantly higher environmentally responsible behavior and more participation in environmental behavior. These literatures suggest that "environmental consciousness" could, at least to some degree, be taught. This motivated the study that led to this paper. It would be like to understand whether education can play an important role for students to obtain attitudes that make them more likely to promote sustainable transport policies. In the following it is shown some evidence for this based on a survey among students at Kyoto University, Japan.

6.3. The Status of Environmental Education

6.3.1. Environmental Education in Kyoto University

At Kyoto University transport planning education is part of the "School of Global Engineering" at undergraduate level which combines various civil engineering related subjects into the curriculum. To understand the effect of engineering education it was surveyed undergraduate students from different faculties regarding their environmental attitudes in general and their attitudes towards sustainable transport policies in specific. As a proxy for the amount of environmental education received it was considered how many modules with the term "environment" included in the module title the student has taken. Figure 6.1 shows the number of environmental classes offered among faculties at Kyoto University and departments

in the engineering faculty. The faculty of agriculture has the most modules related to environment (31) and the faculty of engineering ranks number two with 17 modules that include the term environment. Within the faculty of engineering, the department of global engineering, which includes transport and urban planning, has 9 modules and holds therefore the first rank compared to other departments (see Figure 6.1).

This study focuses on undergraduate students only, for two main reasons. Firstly, this is a four year course over which the impact of education might be more evident than for the two year Master degree programs. Secondly, for postgraduate students, it is even more difficult to disentangle educational effects and interests in transport issues as choosing a degree program and specific courses within the program are likely to be related with a higher interest in transport policy when entering the course. This might also be to some degree the case for undergraduate students, though at least in the first two years the curriculum is fairly broad and there are fairly few choices for students to choose additional environmental related courses.

6.3.2. Survey and Respondents

Table 6.1 lists the surveys that have been undertaken from March to July 2012. All surveys have been conducted during the last 15 minutes of lectures. This presents the corresponding descriptive statistics of the sample. As shown in Table 6.1, students from all grades in civil engineering answered survey, as well 1st grade chemical engineering students and third year students majoring in the economy faculty. A total of 524 observations were gathered for this study. The selection of the chosen lectures in which was surveyed was not influenced by the topic of the module; it rather chosen lectures attended by large student numbers in order to catch the majority of

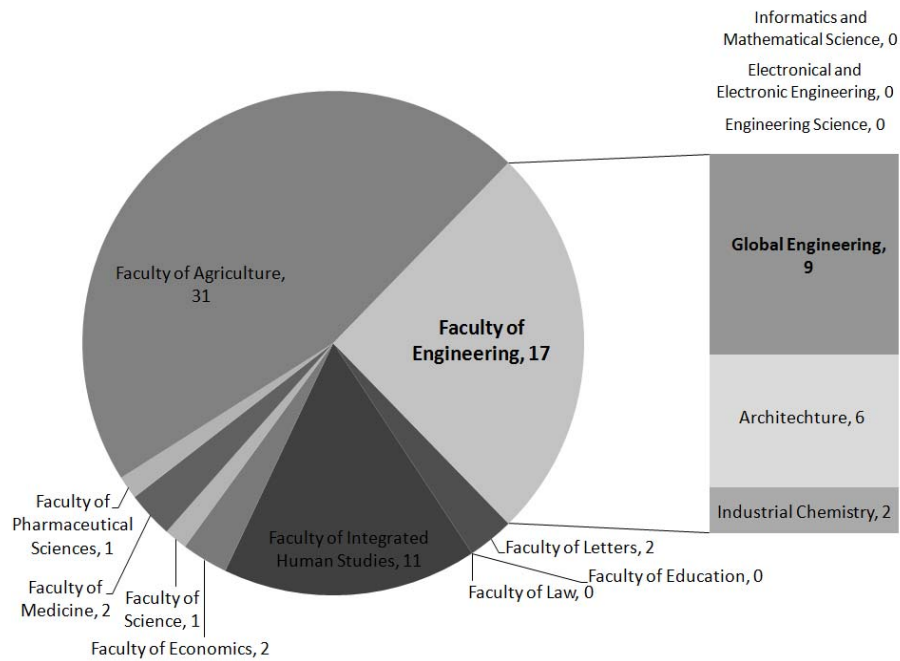


Figure 6.1 Number of modules with a title including “environment” in Kyoto University and in the engineering faculty

students of each grade during a single survey. The students were asked about their socio-demographics as well as which module related to environmental teaching they have been taking and further let them check the modules they completed from the list of environmental modules. Students in their first and second year had so far, on average, taken less than 1 module directly related to environment. In contrast students in the 3rd and 4th grades of global engineering took about 4.4 modules. This is because at Kyoto University the majority of the environment related modules are taught in the second semester of the 2nd as well as throughout the 3rd grade. 4th year students could not be considered separately since at Kyoto University there are no dedicated

classes for 4th year students. Instead final year students complete some remaining classes together with 3rd year students if they have not yet collected sufficient credits and otherwise focus on their final year project. The average age of respondents is 19.9 years and the proportion of males in the sample is 88%, which is fairly representative of the gender split within the engineering school. 35.5% of the respondents stated they own a driving license but there are very few students owning a car themselves.

Table 6.1 Descriptive statistic of data

Categories	Engineering				Economy	Total
	Global (Civil)			Chemical		
	1 st	2 nd	3 rd ,4 th	1 st	3 rd ,4 th	
Sample size	138	137	97	101	51	524
Environmental Classes taken (Mean)	0.52	0.93	4.43	0.04	0.65	1.31
Age (Mean)	18.68	19.60	20.90	18.68	21.53	19.88
Gender (% of Male)	90.58	93.43	87.63	90.10	78.43	88.03
Driving License %	4.35	44.53	70.10	10.89	62.75	35.52
Car Owners %	0.72	1.46	7.22	0.00	0.00	1.88

6.4. Differences of Environmental Attitudes

6.4.1. Measures of Environmental Concern

In the survey the questions are further asked measuring the environmental concern of students (see Table 6.2). In case of two of *Problem awareness*, questions were extracted in Table 3.1. It is distinguished *Problem awareness* from *Ascribed responsibility* as well as personal self and social dimensions of environmental issues. This set up of questions is based on a large set of literature emanating from environmental psychology.

Gärling et al. (2008) reported that *Self problem awareness* is an important factor when discussing road user charging acceptability in Sweden. *Self problem awareness* relates to the awareness that “my own behavior is part of the problem” as discussed for example by Choocharukul and Fujii (2007). *Personal problem awareness* instead describes whether a person perceives the problem to be significantly related not just to the general public but to him/her personally (Gärling et al., 2008). The questions for *Awareness* were taken from Schmöcker et al. (2012) and Kim et al (2013). Gärling et al. (2003) noted that *Awareness* of consequences must induce an *Ascribed responsibility* to perform the behavior that in turn activates a moral obligation to perform the behavior. In this study therefore two questions were taken from Gärling et al. (2003) to measure “personal” and “social” aspects of *Ascribed responsibility*.

All questions were asked on a 7 point Likert scale. Ratings were obtained with verbally defined endpoints and midpoints (“Totally disagree” – “Neutral” – “Fully agree”).

Table 6.2 Survey questions regarding environmental concern

Self Problem Awareness	Do you think the CO ₂ that you produce in your daily life will contribute to climate change and this will negatively influence society?
Personal Problem Awareness	Do you think global warming will serious damage yourself ?
Personal Ascribed Responsibility	I am not concerned about the environment (-)
Social Ascribed Responsibility	Every citizen must take responsibility for the environment

6.4.2. Comparative Analysis

It is hypothesized that environmental education has a significant impact on *Environmental problem awareness* and *Ascribed environmental responsibility*. Firstly it is compared 1st year engineering students with those majoring in chemical engineering. The objective is to understand whether there might be some differences due to environmental interests between the two groups. In other words, differences in environmental attitudes might not be due to education but rather due to attitudinal differences obtained before entering university which might have influenced their choice of subject.

The values of environmental concern are compared between the two groups as shown in Table 6.3. There is not significant difference in *Problem awareness* between 1st grade students in global and chemical engineering. However, the results show that students who major in civil engineering seem slightly more concerned about the environment as they score higher on *Personal responsibility*.

Further civil engineering students in upper grades are compared with those majoring in economy. As shown in Table 6.4, there are large differences in the environmental education received. The results from the comparative analysis indicate that engineering students show higher *Environmental problem awareness* than students with an economy major. This suggests an education effect but to clearly separate also here the effect of “interest” from “education” further data collection will be required.

Independent of distinguishing the cause for the difference, the findings suggest that graduates with an economic major might have a different outlook on transport problems than graduates from engineering faculties. This is in line with Yezer et al. (1996) who compared cooperation in dilemma situations between economic students and those belonging to other faculties. They found that economic students co-operate less and that exposure to economic classes is correlated with lowered cooperation. Erikson (2008) further showed that cooperation in dilemma situations and pro-environmental behavior are related.

To understand the impact of environmental education only, it is compared global engineering students in their 2nd and 3rd grades. These two groups differ significantly in the number of environmental classes taken (0.93 vs 4.43 as shown in Table 6.5.) as discussed before. Assuming that the one to two year age difference in itself has no impact on *Environmental problem awareness*, therefore the results from this comparison can be considered as impact of education. In line with above results in Table 6.4, it is indicated that *Self* and *Personal problem awareness* are higher among the more senior students. This suggests that environmental concern can be increased by environmental education.

Table 6.3 Comparison of 1st year civil and chemical eng. students

Determinants	Civil Eng 1 st students Mean (Std. Dev.)	Chemical Eng 1 st students Mean (Std. Dev.)	t-test (p-values)
Environmental Education (average number of taken classes related to environment)	0.51 (1.41)	0.04(0.20)	
Self Problem Awareness	4.75(1.62)	4.69(1.77)	0.27 (0.79)
Personal Problem Awareness	4.88(1.67)	4.87(1.70)	0.03 (0.98)
Personal Ascribed Responsibility	5.62(1.32)	5.05(1.62)	3.01** (0.00)
Social Ascribed Responsibility	5.31(1.37)	5.13(1.36)	1.02 (0.31)

Bold*** 0.01, **0.05, *0.1

Table 6.4 Comparison of 3rd + 4th year civil eng. and economy students

Determinants	Civil Eng 3 rd , 4 th students Mean (Std. Dev.)	Economy 3 rd , 4 th students Mean (Std. Dev.)	t-test (p-values)
Environmental Education (average number of taken classes related to environment)	4.43(1.23)	0.65(0.56)	
Self Problem Awareness	5.18(1.50)	4.39(1.47)	0.91*** (0.00)
Personal Problem Awareness	5.03(1.58)	4.49(1.45)	0.87** (0.04)
Personal Ascribed Responsibility	5.48(1.56)	5.33(1.49)	0.57 (0.57)
Social Ascribed Responsibility	5.32(1.43)	5.14(1.40)	0.74 (0.46)

Bold*** 0.01, **0.05, *0.1

Table 6.5 Comparison of 2nd and 3rd+4th year civil eng. students

Determinants	Civil Eng 2 nd year students Mean (Std. Dev.)	Civil Eng 3 rd and 4 th year students Mean (Std. Dev.)	t-test (p-values)
Environmental Education (average number of taken classes related to environment)	0.93(0.43)	4.43(1.23)	
Self Problem Awareness	4.61(1.52)	5.18(1.50)	-2.85*** (0.01)
Personal Problem Awareness	4.63(1.56)	5.03(1.58)	-1.94* (0.05)
Personal Ascribed Responsibility	5.42(1.53)	5.48(1.56)	-0.30 (0.77)
Social Ascribed Responsibility	5.24(1.48)	5.32(1.43)	-0.41 (0.68)

Bold*** 0.01, **0.05, *0.1

6.5. Influence of Education on Transport Policy

6.5.1. *Environmental Concern and Transport Policy*

There is a large body of literature showing that acceptability of transportation policy, depends on people's environmental concern for climate change or global warming. In particular Schade and Schlag (2000) demonstrated that the acceptability of road pricing is dependent on people's problem awareness. Similarly, Steg (2003) argued that people who are more aware of the environmental problems caused by car usage are also more likely to perceive needs for policies to solve these and are therefore more likely to accept environmental friendly policies. Eriksson et al. (2006, 2008) considered *Personal norms* such as moral motivation to reduce environmental problems and the relation toward acceptability of travel demand management measures. They discussed that *Personal norms* influence acceptability through willingness to act indirectly, and also show that there is a direct correlation among various types of travel demand measures. Moreover, Nilsson and Kuller (2000) verified that environmental attitudes and knowledge are strongly related to the acceptability of various traffic restrictions for private cars such as road toll, petrol tax and no parking areas.

6.5.2. *Attitudes to Sustainable Transport Policies*

Above literature shows evidence that environmental concern influences acceptability of transportation policy. Further it was shown in previous section that education appears to influence environmental concern. Therefore it is hypothesized that education is also related to attitudes of environmental and transportation policies, mediated by environmental concern. To demonstrate this, it was measured the

attitudes towards various policies aimed at restraining car usage.

In total four questions are asked as examples for environmental friendly transport policy (Table 6.6). The first question is chosen to measure support for the promotion of public transport. In Kyoto, the subway network is limited but there is an extensive bus network that is frequently used by students. For example the main campus of Kyoto University is accessible by several bus lines but not by subway. The second question aims to understand support for parking restrictions and it is asked about attitudes towards parking charges in the CBD of Kyoto. There exist several parking houses as well as small capacity parking lots in Central Kyoto which all charge usually around 500 Japanese yen (around 5 US\$) per hour. With the third question the students were asked for the support of periodic car inspections to reduce CO₂ emissions. Currently in Japan, there is a regulation that cars older than ten years, must undergo an inspection every 2 years. Finally, expressway pricing is included as a typical TDM policy, because all students will be familiar with this as almost all expressways are tolled in Japan.

Since four of these policies can also be promoted for congestion reduction reasons, it is included *Awareness* about congestion problems as an additional control variable in model. To measure *Congestion problem awareness*, following question was asked: “do you think the congestion level in Kyoto city is serious?” (mean: 5.17, std. dev.: 1.29). In the same way as the questions for environmental concern, all questions were asked on a 7 point Likert scale. Also here all ratings were obtained with verbally defined endpoints and midpoints (“Totally disagree” – “Neutral” – “Fully agree”). Because it was assumed students in different department may have different attitude to environmental concern regardless of environmental education, it was analyzed only considering civil

engineering students for appropriate result derivation. Therefore the transport policy questions were only posed to civil engineering students so that the analysis described subsequently is limited to this group (N = 372).

Table 6.6 Questions regarding attitudes to sustainable transport policies

Transport Policy	Question	Mean (Std. Dev.)
Public Transport	Do you feel that all citizens should use public transport in Kyoto?	4.67 (1.63)
Parking Charges	Do you support parking charge systems like a pay garage in the CBD or near the train station?	5.14 (1.63)
Eco Inspection	Do you support the law of eco-inspection of cars once in 2 years?	5.15 (1.48)
Expressway Pricing	Do you support to pay some fees for using highway?	4.95 (1.45)

6.5.3. Model Estimation

From the surveyed data, Structural Equation Models (SEM) was estimated to verify the impact of education on transportation policies using the AMOS 21 software. The structural equations are meant to represent casual relationships among the variables in the model. The least-squares method is used for model estimation which is a general method for the analysis of SEM with latent exogenous and endogenous variables. The equations of the hypothesized model are described as follows and shown in Figure 6.2. where endogenous variables are shown as η and exogenous variable as ξ . The β and γ are the estimated coefficient values of the endogenous and exogenous

variables respectively (Fox, 2006). The model estimation results are reported in Table 6.7, along with t-values.

Environmental problem awareness and *Ascribed responsibility* are constructed by two indicators. *Self awareness* and *Personal awareness* are grouped as *Environmental problem awareness* with high Cronbach's alpha of 0.75. The factor *Ascribed responsibility* includes the two indicators *Personal* and *Social responsibility*. For this construct the reliability is not as high (Cronbach's alpha = 0.55) but it is still acceptable for this model in which it derives the weight for γ_3 and γ_4 in estimated model.

On the right are the attitudes to the four transport policies and in the model design it is only allowed for paths from left to right. It is hypothesised that environmental education is a more distal factor than *Environmental problem awareness* and estimate model embedding the hypothesis of a direct path from *Environmental problem awareness* to *Ascribed responsibility* in Gärling et al. (2003). Besides, *Environmental problem awareness* in turn was hypothesised to influence *Ascribed responsibility* and *Congestion problem awareness* which are considered as direct determinants of the policy attitudes.

From estimated model, it is shown that indeed environmental education is indirectly associated with attitudes to transport policies through *Environmental problem awareness* and *Ascribed responsibility*. There is no any significant path from *Environmental problem awareness* to *Congestion problem awareness* so that the latter appears to be separate variable influencing attitudes towards transport policies. The final model only includes paths that are found significant at least at the 10% level. The overall goodness of fit of the model also appears to be acceptable with GFI= 0.97, Adj GFI = 0.95, RMSEA = 0.05, and CFI = 0.94.

Considering the path coefficients in Table 6.7 and total effects

in Table 6.8, following observations appear important to us: Firstly, it is found a significant path between environmental education (number of environmental classes attended) and *Environmental problem awareness*. This is equivalent to the results in Section 6.4 and suggests that environmental education influences *Environmental problem awareness*. Moreover, Figure 6.3 shows that *Awareness* has a significant effect on *Ascribed responsibility* and this positively influences attitudes towards the various transportation policies aimed at reducing car use except for expressway pricing. Finally, it is found that *Congestion problem awareness* influences all four policy types. It is only hypothesised this link for three of the policies but also found a significant path to eco inspection.

When the effect of *Ascribed environmental responsibility* on policy attitudes is compared, the explanatory power for public transportation support is higher than for the support of eco inspection and parking charges. Furthermore, the β coefficients for the latter two policies are only significant at the 10% level. A significant effect of *Ascribed responsibility* on expressway pricing could not be established. *Congestion problem awareness* has a strong correlation with the support of parking restrictions. Support for public transport focused policies and road pricing policies are also significantly correlated with *Congestion problem awareness*, but there is a relatively weak correlation with environmental transport policies.

The results are further illustrated by the description of the total effects in Table 6.8. Environmental education, via *Environmental problem awareness* and *Ascribed responsibility*, primarily increases the support for public transport, the effects on support for eco inspection and parking charging are weaker. These three policies are positively determined by *Ascribed responsibility* as well as *Congestion problem awareness* whereas acceptability of road pricing

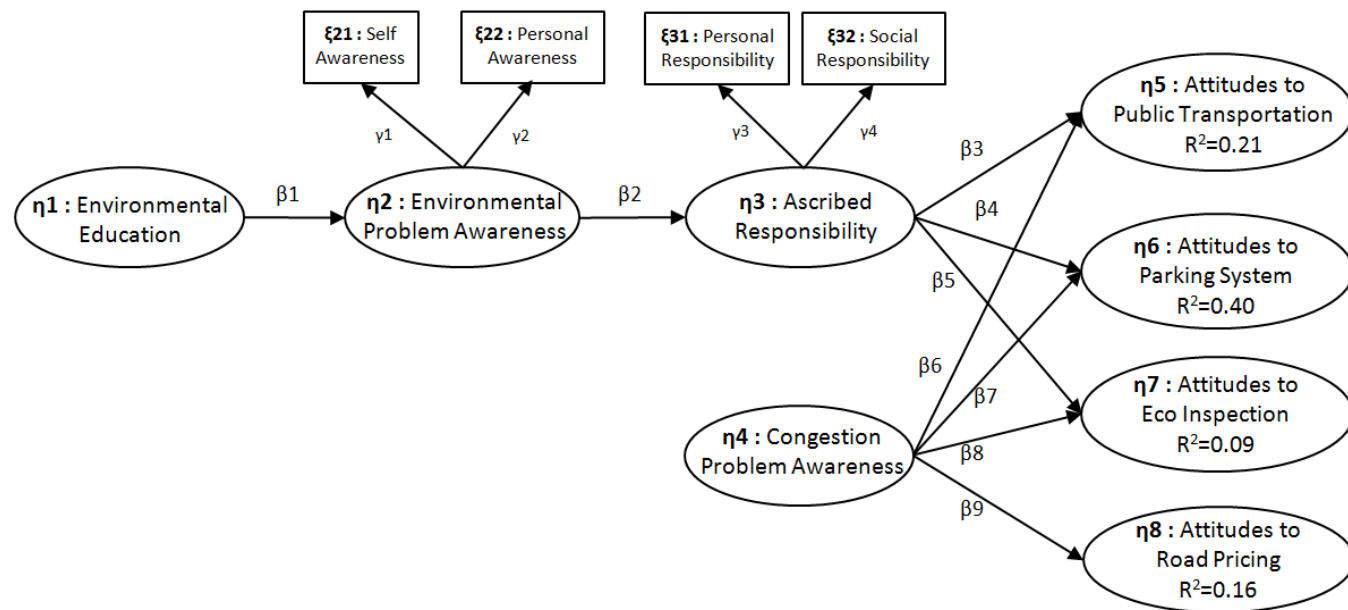


Figure 6.2 Estimated SEM analysis result

is influenced by only *Congestion problem awareness*. Both predictors explain 21% of the variance for attitudes towards the support of the public transport policy, 40% of parking policy acceptability variance but only 9% of eco inspection acceptability variance. The low value for eco-inspection might be due to many students not having a strong opinion on this issue. As mentioned before, only older cars require currently an inspection and most of the students are not car owners (see Table 6.1). In how far the results described in this section are influenced further by Kyoto and Japan specific experiences of the respondents should be explored though in further research.

Table 6.7(1) The results of the estimated model

Link	Variable	Coefficient	S.E	t-value
β_1	Environmental Education → Environmental Problem Awareness	5.81*	3.14	1.85
β_2	Environmental Problem Awareness → Ascribed Responsibility	0.61**	0.07	8.64
β_3	Ascribed Responsibility → Attitudes to Public Transportation	0.35**	0.13	2.77
β_4	Ascribed Responsibility → Attitudes to Parking System	0.20*	0.11	1.81
β_5	Ascribed Responsibility → Attitudes to Eco Inspection	0.21*	0.11	1.86
β_6	Congestion Problem Awareness → Attitudes to Public Transportation	2.04**	0.71	2.85

* $p < 0.10$, ** $p < 0.05$

Table 6.7(2) The results of the estimated model

Link	Variable	Coefficient	S.E	t-value
β_7	Congestion Problem Awareness →Attitudes to Parking System	2.74**	0.96	2.85
β_8	Congestion Problem Awareness →Attitudes to Eco Inspection	1.25**	0.49	2.54
β_9	Congestion Problem Awareness →Attitudes to Road Pricing	1.69**	0.60	2.80
Environmental Problem Awareness (Cronbach's alpha =0.75)				
γ_1	(Self Problem Awareness)	1.000	-	-
γ_2	(Personal Problem Awareness)	0.97**	0.09	11.19
Ascribed Responsibility (Cronbach's alpha =0.55)				
γ_3	(Personal Responsibility)	1.000	-	-
γ_4	(Social Responsibility)	1.08**	0.14	7.65

* $p < 0.10$, ** $p < 0.05$

Table 6.8 Total effects on transport policies

Attitudes to Transport Policy	Congestion Awareness	<i>Env. Education</i>	<i>Env.Problem Awareness</i>	Ascribed Responsibility
Public Transport	2.04**	1.25**	0.22**	0.35**
Parking System	2.74**	0.72*	0.12*	0.20*
Eco Inspection	1.25**	0.76**	0.13**	0.21**
Road Pricing	1.69**	-	-	-

Bold: direct effects, Italic: Indirect effects

* $p < 0.10$, ** $p < 0.05$

6.6. Attitude Changes to Environment and Policy

To measure the changes of psychological attitudes resulted from environmental education, the third surveys also were conducted on June and July in 2013. These targeted the 2nd and 3rd students of global engineering in Kyoto University. Total 176 students (103 respondents in 2nd year and 73 respondents in 3rd year) who responded to previous survey on 2012, were chased to understand whether their attitude changed during 1 year. The same questions were used for measuring environmental concern, awareness of congestion and attitudes to transport policies (see Table 6.2 and 6.6). Same with analysis in Section 6.4, environmental education is regarded as an average number of taken classes related to environment.

Firstly, it was confirmed that 2nd year students in both years (2012 and 2013) show similar attitudes. As shown in Table 6.9, it is verified that there are no significant differences between the two groups. It seems that students have similar attitudes when they are 2nd year. Therefore it might be considered that the attitudes changes of two groups quite depend on impact of education. The students' attitudes when they are 1st and 2nd year are compared. Table 6.10 shows there are differences in *Congestion problem awareness* and attitude towards parking system, though students have not taken many environment related clases during this 1 year. (Average number of environmental classes taken: 0.40 → 1.00) This means other factors, for example social norms based on social experience but also other non-environment related classes, might influence transport policy attitudes. To verify the effect of environmental education clearly, students' attitudes are compared when they were 2nd year compared to when they are 3rd year. This is because almost all classes related to environment are taught in the second semester of the 2nd year and in

the first semester of the 3rd year. Answered students have taken 0.97 classes until their 2nd year while 3.99 classes were taken when they are 3rd year. Especially *Personal problem awareness* appears to be significantly different between 2nd year and 3rd year, and it might be regarded that this difference is resulted from education. Although the comparison analysis in subsection 6.4 showed that education probably increases *Self* and *Personal problem awareness*, the result of this panel survey only shows *Personal problem awareness* is influenced by environmental education. In line with above results in Table 6.11, it is indicated that *Congestion problem awareness* and attitude to parking system are higher in 3rd year than 2nd year.

Moreover, Table 6.12 and 6.13 show the result of analysis with data of attitude changes (differences between attitudes in 2012 and 2013). In Table 6.12, second column ([3rd year students in 2013] – [2nd year students in 2012]), the tendency of increase is confirmed in almost determinants except for an attitude towards eco inspection. There is a decrease in attitude to eco inspection, but it seems to be insignificant. Table 6.13 shows the correlation among determinants, expressed as $cor(\mathbf{att}_{i,t} - \mathbf{att}_{i,t-1}, \mathbf{ee}_t - \mathbf{ee}_{t-1})$ where, $\mathbf{att}_{i,t}$ and $\mathbf{ee}$ are vectors describing the attitudes/problem awareness factors i and environmental education of respondents respectively measured in year t . Here, it is verified that environmental education is only correlated with changes in attitudes towards road pricing. In line with previous results, the correlation analysis does not show a strong impact of environment related modules taken on attitudinal changes.

Table 6.9 Comparison of 2nd year civil eng. students (* 3rd year student in 2013.)

Determinants		Mean (Std. Dev.)		t-test (p-values)
		2013 : 2 nd year students	2012 : 2 nd year students*	
Environmental Education		1.00	0.97	
Environmental Concern	Self Problem Awareness	4.76 (1.37)	4.75 (1.53)	-0.02 (0.99)
	Personal Problem Awareness	4.96 (1.51)	4.77 (1.42)	-0.86 (0.39)
	Personal Ascribed Responsibility	5.50 (1.31)	5.62 (1.44)	0.58 (0.56)
	Social Ascribed Responsibility	5.20 (1.46)	5.24 (1.47)	0.19 (0.85)
Congestion Problem Awareness		5.58 (1.36)	5.38 (1.60)	-0.89 (0.38)
Attitudes to Transport Policy	Public Transport	4.84 (1.65)	4.52 (1.61)	-1.30 (0.20)
	Parking System	5.16 (1.41)	5.12 (1.27)	-0.16 (0.88)
	Eco Inspection	5.07 (1.46)	5.15 (1.55)	0.36 (0.72)
	Road Pricing	5.37 (1.33)	5.08 (1.31)	-1.42 (0.16)

Table 6.10 Comparison of 1st year in 2012 with 2nd year in 2013 (Bold, **0.05,*0.1)

Determinants		Mean (Std. Dev.)		t-test (p-values)
		2012 : 1 st year students	2013 : 2 nd year students	
Environmental Education		0.40	1.00	
Environmental Concern	Self Problem Awareness	4.67 (1.67)	4.76 (1.37)	0.41 (0.68)
	Personal Problem Awareness	4.89 (1.71)	4.96 (1.51)	0.30 (0.76)
	Personal Ascribed Responsibility	5.62 (1.31)	5.50 (1.31)	-0.69 (0.49)
	Social Ascribed Responsibility	5.34 (1.27)	5.20 (1.46)	-0.71 (0.48)
Congestion Problem Awareness		5.22 (1.44)	5.58 (1.36)	1.84 (0.07)*
Attitudes to Transport Policy	Public Transport	4.60 (1.71)	4.84 (1.65)	1.04 (0.30)
	Parking System	4.76 (1.62)	5.16 (1.41)	1.88 (0.06) *
	Eco Inspection	5.07 (1.52)	5.07 (1.46)	0.00 (1.00)
	Road Pricing	5.14 (1.36)	5.37 (1.33)	1.25 (0.22)

Table 6.11 Comparison of 2nd year in 2012 with 3rd year in 2013 (Bold, ***0.05,**0.1)

Determinants		Mean (Std. Dev.)		t-test (p-values)
		2012 : 2 nd year students	2013 : 3 rd year students	
Environmental Education		0.97	3.99	
Environmental Concern	Self Problem Awareness	4.75 (1.53)	4.82 (1.51)	0.27 (0.79)
	Personal Problem Awareness	4.77 (1.42)	5.16 (1.28)	1.78 (0.08)*
	Personal Ascribed Responsibility	5.62 (1.44)	5.63 (1.32)	0.06 (0.95)
	Social Ascribed Responsibility	5.24 (1.47)	5.36 (1.33)	0.47 (0.64)
Congestion Problem Awareness		5.39 (1.60)	5.95 (1.19)	2.40 (0.02)**
Attitudes to Transport Policy	Public Transport	4.52 (1.61)	4.44 (1.48)	-0.32 (0.75)
	Parking System	5.12 (1.27)	5.48 (1.20)	1.74 (0.08)*
	Eco Inspection	5.15 (1.55)	5.51 (1.25)	1.53 (0.13)
	Road Pricing	5.08 (1.31)	5.32 (1.51)	1.00 (0.32)

Table 6.12 Descriptive analysis of attitude changes

Grade		(2013 : 2 nd year students) - (2012 : 1 st year students)		(2013 : 3 rd year students) - (2012 : 2 nd year students)		Total	
Sample size		matched 103 students		matched 73 students		176 students	
Determinants		Mean	Std	Mean	Std	Mean	Std
Env. Concern	Self Problem Awareness (SPA)	0.087	1.657	0.069	1.718	0.080	1.678
	Personal Problem Awareness (PPA)	0.068	2.166	0.397	1.488	0.205	1.916
	Personal Ascribed Responsibility (PAR)	-0.126	1.564	0.014	1.814	-0.068	1.669
	Social Ascribed Responsibility (SAR)	-0.136	1.727	0.110	1.745	-0.034	1.733
Congestion Problem Awareness (CPA)		0.359	1.558	0.562	1.581	0.443	1.566
Attitudes to Transport Policy	Public Transport (PT)	0.233	1.658	0.233	1.296	0.233	1.515
	Parking System (P)	0.398	1.773	0.356	1.540	0.381	1.676
	Eco Inspection (EI)	0.243	1.785	-0.082	2.019	0.108	1.887
	Road Pricing (RP)	0.000	1.950	0.370	1.603	0.153	1.819
Environmental Education (EE)		0.689	0.754	3.014	1.286	1.653	1.527

Table 6.13 Correlation analysis of attitudes changes in 176 students (Bold, ***0.01, **0.5, * 0.1)

Determinants		Environmental Concern			CPA	Attitudes to Transport Policy				EE
		PPA	PAR	SAR		PT	P	EI	RP	
Env. Concern	SPA	0.395***	0.096	0.182**	0.063	0.085	-0.007	0.104	-0.041	0.006
	PPA	-	0.224***	0.281***	0.017	0.102	-0.088	0.071	-0.050	0.032
	PAR	-	-	0.049	0.003	0.106	0.140*	0.001	-0.036	-0.043
	SAR	-	-	-	0.126	0.086	0.036	0.109	0.042	0.058
CPA		-	-	-	-	-0.056	0.083	0.210***	0.056	0.026
Attitudes to Transport Policy	PT	-	-	-	-	-	0.226***	0.017	0.153**	-0.032
	P	-	-	-	-	-	-	0.298***	0.119	-0.011
	EI	-	-	-	-	-	-	-	-0.028	-0.078
	RP	-	-	-	-	-	-	-	-	0.122*

6.7. Discussion

Sustainable transport is not achievable without planners who fully embrace such policies. Planners are “created” at universities through appropriate education. Many major universities are nowadays rethinking therefore their engineering curriculum to a) address a more global audience and b) to respond to changing needs towards more sustainable transport policies. Environmental education is in many institutions seen to be of primary importance though evidence on the impact of education has been largely missing so far. The aim of this study is to be a first step to close this knowledge gap.

With a survey among Kyoto University undergraduate students, it was verified that environmental education increases environmental problem awareness. *Problem awareness* includes “self and personal aspects”, i.e. understanding of the environmental effects of one’s own actions as well as the effects of environmental problems on one’s own future. It could not be verified any direct education effects on *Ascribed responsibility* which would also be hoped for. In particular gaining *Social ascribed responsibility* will help transport planners to understand the role of community involvement for achieving sustainable transport. There appears to be though an indirect effect of education on *Ascribed responsibility* via *Problem awareness*.

The second major finding is that education in civil engineer modules also influences attitudes to transportation policies, again highlighting the role of university education in shaping future transport policies. It is demonstrated by an SEM analysis that *Congestion awareness* and *Ascribed responsibility* influence attitudes towards various transportation policies among civil engineering students. It is shown that support for transport policies that promote public transport and car use restrictions, are significantly correlated

with environmental concern. This means that students who have been better educated about environmental issues are more likely to support the usage of public transport or the need of other environmental policies. More generally, one might also conclude that increasing public awareness of, and responsibility for, environmental issues is important to gain wider support for specific transportation policies.

This study clearly has some limitations. Firstly, proxy for the amount of environmental education is the number of modules students have taken with the name “environment” in the module title. Obviously, also other modules might teach environmental aspects. Secondly, in comparison with students from other faculties, it cannot be controlled whether students entering the faculty of engineering already choose this faculty because of previous environmental interests. Finally, the analysis with panel data is shown in Tables 6.12 and 6.13. Actually the impact from environmental education on attitudes to environmental concern and transport policies was not verified, but weak impact of education was shown. Therefore my hypothesis that education is correlated with and can increase positive attitudes to transport policies, could not be confirmed from panel data. It might be concluded that the impact of one year education is too weak to be measured through analysis with panel data and the methodology to measure environmental education is not good enough.

Therefore in future studies this survey should be repeated and panel data should be collected in order to directly measure the change in environmental attitudes over the four years. Further, with more detailed data the effect of some specific modules on environmental attitudes could be analyzed. Finally, similar studies might also be conducted at other universities in order to confirm the findings and derive at some more practical conclusions how to best educate future transport planners.

Chapter 7

7. Conclusions

7.1. Summary

This thesis has focused on the development of strategies on how public acceptability would be increased towards sustainable transport policies. The major findings are not only verifying what psychological determinants are related to increase public acceptability, but suggesting general strategies to decision makers how to promote acceptability of policies. Previous studies mainly demonstrated how psychological factors influence acceptability, but did not suggest practical ways of how to increase it. The main conclusions obtained are described in the following by each chapter. There are researches to demonstrate how to change psychological intervention, such as TFP, but researches about direct intervention for acceptability are more limited.

In Chapter 3, two sustainable policies were compared, congestion pricing and environmental taxation among three countries, UK, US, and Japan. Despite significant differences in the pricing schemes, the estimated models show that both have similar structures

and a number of well established psychological determinants provide good explanations for the acceptability for both policies and in all locations. The major finding is that *Scenario fairness* appears to be the most important direct determinant of acceptability in all countries. The effect of *Specific trust in government* on *Scenario fairness* and other direct determinants is further verified indicating the important role of general government performance to increase acceptability for sustainable policies. Further the findings suggest that awareness of wider environmental issues, such as global warming, can lead to the support of specific sustainable transport policies, such as road pricing, which are not directly designed to address global warming issues. It was further found that different university majors affect attitudes. The results show that students in classes of social science are more aware of the environmental problems compared with students majoring in engineering.

Chapter 4 indicates that persons with arrogant personality traits show different levels of attitudes towards transport policies and its related psychological determinants. To separate groups by *Arrogance*, a two step cluster analysis was carried out and then some statistical analyses were conducted to verify correlations to policy acceptability. In the results, it is highlighted that there are different determinants which influence on acceptability depending their traits. Acceptability of arrogant people was lower than that of the non-arrogant group when comparing mean values of responses. This shows that the hypothesis, *Arrogant people show defection behavior to accept the sustainable transport policy*, is demonstrated through this study. Moreover, other finding is there is not significant differences in case of *General trust in government* between two groups. These findings show policy is influenced by arrogance personality that is one vulgarity traits of mass. Finally, it was carefully

suggested that some early education can prevent students to develop arrogant attitudes for sustainable transport policy. Moreover, decision makers can deal with consistent trust of arrogant towards government to promote environmental policy effectively.

Chapter 5 highlighted that the Big-Five personality traits correlate with environmental concern and acceptability. The estimated model reveals that acceptability is related to the personality traits *Extraversion*, *Agreeableness*, and *Conscientiousness*. Extraverted individuals have higher levels of *Trust in government* which leads to higher acceptability. Also correlations between *Agreeableness* and *Conscientiousness* as well as *Environmental concern* are observed. It was discussed strategies for effective marketing of transportation policies considering how acceptability is related to personality traits. Moreover it was suggested using the Big-five personality trait scale as an indicator for the level of policy acceptability in various sub-cultures, because there are a few studies to apply this scale to various cultures in over the world. Therefore if government knows the composition of traits for citizen, it would be possible to suggest some effective ways to promote the policy.

In Chapter 6 firstly it was demonstrated that there is a positive relationship between environmental education and environmental concern. In particular, differences of environmental attitudes by grades and majors were shown. Then use Structural equation model to derive that education also positively influences attitudes to various transportation policies aimed at reducing car usage such as support for public transport and pricing scheme. From the findings, it can be concluded that raising *Awareness of environmental problems* and promoting *Responsibility* through the university curriculum is important to educate future transport decision makers as well as to gain general support for sustainable transportation policies.

7.2. Research Implications

This thesis began by arguing that policy makers have to understand what prevents individuals from making environmentally friendly travel decision. Furthermore, what psychological factors are positively related to accept sustainable transport policies and what strategy can be suggested for increasing public acceptability with practicality.

In this thesis it was carefully suggested some soft measures regarding the findings. It is noted in Chapter 1 that transport policy may be divided into “hard” and “soft”. Usually hard measures include the way to supply, for examples, improvements of infrastructure for and management of public transport services, increased costs for car use, and prohibition or rationing of car use. Strictly speaking, road pricing is also one of hard measure. As already mentioned, however this alone is not effective for achieving car-use reduction (Stopher, 2004), and some are difficult to implement because of public opposition (Gärling and Schuitema, 2007; Jones, 2003). Therefore, the interests in soft measures has increased which use techniques of information dissemination and persuasion to influence car users to voluntarily switch to sustainable travel modes (Gärling and Fujii, 2009; Jones and Sloman, 2006; Rose and Ampt, 2003; Taniguchi et al., 2007; Taylor, 2007; Taylor and Ampt, 2003). Fujii and Taniguchi (2006) defined soft measures are also psychological and behavioral strategies. Therefore, to increase the effects of pricing scheme which is one of hard measures, the psychological approach as strategies can be considered like as soft measures.

Here are some important implications, highlighting individual's differences by culture, social background, personality traits, and external influences like education. This thesis mentions the

important role of communication including campaigns, and marketing as well as early school education considering the target population and regions, for successful policy implementation. In some empirical case studies, the impact of communication methodology on personal behavior was already demonstrated. The report for Promoting Sustainable Consumption, that was published by the OECD (Organization for Economic Co-operation and Development) includes an important role of communication showing the case of personalized travel planning campaign as part of the Sustainable Travel Towns program in the UK to reduce consumer car mileage (OECD, 2008).

Moreover, social marketing can be applied to Travel Demand Management (TDM). Thøgersen (2014) noted that social marketing is an increasingly popular means of TDM for promoting non-car modes of travel that has proven to be effective. McGovern (2005) suggested that social marketing programs could be of value as information instrument in support of TDM. It is also discussed that communication and marketing help increasing acceptability in the process of the introduction of congestion charging (OECD, 2010). New York City planned to promote the campaign aspects to marketing for congestion pricing after unsuccessful attempt in 2008. One specific aspect of the campaign is how traffic reduction would benefit New York City congestion pricing. The marketing also emphasizes on improvement of transit service in the near-term if the congestion pricing gain approval (AASHTO, 2009). Transportation Bureau of London (TfL: Transport for London) also has used communication methodology for successful implementation of congestion charging. Indeed they identified four success factors for a congestion charging campaign; 1) To be comprehensive in terms of information transmission, 2) To create empathy between drivers and TfL, 3) To be flexible enough to encompass different messages, 4) To be visually engaging (TfL, 2010).

However uniform transport policy, i.e. a policy which does not consider the characteristics of a region and its citizen or is just an imitation of other countries' policies, may not be in success. Therefore, it is expected that the results and some suggested strategies in this study would contribute to give directions to decision makers how to implement an effective transport policy and to establish a successful long-term policy.

7.3. Future Works

In future work it would be preferable to survey the general populace, because all data used in this study are from university students. The results presented in this thesis might not be a general conclusion since the results do not explain all acceptability behavior of the general population. There might be some more differences towards transport policy by socioeconomic factors such as gender, age, job, income, and level of education etc. In this thesis, these socioeconomic factors were not dealt with because of these sampling limitations. Therefore further work should be done for explaining general behavior through random samples gathered from a wider population.

This thesis is limited to suggest one specific way of how to deal with arrogance of mass-man for sustainable transport policy because there are not enough empirical studies how to improve arrogant attitude. Hogan et al. (2010) noted that highly arrogant people expect to be admired, praised, indulged, and obeyed. Therefore to use "polite words" in communication for policy implementation, as suggested in Chapter 4, might be one solution to deal with arrogant

people. However further studies are needed to suggest detailed knowledge of effective ways how to influence arrogant persons.

As noted in Chapter 1, the term of acceptability and acceptance is different. Acceptability is just concept being considered as hypothetical or not yet implemented schemes. Therefore it is doubtful high acceptability would be revealed as high acceptance (i.e. some people still keep to travel with a car though they accepted). When the specific case is considered, for instance people still keep to travel with car though they accepted to pay high charge or fuel tax, it can be regarded that road pricing does not necessarily lead to car use reduction. Gehlert et al. (2008, 2011) investigate how public acceptability and car use changed with the introduction of an urban road pricing scheme and whether there were any contingencies between acceptability change and car use reductions (as real actions) that could explain the positive attitude change repeatedly observed after the introduction of an urban road pricing scheme and demonstrated there are differences between public acceptability and real car use reduction towards road pricing. However, in this thesis such comparison was not possible with used data set. Finally, it is my hope to verify what psychological determinants derive real actions to reduce car use from acceptability regarding the strategies which were suggested in this thesis.

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Appendix A

Theory of Structural Equation Model

The structural equation model (SEM) is a statistical technique for testing and estimating causal relations using a combination of statistical data and qualitative causal assumptions. This is the widely used model in various fields especially to verify relationship between psychological factors. In this thesis, we used SEM to cope up with our objectives for every sub-studies.

This definition of SEM was articulated by the geneticist Sewall Wright (1921), the economist Trygve Haavelmo (1943), and the cognitive scientist Herbert Simon (1953); it was formally defined by Judea Pearl (2000) using the calculus of counterfactuals. The SEM, also called simultaneous equation model, is a multivariate regression model. However, unlike the more traditional multivariate linear model, the response variable in one regression equation in an SEM may appear as a predictor in another equation; indeed, variables in an SEM may influence one another reciprocally, either directly or through other variables as intermediaries. These structural equations are meant to represent casual relationships among the variables in the model. Among the strengths of the SEM is the ability to construct latent variables, i.e., variables that are not measured directly, but are estimated in the model from several measured variables, each of which is predicted to “tap into” the latent variables. This allows the modeler to explicitly capture the unreliability of measurement in the model, which in theory allows the structural relations among latent variables to be accurately estimated. Factor analysis, path analysis, and regression all represent special cases of SEM. The least-squares method is a general method for the analysis of SEM with latent

variables and is described as follows:

$$S = \text{Min} \sum_{i=1}^n r_i^2 \quad (\text{A.1})$$

where a residual is defined as the difference between the value of the dependent variable and the model value.

$$r_i = y_i - f(x_i, \beta) \quad (\text{A.2})$$

The objective is to adjust the parameters of a model function to best fit a data set. A simple data set consists of n points (data pairs), (x_i, y_i) , $i=1 \dots n$ where x_i is an independent variable, and y_i is a dependent variable whose value is found by observation. The model function has the form $f(x, \beta)$, where the m adjustable parameters are held in the vector β . The goal is to find the parameter values for the model that best fit the data. The least-squares method finds its optimum with the sum, S , of squared residuals. To solve the least-squares problem, the minimum of the sum of squares is found by setting the gradient to zero. Because the model contains m parameters, there are the gradient equations.

$$\frac{\partial S}{\partial \beta_j} = 2 \sum_i r_i \frac{\partial r_i}{\partial \beta_j} = 0, \quad j = 1, \dots, m \quad (\text{A.3})$$

Furthermore, because, the gradient equation becomes

$$-2 \sum_i \frac{\partial f(x_i, \beta)}{\partial \beta_j} r_i = 0, \quad j = 1, \dots, m \quad (\text{A.4})$$

The gradient equations apply to all least-squares problems. Therefore SEM is argued as a multivariate regression model with latent variables in which, unlike the more traditional multivariate linear models, the variables in one regression equation may appear as

a predictor in another equation; variables in a SEM analysis may even influence one another reciprocally, either directly or through other variables as mediators. The structural equations thus represent casual relationships among the variables in the model. The least-squares method is a general method for the analysis of SEM with latent exogenous and endogenous variables (Fox, 2006). where endogenous variables are denoted η and exogenous variables ξ , β , and γ are the estimated coefficients of the endogenous and exogenous variables, respectively. For each latent variable an error term is defined. In this study, AMOS software was selected as an appropriate tool for analysis.

Appendix B

Questionnaire for 1st and 2nd Data Collection

Survey on Personal Values and Environmental Consciousness

- This questionnaire aims to survey personal attitudes towards environmental problems.
- Information collected from this survey will be used for research purposes only, and never be distributed to others.

Tokyo Institute of Technology, Department of Civil and Env. Engineering (Fujii Laboratory)

Section 1 First, please read the below scenario carefully.

The UK government has decided to introduce an environmental tax of **£50 per month** to be paid by all UK residents including all university students.

The decision was made after a long debate with several economists and scientists through which the government got convinced that this additional tax is needed to influence greenhouse emissions.

The tax will be used for environmental research and to subsidise the introduction of new technology that emits less CO₂. The government accounted that they justified the amount by scientific research referring to the carbon footprints.

Once you have finished reading please answer following questions connected with this scenario.

Please indicate from 1 to 7 how much you agree with the statements.
(1= totally disagree, 7= fully agree)

1) Do you support this governmental decision for an environmental tax?	Not at all neutral Yes, strongly ← → ☐ ☐ ☐ ☐ ☐ ☐ ☐
2) Are you willing to accept this governmental decision for an environmental tax?	Not at all neutral Yes, strongly ← → ☐ ☐ ☐ ☐ ☐ ☐ ☐
3) Do you think this environmental tax is fair?	Very unfair neutral Very fair ← → ☐ ☐ ☐ ☐ ☐ ☐ ☐

4) Do you think this process of governmental decision making for an environmental tax is fair?	Very unfair neutral Very fair ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
5) Do you think this environmental tax is impartial?	Very partial neutral Very impartial ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
6) Do you think this environmental tax "infringes on your freedom"?	Infringe to very small extent neutral Infringe to very large extent ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
7) Do you trust the government that made a decision to introduce this tax?	Not at all neutral Yes, strongly ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
8) How serious do you feel the global environmental problem is?	No serious at all neutral Very serious ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
9) Do you think global warming will seriously damage our society?	No, at all neutral Yes, damaging strongly ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
10) Do you think the CO ₂ that <i>you</i> produce in your daily life will contribute to global warming and this will negatively influence our society?	Not at all neutral Yes, influencing strongly ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
11) Do you think global warming will seriously damage <i>yourself</i> ?	Not at all neutral Yes, damaging strongly ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
12) Do you think a tax like this can help to eventually reduce the effect of global warming?	Not at all neutral Yes, can help significantly ←----- -----→ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Section 2 Please answer following questions on your attitude towards
London's congestion charging scheme.

Please indicate from 1 to 7 how much you agree with the statements
 (1= totally disagree, 7= fully agree) (1= totally disagree, 7= fully agree)

1) Do you support the congestion charge?	Not at all neutral Yes, strongly ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
2) Do you think the congestion charge is fair?	Very unfair neutral Very fair ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
3) Do you think the process how congestion charge was introduced is fair?	Very unfair neutral Very fair ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
4) Do you think the congestion charge is impartial?	Very partial neutral Very impartial ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
5) Do you think the congestion charge "infringes on your freedom"?	Infringe to very small extent neutral Infringe to very large extent ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
6) Do you trust the government that made the decision to introduce the congestion charge?	Not at all neutral Yes, strongly ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
7) Do you think the congestion charge helps to eventually reduce the effect of global warming?	Not at all neutral Yes, helps significantly ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
8) Do you think that congestion is a serious problem in London?	Not serious at all neutral Very serious ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
9) Do you think the congestion charge is effective in reducing congestion?	Not at all neutral Yes, very effective ←————— ————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Section 3 Please indicate from 1 to 7 how much you agree with the following statements
(1= totally disagree, 7= fully agree) (1= totally disagree, 7= fully agree)

1) What restricts me in my actions is nothing but myself.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
2) I think my opinion is always right.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
3) I feel that I will win all the time.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
4) I am sure my preference should be reflected by the society.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
5) In any circumstance, I should believe in myself and not listen to others' opinions.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
6) I do not usually try to understand the reasons behind the situation.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
7) I am not interested in any background facts.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
8) It might be possible that our society will disappear in the future.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
9) Every problem can eventually be solved by technology.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
10) I think I am I and others cannot be compared to me.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
11) Only I should be in charge of my own issues.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
12) I would like to live freely from morality or ethics.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐

13) I have respect for traditions	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
14) Our daily life is full of things that should be appreciated.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
15) Our world is full of wonder.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
16) I think we have a responsibility to inherit, improve and take over traditions.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
17) I impose a lot of demands on myself.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
18) I think we cannot see any meaning in our life if we lose objectives or ideals to serve.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
19) I am willing bear with responsibilities and difficulties more frequently than others.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
20) I think it is a national obligation to obey the decision made by the government.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
21) I respect the government.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐
22) In general I trust the government.	Totally disagree neutral Fully agree ←————— —————→ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Section 4 Please indicate from 1 to 7 how much you agree with the following statements
(1= totally disagree, 7= fully agree) (1= totally disagree, 7= fully agree)

1) I think there is an objective truth in the world.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
2) I think there is an "authentic beauty" (in society and nature) which is true for all nations and all times.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
3) I think there is a "true justice" which is true for all nations and all times.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
4) There is no definite "authentic beauty" as the sense of beauty differs between individuals, where they live, their culture and time.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
5) I think that humans will be judged according to how they live.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
6) There are no definite standards of justice as it depends on the background of an individual, where they live, their culture and time.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
7) There is no truth publically (in the world) as people take things according to their own understanding.	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐
8) I believe that no one has a right to criticise my beliefs	Totally disagree	neutral	Fully agree
	←		→
	☐	☐	☐

Section 5 Questions about your car usage and other transport modes

Do you have a driving license?	☐ Yes, I do ☐ No, I don't
Do you own a car?	☐ Yes, I do ☐ No, I don't
For each of the travel modes how often do you use them presently? (If you do not use at all, please write down "0 days")	Car about _____ days per ☐ Week ☐ Month ☐ Year Bicycle about _____ days per ☐ Week ☐ Month ☐ Year Public Transport about _____ days per ☐ Week ☐ Month ☐ Year
How many flights do you make per year? (count return flights as 2)	Domestic flights about _____ times per year Continental flights about _____ times per year Intercontinental flights about _____ times per year
How much do you walk per day in average?	about _____ hours _____ minutes

Section 6 Some personal questions

What is your grade?	☐ Undergraduate _____ year ☐ Master ☐ Doctoral _____ year
In which department do you study?	
How far do you commute to university?	☐ within 2km ☐ 2-10km ☐ 10-20km ☐ Over20km
Do you have fulltime work experience ?	☐ Yes ☐ No
Please tell us your sex and age.	☐ Male ☐ Female _____ years
Please tell us your nationality.	

Thank you for taking the time to complete this questionnaire.



交通行動分析 藤井研究室
京都大学 工学研究科 都市社会工学専攻

NO:

環境問題に関するアンケート調査

- この調査は皆さんのパーソナリティや環境問題に対する意見をたずねることを目的としています。
- 調査用紙は6つのパートから成っており、おおよそ10分で完答できる問題です。
- 回答されたすべての情報は厳正に管理され、調査、研究以外では絶対使用致しません。
- 本アンケートの御不明点等は以下までお問い合わせ下さい。

金 貞花 (キム ジェンワ)
京都大学大学院 工学研究科 都市社会工学専攻 交通行動システム分野 藤井研究室
〒615-8540 京都市西京区京都大学桂 C1-2-437 号室
TEL: 075-383-3242 e-mail: kim@trans.kuciv.kyoto-u.ac.jp

専攻:

学年:

学生番号:

名前:

- 学生さんの名前は他の調査に使わないので、安心してください。

SECTION A

以下の質問に7段階でご回答ください。

パーソナリティについて、質問します。		まったくあてはまらない ←	非常にあてはまる →
Q.1.	感情の起伏が甚だしい。	☐	☐
Q.2.	自分が好きじゃない。	☐	☐
Q.3.	他人を敬う。	☐	☐
Q.4.	生きていると楽しいことしかない。	☐	☐
Q.5.	用意周到だ。	☐	☐
Q.6.	創造性に富む。	☐	☐
Q.7.	気分が落ち込むときがある。	☐	☐
Q.8.	人を侮辱するときがある。	☐	☐
Q.9.	社交性がある。	☐	☐
Q.10.	一度きめたら、最後までやりぬく。	☐	☐
Q.11.	想像力が豊かである。	☐	☐
Q.12.	友達を簡単にしてくれる。	☐	☐
Q.13.	計画を実行に移す。	☐	☐
Q.14.	今日出来ることを明日に延ばさない。	☐	☐
Q.15.	絶望感をいだきやすい。	☐	☐

SECTION B

以下の質問に7段階でご回答ください。

他人との付き合い方について、質問します。		まったくしない						いつもする
Q.1.	知らない人に道を教えてあげたことがある。	☐	☐	☐	☐	☐	☐	☐
Q.2.	服や物を寄付したことがある。	☐	☐	☐	☐	☐	☐	☐
Q.3.	ボランティア(奉仕活動)をしたことがある。	☐	☐	☐	☐	☐	☐	☐
Q.4.	知らない人の荷物を運ぶのを手伝ったことがある。	☐	☐	☐	☐	☐	☐	☐
Q.5.	知らない人のために、エレベーターのドアを開けて待ったことがある。	☐	☐	☐	☐	☐	☐	☐
Q.6.	友達の宿題を手伝ってあげたことがある。	☐	☐	☐	☐	☐	☐	☐
Q.7.	路上で障害者やお年寄りを助けてあげたことがある。	☐	☐	☐	☐	☐	☐	☐
Q.8.	バスや電車の中で席を譲ったことがある。	☐	☐	☐	☐	☐	☐	☐

人生に対する思いについて、質問します。		全く支持しない						とても強く支持する
Q.1.	私に起こる多くの事は、たんなる偶然の産物だ。	☐	☐	☐	☐	☐	☐	☐
Q.2.	私の未来は運命に左右される。	☐	☐	☐	☐	☐	☐	☐
Q.3.	他人の助けがなければ、問題を処理できない。	☐	☐	☐	☐	☐	☐	☐
Q.4.	人生を通して、私は問題を抱え続けている。	☐	☐	☐	☐	☐	☐	☐
Q.5.	成功は運と無関係であり、一生懸命努力することによってのみ得られる。	☐	☐	☐	☐	☐	☐	☐
Q.6.	私の人生は外的な要因によって左右される。	☐	☐	☐	☐	☐	☐	☐
Q.7.	ストレスがあるとき、体が強張る傾向がある。	☐	☐	☐	☐	☐	☐	☐
Q.8.	困難な状況に陥った時、過呼吸になる。	☐	☐	☐	☐	☐	☐	☐
Q.9.	未来にどんな大変なことが起こっても、うまく対処できるという自信がある。	☐	☐	☐	☐	☐	☐	☐
Q.10.	問題を抱えながらも自分をコントロールできているのは、ほとんど幸運によるものだ。	☐	☐	☐	☐	☐	☐	☐

以下の質問に7段階でご回答ください。

ご自身について、質問します。		← 全く支持しない	とても強く支持する →
Q.1.	私は価値がある人だ。	☐	☐
Q.2.	私にはいくつか長所があると思う。	☐	☐
Q.3.	すべての事に失敗する気がする。	☐	☐
Q.4.	他人より、仕事がよくできるという自信がある。	☐	☐
Q.5.	誇れることが何もないと思う。	☐	☐
Q.6.	いつも自分に肯定的である。	☐	☐
Q.7.	概して自分自身に満足する。	☐	☐
Q.8.	もつと自尊心をもちたいと思う。	☐	☐
Q.9.	時々自分が役立たずだと感じる。	☐	☐
Q.10.	時々、自分を悲観する。	☐	☐
Q.11.	自分の意見が誤っていることなどない、と思う。	☐	☐
Q.12.	私はどんな時でも勝ち続けるのではないか、と思う。	☐	☐
Q.13.	自分個人の嗜好が社会に反映されるべきだと思う。	☐	☐
Q.14.	どんな時も自分を信じて、他人の言葉などに耳を貸すべきではないと思う。	☐	☐

SECTION C

以下の質問に7段階でご回答ください。

環境問題に対する認識について、質問します。		まったくあてはまらない 非常にあてはまる						
Q.1.	わたしたちが認知しているよりもっと環境汚染は大衆の健康に悪影響を及ぼしている。	☐	☐	☐	☐	☐	☐	☐
Q.2.	ある国から発生した汚染は世界中の人々に悪影響を及ぼす。	☐	☐	☐	☐	☐	☐	☐
Q.3.	自然界のバランスは崩れやすい。	☐	☐	☐	☐	☐	☐	☐
Q.4.	数十年後には、何千もの種が絶滅の危機にひんしているだろう。	☐	☐	☐	☐	☐	☐	☐
Q.5.	気候変動は、我々の社会に深刻な悪影響を及ぼすだろう。	☐	☐	☐	☐	☐	☐	☐
Q.6.	日常生活で私が排出する二酸化炭素は、気候変動に影響し、社会にも悪影響を及ぼす。	☐	☐	☐	☐	☐	☐	☐
Q.7.	地球温暖化問題は私自身にも深刻な悪影響を及ぼすだろう。	☐	☐	☐	☐	☐	☐	☐

環境問題に対する意見と要望について、質問します。		まったくあてはまらない 非常にあてはまる						
Q.1.	私は環境問題をまったく心配していない。	☐	☐	☐	☐	☐	☐	☐
Q.2.	全国民が環境問題について責任感を持たなければならない。	☐	☐	☐	☐	☐	☐	☐
Q.3.	自治体は国民より、もっと環境問題について責任感を持たなければならない。	☐	☐	☐	☐	☐	☐	☐
Q.4.	環境保護は道徳的義務であると思う。	☐	☐	☐	☐	☐	☐	☐
Q.5.	環境は保護されなければならないと思う。	☐	☐	☐	☐	☐	☐	☐
Q.6.	一般的に人々が環境保護することは重要だと感じる。	☐	☐	☐	☐	☐	☐	☐
Q.7.	環境汚染は無視できない問題である。	☐	☐	☐	☐	☐	☐	☐
Q.8.	私が環境保護団体に寄付する。	☐	☐	☐	☐	☐	☐	☐
Q.9.	私は厳しい環境法を支持する。	☐	☐	☐	☐	☐	☐	☐
Q.10.	環境に悪影響を与えている企業へのデモ活動に参加する。	☐	☐	☐	☐	☐	☐	☐
Q.11.	少し高くてもリサイクルされた製品を買おうと思う。	☐	☐	☐	☐	☐	☐	☐

SECTION D

次の「仮想的な状況」についての文章を「よく読んで」、次いで、以下の質問にお答え下さい。

日本政府は、この度、学生を含む全国民から一月当たり一万円の環境税を導入することを決定した。この決定は、様々な経済学者と科学者が長い間議論した末に下されたもので、政府は、この環境税が地球温暖化対策として大変有効であるということを確認している次第である。

この環境税は、環境関連の研究に使用されると共に、二酸化炭素排出量を削減する新技術の導入にも活用される。なお、政府は、今回の税額 政策を温暖化対策量に関する科学研究に基づいて決定したものであると説明している。

上の文と関係がある質問です。

Q.1.	この環境税の政府決定を支持しますか？	全く支持しない とても強く支持する ← □ □ □ □ □ □ □ →
Q.2.	この環境税の政府決定を、受け入れられますか？	全く受け入れられない 喜んで受け入れる ← □ □ □ □ □ □ □ →
Q.3.	この環境税は「公正」なものだと思いますか？	とても不公正だ とても公正だ ← □ □ □ □ □ □ □ →
Q.4.	この環境税を決定した政府の手続きは「公正」なものだと思いますか？	とても不公正だ とても公正だ ← □ □ □ □ □ □ □ →
Q.5.	この環境税は「公平」なものだと思いますか？	とても不公平だ とても公正公平だ ← □ □ □ □ □ □ □ →
Q.6.	この環境税は「あなたの自由を侵害する」ものだと思いますか？	ほとんど侵害しない とても強く侵害する ← □ □ □ □ □ □ □ →
Q.7.	この環境税が「環境問題の解決のために効果がある」と思いますか？	ほとんど効果ない とても強く効果ある ← □ □ □ □ □ □ □ →
Q.8.	日本政府を尊敬しますか？	全く尊敬しません とても強く尊敬します ← □ □ □ □ □ □ □ →
Q.9.	一般的に政府を信頼しますか？	全く信頼しません とても強く信頼します ← □ □ □ □ □ □ □ →
Q.10.	この環境税を決定した政府を、あなたは信頼しますか？	全く信頼しません とても強く信頼します ← □ □ □ □ □ □ □ →
Q.11.	「一月当たり一万円の環境税金額が当を得る」と思いますか？	ほとんど不適切だ とても強く適切だ ← □ □ □ □ □ □ □ →

6]

SECTION E

以下の質問に7段階でご回答ください。

[illegible]

SECTION F

下に返答してください。

No	質問	回答
Q.1.	年齢	 歳
Q.2.	性別	☐ 男、 ☐ 女
Q.3.	運転免許証を持っていますか？	☐ はい、 ☐ いいえ
Q.4.	マイカーを持っていますか？	☐ はい、 ☐ いいえ
Q.5.	どのような手段で通学しますか？	☐ 徒歩 ☐ 自転車 ☐ 車 ☐ 二輪車 ☐ 公共交通機関 ☐ その他(.....)
Q.6.	家から学校まで、どのぐらいかかりますか？	時間..... 分
Q.7.	以下から聴講したこととか、聴講中のある授業をチェックしてください。 [工学部 地球工学科] ☐ 大気・地球環境工学 ☐ 基礎環境工学 II ☐ 海岸環境工学 ☐ 環境装置工学 ☐ 環境衛生学 ☐ 地盤環境工学 ☐ 基礎環境工学 I [他の授業があれば・・・] 科目名 1 科目名 2 科目名 3 [ポケット・ゼミ] ☐ エネルギーと環境のシステム学 ☐ 環境の評価 ☐ 環境問題と法 ☐ 動物と環境にやさしい科学をめざして ☐ キャンパス周辺の自然環境の可視化と考察 ☐ アジア途上国の水環境・衛生問題 ☐ 環境と健康、疾病の関わりについて考える ☐ 地球型惑星の環境地図科学 ☐ 環境農学論ゼミ ☐ 海洋環境微生物学ボケゼミ ☐ 水辺の環境 ☐ 洛南の歴史景観と河川環境巡検 ☐ 山地流域で学ぶ自然環境のしくみと防災	

他にコメントがあれば、お書きください。

ありがとうございました！！



TRAVEL BEHAVIOR ANALYSIS LABORATORY
Graduate School of Engineering Kyoto University, JAPAN

NO:

Survey on Environmental Concern and Acceptability of Environmental Policy

- This questionnaire aims to survey student personality and opinion about environmental problem and transportation policy.
- This survey consists of 6 sections, it should take around 20 minutes to complete.
- All information given by the respondents will be kept confidential and is not used for any commercial purposes.

Major :	_____	● Please regard that we would like to re-identify for next survey through chasing your student ID ● Your name will not be used for any other analysis.
Grade :	_____year	
Student Number :	_____	
Name :	_____	

1/

SECTION A

Please answer the following questions
and indicate from 1 to 7 how much you agree with statements.

Questions about your personality		Fully disagree ← Fully agree →
Q.1.	I have frequent mood swings.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.2.	I dislike myself.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.3.	I respect others.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.4.	I think of life is a party.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.5.	I am always prepared.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.6.	I have unlimited creative ideas.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.7.	I seldom feel blue.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.8.	I insult people.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.9.	I am skilled in handling social situations.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.10.	I make plans and stick to them.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.11.	I have rich imagination.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.12.	I make friends easily.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.13.	I carry out my plans.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.14.	I never put off till tomorrow what I can do today.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.15.	I panic easily.	☐ ☐ ☐ ☐ ☐ ☐ ☐

SECTION B

Please answer the following questions
and indicate from 1 to 7 how much you agree with statements.

Questions regarding your interaction to others		Never Very Often
Q.1.	I have given directions to a stranger.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.2.	I have donated goods or clothes to a charity.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.3.	I have done volunteer work for a charity.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.4.	I have helped carry a stranger's belongings (books, parcels, etc.).	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.5.	I have delayed an elevator and held the door open for a stranger.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.6.	I have helped a classmate who did not know that well with a homework assignment.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.7.	I have offered to help a handicapped or elderly stranger across a street.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.8.	I have offered my seat on a bus or train to a stranger who was standing.	☐ ☐ ☐ ☐ ☐ ☐ ☐

Please answer the following questions
and indicate from 1 to 7 how much you agree with statements.

Questions regarding your mind to your life		Fully disagree Fully agree
Q.1.	A great deal of what happens to me is probably just a matter of chance.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.2.	Everyone knows that luck or chance determine one's future.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.3.	I can control my problem(s) only if I have outside support.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.4.	My problem(s) will dominate me all my life.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.5.	Success is a matter of hard work, luck has little or nothing to do with it.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.6.	My life is controlled by outside actions and events.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.7.	When I am under stress, the tightness in my muscles is due to things outside my control.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.8.	It is impossible to control my irregular and fast breathing when I am having difficulties.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.9.	I am confident of being able to deal successfully with future problems.	☐ ☐ ☐ ☐ ☐ ☐ ☐
Q.10.	Maintaining control over my problem(s) is due mostly to luck.	☐ ☐ ☐ ☐ ☐ ☐ ☐

Please answer the following questions
and indicate from 1 to 7 how much you agree with statements.

Questions regarding opinion about yourself		Fully disagree	Fully agree
		←	→
Q.1.	I feel that I am a person of worth, at least on an equal plane with others	☐	☐
Q.2.	I feel that I have a number of good qualities	☐	☐
Q.3.	All in all, I am inclined to feel that I am a failure.	☐	☐
Q.4.	I am able to do things as well as most other people.	☐	☐
Q.5.	I feel I do not have much to be proud of.	☐	☐
Q.6.	I take a positive attitude toward myself	☐	☐
Q.7.	On the whole, I am satisfied with myself.	☐	☐
Q.8.	I wish I could have more respect for myself.	☐	☐
Q.9.	I certainly feel useless at times.	☐	☐
Q.10.	At times I think I am no good at all.	☐	☐
Q.11.	I think my opinion is always right.	☐	☐
Q.12.	I feel that I will win all the time.	☐	☐
Q.13.	I am sure my preference should be reflected by society.	☐	☐
Q.14.	In any case, I should believe in me and should not listen to others' opinion.	☐	☐

SECTION C

Please answer the following questions
and indicate from 1 to 7 how much you agree with statements.

Questions for environmental problem awareness		Fully disagree	Fully agree
		←-----→	
Q.1.	The effects of pollution on public health are worse than we realize	☐	☐
Q.2.	Pollution generated in one country harms people all over the world	☐	☐
Q.3.	The balance in nature is delicate and easily upset	☐	☐
Q.4.	Over the next several decades, thousands of species will become extinct	☐	☐
Q.5.	Climate change will seriously damage our society.	☐	☐
Q.6.	CO ₂ that <i>I</i> produce in my daily life will contribute to climate change and this will negatively influence society.	☐	☐
Q.7.	Global warming will serious impact on <i>myself</i> .	☐	☐

Questions for your opinion and intention for environmental problem		Fully disagree	Fully agree
		←-----→	
Q.1.	I am not concerned about the environment	☐	☐
Q.2.	Every citizen must take responsibility for the environment	☐	☐
Q.3.	Authorities rather than the citizens are responsible for the environment	☐	☐
Q.4.	I feel a moral obligation to protect the environment	☐	☐
Q.5.	I feel that I should protect the environment	☐	☐
Q.6.	I feel it is important that people in general protect the environment	☐	☐
Q.7.	Our environmental problems cannot be ignored	☐	☐
Q.8.	I would contribute money to an environmental organization	☐	☐
Q.9.	I would sign a petition in support of tougher environmental laws	☐	☐
Q.10.	I would participate in a demonstration against companies that are harming the environment	☐	☐
Q.11.	I aim to buy products made with recycled materials even if they are more expensive.	☐	☐

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SECTION D

Answer the following box and indicate from 1 to 7 how much you agree with statements for each questions.

Please read the following scenario carefully.

日本政府は、この度、学生を含む全国民から一月当たり一万円の環境税を導入することを決定した。この決定は、様々な経済学者と科学者が長い間議論した末に下されたもので、政府は、この環境税が地球温暖化対策として大変有効であるということを確信している次第である。

この環境税は、環境関連の研究に使用されると共に、二酸化炭素排出量を削減する新技術の導入にも活用される。なお、政府は、今回の税額 政策を温暖化対策量に関する科学研究に基づいて 決定したものであると説明している。

Questions related to above scenario.		Fully disagree ←	Fully agree →
Q.1.	Do you support this government decision to implement an environmental tax?	☐	☐
Q.2.	Are you willing to accept this government's decision to implement environmental tax?	☐	☐
Q.3.	Do you think this environmental tax fair?	☐	☐
Q.4.	Do you think the process of government decision making that lead to an environmental tax is fair?	☐	☐
Q.5.	Do you think this environmental tax is equitable?.	☐	☐
Q.6.	Do you think environmental tax "infringes on your freedom"?	☐	☐
Q.7.	Do you think a tax like this can help to eventually reduce the effect of global warming?	☐	☐
Q.8.	I respect the Japanese government.	☐	☐
Q.9.	In general I trust governments.	☐	☐
Q.10.	Do you trust the federal government to make a decision to introduce this tax?	☐	☐

SECTION E

Please answer the following box.
and indicate from 1 to 7 how much you agree with statements for each questions.

交通需要管理施策 (TDM; Transportation Demand Management)

自動車利用者の交通行動の変化を促すことにより、交通量を削減する手法。すなわち、車の利用の仕方や生活の工夫によって自動車交通量を削減する方法。

Questions for your opinion about TDM policy		Certainly Not ←	Definitely Yes →
Q.1.	Do you support to pay some fees for using highway?	☐	☐
Q.2.	Do you support 'prohibition to park a car on 四条通'?	☐	☐
Q.3.	Do you support parking charge systems like a pay garage in CBD or near train station?	☐	☐
Q.4.	Do you feel that all citizens should use public transport for Kyoto?	☐	☐
Q.5.	Do you support to permit free fare of Kyoto-si bus for elderly people?	☐	☐
Q.6.	Do you support the law of car inspection for environmental once in 2 years?	☐	☐
Q.7.	Do you support illegal park of bicycle?	☐	☐
Q.8.	Do you support the increase in cost of gasoline to 200 円/L?	☐	☐

SECTION F

Please answer the following questions

No	Question	Answer
Q.1.	Please state your age	 years
Q.2.	Sex (Male/Female)	Male ☐ , Female ☐
Q.3.	Do you have a driving license?	Yes ☐ , No ☐
Q.4.	Do you have your own car?	Yes ☐ , No ☐
Q.5.	How do you commute to university?	☐ Walk ☐ Bicycle ☐ Car ☐ Motorbike ☐ Public Transport ☐ other (.....)
Q.6.	How long does it take you to travel from home to campus?	 min
Q.7.	Please check the blank which you took the class related to environmental. [工学部] ☐ 大気・地球環境工学 ☐ 基礎環境工学 II ☐ 海岸環境工学 ☐ 環境装置工学 ☐ 環境衛生学 ☐ 地盤環境工学 ☐ 基礎環境工学 I [ポケット・ゼミ] ☐ エネルギーと環境のシステム学 ☐ 環境の評価 ☐ 環境問題と法 ☐ 動物と環境にやさしい科学をめざして ☐ キャンパス周辺の自然環境の可視化と考察 ☐ アジア途上国の水環境・衛生問題 ☐ 環境と健康、疾病の関わりについて考える ☐ 地球型惑星の環境地圏科学 ☐ 環境農学論ゼミ ☐ 海洋環境微生物学ポケゼミ ☐ 水辺の環境 ☐ 洛南の歴史景観と河川環境巡検 ☐ 山地流域で学ぶ自然環境のしくみと防災 [他の授業があれば・・・] 科目名 1 科目名 2	

This is the end of the questionnaire. If you have any other comments, please use below space.

Thank you for your support!