

Choosing Efficient Combinations of Policy Instruments for Low-carbon development and Innovation to Achieve Europe's 2050 climate targets

# What Influences Public Acceptance of the Current Policies to Reduce GHG Emissions?



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## LIST OF ABBREVIATIONS

CV	Contingent Valuation
DCE	Discrete Choice Experiment
ETS	Emission Trading System
GHG	Greenhouse Gases
HM	Hybrid Methods
MM	Matching Methods
NAM	Norm Activation theory
NEP	New Environmental/Ecological Paradigm
NOAA	National Oceanic and Atmospheric Administration
RES	Renewable Energy Sources
RP	Revealed Preferences
SP	Stated Preferences
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
VBN	Value-Belief-Norm theory
WP	Work Package
WTP	Willingness to Pay

## Executive summary

**Motivation: Successful implementation of climate policies depends on public acceptability and support. Thus, the analysis of factors that affect public acceptability is needed.**

Public resistance and related reluctance among politicians to pursue unpopular policies are factors that can inhibit the successful implementation of climate policies. An example that illustrates importance of this issue is failure to introduce the carbon-energy taxation in Switzerland in 2000 or carbon taxation in France in 2010. To be able to identify potential for improvements of climate change policy design in respect to social acceptance the analysis of factors that affect public acceptability or public support is needed.

**Methods: systematic literature review, qualitative pre-survey, quantitative data analysis, stated preference methods**

The systematic literature review and secondary data analysis that we carried out in this task provides a very good overview of possible explanatory factors, yet considering the complexity of the problem, we need to examine the determinants systematically by use of theories, ideally combing several theoretical and methodological approaches. Those are, in our stated preference survey, economic and social-psychological frameworks and mixed-method research design.

**Findings I: Characteristics of individuals (social-psychological, socio-economic and demographic) and characteristics of proposed policies are both important factors influencing public acceptability of policies.**

People consider a variety of policy characteristics (policy effectiveness, costs and their distribution, moral implications, diversity of possible consequences etc.) depending on their own values, attitudes, and preferences.

**Findings II: social-psychological factors**

Overall, people are more likely to accept proposed policies if they:

- are aware of and **concerned about the environmental problems** the policies are focused on;
- are **aware of consequences of climate change**, for example impacts on health and standard of living of people, and number of species lost;
- **feel morally obliged to contribute** to tackle these problems;
- perceive policies as **fair and environmentally effective**;
- **trust the institution** which proposes the policy.

On the other hand, many people tend not to favour the policies, which **considerably influence their own behaviour** and if they think a policy may **restrict their personal freedom**.

**Findings III: policy attributes**

Willingness to pay of people for a climate policy rises:

- with **policy effectiveness**, such as the temperature increase which should be prevented or annual percentage reduction in GHG emissions;
- with **probability of policy success** in mitigating climate change;

- if the **ancillary benefits**, such as reduced air pollution and related adverse health effects, or deployment of environmentally-friendly technologies are described.

People often favour investment of **revenues** back into the domain of environmental protection rather than their use in other domains, and they favour cost distribution following the **polluter-pays principle**.

People generally tend to prefer policy instruments resulting in **lower prices of environmentally friendly products and services** (e.g. subsidies for renewable energy sources) opposite to instruments increasing the prices of those environmentally harmful (e.g. fossil fuel taxation).

### **Conclusion: Tax-aversion and how to raise support for Pigouvian taxes**

A policy instrument labelled as 'tax' is significantly less acceptable than an unlabelled policy instrument, even though other characteristics are the same.

Tax-aversion seems to stem from:

- one's perception that taxes are **not very effective, infringe on freedom** and are **unfair**;
- **distributional concerns**, especially concerns about regressive effects, however normative beliefs about distribution of cost or benefits are very variable;
- feeling that people are **not morally responsible** for reduction of negative environmental impacts;
- a **lack of confidence** in politicians and other citizens;
- a **lack of understanding how a tax can reduce the externalities and increase welfare**. General public may not comprehend the difference between a Pigouvian tax and a Ramsey tax and perceives taxes only as a way to increase revenues.

Support for Pigouvian taxes may be raised by:

- **taking into account distributional consequences**, especially protecting from regressive effects;
- **strengthening trust in government and public organizations** (transparency, public participation, etc.; see literature on public governance and public trust);
- **support acquiring information** about how taxes work, how they can reduce externalities and increase welfare and in general any information about their effectiveness;
- **earmarking the revenues** for environmental measures and revenues are targeted to narrowly specified groups;
- recycling the revenues to support investments in **environmentally friendly technologies**, transport infrastructure, and renewable energy.

### **Discussion: ways to strengthen support for climate policies**

The above summarized factors influencing public support for climate policies are general findings about different policies and instruments stemming from different countries. To suggest ways to improve public acceptability of the EU's climate policies detail analysis of introduction of a specific policy mix is needed, which is further objective of the CECILIA2050 project within its Work package 4.

# 1 Introduction

Climate politics cannot be successful unless a majority of various groups of people support climate policies not only by talking about them but also by action and voting for them (Beck, 2010). Moreover, public resistance and related reluctance among politicians to pursue unpopular policies are factors that can inhibit the successful implementation of climate policies (Steg et al. 2006). Therefore, the involvement of the key stakeholders in the decision making process may not be sufficient.

The obvious example of failure to implement a climate policy due to lack of social and political acceptance is failure to introduce the carbon-energy taxation, such as fossil fuel taxation in Switzerland in 2000 and carbon taxation in France in 2010.

Thus, the aim of the two interlinked tasks of the CECILIA2050 project that deal with policy feasibility is to suggest ways of anticipating public resistance and overcoming it through adequate design of policy instruments.

To be able to identify potential for improvements of climate change policy design in respect to social acceptance the analysis of factors that affect public acceptability or support is needed.

In addressing these issues, this report summarizes research results of the first task, which provides literature review and prepares a stated preference survey also for the second task. However, while the first task is focused more on public perception of the current policies, the second task will aim at public acceptability of possible future policies.

Specifically, the objectives of this report are:

1. to provide a literature review on factors influencing public acceptance and acceptability of climate policies (Chapter 2);
2. to describe methods and progress of an original survey to examine public acceptance of the EU's current and possible future policies (Chapter 3);
3. to assess attitudes of EU inhabitants towards the current EU climate policies and to investigate which segments of the population support these policies more than others (Chapter 4).

The main findings of the report are presented in the Executive summary.



## 2 Chapter: literature review on factors influencing public acceptance of climate change policies

Public acceptability of a policy is influenced at least by two factors: i) individual factors, such as individual attitudes and preferences, and ii) characteristics of the policy to be implemented, such as environmental effectiveness, compliance costs, or the allocation of policy costs between different groups (Eriksson, Garvill, and Nordlund 2006; Steg and Schuitema 2007; Steg, Dreijerink, and Abrahamse 2006).

While economic studies are in general more concerned with preferences for various characteristics of the policies, (social) psychological studies and few sociological studies deal in depth with individual factors, such as values, attitudes, and personal norms. Both economic and (social) psychological studies are embedded in theories. While most of economic studies are based on the utility theory, (social) psychological research draws mainly on the theory of normative conduct and some studies depart from the expectancy-value theory. There are also few studies that apply the cultural theory. In addition to these two approaches we label as 'economic' and '(social) psychological', we distinguish 'public opinion research' on public acceptance of climate change policies. All three approaches employ socio-demographic characteristics as explanatory variables for public acceptance of policies. Based on this classification of research streams, we structure the results of a literature review presented in this report. Empirical studies that were difficult to classify are included in the subchapter on public opinion studies.

Literature on different aspects of public acceptability and acceptance of policies and policy instruments that has been published over the last two decades is quite voluminous. Fortunately, there are few recent review studies or overviews that attempt to summarize the available evidence on public acceptability of transport measures (Pridmore and Miola 2011), particularly transport pricing (Steg and Schuitema 2007; Jaensirisak, Wardman, and May 2005), energy policy (Steg, Dreijerink, and Abrahamse 2005; Steg, Dreijerink, and Abrahamse 2006), or public preferences for climate change policy measures (for very brief review see for example Brännlund and Persson 2012, and for brief review of contingent valuation studies see Akter and Bennett 2011) and environmental taxes (Sælen and Kallbekken 2011).

Further, there are reviews and overviews that do not inquire specifically into public acceptability, but are relevant for our survey because they deal with related issues, methods or theories, for example overview of the environmental psychological research on understanding and promoting pro-environmental behaviour in general (Steg and Vlek 2009), or stated preference studies on renewable energy (Yoo and Kwak 2009). A recent review by Pidgeon (2012) summarizes also the empirical evidence on public's attitudes to climate change.

Although several reviews and overviews of literature relating to the topic of public acceptability exist, a literature review that would aim at public acceptability of policies and policy instruments to reduce GHG emissions is missing. Unlike the above-cited recent works, ours is a systematic review (see Cooper 2010) of empirical studies that examine public acceptability or acceptance of climate change policies.

The objective of the literature review is not only to summarize the empirical evidence, but also to synthesize prevailing findings about factors influencing public acceptability, both individual and socio-demographic factors, and characteristics of the policies.

## 2.1 Methods of the literature review

In 2013, we conducted a systematic review of empirical studies on public acceptability of climate change policy. The empirical studies included in the review were published since 2000 and target public in developed countries or in large developing economies (e.g. China). There was no further specification of the policy domain other than GHG emissions reduction policy (in case of road pricing policies, only studies taking into account the environmental effects of these policies were considered to be relevant). There was also no limitation on what methods were used to tackle the problem of policy acceptability in the study. Papers focusing on acceptability of and WTP for green electricity, biofuels, green technologies *etc.*, were considered as relevant as long as they contain a formulation of GHG emissions reduction policy (there are also few reviews covering these studies in general, for example (Longo, Markandya, and Petrucci 2008; Ricci, Bellaby, and Flynn 2008; Menegaki 2008). Studies targeting stakeholders other than public (e.g. companies and politicians) were also excluded from the search.

Several academic databases (*Academic Search Complete, Political Science Complete, EconLit, SocIndex, and Environment Complete in EBSCO; CBCA Complete, OxResearch, ProQuest Biology, Psychology, Science, and Social Science Journals, ProQuest Research Library, and Environmental Sciences and Pollution Management in ProQuest; ScienceDirect and Scopus databases, Web of Science databases and ebrary for books*) were systematically searched for the terms *policy* and *acceptability* or *acceptance*. In some databases where the search query returned too many records, it was narrowed by use of supplemental terms (*climate, public, social*) or rules (excluding news articles, limiting sources to books, conference papers and proceedings, working papers, and reports and excluding topics like medicine, health and business, limiting the search for the terms to abstracts of articles). Overall, the search produced more than 4 000 records, from which over 200 abstracts were downloaded and further sorted based on the criteria. The review was performed in three waves – the main part of the review was conducted in January and February 2013, but new studies published since February were included following the two subsequent waves of the search in May and September (18 studies). In sum, the search itself has produced 53 relevant records. Other 64 studies were found in bibliographies of included studies, making it 117 papers in total.

The studies were sorted into five categories: *studies applying social psychological theories of behaviour or Cultural theory, studies using microeconomic and utility theories, public opinion*

*research, referenda, and qualitative studies*. The latter being the only category containing papers using solely qualitative methods. Studies applying social psychological theories of behaviour or Cultural theory are focused on attitudes, norms and values related to the acceptability of policies. Only studies using a theory of behaviour, such as the VBN (or those using Cultural theory), were included in this category. On the other hand, studies introducing *ad hoc* models (or stemming from other theoretical backgrounds) or pursuing only descriptive goals were considered as public opinion research or as referenda studies depending on the data collection methods used. The second group consists of studies based on the microeconomic theory or utility theory, which utilize stated preference methods and estimate WTP. The basic overview of social-psychological and economic studies is provided in Table 2, Table 3, and Table 5.


In order to overview policies that were examined in the studies, we utilized i) the classification of policy landscapes, namely carbon pricing, support for renewable energy, energy efficiency and non-CO<sub>2</sub>-greenhouse gases, and ii) the taxonomy of policy instruments (see Table 1) elaborated in the first work package of the CECILIA2050 project and used throughout the project (Görlach 2013), and iii) the classification of economic sectors, namely economy-wide, industrial, transport, food and agriculture, mining, energy (generation), construction, trade, residential, forestry, market services, public services. Since each study may investigate several policies, it also may be classified in more policy landscapes, instrument categories or economic sectors. In some studies, on the other hand, policies could not be classified at all. Therefore the absolute numbers in these categories do not have to add up exactly to the total of all studies in the review.

### 2.1.1 Policies and policy instruments examined in the studies

The results from this review were summarized in the following section according to the number of studies belonging to the instrument categories (see Table 1) and the sectors.

Many researchers do not specify the concerned policies and describe the instruments rather generally and vaguely, if they contain some instrument at all, which may result in problems of classification and further analysis. There were in total 14 studies which do not specify the economic sector for the policy to take place in, 14 studies for which the policy landscape is not identifiable, and 18 which we were not able to classify according to the taxonomy of instruments (some other were possible to classify into instrument category, but not subcategory).

Taxes are probably the most researched instruments to tackle the climate change in the field of public acceptability. Specifically, taxes levied on goods and fuels are common in most European and North-American countries, and therefore are an important research subject. Fuel tax is one of the most commonly researched taxes in our review. To highlight a frequent research topic, we decided to include road pricing instruments into the subcategory of taxes on inputs and outputs of a production process, although it was not part of the CECILIA2050 instrument taxonomy.



In comparison with taxes, other, both market and non-market based instruments, are covered significantly less. Moreover, some of the studies comprise other instruments only as supplements to taxes (e.g. technology support through subsidies as a use of tax revenues). Except the ETS, which is now widely discussed as a viable policy option, there is only few studies focusing solely on other policy instruments than taxes. Surprisingly, this also applies to information and voluntary approaches, which are quite popular among the public, yet deemed by some researchers as less efficient than taxes (Gärling and Schuitema 2007).

Almost half (45) of the studies in our review is interested in transportation policy, which is in accordance with the popularity of the topic. The transportation is one of the most visible sectors of economy, producing a substantial part of global GHG emissions. It is also quite susceptible to change and a well formulated transportation policy could bring good results in relatively short time. Not all studies focus only on environmental effects of the policy – there is also the issue of congestion, which is another strong reason for many to employ themselves in this topic.

It is worth reminding, that we excluded studies exploring WTP for renewable energy sources and electricity produced by them. This field is also quite broad and well covered by other reviews (Longo, Markandya, and Petrucci 2008; Ricci, Bellaby, and Flynn 2008; Menegaki 2008) and moreover, most studies do not deal with public acceptance or acceptability. Still there are several studies on acceptability of energy generation GHG emissions reduction policy (21 studies). Some electricity related policies (rather electricity consumption) are also comprised in the residential sector policies (the second most numerous studies in our review - 34). Residential sector policies include energy efficiency (behaviour, appliances etc.), energy consumption, and taxes paid by citizens or levied through higher prices of goods and other instruments. However, there is little research into construction (e.g. subsidies for energy efficient houses etc.). Researchers are also interested in economy-wide policies (14 studies), although some of them are classified in this review as economy-wide rather because of the lack of exact formulation, than from economy-wide impact. Some studies (13) did not even contain a specification of economy sector targeted by the policy.

**Table 1: The number of studies according to taxonomy of instruments**

Market-based instruments		
Taxes	<i>All subcategories</i>	67
	Taxes directly applied to the pollution source (Carbon Tax)	9
	Taxes on inputs or outputs of a production process	55
	<i>road pricing</i>	14
	Negative tax for environmentally-friendly activities	14
Liability instruments	<i>All subcategories</i>	2
	General liability rules	0
	Adapting liability rules in dependence of environmental impact	0
	Sanctions	2
Removal of perverse incentives	<i>All subcategories</i>	4
	Removing negative taxes	4
	Removing other incentives	0
Emission trading systems	<i>All subcategories</i>	13
	Cap-and-trade	11
	Credit systems	0
Deposit refund systems		0
Non-market based instruments		
Command and control regulations	<i>All subcategories</i>	18
	Framework standards	0
	Prohibition or mandating of certain products or practices	5
	Performance standards	9
	Technology standards	2
	Building codes and standards	0
	Land use planning, zoning	0
Stand-alone reporting requirements		0
Active technology support policies	<i>All subcategories</i>	16
	Public and private RD&D funding	6
	Financial measures (subsidies)	8
	Public procurement	0
	Public investment in underpinning infrastructure for new technologies	2
	Policies to remove financial barriers to acquiring green technology	2
	Green certificates	0
	Renewable portfolio standard	2
	Feed-in tariffs	1
Information and voluntary approaches	<i>All subcategories</i>	6
	Information campaigns	5
	Education and training	0
	Environmental labelling programs	1
	Award schemes	0
	Voluntary agreements	1
	Unilateral commitments	0
Public voluntary schemes	0	
n/a (not available information in given study)		16

## 2.2 Results

### 2.2.1 Toward a clarification of terms: ‘acceptance’, and ‘acceptability’ versus ‘support’

Recently, a debate about clarity of concepts and terms has arisen in research on attitudes towards green electricity or technologies. Several authors (Batel, Devine-Wright, and Tangeland 2013; Dreyer and Walker 2013; Schade and Schlag 2003) have pointed out, that the terms *acceptability*, *acceptance*, and *support* are often used interchangeably or without clearly defined distinction. As our literature review has shown, the same holds for research on acceptability of policies. Considering the growing number of studies in this field, the need to define terms used and concepts explored is even more pronounced. Further, we discuss distinctions between these terms and concepts and propose our own definitions.

First, terms *acceptability* and *acceptance* are both conceptualized more as a passive evaluation, i.e. only attitudes, while *support* indicates also a behavioural reaction (Batel, Devine-Wright, and Tangeland 2013; Schade and Schlag 2003). Batel and her colleagues (*ibid.*) empirically examine the difference between *acceptance* and *support* in the case of high voltage infrastructures. Their findings corroborate the difference between the two terms and have shown that some people (16.5 %) generally accept these infrastructures but do not support them. This study concludes that assuming equivalence of *acceptance* and *support* may therefore result in misleading findings. However, in our opinion, further analysis of the distinction that will be based for example on examination of underlying attitudes, norms, associated perceived barriers and behaviours is needed. If the term *support* includes also behavioural component, the gap between *support* and *acceptance* may reflect the difference between attitudes and behaviour that is well documented in the social sciences. The measurement of both concepts should be further discussed. Batel and colleagues (2013) use only one item to measure acceptance and the other one to measure support. Single-item measures of attitudes, however, tend to be rather unreliable, i.e. repeated observations are weakly correlated (Ajzen 2005). Multi-items measures of attitudes are usually preferred for several reasons, for example some types of errors related to some items tend to be cancelled by other types of errors adherent to other items, resulting in relatively uninfluenced total score (Ajzen 2005). Interestingly, Batel and colleagues (2013) also suggest employing other terms and concepts as well, such as resistance, apathy, and uncertainty, since *acceptance* and *support* are only two of several possible reactions towards new infrastructures, technologies or, in our case, policies.

Moreover, the prevalent use of the concept of *acceptance* strengthens the top-down perspective, in which policies are proposed by authorities and then given to public to be accepted. If people do not accept (or support), then they are assumed to be opposed (Batel, Devine-Wright, and Tangeland 2013). Such use of the concept is ever more apparent as many studies in our review uses a dichotomous referendum question to measure acceptability or acceptance, giving respondents only two options: accept or decline, ignoring the whole spectrum of attitudes in between.

Third, the difference between *acceptability* and *acceptance* is a matter of time. *Acceptability* concerns the attitude before the implementation of technology, energy facility, or policy, while *acceptance* the attitude after (Dreyer and Walker 2013; Schuitema, Steg, and Forward 2010).

Finally, a similar definition problem arises with the term *public*, which often designates many different things – motorists, car owners, adult population, citizens, inhabitants, consumers and others (Schade and Schlag 2003). Some researches use *social acceptability/acceptance* instead, which is even vaguer, as *social* encompasses all social agents who might be involved and their respective views. Wüstenhagen, Wolsink, and Bürer (2007) distinguish three dimensions of social acceptance of renewable energy sources and facilities in their conceptualization of the term: socio-political, community, and market acceptance. Socio-political acceptance corresponds with the usual use of the term *social acceptance* – it concerns all social agents (the public, policy makers, and stakeholders) and rather general decisions and policy formulations. On the other hand, community acceptance targets the specific acceptance of siting decisions, where mostly local inhabitants and public authorities are the key agents. The difference between these two dimensions is often implicitly reflected in the discussion of the divergence of acceptance of general policy or RES use on one hand and refusal of the corresponding local policy and RES siting on the other. Community acceptance concerns procedural and distributional justice and trust. The market acceptance refers to acceptance by consumers, investors and firms. The market acceptance reflects the process of market adoption of innovations, which is more relevant in the context of renewable energy source, in which it was formulated than in the context of policy. In this respect, we focus on socio-political dimension, which we narrow to only one – public. We define *public* as citizens of a given country with the right to vote.

In our research, we use the terms *acceptability* and *acceptance* consistently with their conceptualizations as attitudinal evaluations before and after (respectively) the implementation of policy, except those parts of the text, where we cite other studies or summarize their methods or measures, as they often use these terms as synonyms. In our review, we searched for the both terms. Although we did not choose the term *support* as a keyword for the search, we found studies that dealt with support for climate change policies as well and we included them in the database of studies. As the primary goal of the literature review was to summarize findings about policy *acceptability*, we relied, in respect of the other types of reaction to policy, such as *support*, *opposition*, *resistance etc.*, on search results generated by the other keywords, particularly *acceptability* and *acceptance*.

## 2.2.2 Public Opinion and Referenda Studies

### *Brief overview of studies*

Although the main focus of our research and literature review is on stated preference and social-psychological studies, we also concern research using other theoretical frameworks or

without a more profound theoretical background. In our review, we found 45 studies which present relevant descriptive statistics or apply a multidimensional statistical analysis, but do not aim at theory development. Five of these are using referenda or post-referenda data, therefore we refer to them as referenda studies, analysing them separately from the main group, which we denoted as 'public opinion' studies. Due to the common absence of theoretical background and a broad diversity of approaches taken, we do not report here all studies and their methods in detail. Rather, we concentrate on the main findings and key factors influencing acceptability.

Overall, the public opinion studies used mostly some type of regression analysis. Data were usually gathered by post or on-line questionnaire (only five studies used telephone interviews). Several studies (12) do not specify the sampling method and only few used probability or quota sampling (5). Four studies narrow the sample on urban areas. Most surveys were conducted in the USA (13), the UK (9), Sweden (7), and other developed western countries (the Netherlands, Australia, Switzerland, Canada), four in Asia (Japan, China, and Taiwan). We purposely omitted studies from developing countries (with exception of the biggest economies, such as China or Brazil), but we found only few studies of this kind in our search in total. The referenda studies are limited geographically to Switzerland, since this is a country with a long standing tradition of referendums on public policy issues (LeDuc 2003).

The referenda and post-referenda studies use either solely the votes, or representative samples of citizens surveyed in post-referenda telephonic interviews. One referenda study using votes employed also aggregated regional data, studying the relationship between number of yes or no votes for the ballot and characteristics of the corresponding region (Bornstein and Lanz 2008). However, most studies using data from Swiss referenda exploit data from post-referenda telephonic interviews conducted after each national ballot. In these surveys, citizens were asked for their socio-demographic characteristics, attitudes, opinions and reasons for their voting decision. These studies use representative national samples and investigate real decisions about proposed policies during last three or four decades. On the other hand, these studies mostly explore selected socio-demographic characteristics, general environmental attitudes, political orientation, or basic policy characteristics as possible determinants (e.g. push or pull measures, type of instrument etc.) and are not embedded in a theory.

### ***Policies and policy instruments examined in the studies***

In most studies, authors formulate policies on national level (31 studies), in five on regional or local levels, and in seven papers the formulation is too general, and thus we could not determine the level of implementation. No study is engaged in studying the EU or global policies.

Overall, a majority of policy acceptability studies is focused on transport policies and measures. Public opinion studies in our review are no exception (in total 25 studies). A number of studies researches policies in the residential sector (16), energy generation



domain (10 studies), and industry and business (8). Only three studies concern economy-wide policies, three other economic sectors, and another three do not specify the targeted sector.

Related mostly to transportation and residential sectors, majority of researched policies can be classified within the energy efficiency and energy consumption (30 studies) and carbon pricing (21 studies) landscapes. Regarding policy instrument taxonomy, most studies deal on taxes (28), especially on taxes on inputs and outputs of a production process (23 studies). We included also fuel tax in this category and created a special sub-category – road pricing instruments, since it was not originally in the taxonomy (6 studies in this category). Only six and seven studies respectively deal with taxes directly applied to the pollution source and negative taxes for environmentally friendly behaviour or products. Some studies (13 in total) focus on other policy instruments, such as sanctions (liability), removing perverse incentives, ETS, and information instruments. Some command and control instruments and support for technologies are researched in ten studies respectively for each instrument category. Only three studies do not specify the policy instrument in question. Overall, the diversity of researched policies and instrument types is low in relation to the high variety of existing measures.

The referenda and post-referenda studies investigate either taxes accompanied by nonspecific technology support or information measures, or a variety of ballot proposals on environment protection submitted to national referenda during last three or four decades.

### ***Factors influencing policy acceptability***

#### ***Socio-economic and demographic factors***

The evidence for the influence of most socio-economic and demographic factors is mixed. Overall, the negative effect of age seems to be the only robust influence throughout the variety of results. Emissions reduction policies are in general more acceptable for younger people. The results of the post-referenda studies support this relationship. The effect of gender is less robust (see Hammar and Jagers 2006; McCright 2008; O'Connor et al. 2002), yet the results indicate that women may be more in favour of emissions reduction policies. This conclusion would correspond with the general finding that women are more engaged in pro-environmental behaviour than men (Zelezny, Chua, and Aldrich 2000). People with higher education, higher income and left or green political orientation are also more likely to accept emission reduction policies. This conclusion is also supported by the post-referenda studies. However, the evidence is generally ambiguous and the results for these factors in several studies are not robust (e.g. McCright 2008; Zahran et al. 2006). Few studies are concerned with other factors, such as ethnicity (Krupnick, Harrington, and Alberini 2001; McCright 2008), access to car, car commuting, miles driven, and urban place of residence – all negatively affecting policy acceptability (Hammar and Jagers 2006; Hsu, Walters, and Purgas 2008; Krupnick, Harrington, and Alberini 2001; Löfgren and Nordblom 2009) respectively).

Further, there seem to be differences between acceptability of policy instruments in respect to socio-economic and demographic characteristics. However, the evidence is also far to be conclusive. Women are more likely to support regulatory proposals (higher emissions and

pollution standards) than men, but gender does not affect support for the investment-based proposals, such as government investments in alternative fuels, solar and wind energy (McCright 2008). University or college educated people and students have more favourable attitudes towards a tax increase in comparison to less educated people (Hammar and Jagers 2006). Although richer households more likely prefer financial incentives policies, including the increase in fuel prices, they do not tend to support information provision policies to intervene in the adoption of environmentally-friendly cars (Coad, de Haan, and Woersdorfer 2009).

Unfortunately, although there are some public opinion studies using international samples, there are no thorough analyses of differences between different national samples. Even though some such comparisons were made in several social-psychological or economic studies, the samples are not country representative (Schade and Schlag 2000; Schade and Schlag 2003 work with sample of inhabitants of four major cities in four countries, several others use convenience samples or college students) or the respective countries were not European (Lachapelle, Borick, and Rabe 2012 focused on the USA and Canada; Carlsson and Johansson-Stenman 2012; Carlsson et al. 2013 on the USA, China and later Sweden). There are only two studies using European data from Eurobarometer in our review, reported in Section 0 on economic studies (Hersch and Viscusi 2005; Hersch and Viscusi 2006). The situation is similar for public opinion studies. Several analyse international samples of college students (Bostrom et al. 2012; Kim et al. 2013; Schmöcker, Pettersson, and Fujii 2012). Fujii, Gärling, Jakobsson, and Jou (2004) compare samples of Swedish, Japanese, and Taiwanese car owners. The only study which surveyed the citizens of five European countries used non-probability sampling based on snowball technique. This prevents any meaningful international comparison. Therefore, other European country comparisons are needed in order to understand the policy acceptability of the EU policies.

### *Policy design*

Generally, pull measures (or voluntary or soft measures) are preferred (Attari et al. 2009; de Groot and Schuitema 2012; Gatersleben 2001; Schuitema, Steg, and Kruining 2011) and policies aiming at low cost behaviour are also more favourable (de Groot and Schuitema 2012). Jakobsson, Fujii, and Gärling (2000; replicated in Fujii et al. 2004) have found also a significant negative influence of perceived infringement on freedom. These results indicate that people may accept policies with lower probability of changing their own behaviour. This supports the assumption of the influence of self-interest (see below).

People also prefer revenue recycling (Hsu, Walters, and Purgas 2008), but this issue seems to be marginal in most studies in public opinion category, although it is an important factor (Sælen and Kallbekken 2011). Several studies (Hardisty, Johnson, and Weber 2009; Lockwood 2011; Löfgren and Nordblom 2009; Parag, Capstick, and Poortinga 2011) have found significant influence of policy framing or labels. However, the evidence is not clear cut (Attari et al. 2009; Lockwood 2011) and further research is needed in this respect, since labels could be easily changed without affecting the functionality of the instrument.

### *Social-psychological factors and policy specific beliefs*

Although public opinion studies do not employ complete or at least two of the constructs of social-psychological theories or models that aim to predict behaviour, they consider some particular social-psychological factors, such as environmental values (measured usually by the NEP scale), beliefs about environmental impacts, policy specific beliefs (perceived effectiveness, fairness, and coerciveness), trust, and social norm. Overall, results of public opinion studies support the conclusions from studies overviewed in Chapter 2.2.3.

Perceived fairness of policies and policy instruments seems to be a key factor influencing policy acceptability. There is also some evidence for self-serving bias (Brekke and Johansson-Stenman 2008), which is connected to the perception of what is fair and what is not. Hammar and Jagers (2007) investigate the conflict between people's preference for equity principle in reduction of CO2 emissions (those who emit the most also reduce their emissions the most) and self-interest of frequent car users. They conclude that self-interest weighted heavier for frequent car users than the equity principle. The results of Jagers, Löfgren, and Stripple (2010) support the idea that people are prone to self-serving bias in their fairness perceptions. Their study compares different rules for redistribution of policy revenues, while the only one that does not support the self-serving bias hypothesis is the redistribution from those with high income to those with low income. To conclude, people tend to accept policies they personally think as fair, while this perception may be influenced by their own interests. Unfortunately, no study concerns determinants of perceived fairness.

Based on the results of some social-psychological and stated preference studies (see in Chapters 2.2.3 and 2.2.4), policy acceptability seems to be also positively influenced by the extent to which people believe the policy is effective. Only six public opinion studies deal with perceived effectiveness, from which four studies have evaluated this influence as robust (Bostrom et al. 2012; Dreyer and Walker 2013; Fürst and Dieplinger 2013; Hammar and Jagers 2006 – their study measured effectiveness as the perceived power of the instrument to change behaviour). Schmöcker, Pettersson, and Fujii (2012) have found the effect of perceived effectiveness significant only in their sample from the UK, but not on their Japanese sample, and Kim, Schmöcker, Fujii, and Noland (2013) conclude that the effect is not robust. According to them, perceived fairness and effectiveness mediate the positive effect of trust in government. Trust seems to be an underlying factor in the formulation of respondents' policy specific beliefs. If people do not have confidence in the government (e.g. that it could create, implement or enforce an effective policy), then the policy itself is deemed as ineffective in its anticipated implementation by the untrustworthy government. In line with results from social-psychological studies (see Chapter 2.2.3) trust has been identified as influential factor in four studies (Hammar and Jagers 2006; Jagers, Löfgren, and Stripple 2010; Kim et al. 2013; Schmöcker, Pettersson, and Fujii 2012).

Three studies have found a positive influence of social norm or social pressure (de Groot and Schuitema 2012; Fürst and Dieplinger 2013; Wang, Zhang, and Zhang 2012), and only one study (Bostrom et al. 2012) considers the issue of moral responsibility. In this one case, moral responsibility is one of three factors of perceived risk characteristics and it significantly and

positively affects policy acceptability. Perceived risk in general seems to be an influential factor. Although it was measured in different ways, the results are quite robust – perceived risk has a positive influence on acceptability, similarly to related concept of environmental concern. People tend to find emissions reduction policies as more acceptable if they perceive higher risk of adverse environmental impacts of global climate change (or climate change in general). This is in line with results of social-psychological studies. Problem awareness is an influential factor in the VBN model as well (see below). Similarly, environmental values (measured by the NEP scale in some public opinion studies and the VBN model) proves to be an important factor also without the background of theoretical model. The influence is positive, yet only four studies analyse this problem and only two used the NEP scale (Attari et al. 2009; Bord, O'Connor, and Fisher 2000). No study measures the influence of general values or worldviews. There is some, but rather weak, evidence for the positive influence of knowledge (Bord, O'Connor, and Fisher 2000; McCright 2008; Pietsch and McAllister 2010; Wang, Zhang, and Zhang 2012; Zahran et al. 2006).

In general, the results of public opinion studies tend to support the conclusions of application of theoretical models to policy acceptability. However, their interpretation is limited regarding the relationships and ordering of the social-psychological constructs. The results are also not systematic and from the relatively high number of studies only few used similar or comparable variables and their measures. The diversity of approaches and ad hoc models makes it difficult to conclude on the main factors influencing policy acceptability.

### 2.2.3 Social Psychological Theories of Behaviour and Cultural Theory

#### *Brief overview of studies*

Since the 1970s, the social-psychological theories of behaviour have been quite commonly employed to explain pro-environmental behaviour (for overview see Stern 2000; Steg and Vlek 2009). However, only few researches apply these theories in the field of acceptability of environmental policies, although considering their overall good results it is desirable to further examine whether these theories can be applied, or whether modification of them or even a new theory is needed in this domain.

The key characteristics of in total seventeen studies are summarized in Table 2 (socio-psychological studies) and Table 3 (studies based on the cultural theory). Surveys were conducted mostly in northern Europe (Norway, Sweden, the Netherlands and the UK) and in the USA, with an exception of two related studies comparing samples from Greece, Italy, and Germany (Schade and Schlag 2000; 2003). All studies were published in peer-reviewed journals. Most used internet or mail survey methods. Several studies do not contain important information about the survey design, such as the sampling method or the year of data collection. Since most of the studies pursue the objective of theory testing, and do not aim at describing attitudes of general public, such insufficiencies do not prevent meaningful

analysis of the results. Thus, we did not exclude studies with incomplete information on the survey design from the literature review.

**Table 2: Selected characteristics of socio-psychological studies included in the review**

Study	Country	Survey year	Sample size	Survey method	Sampling	Policy	Model
<b>Cools et al. (2011)</b>	Netherlands	n/a	<b>300</b>	internet survey	n/a	road pricing	VBN (pro-environmental orientation, problem awareness, norms; extended: policy specific beliefs)
<b>Dietz, Dan, and Shwom (2007)</b>	USA	2004	<b>316</b>	internet survey (e-mail)	random	general (index)	VBN (extended: future orientation, information about CC, trust); ascription of responsibility not included)
<b>Eriksson, Garvill, and Nordlund (2006)</b>	Sweden	n/a	<b>922</b>	mail survey	<i>not specified random</i>	information campaign / fuel taxation / public transport subsidy	VBN (pro-environmental orientation, problem awareness, norms; extended: policy specific beliefs)
<b>Eriksson, Garvill, and Nordlund (2008)</b>	Sweden	n/a	<b>616</b>	mail survey	<i>not specified random</i>	travel demand management measures (index)	VBN (pro-environmental orientation, problem awareness, norms; extended: policy specific beliefs)
<b>Hansla et al. (2008)</b>	Sweden	n/a	<b>855</b>	mail survey	<i>not specified random</i>	<b>green electricity</b>	VBN/TPB (values, awareness of consequences, env. concern, attitude)
<b>Harring and Jagers (2013)</b>	Sweden	2009	<b>1 057</b>	mail survey	<i>not specified random</i>	fuel taxation	VBN (complete, extended: trust)

<b>Kallbekken and Saelen (2011)</b>	Norway	2010	<b>1 177</b>	internet survey	n/a	fuel taxation	VBN (used as a point of departure; beliefs about consequences, trust)
<b>Loukopoulos et al. (2005)</b>	Sweden	n/a	<b>291</b>	internet survey	<i>not specified random</i>	travel demand management measures (index)	TRA/TPB (only relationships between attitude and beliefs of consequences)
<b>Poortinga et al. (2012)</b>	UK	2010	<b>1 822</b>	face-to-face interview	multistage quota	demand-side measures and supply-side technologies (index)	VBN (modified constructs; ascription of responsibility not included )
<b>Poortinga, Steg, and Vlek (2004)</b>	Netherlands	1999	<b>455</b>	mail survey	<i>not specified random</i>	<b>home and transport energy-saving measures (index)</b>	VBN (NEP, concern; values measured differently)
<b>Shwom et al. (2010)</b> ( <i>same survey as Shwom, Dan, and Dietz 2008</i> )	USA	2004	<b>316</b>	mail survey	random	general (index)	VBN (values, NEP)
<b>Schade and Schlag (2003) &amp; Schade and Schlag (2000)</b>	Greece, Italy, Germany, Norway	1998/1999	<b>954</b>	mail survey	quota	road pricing strategies	NAM/TPB (ascription of responsibility, social norm)
<b>Steg, Dreijerink, and Abrahamse (2005)</b> ( <i>same as Steg, Dreijerink, Abrahamse, and Siero 2011 who study also activism</i> )	Netherlands	2003	<b>112</b>	mail survey	non-probability	general (index)	VBN

Note: n/a denotes not available information in given study. If information was missing in the study, we did not search for the information in other sources.

Table 3: Selected characteristics of studies based on the cultural theory included in the review

Study	Country	Survey year	Sample size	Survey method	Sampling	Policy	Model
Leiserowitz (2006)	USA	2002/2003	673	mail survey	n/a	general policy preferences	<i>cultural theory of values</i>
Poortinga, Steg, and Vlek (2002)	Netherlands	1999	455	mail survey	not specified random	<b>energy-saving measures (index)</b>	<i>cultural theory</i>

Note: n/a denotes not available information in given study. If information was missing in the study, we did not search for the information in other sources.

### ***Policies and policy instruments examined in the studies***

The social-psychological theoretical models are used mainly in the domain of transportation policies (12 studies in our review), which is overall one of the most researched areas in the policy acceptability. Some studies focus also on residential behaviour (5 studies; mostly energy efficient behaviour and energy saving measures) or energy production and industrial sector (2).

The most common policy landscapes to be found in the studies are energy efficiency and consumption, (13 studies) and carbon pricing (10 studies; we included also fuel taxation in the carbon pricing landscape, although it was not in the original classification)<sup>1</sup>. These landscapes are often intertwined (e.g. by tax revenue use in public transportation improvements, use of more efficient technologies in fuel combustion and so forth). Several studies, both in residential and transportation sector, venture also in the promotion of renewable sources of energy (6 studies) and promotion of clean technologies (3 studies) landscapes.

Most studies (11) focus on tax instruments, above all taxes on inputs and outputs of a production process, covering not only fuel tax but also road pricing strategies (4 studies). Some studies employ more general indexes of policy acceptability comprising of several policies or policy instruments. In such cases, we coded them in every category applicable to each component of the index. Three studies deal with ETS, some command and control instruments and technology support within the scope of a more general index. Two other studies focus on information campaigns.

The application of social-psychological models to policy acceptability is still not so common, therefore in order to better inform our research in this respect we included also three studies not targeting clearly policy acceptability. Poortinga, Steg, and Vlek (2002) and Poortinga, Steg, and Vlek (2004) are concerned with home and transport energy-saving measures as particular activities accompanied by preferences in regard to government regulation or market instruments, and Hansla et al. (2008) deal with green electricity. Although these are

<sup>1</sup> For classification of policy landscapes see chapter 2.1 Methods of the literature review.

not GHG emissions reduction policies, the application of the model is comparable with application on policy acceptability and is highly informative for our research.

### *Theoretical approaches to explain policy acceptability*

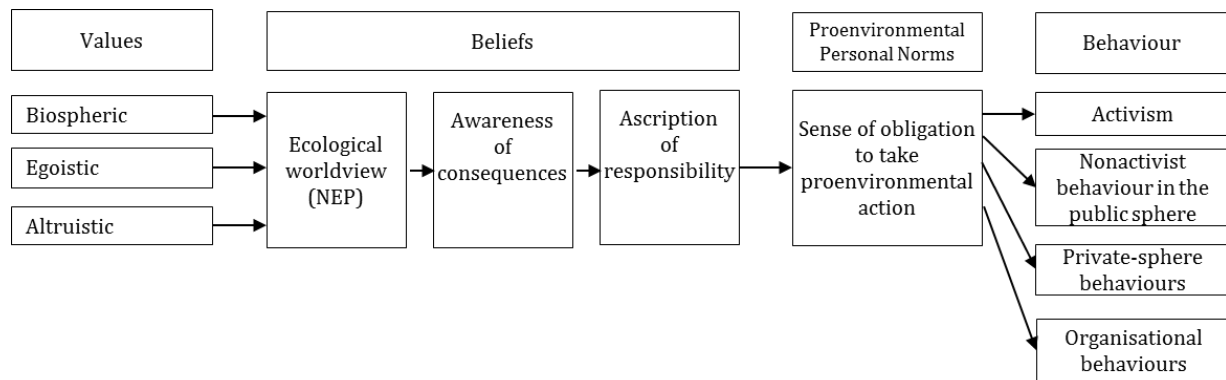
From the many models of behaviour (for overview see Jackson 2005), only few are used in the studies included in this literature review, namely Theory of Planned Behavior (TPB; and the Theory of Reasoned Action – TRA), some versions of cultural theory, and above all the Value-Belief-Norm theory (VBN; and the Norm Activation theory – NAM). Since the VBN model is dominant in this field (it was used in 11 studies out of 16) and we will combine the VBN with the TPB model in our own research, we elaborate here the TPB/TRA models (Ajzen and Fishbein 1980; Ajzen 1985; 1991) only briefly. Three studies using selected constructs of the TPB combine it with constructs of the VBN and NAM models (Hansla et al. 2008; Schade and Schlag 2000; Schade and Schlag 2003). The cultural theory (see Douglas 1966; 1970; Douglas et al. 1998; Douglas and Wildavsky 1982) has been used only in two studies.

**Value-Belief-Norm Theory** was developed by Stern and his colleagues in order to explain environmentally significant behaviour (Stern et al. 1999). Stern later (2000) identified several types of environmentally significant behaviour, among them the support for environmental policies as a type of a non-activist behaviour in the public sphere (in 1999 Stern and his colleagues applied the model on support for environmentalist social movements). The VBN model integrates three existing theoretical concepts in a causal order: the value theory, the NEP scale (New Environmental/Ecological Paradigm, Catton and Dunlap 1978), and the norm activation theory represented by Schwartz's (1977) Norm Activation Model (NAM).

The causal chain (Figure 1) leads from values (biospheric, altruistic or egoistic) to beliefs about human-environment relations, measured by the NEP scale (Dunlap and Van Liere 1978; Dunlap et al. 2000). Based on these values and ecological worldview, individuals consider the consequences of their life environment for themselves, others or their natural environment (awareness of consequences). If individuals believe that their environmental conditions significantly and negatively affect their lives, lives of others or their environment, and at the same time that their actions can avert these consequences (in other words they ascribe responsibility to themselves), a set of norms for protection of (at least their own) living environment is activated accompanied by sense of responsibility to oblige. These norms and feelings consequently lead to the performance of the behaviour (Stern 2000).



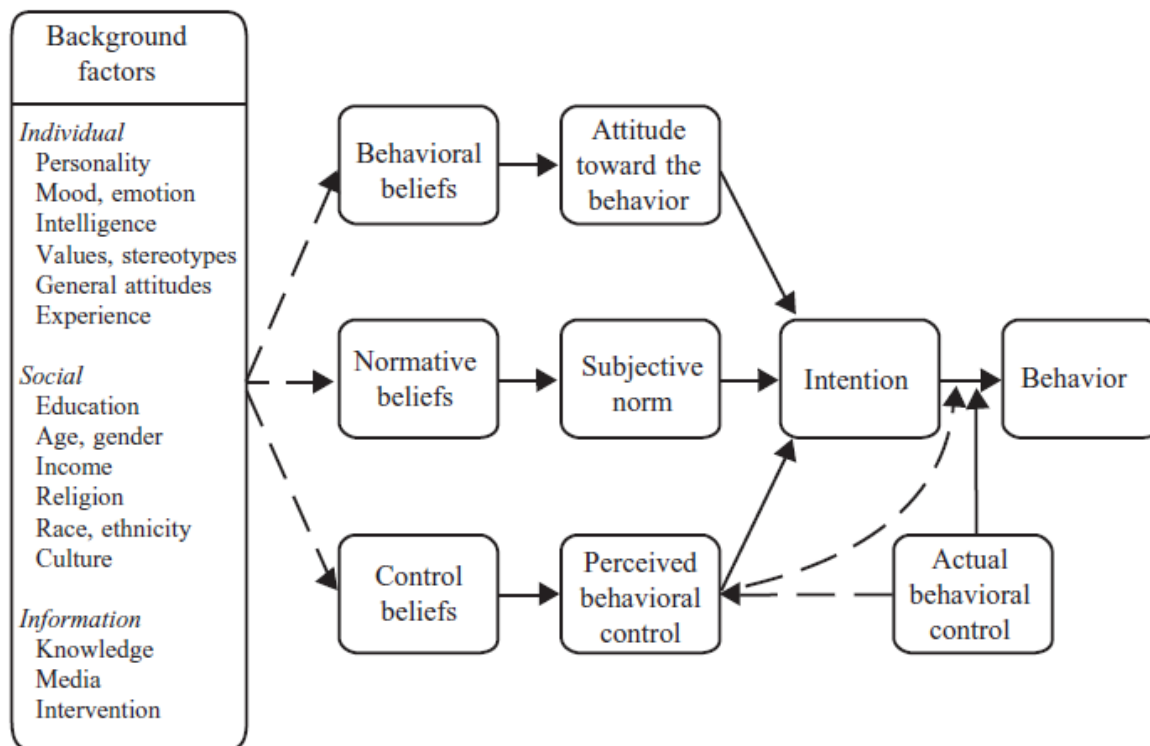
Figure 1: Value-Belief-Norm Theory



Source: adopted from Stern 2000, p. 412

**The theory of planned behaviour** (see Figure 2) was proposed by Icek Ajzen (1985; 1991) as a modification of the earlier theory of reasoned action (Fishbein and Ajzen 1975). In order to improve prediction of behaviour that is under limited volitional control, Ajzen (1985; 1991) added to the theory of reasoned action a construct of perceived behavioural control and related beliefs. Thus, behaviour can be directly predicted from the intention to act and perceived behavioural control, i.e. perception of the factors facilitating or inhibiting performance of the behaviour. Perceived behavioural control can serve as a proxy for actual control to the extent that respondents are able to report accurately on these non-motivational factors (Icek Ajzen 1991; 2002). The intention to act is influenced by attitudes, subjective norms, and perceived behavioural control related to a given behaviour. Intention to perform the behaviour is stronger as attitudes and subjective norms towards behaviour are more favourable and perceived behavioural control is greater (Fishbein and Ajzen 2010, 21). Finally, the TPB presumes that attitudes, subjective norms, and perceived behavioural control are formed based on beliefs regarding the probable outcomes of the behaviour and their respective evaluations (behavioural beliefs), beliefs regarding whether significant others approve or disapprove the performing of the behaviour and motivation to comply with their expectations (normative beliefs), and beliefs regarding the existence and the perceived power of factors that may enable or inhibit realization of the behaviour (control beliefs) (Icek Ajzen 2002; Fishbein and Ajzen 2010).

Figure 2: The theories of reasoned action and planned behaviour



Source: adopted from Ajzen and Fishbein 2005, p. 194.

### ***Application of the VBN and the TPB on environmentally significant behaviour***

The application of the VBN and the TPB has a long tradition in the research on environmentally significant behaviour. Since public acceptability of environmental policies can be considered as an example of environmentally significant behaviour (Stern 2000), the results of empirical testing and comparisons of these theories in several domains should also inform the application in the field of acceptability of environmental policies. Although these studies were not a part of our systematic literature review, we present a brief overview of the main results of the empirical comparisons of the both models.

Several studies successfully applied the TPB, the VBN theory and the norm activation theory (NAT) to explain environmentally significant behaviours (see Table 4). While the TPB has proved to be useful in predicting different types of environmentally significant behaviours (such as travel mode choice, recycling, waste composting, organic food purchase, energy use, conservation behaviour and general pro-environmental behaviour; for references see Table 4), the VBN theory and the norm activation theory are often utilized to examine pro-environmental intention, such as willingness to reduce personal car use, purchasing organic milk (Klößner and Ohms 2009), intention to perform collective pro-environmental behaviour (Gärling et al. 2003), awareness of environmental problems related to energy use and feeling of responsibility for these problems (de Groot and Steg 2007). Moreover, the empirical study by Stern and his colleagues (1999) indicates that the predictive power of the VBN differs for

types of nonactivist pro-environmental behaviour. The VBN theory explained the least amount of variance in private-sphere behaviour (specifically consumer behaviour) and the most amount of variance in policy support (as measured by willingness to sacrifice). Steg and Vlek (2009) summarize that the VBN model is more suitable for predicting behaviour involving smaller costs or the intentions leading to some behaviour, as for example willingness to pay, intention to change one's behaviour or acceptability and support for policies. In cases where the stakes are higher and the behavioural change involves higher costs, the model's predictive power is smaller. Stern (2000) is aware of this partial weakness and recommends accompanying the VBN model with another (ABC model, see Stern 2000). Based on such findings, some researchers (Thøgersen 1999; Lehman and Geller 2004) suggest a need for research on behaviours that require high involvement of consumers and have significant environmental impact. Thus, Jansson, Marell, and Nordlund (2011) examine effects of the VBN constructs on buying of alternative fuel vehicles and found that they were successful in explaining such high involvement decisions.

The studies contrasting models derived from the adjusted expectancy-value theory with those from the theory of normative conduct have shown that explanatory power of the TPB is higher than that of the norm activation theory (in case of car use and recycling domain) and of the VBN theory (in case of conservation behaviour measured by the general ecological behaviour scale – Bamberg and Schmidt 2003; Guagnano, Stern, and Dietz 1995; Kaiser, Hubner, and Bogner 2005). The reason might be that the TPB includes perceived barriers and enabling factors that are important if the behaviour is not fully under volitional control (Ajzen 1985) and that it takes into account not only environmental motivations (Steg and Vlek 2009) but all other beliefs that are elicited in the pilot study.

Moreover, the theoretical models and their combinations were tested by means of a meta-analytical structural equation modelling approach in the studies by Bamberg and Möser (2007) and by Klöckner (2013) which focuses on explanation of various types of environmentally significant behaviour. However, only one data set in each meta-analytical study dealt with public acceptability of policies. The meta-analyses have therefore limited informative value concerning choice of the most suitable theory to examine public support or acceptability of climate change policies.

Both meta-analyses (Sebastian Bamberg and Möser 2007; Klöckner 2013) have proven that behavioural intention is a direct predictor of environmentally relevant behaviour and it integrates effects of attitudes and perceived behavioural control, which is in accordance with the TPB. The direct path from perceived behavioural control to behaviour has been identified only by Klöckner (2013). The reason for this result might be due to larger *N*. That might lead to higher statistical power in this study than in the study by Bamberg and Möser (2007). Unlike the TPB, the “comprehensive action determination model” proposed by Klöckner (2013) includes also habit strength, which has been found to be a second strongest predictor of behaviour following intentions. Both studies have shown that personal moral norm is a further direct predictor of intention. According to Bamberg and Möser (2007), this finding confirms that behaviour is guided both by self-interest and pro-social motives. However,

Klößner (2013) also mentions that there has been large overlap of attitudes and personal norms. As an explanation, Klößner proposes that attitudes partly mediate the link between personal norms and intentions.

**Table 4: Application of the TPB, the VBN and the NAT on environmentally significant behaviours**

<b>Theory</b>	<b>Environmentally significant behaviours</b>	<b>Studies</b>
<b>TPB</b>	<b>recycling behaviour</b>	Boldero 1995; Cheung, Chan, and Wong 1999; Chu and Chiu 2003; Knussen and Yule 2008; Mannetti, Pierro, and Livi 2004; Nigbur, Lyons, and Uzzell 2010; Taylor and Todd 1995
	<b>travel mode choice and car use</b>	Abrahamse et al. 2009; S. Bamberg 2006; Gardner and Abraham 2010; Heath and Gifford 2002; Verplanken et al. 1998
	<b>energy use</b>	Harland, Staats, and Wilke 1999; Abrahamse and Steg 2009
	<b>organic food purchase</b>	Gracia and de Magistris 2013; Saba and Messina 2003; Tarkiainen and Sundqvist 2005; Thøgersen 2009
	<b>waste composting</b>	Mannetti, Pierro, and Livi 2004; Taylor and Todd 1995
	<b>conservation and general pro-environmental behaviour</b>	Beedell and Rehman 2000; Kaiser 2006; Kaiser and Gutscher 2003; Kaiser and Scheuthle 2003; Kaiser et al. 1999; Oreg and Katz-Gerro 2006
<b>VBN</b>	<b>Intention to reduce personal car use</b>	Nordlund and Garvill 2003
	<b>organic food purchase</b>	Klößner and Ohms 2009
	<b>intention to perform collective pro-environmental behaviour</b>	Gärling et al. 2003
	<b>private-sphere behaviour, environmental citizenship, and policy support</b>	Stern et al. 1999
	<b>awareness of environmental problems related to energy use and feeling of responsibility</b>	de Groot and Steg 2007
	<b>alternative fuel vehicles purchase</b>	Jansson, Marell, and Nordlund 2011
<b>TPB and NAT</b>	<b>travel mode choice and car use</b>	Bamberg and Schmidt 2003
	<b>recycling behaviour</b>	Guagnano, Stern, and Dietz 1995
<b>TPB and VBN</b>	<b>conservation behaviour</b>	Kaiser, Hubner, and Bogner 2005

The result that the path from personal norms to behaviour seems to be mediated by intentions is also relevant to development of the VBN theory. This extension should be, in our opinion, further tested. The findings of Klöckner (2013) have not confirmed the path leading from values, via ecological worldview, awareness of consequences and ascription of responsibility to personal norms, as assumed in the VBN. Although the order of all variables in the VBN theory was not verified, it is an important result that all variables from the VBN theory and the NAT significantly affect personal norms. Finally, the VBN lacks non-moral motivations and variables that would mediate the effect of personal norms on behaviour, apart from intentions and perceived behavioural control, habit strength (Klöckner 2013).

Thus, the evidence is still not conclusive in which theory is the most useful for explaining specific types of environmentally significant behaviours (see also Steg and Vlek 2009). For policy acceptability, the VBN model seems to be suitable and sufficient. This might be one of the reasons why most of the studies included in our systematic review (see Table 2) use only the VBN model or its part or modification (mostly some of the measures of values, personal norm, NEP scale, and other). Further, both original formulations of the TPB and of the VBN theories have not been proven and the meta-analyses suggest that combinations of these two influential theories may contribute to better understanding of environmentally significant behaviours. While mediating variables are missing between personal norms and behaviour in the VBN and the NAT, moral motivations are not sufficiently represented in the TPB (Klöckner 2013).

#### ***Application of the VBN and the TPB on policy acceptability***

Most of the studies in our literature review (9 studies; see Table 2 and Table 3) employ only some constructs or modification of the VBN model (mostly some of the measures of values, personal norm, NEP scale, and other). Some of these studies supplement the constructs of the VBN theory by variables from another approaches or models, as for example policy specific beliefs including perceived fairness and effectiveness of policy in question. The conceptual models were tested by means of regression analysis (multiple, hierarchical or other), path model or structural equation modelling.

However, only two studies, as we know, employ the complete VBN model to explain public acceptability of policy or policy instruments. Steg, Dreijerink, and Abrahamse (2005) and Haring, and Jagers (2013) have applied the complete VBN model on acceptability of energy policies and attitudes toward an increased CO<sub>2</sub> tax on gasoline respectively. Both studies have evaluated the performance of the model as good (although the R<sup>2</sup> was 0.32 in the first study and adjusted R<sup>2</sup> was 0,138 in the second study) and have found significant relationships between the variables in the causal ordering. However, Haring, and Jagers (2013) have shown that understanding of factors influencing support for pro-environmental policy has been improved by supplementing the VBN model with other factors, such as political or interpersonal trust. Nevertheless, neither of these two studies tested the model by structural equation modelling. Of course, these studies do not make definitive conclusions on validity of the causal order.

First attempts to combine selected constructs of the TPB with the VBN model have been already made in public acceptability domain, specifically acceptability of road pricing strategies (Schade and Schlag 2000; 2003). While perceived social norm (a construct from the TPB) contributed to the explanation of road pricing acceptability to largest extent, internal attribution of responsibility (a construct from the norm activation theory) and subjective knowledge have only little predictive power (Schade and Schlag 2003).

Another study (Hansla et al. 2008) tries to combine some constructs of the TPB and of the VBN while focusing on willingness to pay for green electricity. This is an interesting attempt to combine economic and social-psychological approach and limitations of its results might help designing our survey. Hansla et al. (2008) propose their own model to explain willingness to pay for green electricity and included values, awareness-of-consequences beliefs as in the VBN, and attitudes toward green electricity from the TPB. In this study, the authors replace ecological worldview initially present in the VBN by environmental concern. Based on the finding that electricity costs have significant effect on willingness to pay for green electricity, they conclude that stated WTP should be viewed rather as an intention (Ajzen 1991) than an attitude (Kahneman et al. 1993; Kahneman, Ritov, and Schkade 1999). The proposed model was partly empirically supported, but the OLS regression models did not explain large amounts of variance. The reason for this might be that both the attitude measure and the proxy for behavioural control (electricity costs) were not at the same level of specificity as the WTP measure. For example, the study measured the attitude towards “green electricity” instead of attitude towards “payment for green electricity” (Hansla et al. 2008).

To sum up, although there have been already successful applications of the VBN model on willingness to sacrifice, acceptability of energy policy, and tax and the VBN seems to be appropriate model to explain public acceptability of policies, the complete model has not been tested using structural equation modelling in this specific field. Moreover, there is little empirical evidence of usefulness of combining the VBN theory with the TPB and socio-psychological with economic approaches to explain public acceptability of climate change policies. In order to fill these gaps in the literature, we use the complete VBN model and a construct of the TPB, specifically the perceived behavioural control, in own survey on public support for climate change policies, which will also allow estimating the willingness-to-pay premiums for climate change policy attributes.

### ***Application of cultural theory on policy acceptability***

Cultural theory, originally formulated by Douglas and Wildavsky (Douglas 1966; 1970; Douglas and Wildavsky 1983; Douglas et al. 1998), is mainly oriented at the problem of risk perception. The theory is based on the notion that different social groups have different priorities, hence they perceive different risks as important and more serious. Four social groups are distinguished in cultural theory: hierarchists, individualists, fatalists, and

egalitarians.<sup>2</sup> These groups differ in their social integration and regulation characteristics (i.e. hierarchists prefer regulation and collective actions and solutions, while individualists' priorities lie in unrestricted individual freedom and independence; fatalists follow the rules but remain individualized, while egalitarians do not trust the authorities prescribing the rules and prioritize the rights of all – people, animals, and nature, collectively). The individual risk perception is 'biased' by the worldview shared and formulated in the group. This worldview does not concern only risks posed to the group and society, but also the views on nature itself: hierarchists see nature as vulnerable at some point, but they expect it to settle in a new equilibrium state once disturbed; fatalist do not have a definite opinion on nature and its vulnerability; individualists see nature as very resilient, while egalitarians see it as very fragile. Therefore, egalitarians are the most concerned by environmental risks, whereas other groups prioritize other types of risks and their concern is lower (low for individualists and fatalists, medium for hierarchists). The groups are a more ideal-type construct, thus no individual is a clear-cut individualist or hierarchist. Still, this theory has been sometimes applied in quantitative research following a methodologically individualistic approach, rather as a psychological typology (Tansey and O'Riordan 1999). Such an application has been criticized as a model of risk perception (Douglas 1992, 40; Sjöberg 2002).

Group specific worldviews influence not only risk perceptions and views on nature, but also policy preferences. Poortinga, Steg and Vlek (2002) use the concept of myths of nature to explain preferences for risk management strategies: tolerant nature (hierarchists), benign nature (individualists), and ephemeral nature (egalitarians). The fatalists, with the view of capricious nature, are expected to have incoherent preferences for the two risk management strategies dimensions: political-strategy and solution-strategy dimension. While the political-strategy dimension concerns the responsibility for solutions to environmental problems (ascribed either to government or market), the second dimension focuses on the form of solutions (either behavioural or technical).

Results of the study by Poortinga et al. (2002) show that respondents subscribing in the questionnaire to the view of nature as benign evaluated more positively market-oriented strategies, while the government regulation was least preferred by these respondents (i.e. individualists). Surprisingly, egalitarians (subscribing to ephemeral nature myth) preferred governmental regulation the most (and, as expected, the behavioural solution strategies as well), while the other two groups held a middle position. However, no significant differences in preferences for governmental regulation between the three groups viewing nature as benign, tolerant, and capricious were found by means of contrast analysis. Similarly, respondents holding nature ephemeral view preferred market-based instruments least, while nature tolerant and capricious took middle positions, again with no significant differences based on contrast analysis. The only significant difference was between nature ephemeral and benign. Specific behavioural and technical energy-saving measures were most acceptable for egalitarian respondents with the ephemeral nature view. They were least acceptable for

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<sup>2</sup> The names and number of these groups are different in different works. Here we use the most common model

those adhering to the benign nature view. The other two groups, with nature tolerant and nature capricious views, were again in the middle. In sum, the results indicate that the nature benign and nature ephemeral are the most competitive views. Thus individualists and egalitarians may be groups in opposition. Even though cultural theory assumes that egalitarians would not prefer governmental solutions due to their mistrust to experts and official authorities (Rippl 2002), they prefer governmental over market-based strategies in the presented study. This may reflect even greater mistrust of egalitarians in market principles and players.

Leiserowitz (2006) has applied the cultural theory on risk perception in the USA. He tested several models, including those of policy preferences (a constructed Policy Preferences Index as the dependent variable). While increased support for national and also tax policies correlated with egalitarianism, the opposition to both national and tax policies correlated with hierarchism and individualism. Fatalists were more likely to oppose only tax policies. The regression models for national and tax policy preferences explained 34 % and 26 % of variance respectively. The author also concludes that these general value orientations were stronger predictors than political identification or ideology.

Although these two studies' results suggest that cultural theory might be a good theoretical framework for further research, the approach taken in the studies is methodologically individualistic, while the theory itself is embedded in integration and regulation of groups. As mentioned above, such application is problematized by the author of the theory herself (Douglas 1992, 40). Yet, the results imply the importance of values in research on policy acceptability.

### *Social-psychological predictors of policy acceptability*

Although the studies used different theoretical approaches or models and Poortinga, Steg, and Vlek (2004) conclude that different types of policies have different sets of predictors, the results are fairly consistent, indicating the importance of social-psychological factors from general values and norms to more concrete constructs, such as policy specific beliefs.

**General values** are a significant predictor of policy acceptability and play a crucial role in formulation of more specific attitudes and beliefs (Dietz, Dan, and Shwom 2007; Hansla et al. 2008; Harring and Jagers 2013; Leiserowitz 2006; Poortinga et al. 2012; Poortinga, Steg, and Vlek 2002; 2004; Shwom et al. 2010; Steg, Dreijerink, and Abrahamse 2005). Based on the representative survey of the U.S. public, Leiserowitz (2006) has shown that the value concept of egalitarianism derived from the cultural theory was the single most powerful predictor of support for green policies – more powerful than political ideology. Although Dietz, Dan, and Shwom (2007) claim that **political orientation** is more influential than values, their results also proof their importance, since the influence of political orientation is mostly mediated by other concepts, values included. Interestingly, altruistic values had the strongest total effect on policy support, traditional values had indirect and more modest effect, but the effect of egoistic values was only very modest. Similarly, in Hansla et al. (2008) only self-transcendent



or altruistic value orientation had an indirect significant effect (mediated by attitudes) compared to self-enhancement orientation which had no effect at all.

Overall, the evidence on the influence of **self-concern** on environmental policy acceptability is mixed. Schade and Schlag (2000; 2003) have presented a combined NAM and TPB model, in which the factor with second most predictive power was a variable of personal outcome expectations of policy. On the other hand, in Kallbekken and Saelen's (2011) study based on hypothetical referendum about taxes, the beliefs about consequences of the policy to oneself had only little predictive power compared to beliefs about environmental consequences. This leads the authors to the conclusion that the standard economic model of self-interested behaviour is not well-suited for explaining the voting decisions about fuel taxation. Similarly, according to Shwom and her colleagues (Shwom et al. 2010) the survey participants' preferences are derived rather from basic **values and general beliefs** than from personal cost-benefit analysis.

Interestingly, **post-material and material values** (Inglehart 1995) have not been found to be an important predictor of policy support or even other model variable, such as environmental concern (Dietz, Dan, and Shwom 2007). This may be surprising considering the importance of environmental concern (see below), which is supposed to be affected by post-material value orientation. It may be caused by a failure of the concept of post-material values or the fact, that other general values are actually more important.

Next to general values, specific **environmental values**, also called biospheric values (such as preventing pollution, protecting the environment, respecting the earth and unity with nature), have significant impact on policy acceptability and preferences mostly mediated by other variables, such as the rest of the VBN, i.e. awareness of consequences, ascription of responsibility, and personal norm (Steg, Dreijerink, and Abrahamse 2005). Especially the awareness of consequences (Dietz, Dan, and Shwom 2007), and personal norm (Eriksson, Garvill, and Nordlund 2006) seem to be important mediating variables for environmental values. Environmental values are mostly measured by the NEP scale or at least by some items from it (7 studies in total). Only one study (Poortinga et al. 2012) uses another concept, namely environmental identity, which was particularly important factor in explaining willingness to engage in low-carbon behaviours next to the concern about climate change and personal norms.

Similarly, **environmental concern** and **concern about climate change** are significant factors (Loukopoulos et al. 2005; Poortinga et al. 2012; Poortinga, Steg, and Vlek 2002) whose effect on policy acceptability is possibly mediated by attitudes (Hansla et al. 2008) or, analogous to awareness of consequences in the VBN model, by personal norm (see Figure 1).

Also **problem awareness** and **awareness of consequences** are influential factors regardless of the specific policy domain and respective environmental problem in question (Cools et al. 2011; Dietz, Dan, and Shwom 2007; Eriksson, Garvill, and Nordlund 2006; Steg, Dreijerink, and Abrahamse 2005).

Further, some studies examined the subjective knowledge about climate change and have discovered rather low knowledge levels. Most people stated that they know something about climate change (Dietz, Dan, and Shwom 2007) and little about transport pricing strategies (Schade and Schlag 2000; 2003). However, neither the number of sources of **information** nor **subjective assessment of respondents' own knowledge** about climate change had any significant effect on environmental policy acceptability (Dietz, Dan, and Shwom 2007; Schade and Schlag 2000; 2003). In relation to climate change policy acceptability, rather actual knowledge about causes of climate change (O'Connor, Bard, and Fisher 1999; Dietz, Dan, and Shwom 2007) or about strategies to tackle the related issues might be influential; however neither of these studies included such constructs.

**Ascription of responsibility**, although a significant predictor in the VBN model (Harring and Jagers 2013; Steg, Dreijerink, and Abrahamse 2005), is not captured by most of the modified models. On the other hand, **personal norms** were covered very well and appeared as a key factor (Cools et al. 2011; Eriksson, Garvill, and Nordlund 2008; Harring and Jagers 2013) also mediating the effects of ascription of responsibility (Steg, Dreijerink, and Abrahamse 2005) or pro-environmental orientation and problem awareness (Eriksson, Garvill, and Nordlund 2006). Together with the results of Schade and Schlag (2000; 2003) confirming the significance of the TPB concept of **perceived social norms** (Ajzen 1991; 2002 uses for this construct the term subjective norms, which can be measured directly or indirectly by asking the respondents to evaluate what their significant others think they should do and how much they want to comply with the expectations of other people), we can conclude that norms play an important role in formation of people's policy preferences and attitudes. This is further supported by Shwom's and her colleagues' (Shwom et al. 2010) conclusion that moral reasons for voting decision were more predictive of stronger policy support than economic and political reasons, which were associated with less support.

Next to the factors included in the VBN model or related factors (e.g. environmental concern) cited above, **trust** has emerged from the existing research as an important predictor of environmental policy acceptability (Dietz, Dan, and Shwom 2007; Harring and Jagers 2013; Kallbekken and Sælen 2011). However, partial inconsistencies are present in the results of studies commenting on the effect of trust. All agree on the importance of the general concept of trust, yet while Kallbekken and Sælen (2011) stress the predictive power of trust in government and Harring and Jagers (2013) an independent and significant influence of political trust (people's trust in "government", "parliament", "Swedish authorities", and "politicians") on policy support, Dietz, Dan, and Shwom (2007) show that trust in industry and environmental groups is more related to policy support than trust in governmental agencies, which had no influence at all. This is probably an effect of situations in each country (the studies were conducted in Norway, Sweden, and the USA respectively) and therefore it does not question the general conclusion.

Several studies include measures of policy specific beliefs, namely **perceived effectiveness** and **perceived fairness** of policy. With one exemption in case of perceived effectiveness (Eriksson, Garvill, and Nordlund 2006, who measured it as an expectation of respondents that

other drivers will reduce car use as an effect of the proposed policy), both concepts were important factors explaining acceptability (Cools et al. 2011; Eriksson, Garvill, and Nordlund 2006; 2008; Schade and Schlag 2000; 2003 for perceived effectiveness only). Eriksson, Garvill, and Nordlund (2006), who investigate fuel taxation, public transportation improvement, and information campaigns, state that perceived fairness is the most influential factor from their model. Interestingly, perceived fairness also mediates the influence of perceived freedom to choose travel mode. Freedom to choose travel mode did not influence the acceptability of fuel tax increase directly, but did influence the perceived fairness which was in turn the main factor influencing acceptability. However no other study investigates the concept of perceived infringement of freedom which could be an important mediated factor.

On the other hand, Poortinga, Steg, and Vlek (2004) argue that purely attitudinal model may be too limited in explanation of environmental behaviour (including policy support). Their study shows clearly that **socio-demographic variables** play a key role in home and transport energy use. In the case of policy acceptability, the evidence is not so clear. Socio-economic characteristics, such as **income**, are mostly weaker predictors than social-psychological factors (Poortinga, Steg, and Vlek 2002; Schade and Schlag 2000; 2003), although for example Shwom, Bidwell, Dan, and Dietz (2010) have found income to have a significant positive relationship to mitigation policy support. However, these variables are not the focus of social-psychological studies as they are assumed to be the background variables influencing for example values at the start of the causal path.

Most of the examined social-psychological factors, and all of those included in the VBN model, have at least some predictive power. Values (both general and specific environmental), norms, and beliefs about environment, problem, or policy in question are consistently important predictors of environmental policy acceptability or support. Taking into account limits of the models employing only social-psychological factors, such as values, beliefs, attitudes, personal norm and intention, we can conclude that these factors should not be omitted from policy acceptability analysis. Relying only on economic models of self-interested behaviour could be misleading, since, as was shown before, the individuals are also influenced by concerns about their environment, morality and norms, which they may find to some extent binding. Understanding of social-psychological predictors of policy acceptability also presents considerable opportunities to propose changes in policy formulation. Such changes may affect the acceptability without shifting the core idea of the policy or instrument.

## 2.2.4 Economic Perspective: Utility Theory

### *Brief overview of studies*

Studies reviewed in this part of the report are in general using stated preference methods to estimate Willingness to Pay (WTP) for policies and policy instruments for GHG emissions reductions (see Table 5 that summarizes the key characteristics of all 43 studies).

However, there are few exemptions from this general description of common characteristics of the economic studies, which are highlighted in bold italics in the Table 5. The exemptions were related to i) objectives of the studies, ii) presentation of the results or iii) utilized methods. First, we included few studies exploring WTP for green electricity or GHG emissions reductions, as long as a formulation or policy was present or as the design was highly informative and relevant to our study (e.g. Hansla et al. 2008 use also social-psychological model). Further, few studies also examine the public preferences toward consequences of policies, but the policies and instruments are not specified, such as higher prices for gasoline, which are presented to the respondents to have less negative effects on environment (Hersch and Viscusi 2005; 2006). Paper by Carson, Louviere and Wei (2010) focuses on examination of trade-offs among different policy options and does not include costs as an attribute in the discrete choice experiment, thus WTP estimates are not present. However, respondents were informed about the increase in prices induced by different policy options. Second, some papers present descriptive statistics, results of the regression analyses but not the WTP estimates based on these models (e.g. Hansla et al. 2008; Hersch and Viscusi 2005; 2006). Third, two studies claim to use revealed preferences method (Cherry, Kallbekken, and Kroll 2012; Löschel, Sturm, and Vogt 2010). We included these studies in our review as well and comment on them further in the text.

The economic research on preferences for climate change policy is mainly represented by studies carried out in the USA (almost half of the studies, i.e. 19) and in the EU (in total 18), specifically in the UK (4), Sweden (4), Spain (3), and other European countries (5). Two papers even analyse data from fifteen European countries using the data from Eurobarometer survey (Hersch and Viscusi 2005; 2006). Other studies were conducted in Canada (5) and Australia (5). We included by one study from Turkey and South Korea, and two studies from China.

Although most of the studies describe all relevant methodological information that we decided to gather, two studies do not report their sampling method at all. Seven others do not specify the type of random sampling (some of these studies obviously did not use a representative sample – e.g. students), therefore we cannot determine whether the sampling matches the requirements of proper random sampling or not. In total, almost one third of the studies (14) focused on specific population (e.g. household heads, residents of urban areas or students); the rest targeted the general public or adult population. Most often, the researchers used on-line instrument to gather data (16 studies). Overall, the literature indicates the need for further analysis of data from representative surveys of public policy preferences for at least two following reasons. First there are no empirical studies on

willingness to pay of inhabitants of several countries, including some European countries (such as Poland or the Czech Republic), or recent data are missing. Second, many results from the stated preference studies cited in our review are not generalizable for the given country's citizens, which limits the interpretation and reaching conclusions.

**Table 5: Summary of studies on policy acceptability – economic approach**

Study	Country	Survey year	Sample size	Survey method	Sampling	Policy	Method: elicitation technique
<b>Adaman et al. (2011)</b>	Turkey	2007	2 422	face-to-face interviews	random stratified	voluntary	DCE: Binary double-bounded dichotomous choice
<b>Akter and Bennett (2011)</b>	Australia	2008	634	internet survey	panel	cap-and-trade	DCE: Single binary discrete choice (Take-it-or-leave-it)
<b>Akter, Bennett, and Ward (2012)</b>	Australia	2008	300	internet survey	panel	cap-and-trade	DCE: Multinomial choice sequence
<b>Bannon et al. (2007)</b>	USA	2007	1 491	telephone survey	panel (random digit dialling)	fuels / electricity production – standards, taxes, cap-and-trade	<i>lowest price at which at least 50 % of Americans would vote in favour of policy</i>
<b>Berrens et al. (2004) same data as Li et al. (2004)</b>	USA	2000	28 055	telephone & internet survey	random digit dialling, panel	Kyoto Protocol	DCE: Single binary discrete choice (Take-it-or-leave-it)
<b>Brännlund and Persson (2012)</b>	Sweden	2009	2 400	internet survey	panel	<i>label: tax / none</i>  <i>goal: 4 % reduction in 2012 (1999 levels)</i>	DCE: Binary choice sequence
<b>Bristow et al. (2010)</b>	UK	2008	287	face-to-face interviews	non probability sampling	cap-and-trade, taxes on products	DCE: Binary choice sequence
<b>Cai, Cameron, and Gerdes (2010) &amp; Cai, Cameron, and Gerdes (2011)</b>  <i>same data as Cameron and Gerdes (2007)</i>	USA, Canada	2001	1 770	internet survey	non probability sampling	<i>goal: climate change prevention</i>	DCE: Single multinomial choice & Single binary choice ( <i>split sample</i> )

<b>Cameron (2005)</b>	USA	n/a	602	self-administered paper survey	non probability sampling	<i>goal:</i> climate change mitigation	DCE: Single binary discrete choice (Take-it-or-leave-it)
<b>Cameron and Gerdes (2007)</b>	USA, Canada	2001	1 770	internet survey	non probability sampling	<i>goal:</i> climate change prevention	DCE: Single multinomial choice
<b>Carlsson et al. (2013)</b>	USA, China	2009	2 173	internet survey + computer in lab	random digit dialling	<i>goal:</i> 60 % CO <sub>2</sub> emissions reduction by 2050	DCE: Binary choice sequence
<b>Carlsson et al. (2012)</b>	USA, China, Sweden	2009	3 493	internet survey	random digit dialling, panel, neighbourhood database	<i>goals:</i> 30 %, 60 % or 85 % CO <sub>2</sub> emissions reduction by 2050	MM: Payment card
<b>Carson, Louviere, and Wei (2010)</b>	Australia	2008	768	internet survey	panel	ETS	DCE: Binary choice sequence ( <b><i>no cost attribute</i></b> )
<b>Cherry, Kallbekken, and Kroll (2012)</b>	USA	2011	95	<i>lab experiment</i>	non probability sampling	tax, subsidy, regulation	DCE: non-hypothetical choice experiment
<b>Cole and Brännlund (2009)</b>	Sweden	2008	76	mail survey	non probability sampling	<i>goal:</i> 4 % reduction of emissions by 2010	DCE: Binary choice sequence
<b>Dietz and Atkinson (2010)</b>	UK	2005	468	mail survey	stratified cluster	London Low Emissions Zone	DCE: Multinomial choice sequence
<b>Grösche and Schröder (2011)</b>	Germany	2008	2 948	Web-TV survey	panel (multistage)	feed-in-tariff and renewable portfolio	MM: Open-ended question
<b>Hanemann, Labandeira, and Loureiro (2011)</b>	Spain	2009	n/a	telephone survey	multistage	electricity production (higher prices for clean energy)	DCE: Single binary discrete choice (Take-it-or-leave-it)
<b>Hansla et al. (2008)</b>	Sweden	n/a	855	mail survey	<i>not specified random</i>	<b><i>green electricity</i></b>	<b><i>no WTP estimation</i></b> (MM: Payment card)
<b>Hersch and Viscusi (2006) &amp; Hersch and</b>	<i>Eurobarometer</i>	1999	14 503	<i>Eurobarometer</i>	<i>Eurobarometer</i>	<b><i>higher prices for gasoline to reduce</i></b>	<b><i>no WTP estimation</i></b> (MM: Payment card)

Viscusi (2005)						<i>environmental harm</i>	Payment card)
Ivanova (2011)	Australia	n/a	1 113	internet survey	panel	Government emissions reduction policy (taxes)	DCE: Single binary discrete choice (Take-it-or-leave-it)
Jaensirisak, Wardman, and May (2005)	UK	2000, 2001	830	n/a	n/a	road pricing	DCE: Single binary discrete choice (Take-it-or-leave-it)
Kotchen, Boyle, and Leiserowitz (2013)	USA	2010, 2011	2 034	internet survey	panel	cap-and-trade, tax policy, command-and-control	MM: Payment card
Lachapelle, Borick, and Rabe (2012)	USA, Canada	2010, 2011	2 130	telephone survey	random digit dialling	energy carbon tax, cap-and-trade, renewable energy sources	MM: payment card ( <i>frequencies only</i> )
Layton and Levine (2003) & Layton and Brown (2000)	USA	n/a	373	self-administered paper survey	<i>not specified random</i>	<i>higher prices for mitigation of forest loss</i>	DCE: Best-worst choice sequence
Lee and Cameron (2008)	USA	2001 – 2002	1 651	mail survey	random address selection	prices / taxes (DCE attribute)	DCE: Single binary choice
Li et al. (2004) <i>same data as Berrens et al. (2004)</i>	USA	2000	24 194	telephone, internet, & WebTV surveys	panel	Kyoto Protocol	DCE: Single binary discrete choice (Take-it-or-leave-it)
Li et al. (2009)	USA	2006	2 333	telephone & internet surveys	random digit dialling, panel	Energy R&D Fund (ERDF); fossil fuel replacement	DCE: Single binary discrete choice (Take-it-or-leave-it)
Longo, Markandya, and Petrucci (2008)	UK	n/a	300	face-to-face interviews	non probability sampling	energy taxes (electricity)	DCE: Multinomial choice sequence
Longo, Hoyos, and Markandya (2011)	Spain	2008	1 000	face-to-face interviews	n/a	renewable energy and energy efficiency programmes, Basque Plan to Combat CC (taxes)	DCE: Single binary discrete choice (Take-it-or-leave-it)

<b>Löschel, Sturm, and Vogt (2010)</b>	Germany	2010	202	<i>lab experiment</i>	non probability sampling	cap-and-trade	DCE: non-hypothetical choice experiment
<b>Morrison and Hatfield-Dodds (2011)</b>	Australia	2006	797	internet surveys	panel	tax (product prices)	<b>no WTP estimation – willingness to support</b> ; DCE: Discrete choice
<b>Poortinga et al. (2003)</b>	Netherlands	1999	455	mail survey	<i>not specified random</i>	<b>energy-saving measures</b>	rating
<b>Saelen and Kallbekken (2011)</b>	Norway	2010	1 147	internet survey	panel	fuel tax	DCE: Binary choice sequence
<b>Steg, Dreijerink, and Abrahamse (2006)</b>	Netherlands	2003	112	mail survey	non probability sampling	mix of policies	rating
<b>Solino, Vasquez, and Prada (2009)</b>	Spain	2006	572	face-to-face interviews	multistage	energy tax (renewable energy sources)	DCE.: Single-bounded and double bounded choice
<b>Viscusi and Zeckhauser (2006)</b>	USA	2004	257	self-administered paper survey	non probability sampling	fuel tax	HM: Open-ended technique combined with discrete-choice
<b>Wiser (2007) &amp; Wiser (2003)</b>	USA	n/a	1 574	mail survey	<i>not specified random</i>	energy tax (renewable energy sources)	DCE: Single binary discrete choice (Take-it-or-leave-it)
<b>Yoo and Kwak (2009)</b>	South Korea	2006	800	face-to-face interviews	<i>not specified random</i>	energy tax (renewable energy sources)	DCE: Single binary discrete choice (Take-it-or-leave-it)

### ***Stated preference approaches***

To evaluate whether an environmental policy is economically advisable, an estimation of the value of non-market commodities is needed (Carson and Czajkowski 2012). Eliciting information about preferences of individuals in order to place monetary value on (non-) marketed goods has long tradition in economics. There is a consensus among economists to derive a value from revealed preferences (RP) either by means of hedonic pricing (Rosen 1974; Waugh 1928) or travel cost analysis (Hotelling 1949; Phaneuf and Smith 2005 for the review). However, the RP techniques can be used to derive the monetary value only for goods or their attributes that are traded at real markets.



To obtain value for goods not traded in the market place, stated preference (SP) based approaches need to be utilized. In brief, the SP methods introduce a hypothetical contingent scenario and then directly question individuals via surveys to obtain the information needed to value the goods (Freeman 2003). Since Davis's (1963) Harvard thesis – the first application of the SP study appearing in the academic literature – the use of the SP method has been significantly growing. The importance of the SP related research for modern welfare economics, as documented by over 7 500 contingent valuation studies found by Carson (2011), can be hard to miss.

Many good reasons for using SP approaches have been emphasised. The SP methods are very flexible in terms of type of the good or its attributes to value. For instance, possibility to control relationships between attributes allows estimating demand for new goods and services with new attributes (Louviere, Hensher, and Swait 2004). The SP is also the only method to measure non-use (passive) values (Krutilla 1967; Whitehead et al. 2008). Hypothetical decision contexts can be then described, which is useful for formulation of realistic policy scenarios.

Although the stated preference methods have become widely used tool for estimating the economic values of goods and services not traded in the market, it has been questioned whether valid and reliable inferences about real market behaviour can be achieved based on analysis of SP data (Louviere, Hensher, and Swait 2004).

In general, two categories of biases associated with the SP methods have been distinguished: psychological and statistical biases. The essential bias may arise from the hypothetical nature of SP approaches that can lead to an overestimation of willingness to pay (WTP) in hypothetical or contingent markets compared to actual payment in otherwise identical real cash markets. This discrepancy – the upward bias of the WTP results based on SP estimates – is often called “hypothetical bias”.

The issue of hypothetical bias has received large attention in economic research. Number of meta-analyses to investigate existence and scope of the hypothetical bias have been conducted (List and Gallet 2001; Little and Berrens 2004; Murphy and Stevens 2004; Murphy et al. 2005). The quantitative meta-analysis of 30 lab and field experiments by List and Gallett (2001) and Murphy et al. (2005) support the upward-bias of hypothetical estimates; while the former finds that hypothetical values exceed actual values on average by factor of three, the latter finds skewed distribution and reports median of 1.35. Although this upward-bias needs further examination, Carson and Czajkowski (2012) point to three issues that should be considered when judging the usefulness of SP methods in relation to this bias. First, such uncertainty of estimates is connected to other economic analysis as well (for example regulatory cost estimate). Second, most of the lab and field experiments are conducted on samples of students and respondents are paid for participation. Moreover, there are usually several differences between the survey instruments prepared for the experiments and for the contingent valuation (CV) studies. Most importantly, properly designed CV surveys are not purely hypothetical, but also consequential, meaning that respondent thinks that survey results may have an impact on actions (e.g. policy impact) and that respondent is interested

in the outcomes of those actions (e.g. policy effects) (Carson and Groves 2007). Thus, Carson and Czajkowski (2012) question whether findings of these tests can be helpful from the perspective of a consequential CV survey.

Regarding the policy relevance of results of studies applying stated preference methods, it was already the NOAA Panel (Arrow et al. 1993) that concluded that contingent valuation studies relay useful information<sup>3</sup>.

Recently, Carson and Czajkowski (2012) summarize that environmental policies that are in general important for public can be identified based on CV studies. Policy makers may especially utilize results of CV surveys under two conditions. First, the CV survey might be very helpful, if the provision of the good is highly beneficial but diffused and if an influential special interest group tries to hinder implementation of relevant policy. Reductions of GHG emissions and related climate change mitigation might be a case of such a situation. Second, a special interest group may have a high interest in providing the good, but the costs of it exceed the aggregate WTP of public. Thus, results of CV surveys can constitute a counterbalance to special interest groups, can be a part of participatory process and can affect and clarify the result of the decision making process.

#### ***Application of stated preference methods on policy acceptability***

Since the application of stated preference methods on policy acceptability (further we refer to it more generally as environmental policy) is a specific domain of research, the variety of authors in this domain is limited. Yet the terminology used is not entirely unified. This is a problem for the stated preference approach as a whole (Carson and Louviere 2011), hence we use the nomenclature clarified by Carson and Louviere (*ibid.*). Based on their work, we distinguish two main categories of studies according to the elicitation methods that are utilized: matching methods (MM) and discrete choice experiments (DCE). Third category labelled hybrid methods (HM) refers to combination of matching and DCE questions in a survey instrument (only one study in the review). Within these categories, the studies differ in applied elicitation techniques (see Table 5).

The most frequent matching elicitation format in our review is the payment card, which was used in 6 studies; including two studies analysing data from Eurobarometer research (Hersch and Viscusi 2005; 2006). Following the general trend in CV surveys, only three studies asked a direct question (often called open ended question, i.e. simple question on how much the respondent is willing to pay for a policy without showing any bids).

The objective of some studies (e.g. Hersch and Viscusi 2005; 2006) was not to estimate the WTP, but to identify the factors affecting the WTP. Thus in these studies, the median or mean WTP are not presented and the WTP serves as the dependent variable in regression model. In

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<sup>3</sup> “We [the NOAA Panel] think it is fair to describe such information as reliable by the standards that seem to be implicit in similar contexts, like market analysis for new and innovative products and the assessment of other damages normally allowed in court proceedings... Thus, the Panel concludes that CV studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values.” (cited in Kling, Phaneuf, and Zhao 2012, 6).

such cases, independent variables are more often individual characteristics than characteristics of the policy instruments (we comment on the influence of personal characteristics in the second part of this chapter).

Concerning the category of discrete choice experiments, studies that apply the single binary discrete choice question (called also dichotomous choice, or take-it-or-leave-it) often simulate a national referendum on presented policy and vary the cost of the policy randomly over respondents (with broad variety of bids among studies). Only two studies employed double-bounded dichotomous choice asking a respondent two following questions on WTP.

More complex discrete choice experiments elicit stated preferences and allow estimation of WTP for several attributes of policy options (15 studies), which are described in the Table 6. These DCE studies elicited the WTP mostly by sequence of binary choice questions (usually using two different options and no status quo option) or sequence of multinomial choice questions (choice between more than two alternatives and often status quo is included). Only two studies used another technique (namely best-worst choice question).

The DCE studies estimated WTP for variety of attributes (see below), mostly policy effectiveness (however very diversely conceptualized), distribution of cost and revenue use. Yet several studies did not elicit WTP for specific policy attribute, rather simulated the value for different scenarios (Cai, Cameron, and Gerdes 2010; 2011; Lee and Cameron 2008) and Carson, Louviere and Wei (2010) did not include a cost attribute in their experimental design, thus being more a public opinion study in its results, although they use DCE (we report on this study in more detail in *Policy characteristics* subsection of this chapter).

However, two studies cannot be classified in any of the three presented categories, as they applied a rating exercise (Poortinga et al. 2003; Steg, Dreijerink, and Abrahamse 2006) asking respondents to evaluate policies or measures on 5-point Likert scale regarding their acceptability and two other studies carried out non-hypothetical experiments (Cherry, Kallbekken, and Kroll 2012; Lösschel, Sturm, and Vogt 2010).

### ***Policies and policy instruments examined in the studies***

Majority of studies (25) focuses on national policies, only five on regional or local levels, and nine on international level. Only one study deal with the EU policy (Lösschel, Sturm, and Vogt 2010). Another nine studies do not specify the level. Compared to public opinion and social-psychological literature, economic studies do not research into transportation sector (8 studies) most often, but on economy-wide polices (11), and residential (12) and energy generation (9) sectors. In nine cases, the target sector was not specified. The policies belong most frequently to the following categories: carbon pricing, energy efficiency, and promotion of RES policy landscapes.

Similarly to the other two research streams included in the review, the majority of studies investigate taxes (27), especially taxes on inputs or outputs of a production process. Contrary to the other research streams, stated preference studies usually use a policy instrument as a payment vehicle in the survey's scenario. In the case of climate change policies, most frequent payment vehicles are taxes on or higher prices of certain goods (electricity, gasoline

etc.). Several papers also dealt with ETS (8), some command and control (5) and technology support (4) measures. Li et al. (2004; 2009) and Berrens et al. (2004) analysed support for US Senate ratification of the Kyoto Protocol.

The policies in question were formulated with very diverse generality regarding their instruments. On the one hand, several studies did not specify the instrument at all (8), as the main research interest was goal of the policy (mostly GHG emissions reductions by some level in 2020, 2030 or 2050 time horizon). On the other hand, other studies concerned only instruments (electricity prices, energy saving measures) without broader policy background. This diversity is common for all climate change policy acceptability papers and complicates the analysis and comparability of results. The advantage of stated preference approach in this regard is the use of selected characteristics of the policy instrument as attributes in the choice experiments. This allows us to examine the influence of policy characteristics on policy acceptability. The following part of this section is therefore structured around these policy attributes and aims at summarizing the main results.

**Factors influencing willingness to pay for climate change policies**

**Policy characteristics**

Based on the results of the discrete choice experiments, we distinguish three categories of attributes according to the key characteristics of policies that influence public acceptability: perceived policy effectiveness, distribution of cost (burden-sharing rules), and use of revenues. We define these categories rather broadly since the conceptualizations and specifications of the attributes are very diverse. Thus, our categories cover most of the attributes we found in the literature. Yet, very specific attributes are classified as *other* and described at the end of this section. We provide an overview of the attributes used in the DCE studies that asked a sequence of choice sets in the Table 6.

Table 6: Discrete choice attributes in the stated preference studies (only studies applying a sequence of choice sets)

Study	DCE elicitation technique	Cost	Effectiveness	Distribution of costs	Revenue use	Other
<b>Akter, Bennett, &amp; Ward 2012</b>	Multinomial choice sequence	cost per month	average temperature increase			probability of policy success
<b>Brännlund &amp; Persson 2012</b>	Binary choice sequence	household cost per month until 2012	effect on green technology R&D; increased climate 'awareness'	social distribution of cost		<b>geographical distribution of the reduction in emissions</b>
<b>Bristow et al. 2010</b>	Binary choice sequence	permit price / tax rate		permit allocation / how tax works	revenue use	permit life; transactions; purchase limits; market operation;

						excess permits; management of carbon accounts
<b>Cai, Cameron, &amp; Gerdes 2010 &amp; Cai, Cameron, &amp; Gerdes 2011</b> <i>(same data as Cameron, &amp; Gerdes 2007)</i>	Single multinomial choice & Single binary choice <i>(split sample)</i>	household cost per month		domestic cost shares (%); international cost shares (%)		
<b>Cameron &amp; Gerdes 2007</b>	Single multinomial choice	household cost per month	prevention of subjectively anticipated climate change impacts	domestic cost shares (%); international cost shares (%)		
<b>Carlsson et al. 2013</b>	Binary choice sequence	household cost per month until 2050		burden-sharing rule		
<b>Carson, Louviere, &amp; Wei 2010</b>	Binary choice sequence ( <i>no cost attribute</i> )	n/a		exemptions for transport-related industries; special treatment for energy-intensive industries	revenue use; investing 20 % of revenues	start date of policy
<b>Cole &amp; Brännlund 2009</b>	Binary choice sequence	personal cost per month until 2010	effect on green technology R&D; increased climate 'awareness'	social distribution of costs		
<b>Dietz &amp; Atkinson 2010</b>	Multinomial choice sequence	average annual cost to a London household	improvement in air quality	who pays?; discounts for those on low incomes		timing of impacts; forestry practices
<b>Layton &amp; Levine 2003 &amp; Layton &amp; Brown 2000</b>	Best-worst choice sequence	household cost today	amount of forests loss; carbon emissions reduction int.			

			agreement			
<b>Lee &amp; Cameron 2008</b>	Single binary choice	cost per month	individual's subjective climate change impacts	the likely first-round incidence of costs, both domestically and international ly		
<b>Longo, Markandya, &amp; Petrucci 2008</b>	Multinomial choice sequence	increase in the electricity bill	annual percentage reduction in greenhouse gases			shortages of energy supply; employment in the energy sector
<b>Saelen &amp; Kallbekken 2011</b>	Binary choice sequence	fuel tax increase per litre			revenue use	

### Policy effectiveness

Policy effectiveness of a climate change policy, i.e. whether the policy achieves its objective(s), is an important evaluation criterion not only for researchers, administrators and policy makers by policy evaluation (Görlach 2013) but also for public. In general, literature confirms that WTP for a climate change policy increase with required greenhouse gas emission reductions.

Besides the objectives defined in terms of policy impacts (the avoided greenhouse gas emissions), the objectives may be formulated in terms of policy outputs that should lead to greenhouse gas emissions reductions (such as improvements in energy efficiency), or in terms of policy outputs (such as laws and regulations).

Moreover, a climate change policy may have ancillary benefits (side effects; see Morgenstern 2000) or serve other objectives than climate mitigation, such as job creation, and air quality improvements (Görlach 2013). Effects of including these objectives in climate change policies on public acceptability were also examined, although to lesser extent.

In general, there are two ways to present the policy effectiveness to respondents. First, respondents can assess a scientific **indicator of policy effectiveness** or respondents' own **subjective assumptions about climate change impacts**.

First way to measure climate change policy effectiveness is to calculate the temperature increase it should prevent or annual percentage reduction in GHG emissions. However, this may be too abstract an idea for respondents to imagine. For example, many people do not know what consequences are associated with an increase of 2 °C (see Reynolds et al. 2010). Similar way is to state the improvement in environmental quality (e.g. air quality – Dietz and Atkinson 2010). Some authors use a specific example of climate change impact, such as

**forest loss** in a certain national park in the US (Layton and Levine 2003). This may limit the respondents' imagination and focuses them on a specific problem, but also limits the generalization of the results.

According to Dietz and Atkinson (2010) the amount almost doubles with change from medium to high **improvement in air quality** or from **moderate to big cut in GHG emissions reductions** (EUR 124<sup>4</sup> and EUR 224 per year in 2005 respectively for air quality, EUR 270 and EUR 579 for GHG emissions reductions). It is also interesting that the effectiveness in terms of commitment to future by GHG emissions reductions was valued substantially more (more than twice) than improvement in air quality.

Further, effect of the policy on the development of **environmentally friendly technologies** and on the Swedish populations' **awareness of climate change** have been analyzed (Brännlund and Persson 2012; Cole and Brännlund 2009). It appears that a positive effect on development of environmentally friendly technologies has a perceived benefit for respondents, as the marginal WTP for the positive effect was EUR 16 per month (in 2009) until 2012. On the other hand, the disutility of negative effect decreased down to EUR -15 per month. We cannot compare the values for the two effectiveness attributes in this study, as there was no common scale for them. Nevertheless, the marginal WTP for the positive effect on public's climate change awareness ranged between EUR 12 and 14 per month (these two values are for labelled and unlabelled experiment respectively). Longo, Markandya and Petrucci (2008) designed two attributes specific for energy policy: **length of shortages of power supply** and **number of employed in the energy sector**. Respondents of the study were willing to pay EUR 0.03 (year unknown; presumed 2007) for one new permanent job in the energy sector and EUR 0.5 for each avoided minute of black out (i.e. EUR 30 for hour).

Other studies (Akter, Bennett and Ward 2012; Akter and Bennett 2011) explored willingness to pay for policy effectiveness not only as prevented temperature increase, but also in terms of **probability of policy success** in mitigating climate change. Akter and Bennett (2011) concluded that if respondents did not belief in policy success, their probability of willingness to pay was lower. Akter, Bennett and Ward (2012) denoted the interaction of prevented temperature increase and probability of policy success as a unit of mitigation. According to their results, the utility was EUR 54 per month and household (in 2008) for one additional unit. Keeping the other attribute constant, respondents were willing to pay EUR 27 per month and household for additional 1 °C of prevented temperature increase and EUR 2 for each additional percentage increase in the probability of policy success (Akter, Bennett and

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<sup>4</sup> In order to enable comparison between studies that estimated WTP values, we always converted the original figures in national currencies presented in the studies into 2012 EUR values using purchasing power parity and consumer price index for the year stated in the study (either the year included in the WTP question in the questionnaire, the year of the survey, or the year preceding the publication of the study if there was no information about the time of data collection). We also calculated WTP per month where other time interval was used (there is no way how to calculate values per person from values per household listed in the studies, therefore a specification regarding the paying entity is always included). In some cases, WTP was elicited for a certain amount of goods (e.g. petrol in litres). These we only converted into 2012 EUR currency as described above.

Ward 2012). This value is particularly important considering possible **public scepticism** about success of proposed policies (Akter and her colleagues noted that half of their respondents believed that the CPRS has 50 % chance to deliver any mitigation results). Such scepticism could substantially reduce the perceived benefit of the policy and hence the amount of money that people are willing to give.

Similarly, the respondent's utility rises with shorter time horizon of negative climate change impacts. Layton and Levine (2003; Layton and Brown 2000) distinguished two levels of forest loss timing: 60 and 150 years. While for 60 years the respondents were willing to pay from EUR 10 to 197 per month and household (presumably in 1999, but the study did not specify the year of data collection) for different levels of loss, the values for 150 year-horizon were not only more than twice smaller, but for the smallest offered retreat the estimated WTP is negative (from EUR -3 to 95 per month for all levels). This indicates a general preference for earlier solutions in which the beforehand mentioned scepticism may play a role, since people might be simply sceptic or unaware about the influence of their actions in remote future. Carson, Louviere and Wei (2010) associated **timing of policy implementation** with cost. Later start of policy (2012 compared to 2010) would cost the household 20 % more. Naturally, respondents preferred earlier start. However, this does not support the hypothesis of preference for earlier solutions, as the attribute is not solely about timing, rather about cost. Hence we need to explore not only if such preference exists, but what are its possible determinants and how timing of policy implementation relates to its effectiveness in the general public perception of policies.

If respondents evaluate the indicator of policy effectiveness, the respondents have still their own ideas of current environmental quality and of its possible deterioration. The value of WTP for effectiveness attributes could be affected by respondents' **perception of climate change risk and their problem awareness** – the more they are aware and/or afraid of possible climate change impacts, the more they are willing to pay for an effective policy. Thus, the WTP for the attribute of policy effectiveness reflects also other individual beliefs. For example, Jaensirisak, Wardman and May (2005) used a sequence of binary choice questions to elicit preferences for road pricing policies. They focused also on environmental improvement and tested a hypothesis that those who perceived pollution as a serious problem would have higher values of the environmental improvement variable. Yet the coefficient was insignificant. This led the authors to conclude that the interpretation of 'substantial improvement' may vary across individuals, which supports the idea that individual beliefs play an important role in assessing one's utility of policy effectiveness.

Second interesting way is to explore respondents' **own ideas of possible climate change impacts on nature**, them and their family or neighbourhood, or different sectors of economy etc. and then use these ideas in the experiment for the effectiveness attribute (Cameron and Gerdes 2007; Lee and Cameron 2008 in our review), e.g. with two or three levels (no, full and/or partial prevention of respondents' anticipated impacts). In this case, the difference in WTP for this attribute should be caused by respondent's willingness to contribute to the prevention of climate change impacts, not by his or her risk perception or problem



awareness. However, both studies taking this approach did not elicit values for specific attributes; rather they simulated the values for different scenarios.

In Lee and Cameron (2008), the median WTP ranged according to different domestic and international cost distribution from EUR 6 to EUR 272 per month per household (in 2001 or 2002) under an assumption of all subjective climate change impacts (to agriculture and water, ecosystems, and oceans or weather) being considered moderate and EUR 458 to 897 per month for all impacts being considered substantial (if assuming impacts to be moderate the 95 % confidence interval includes zero). If the model includes respondents' subjective impacts as elicited in the questionnaire before the experiment, the confidence interval is even wider, with median values for four cost distribution scenarios from EUR 62 to 323 per month. Cameron (2005) found that students were willing to pay EUR 192 per month (in 1997) for a policy preventing an expected temperature increase of 1 °C. The amount rises to EUR 295 with one additional degree. It further increases to EUR 408 and 592 respectively if certainty about the respective temperature change exists. Both these findings furthermore support the conclusion that individual climate change risk perceptions have large effect on people's willingness to pay and cause substantial differences in it. It also suggests that climate change impacts as perceived by respondents are in general far from being seen as severe.

Concerning **ancillary benefits**, Longo et al. (2011) found that if the ancillary benefits were included, the Spanish were significantly more likely to vote in favour of climate mitigation policies and hence willingness to pay for reducing CO<sub>2</sub> emissions derived within their CV scenario increased by 58–75%. The ancillary benefits compose 34% (EUR 351.5 million) of the total social benefits estimated for the implementation of the Basque Programme to Combat Climate Change (EUR 1035 million). Interestingly, the total social benefits of introducing the Basque Programme to Combat Climate Change exceed the costs of its implementation by one order of magnitude (EUR 96.7 million; BG 2008). Futher, Longo et al. (2011) have shown that the Spanish had average willingness to pay for an additional annual tax of EUR 343 (s.e. EUR 48.8) for a four year period to fund projects to reduce current GHG emissions levels by 16% compared to 1990 levels. The willingness to pay an additional annual tax was also derived for other two targets: on average, WTP for a programme to support renewable energy aiming at 4% reduction in GHG is EUR 214 (s.e. EUR 22.3), while it is EUR 161 (s.e. EUR 11.7) for a programme to promote energy efficient measures at home that would result in 0.5% GHG reduction.

Overall, effectiveness and its perception by public prove to be key factors according to results reviewed in this report. The studies generally support this conclusion, as all studies focusing on this problem report the effect of perceived effectiveness on WTP or voting decisions to be significantly influential and positive (Akter and Bennett 2011; Akter, Bennett and Ward 2012; Berrens et al. 2004; Cameron 2005; Li et al. 2004 and Jaensirisak, Wardman and May 2005 also for congestion reduction).

Approximately half of the studies focused on people's beliefs, attitudes and awareness of climate change impacts. These prove to be, in all of these studies, to be significantly and

positively influencing the acceptability or WTP (Akter and Bennett 2011; Berrens et al. 2004; Cameron 2005; Carlsson et al. 2012; Hansla et al. 2008; Hersch and Viscusi 2006 and 2004; Ivanova 2011; Jaensirisak, Wardman and May 2005; Kotchen, Boyle and Leiserowitz 2013; Longo, Hoyos and Markandya 2012; Solino, Vasquez and Prada 2009; Viscusi and Zeckhauser 2006).

The results overall suggest, that people account also for other effects of the proposed policy, not only impacts on natural environment, i.e. the primary goal of environmental policy. The question, whether these other effects may be more important for voters than environmental effectiveness, remains to be answered. Yet it is quite clear that effectiveness, in its broad definition, matters. Due to the variety of its definition, it is hard to reach any general conclusion on what results in terms of their timing, geographical or social target (e.g. air quality in cities, better public transport etc.) and extent are preferred and what is the trade-off between effectiveness of policy and one's own effort (not only financial, but also behavioural) to improve this effectiveness. This may be explored through ascription of responsibility, which is, among others, a part of social-psychological model of VBN (see Chapter 2.2.3). Nevertheless, the price for improved environmental (and possibly also other) effectiveness people are willing to pay is rather high, with effectiveness being one of the most important policy attributes also for public, not only for environmental scientists. However, while scientists usually calculate or estimate the environmental effectiveness of proposed policies following gathered facts, people tend to assess it by using own ideas, beliefs and knowledge gathered not only from scientific materials, but also media and social networks. Therefore, exploring the determinants of what they see as effective is another important task for the future research.

### Distribution of costs

Although we refer to distribution of costs as a single concept, it encompasses several notions. First, we can distinguish distribution on **international or national level**, which can be specified according to population segments, such as **income groups or economy sectors**, which should bear the costs or should be exempt from payments (e.g. Carson, Louviere and Wei 2010 in our review).

Moreover, there are more **general burden-sharing rules** which are applicable on both levels, (i.e. on citizens, households or businesses and nations; see for example Cai, Cameron and Gerdes 2010, 2011). Either the costs could be distributed equally (as a same amount paid by all) or differentiated by level of income (equal or progressively increasing percentage, i.e. ability to pay), production, emissions etc.

According to **polluter-pays principle**, the countries with higher emissions should contribute to joint global effort to reduce emissions more. This rule has been also altered to reflect the historical development: those who emitted more in the past (i.e. from the beginning of industrial revolution) should pay more irrespective of their emissions now (this is particularly important for those developed countries that make efforts to emit less and for those

developing who do not want to slow down their progress; see for example Carlsson et al. 2013).

On the contrary, the **beneficiary-pays principle** assumes that recipients of the positive impacts of emissions reductions (e.g. inhabitants of industrial area after introduction of strict regulations and emission standards) should pay more (e.g. Dietz and Atkinson 2010). Of course, these rules can be optimized for the application level, thus the polluter-pays principle could be formulated by emission levels by country as a whole or emissions per unit of GDP or per citizen. On domestic level, as the government cannot effectively monitor citizens' or households' emission levels, the principle could be based in energy consumption. Similarly, the beneficiary-pays principle is harder to operationalize, since the benefits of avoiding climate change impacts cannot be clearly identified and ascribed to their beneficiaries.

In our review, Dietz and Atkinson (2010) formulated the beneficiary-pays principle in a case of London Low Emissions Zone as residents of central London, where better air is expected to be the result of the policy, to pay for it (the polluter-pays principle, on the other hand, is centred on London motorists). In their first choice experiment out of two, they used three levels of the cost distribution attribute: polluter-pays and beneficiary-pays principles as mentioned before and equal share among all Londoners. In the second experiment, dealing with National Climate Change Mitigation programme (focused on national GHG emissions reductions), only two levels remain. Again the equal shares rule and polluter-pays principle, this time based on emissions households currently produce. No beneficiary-pays attribute level is included. Dietz and Atkinson (*ibid.*) also include the other dimension of cost distribution, variety between income groups, by including an attribute for discount for low income households. Their results suggest a **strong preference for polluter-pays principle**. In the case of London programme, the implicit price for beneficiary-pays principle is negative (-EUR 4 per month; in 2005), while for equal shares is close to zero (EUR 0.32 per month) and for the polluter-pays principle just below EUR 12 per month. In the case of Climate Change Mitigation programme, implicit price for polluter-pays is EUR 31 per month, while for equal shares it is negative (EUR -3 per month). The implicit prices for discounts for low income households are positive, but lower than the values for polluter-pays principle (EUR 21 per month). Nevertheless, this suggests that people prefer the allocation of the costs based **ability to pay** (*ibid.*).

The social distribution of costs was also described by the principles of taxation: all pay the same amount, the same percentage of income or those with higher incomes pay higher percentage of it (progressive taxation) (Brännlund and Persson 2013; Cole and Brännlund 2009). Results of these studies indicate that Swedes tend to support **the progressive distribution of costs rather than regressive cost distribution**. Interestingly, there was a difference in marginal WTP for cost distribution attributes between the experiment labelled with 'tax' and unlabelled experiment. In the first case, the values for the two more progressive levels of the attribute (equal percentage of income and higher percentage for those with higher income) were very close to each other, while in the unlabelled experiment the value for progressive taxation was almost one third higher. Authors offered an

explanation in the effect of the label, as the tax instrument may already be seen as matching respondents' individual criteria of fair distribution.

Two separate attributes for domestic and international cost shares were included in several studies (Cai, Cameron and Gerdes 2010; 2011; Cameron and Gerdes 2007). However, in the case of domestic cost distribution, they chose rather payment vehicles as levels and their implied cost distribution than explicit burden-sharing rules (for domestic shares also Lee and Cameron 2008). Thus, they varied the policy options by variations of cost shares carried on by increases in energy taxes, income taxes, investment returns and consumer prices. Hence, this attribute is more suitable for analysing the effect of label or payment vehicle. Nevertheless, the authors conclude that the domestic distribution of mitigation costs is highly influencing (Cai, Cameron and Gerdes 2010).

On the other hand, the evidence for influence of international shares (3 levels: the US and Japan, other industrialized countries, and India and China), is not so straightforward (Cai et. al 2010). It is ought to be mentioned that the respondents were students, thus the sample was not representative for general public (nor for students in that matter). Yet, the results may suggest that the **domestic distribution and payment vehicle matter more than international burden sharing**.

Further, the cost distribution attribute was defined by four global burden-sharing rules based on historical emissions, income level (i.e. capacity to pay), equal right to emit (emissions per capita), and current emissions (Carlsson et al. 2013). In this study, preferences for distributing the costs of reducing CO<sub>2</sub> missions were examined in the United States and in China. In the United States, although the values have quite large standard deviations and their maximum odds is not more than EUR 2.5 (per month and household until 2050, in 2009) ranging around zero, Americans preferred rules placing smaller burdens on the US (i.e. for distribution according to current emissions the citizens were willing to pay EUR 1.4, on the other hand WTP for income level based distribution – capacity-to-pay principle – was negative; EUR 1.1 per month). The situation is rather different for Chinese who favored the rule based on historical emissions (EUR 8 per month per household) and ability to pay principle (EUR 5 per month per household), while the values for equal right to emit and current emissions are negative (EUR -5 and -8 respectively) but again with large standard deviations. These results suggest that people are prone to self-serving bias and prefer **options which impose lower costs to their country**.

Bristow et al. (2010) explored WTP for different ETS attributes, including allocation of emissions permits. The levels of this attribute cover not only equal allocation to all (including children, or children get 40% allowance), only adults or households, but also allocation according to consumption levels or according to government's assessment of needs. Those in need can further either receive extra permits or extra financial support (the attribute has eight levels). Surprisingly, allocation according to current consumption is insignificantly different from the base level (allocation to all including children), which may be a result of either self-interest, or a perception that such allocation is fair (similar to the base level). No allowances for children are less acceptable, again either it is perceived generally as unfair or

against interests of parents. Despite the higher acceptability of extra permits for those in need (financial support for them is less acceptable), the most **unacceptable option is the government's assessment of needs**.

No study in our review explored distribution of costs according to production (e.g. emissions per GDP) or consumption (i.e. goods produced in countries with higher emissions and sold in countries with lower emission levels), with exception of Bristow et al. (2010), whose results are too inconclusive in this matter. Neither did any study concern charging those who exceed a certain limit (reached by international agreement or imposed by national government), again with exception of Bristow and her colleagues (*ibid.*) who included a level of taxing principle attribute exempting all adults under 4 tonnes of CO<sub>2</sub> emitted. This attribute, in line with the self-serving bias hypothesis, was strongly preferred among other options (mostly taxation of all adults with different revenue use – see below).

Overall, there is **no convincing evidence on universal preference for one of the burden-sharing rules** as described earlier. Further analysis is needed to determine if such a universal preference exists or whether different groups prefer different principles and what influences their preferences (e.g. their own interests and self-serving bias). In line with social-psychological and public opinion studies, there is also a need to explore public's notion of what is a fair cost (or benefit) distribution and what is not. Cai, Cameron and Gerdes (2010) applied a model which included not only attributes of cost distribution on domestic and international level, but also an interaction of this attribute with what people see as fair and how much. This could be a convenient way to explore these concepts in more detail and with relevancy to real policies and policy contexts.

## Revenue use

Three studies included revenue use in the discrete choice experiment. Carson, Louviere and Wei (2010) analysed only preferences (not WTP) for different policy options and their particular characteristics. Slightly more than half of the Australian respondents (59 %) preferred investing 20 % of revenues in R&D of energy efficient technologies rather than to lower the taxes. The revenue redistribution to low income households and seniors (51 %) was compared to reducing the Goods and Service tax from 10 % to 9 %.

Similarly, Bristow and her colleagues (2010) found that allocation of revenues into the general budget is rather unacceptable. On the other hand, there is no significant difference between options of reducing local council tax, cutting income tax, providing a lump sum of money or stimulate energy efficiency. Thus, respondents in this study slightly preferred stimulation of energy efficiency over using revenues in general budget, but not over tax cuts.

The results of Saelen and Kallbekken (2011) indicate that **earmarking generally improves policy acceptability** or support in case of **fuel taxation**. Revenue use for environmental measures (i.e. support for public transport and alternative means of transportation, development of clean technologies etc.) would result in average voter to support a tax increase up to EUR 0.07 per litre (in 2010). On the other hand, earmarking for income

distribution would not result in support in any tax increase at all. The values were higher once the authors excluded the status quo effect (i.e. government would decide to increase the tax in any case). Average voter would be willing to support a tax rise up EUR 0.16 per litre additional to a rise of non-earmarked tax and EUR 0.04 in the case of income redistribution earmarking.

Several possible reasons for this **preference for use of revenues to finance other environmental measures** were proposed by Saelen and Kallbekken (2011). First, people do not believe that the fuel tax alone could have an actual effect on environmental quality. Rather, other measures have more obvious and direct effect, which is more comprehensible for public and the instrument may also be perceived as more effective. Second, preference for any earmarking may stem from the voters' expectations of possible benefits for themselves from the earmarked revenues. Another hypothesised reason for support for earmarked policies was distrust in government spending of revenues. This, however, was not supported in the data. Interestingly, those who distrust government are less in favour of earmarking than those who trust it. Together with the preference for use of revenues for environmental causes, this finding according to the authors suggests that certainty over the concrete use of revenues matters less than the thematic affinity of taxing and spending. Thus, policies perceived by public as less effective (although they maybe evaluated by experts as highly effective), could be accompanied through the use of revenues (usually evaluated by experts as less effective), which raises public acceptability or support for the whole policy mix.

### Other policy characteristics

The three attributes we overviewed in preceding part, namely effectiveness, cost distribution and revenue use, were most often utilized in the discrete choice experiments. There are, of course, also other attributes which do not fit into these three major types. These are often instrument specific attributes, such as forestry practices (Layton and Levine 2003), or permit life, permit purchase limits and others for ETS (Bristow et al. 2010). Bristow and colleagues (*ibid.*) conclude their exploration of many different characteristic of ETS and their influence on respondents' choices by emphasising the importance of policy design. Their results, although specific for ETS, suggest that also smaller and more specific features of the instrument matter. This, however, has relevance rather for analysis of particular instrument than for exploring what are the main traits of policies that influence their acceptability and how.

In general, **perceived fairness** significantly and positively influences acceptability and WTP for Kyoto Protocol (Berrens et al. 2004 and Li et al. 2004). Results of other study (Wiser 2003) also indicate that people may prefer collective, rather than voluntary payments (*ibid.*) and their WTP is lower if they see no direct benefits for themselves in the policy proposal.

More importantly, several studies found negative effect of a label 'tax' on public acceptability of a policy instrument (Hardisty et al. 2010; Brännlund and Persson, 2013; and Cole and

Brännlund 2009; Kallbekken, Kroll, Cherry 2011). A policy instrument **labelled as 'tax' is significantly less acceptable than an unlabelled policy instrument, even though they have the same characteristics** (Brännlund and Persson, 2013; and Cole and Brännlund 2009). Moreover, subsidies were supported rather than taxes and taxes rather than regulation by participants of a non-hypothetical choice experiment (Cherry, Kallbekken, and Kroll 2012). Specifically, in a laboratory experiment, the “tax” label in contrast to “fee” decreased acceptability of instruments with lump sum revenue redistribution, but did not significantly influence acceptability of instruments, which earmarks the revenues (Kallbekken, Kroll, Cherry 2011).

Except the positive effect of earmarking the revenues for environmental measures on acceptability of taxes, it is little known how can be support for taxation raised. One promising hypothesis is that tax-aversion stems from a **lack of understanding how a tax can reduce the externalities and increase welfare** (Kallbekken and Saelen 2011). However, the laboratory experiment that tested the effect of providing information about the workings and effects of the Pigouvian taxes on the opposition to this instrument and was conducted on students, have not verified this hypothesis. Nevertheless, the authors mention that explaining impacts of the introduction of Pigouvian taxes might be more influential in case of public aversion to taxes (Kallbekken, Kroll, and Cherry 2011).

### Socio-economic and demographic factors

Regarding the socio-demographic and socio-economic determinants of WTP, the findings are in general consistent for positive effect of income on WTP (although one study, particularly Hanemann, Labandeira and Loureiro 2011, presented results contradicting this conclusion). On the other hand, the evidence for the influence of gender is rather mixed. While several studies (Cai, Cameron and Gerdes 2010 and 2011; Cameron 2005; Li et al. 2009, Wiser 2003 and 2007 though not robust) concluded that women are generally willing to pay more, few others (Ivanova 2011; Li et al. 2004; Viscusi and Zeckhauser 2006) concluded to the contrary. Although literature often shows that women are overall more engaged in pro-environmental behaviour and are more inclined to have correspondent attitudes (Zelezny, Chua, and Aldrich 2000), this mixed evidence is present also in public opinion studies (see Chapter 2.2.2), may indicate the dependence of this relationship on other factors, such as characteristics of the policy. Some studies also did not find gender to be a significant factor (Adaman et al. 2011; Carlsson et al. 2013; Hersch and Viscusi 2004 and 2006; Kotchen, Boyle and Leiserowitz 2013).

There is some evidence for negative influence of age (Adaman et al. 2011; Carlsson et al. 2012; Hanemann, Labandeira and Loureiro 2011; Hersch and Viscusi 2004 and 2006) and positive influence of education (Adaman et al. 2011; Carlsson et al. 2012; Hersch and Viscusi 2004 and 2006; Kotchen, Boyle and Leiserowitz 2013; Li et al. 2004), thus younger and more educated people tend to pay more.

It also appears that political views and attitudes have some effect on WTP for emission reduction and corresponding policies. Conservatives incline to pay less (Cai, Cameron and Gerdes 2010 and 2011; Cameron 2005), while liberals and left oriented more (Li et al. 2004; Wisner 2003 and 2007 for liberals; Longo, Hoyos and Markandya 2012 for left oriented).


## 2.3 Conclusion and Discussion

Overall, the results of empirical studies indicate that people are more likely to accept proposed policies if they are concerned about the environmental problems the policies are focused on, and if they feel morally obliged to contribute to tackle these problems (Steg, Dreijerink, and Abrahamse 2006). They prefer policies they see as fair (Jakobsson, Fujii, and Gärling 2000), while this preference might be even culturally universal (Fujii et al. 2004). Trust plays a significant role too – trust towards the institution which proposes the policy is a key factor to greater acceptability (Dresner et al. 2006), however distrust of the general principles of taxation is a key factor to lesser (Kallbekken and Sælen 2011). Another set of influential determinants are people's beliefs about the consequences of policies not only for themselves (infringement on freedom – e.g. Fujii et al. 2004, or limiting their comfort), but also for their neighbourhood and the environment (Kallbekken and Sælen 2011). If people think a policy may somehow restrict their personal freedom or cannot effectively mitigate negative impacts of climate change on environment, they will not see such policy as acceptable. In general, people tend to accept policies that effectively solve the environmental problems, yet do not considerably influence their own behaviour (Jakobsson, Fujii, and Gärling 2000).

Several studies focusing on the influence of policy characteristics on policy acceptability pointed out an interesting finding concerning the push and pull approaches of the policies. People generally tend to prefer policy instruments resulting in lower prices of environmentally friendly products and services (e.g. subsidies for renewable energy sources) opposite to instruments increasing the prices of those environmentally harmful (e.g. fossil fuel taxation; see e.g. Schade and Schlag 2003; Eriksson, Garvill, and Nordlund 2006). Incentives for environmentally friendly behaviour, premiums, and positive formulation and wording of the policy are more attractive than bans or penalties for environmentally harmful behaviour, and negative formulation (e.g. de Groot and Schuitema 2012; Steg, Dreijerink, and Abrahamse 2006). In economic terms, allocation of policy costs, distribution of environmental burden, and redistribution of policy revenues were also studied as influential policy characteristics – all more or less connected to perceived fairness. People probably favour investment of revenues back into the domain of environmental protection rather than its use in other domains (Kallbekken and Aasen 2010), and cost distribution according to the polluter-pays principle (Dietz and Atkinson 2010).

To conclude, the review of literature has shown that both the characteristics of people (either social-psychological or socio-economic and demographic) and the characteristics of proposed policies are important determinants of their public acceptability. People obviously consider a variety of policy characteristics (economic aspects, moral implications, diversity of





possible consequences etc.), depending on their own values, attitudes, and preferences. The literature review provides a very good overview of possible explanatory factors, yet considering the complexity of the problem, we need to explore the determinants systematically by use of theories, ideally combining several theoretical and methodological approaches. Those are, in our research, economic and social-psychological frameworks and mixed-method research design.

### 3 Chapter: Survey to examine public acceptance of the EU's current and possible future policies

The research objectives of the survey conducted within the CECILIA2050 project by the authors of this report are to analyse the public acceptance/acceptability of the EU's current and possible future policies, especially to identify:

- (i) individual factors, such as socio-demographic and socio-psychological variables, and
- (ii) characteristics of the policy instruments that influence their acceptability.

The analysis of individual factors, such as socio-demographic and socio-economic characteristics, general environmental awareness, the awareness of and responsibility for the climate change, and personal norms, will be based on application of the value–belief–norm theory to predict acceptability of environmental policies. The identification of specific policy attributes (such as environmental effectiveness, abatement costs, allocation of costs and distribution of burdens) that influence the acceptability of policies aimed to reduce greenhouse gas emissions will be based on conjoint choice experiments.

This stated-preference method will enable us to elicit preferences for the efficiency of policy relative to household costs. Further, our research will allow estimating the willingness-to-pay premiums for climate policy attributes. For instance, this allows a judgement if citizens prefer reducing GHG emissions in general, or introducing particular energy-related policies, taking risk and uncertainty into account. The analysis will also provide information on how much households would be prepared to pay for reducing GHG emissions under which conditions (e.g. the specific policy mix).

#### 3.1 Methods

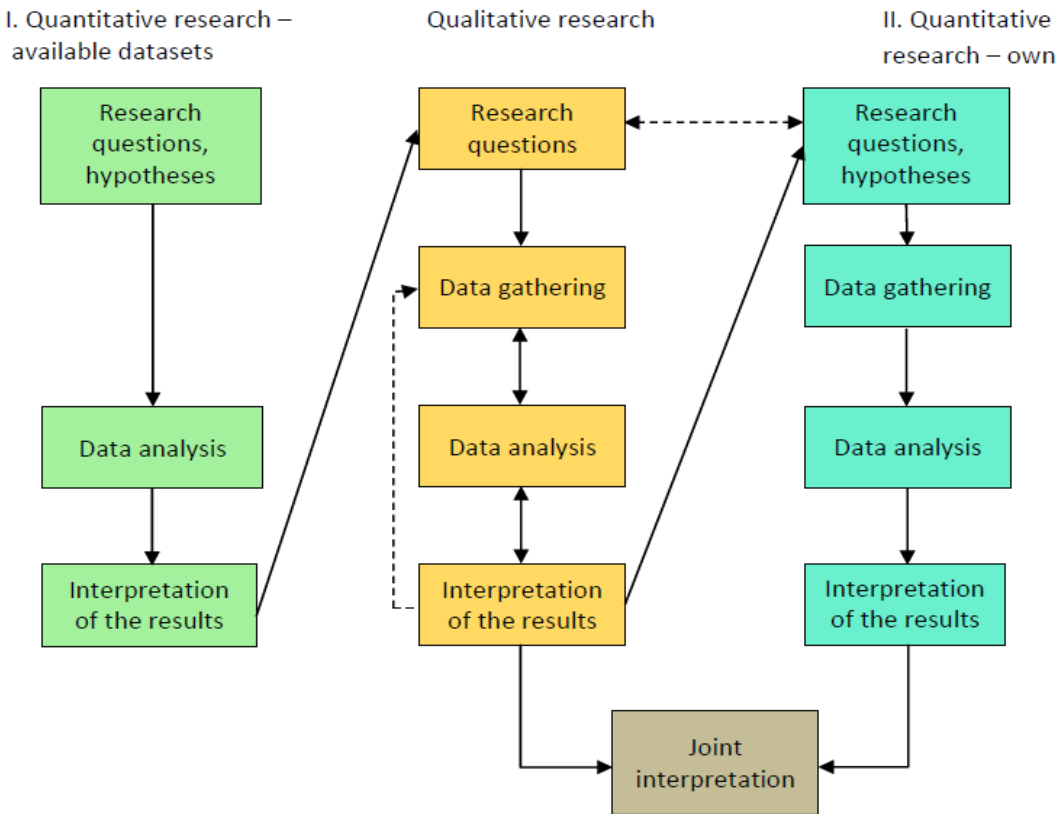
The methodological concept of our empirical research stems from the mixed-method approach (see e.g. Johnson, Onwuegbuzie, and Turner 2007), i.e. it integrates the quantitative and qualitative approaches. The specification of our model of the mixed-method design (see Figure 3) is based on the general sequential research plan proposed by Morse (Morse 1991; 2002) and further elaborated by Tashakkori and Teddlie (2002; 2006) as a sequential multistrand plan. The plan ties a qualitative research (2<sup>nd</sup> sequence) to the results of a quantitative part (1<sup>st</sup> sequence), integrating results of both parts in joint interpretation.

However, our research plan goes beyond the general sequential multistrand plan presented by Tashakkori and Teddlie (2006) by switching the qualitative and quantitative sequences and by adding a secondary data analysis as the first sequence of our plan. The results of the secondary data analysis (see Chapter 4) and the results of the literature review conducted earlier (see Chapter 2) provided a basis for the development of the questionnaire draft and semi-structured interviews outline for the second sequence of our research plan. Moreover,

the results constituted a rich framework and a solid support for interpretation of the results of the qualitative part and the formulation of hypotheses for the main quantitative sequence. In the second sequence, we tested several questions to be included in the questionnaire that measure citizens' beliefs, attitudes and ideas about climate change and GHG emissions reduction policies. Results of this qualitative pre-survey are summarized in the section 3.2. The results of the precedent part helped here in the development of the measurement instrument used in the following quantitative sequence and they will further enter the final interpretation.

The questionnaire survey is theoretically embedded in theory of normative conduct through the use of the modified VBN model, and in the utility theory by using the Discrete Choice Experiment (DCE). We employ also few constructs of the TPB. The theory constructs were operationalized in accordance with the literature and the results of the pre-survey. They are described in more detail in the overview of the literature review and below in the section 3.2.

Figure 3: Mixed method research design of our study



Source: own figure and research design based on Teddlie a Tashakkori (2006)

The stated preference survey will be conducted on representative samples of the general population in three EU countries: the Czech Republic, Poland, and the United Kingdom. In total, 3 000 people will be interviewed. The samples will be drawn from the general population using quota sampling. The survey will be administered by internet in the United Kingdom and by a mix of internet and face-to-face mode in the Czech Republic and Poland

due to the relatively lower penetration of internet users. In each of these two, 400 face-to-face interviews will be conducted.

In sum, we present in this report the results of the first two sequences of our research and the first phase of the final sequence. The completed research will shed more light on the complexity of people's views and policy preferences and integrate our conclusions with the results of previous research.

## 3.2 The qualitative pre-survey

### 3.2.1 Methods of the qualitative pre-survey

First, we developed an outline for the qualitative pre-survey, which took place during August 2013 and consisted from 14 semi-structured interviews with Czech citizens aged from 23 to 64 (Table 7). The structure and the content of the draft was based mostly on previous research summarized in the literature review and on hypotheses and questions formulated in the Description of Work of the CECILIA2050 project and in the theoretical frameworks used.

**Table 7: Socio-demographic characteristics of the participants of the pre-survey**

Characteristics	Number of respondents
<b>Gender</b>	
female	8
male	6
<b>Income (CZK; EUR in parentheses)</b>	
5 500 – 7 000 (214 – 272)	1
13 000 – 18 000 (505 – 799)	4
19 000 – 24 000 (738 – 933)	3
35 000 (1 360) and more	2
<i>Did not answer</i>	2
<b>Age categories</b>	
18-29	6
30-49	4
50 and more	4
<b>Education</b>	
primary	0
secondary	10
tertiary	4

Note: Exchange rate (30.08. 2013) equals to CZK 25,735 for Euro.

The first part of the interviews contained open-ended questions focused on participants' beliefs and ideas of climate change, its impacts, and policies (generally and specifically on GHG emissions reductions) in order to pre-eminently explore the original ideas of the respondents and to propose new hypotheses and corresponding questions. The open-ended questions also provided us with rich material to deepen the interpretations of quantitative data from the first and the third sequence of our research plan. In the second part of the interviews, we included the close-ended questions developed based on the operationalization of the theoretical constructs. The objective of this part was to test the preliminary formulation of the close-ended questions that constituted the draft questionnaire considering their wording and understandability. The interviewer asked complementary questions to further develop participants' answers. During the interview, the interviewer instructed participants to comment on the form and content of the questionnaire. The interviews lasted approximately one hour and were all recorded, transcribed, and afterwards analysed.

Although most participants evaluated the interview as rather long and some of its parts difficult, they found it overall interesting and important and felt motivated to participate. No participant declined to answer or ended the interview before the last question. One female participant rejected that human activities have a significant part in global climate change. She had some difficulties answering few questions of the draft questionnaire (e.g. questions about perceived effectiveness of the policies) due to her opinion that no such policy is needed at all. Yet she was able to provide fairly relevant answers (she did not refuse to answer or stated she does not know how to answer; she also differentiated between policy instruments in the matter of their effectiveness or infringement of freedom). Of course we cannot know how relevant will be the answers of those rejecting anthropogenic climate change or climate change itself and the need to introduce some policy to tackle it, yet these participants can be filtered out and their answers checked separately for consistency.

### 3.2.2 The results of the qualitative pre-survey

The most frequent **beliefs about climate change** expressed by participants were weather sways, changes and extremes (draughts, floods etc.) accompanied by disturbed season changing, alterations in life conditions (leading to species extinction and problems in agriculture), glacier melting, sea-level increase and **ozone layer depletion**. Consistently with the literature, the latter is considered as one of the most widespread **misconceptions about climate change** (Leiserowitz 2006). Most participants repeated themselves when asked about impacts of climate change, which may indicate that people represent climate change through its impacts, rather than its causes. Several participants mentioned greenhouse effect, yet mostly coupled with ozone layer depletion, making no difference between those two. Participants also specified the impacts on Earth's inhabitants as changes in life conditions, lack of food and decrease in comfort of living, leading to higher expenses to sustain it.

Overall, participants stated that impacts on them personally would be low and mostly of financial sort.

Further, we asked about ways to reduce the impacts of climate change, phrasing it intentionally this way, so it included both mitigation and adaptation options. Spontaneously, participants came up with **mitigation** possibilities, the most frequently mentioned was emissions reduction in general. More specific answers comprised technological solutions, education and behavioural changes. The latter was deemed as efficient only on condition that the majority of people change their behaviour, which was seen mostly as unreal.

When confronted with several mitigation and adaptation measures, participants were often quite confused, because they were aware of the difference between these two categories and had considerable difficulties to assess effectiveness of the measures in these two groups, since they found them incomparable. They indicated their perceived effectiveness for the mitigation measures and then struggled with the adaptation ones, stating that it is too late for those or that the nature will make its way and it will turn back to us. Generally, they found the **adaptation measures as effective, but limited to specific problems**, not solving the big ones, the causes. This indicates they might prefer mitigation measures in the long run. However, they did not mention whether they prefer adaptation to mitigation measures in their everyday life (e.g. turning on the air conditioning over not driving to work by car).

All participants had at least a vague idea about some **international agreement** on GHG emissions reductions, but most of them doubted its effect and significance, stating that, in the end, all “participating **countries will do whatever they want**”. China was very often used as an example of a country which will not listen to an international appeal. The EU emissions reduction targets (20 % in 2020, 40 % in 2030, and 80 % in 2050 compared to 1990) were seen as more or less adequate, which is in accordance with the findings from Eurobarometer public opinion poll (European Commission 2012; for detail results see Chapter 4). However, many participants of our qualitative research perceived these EU targets as nearly impossible to reach. Some participants could not evaluate the goals because they had no information about the current situation and the **EU’s progress in reducing greenhouse gas emissions**. This **lack of information** applies also on other participants who saw the goals as beyond reach. Most of them did not know that the EU is on the way to reach the “20 by 20” emissions reduction goal.

We also explored the participants’ notions of **international cost distribution** and **fairness**. All of them refused the idea of equal contribution and inclined to distribution according to the level of production and economic advance (the amount of costs shared depending on the GDP). China was a repeated example of a quickly advancing country with massive production and no consideration of nature and environment. Participants generally believed that countries like China cannot be persuaded to slow down their growth in order to mitigate climate change induced impacts and neither are willing to bother with such things as emissions. Some participants did not blame China in any way because they argued that “we did our share and thus we cannot forbid developing countries to do theirs”. Interestingly, all participants had at least a vague idea of the world emissions distribution, even though they

based it mostly on their idea of world production, not consumption. Most of them considered the **consumption distribution rule** (countries with high pollution-demanding consumption pay more) as **unfair** and named the USA and China as countries with the highest emissions, not mentioning the EU at all. This might indicate the existence of self-serving bias, but we have no solid evidence for it in this case. However, the issue has been examined in previous studies (Brekke and Johansson-Stenman 2008).

The questions used to measure perceived fairness of several cost distribution rules (both international and national) were comprehensible, but the number of distribution rules was rather high and participants had some difficulties to distinguish between them. Therefore only some rules are included in the final questionnaire. All rules are accompanied by examples (or respective countries) as some participants did not understand at first the difference between equal sum of money and share of income.

Most of the participants were not able to formulate on their own what attributes should GHG emissions reduction policy have. This might be caused by problems with translation of the term. In Czech, policy means more the institution of policy-making and governing the country, rather than a governmental policy. Some participants mentioned enforceability and controllability, resistance towards lobbying, and benefits for citizens (e.g. subsidies for housing). At least two participants stressed out the key role of financial accessibility of environmentally friendly alternatives. Both stated that **regulations and economic instruments are naturally needed, but the state “should offer an alternative even for those who do not have much financial resources”**. Without affordable low-emissions alternatives people will seek other cheap ways to keep warm or dispose of the trash, doing it illegally or with higher negative environmental impact.

Spontaneously, participants mentioned motivation of people to change behaviour, education, information campaigns and technology solutions, when asked whether they can come up with some ways to reduce GHG emissions. They agreed on the substantial role of people and their behaviour and necessary support from the state.

Interestingly, participants preferred **pull measures** when talking about **citizens** and themselves, on the other hand they tend to mention tougher **regulations and control of companies**. This tendency to control and restrict more the activities of companies than those of citizens can be shown also on empirical data on general environmental policy preferences stemming from quantitative survey representative for the Czech Republic and the United Kingdom (International Social Survey Programme 2010 Environment III). The general preference to pass laws to ensure environment protection is overall higher for businesses than for ordinary people, especially in the UK and also in the Czech Republic.

Although all participants were familiar with policy instruments (e.g. taxes, command and control, information provision etc.), they sometimes struggled a little with concrete application of the policy instruments in reality, which complicated the evaluation of their effectiveness. Some of the participants also mentioned that they may perceive these instruments as effective as they are formulated, but once they are applied they will probably fail, thus **the feasibility of policy instruments**. We specify in the final questionnaire whether

we mean effectiveness of the measure in its ideal application or when applied in current situation with current conditions.

Participants of the pre-survey evaluated **perceived effectiveness and coerciveness** of basic policy instruments (e.g. taxes, command and control, information provision etc.) on 7-point Likert type scales. First, effectiveness was formulated as likelihood that the policy will reach the objective of 80 % emissions reduction by 2050. Coerciveness used a formulation of infringement on personal freedom (e.g. limiting purchasing options or one's behaviour). Both questions were comprehensible and most participants did not have any trouble answering them. However, in the case of the ETS, all participants did not see any possibility that this could affect their freedom and their lives in general.

### 3.3 Quantitative survey: Development, testing and structure of the questionnaire

The questionnaire was finalized based on the results of the qualitative pre-survey and the content of the questionnaire is described in this section of the report. The final instrument consists of three main parts: i) the application of the modified VBN theoretical model, ii) the discrete choice experiment, and iii) standard socio-demographic questions (not elaborated on in this report). The socio-demographic questions were also tested for comprehensibility in the pre-survey and are queried at the end of the questionnaire.

#### *i) The application of the modified VBN theoretical model*

The questions for the VBN model were developed based on previous experiences with application of the model in empirical studies of climate change policy acceptability (see section 2.2.3 in this report) and general use of the model.

First questions of the questionnaire are focused on general values and attitudes which should not be framed by the problem of climate change. We tested two versions of **values** battery in the pre-survey, first a short version of Schwartz's (1992) universal value scale and second the Portrait Values Questionnaire (Schwartz et al. 2001). We used the first option in the final questionnaire as it is less demanding of respondents (27 items). For measurement of the general **environmental values** and worldview, we used a revised NEP scale consisting of 15 items (Dunlap et al. 2000) included at the end of the second section of the questionnaire. All three batteries are commonly used in empirical research and did not pose any problems to our participants either.

Although it was originally included in later part of the questionnaire, the measurement of trust is the second question of the final questionnaire for the same reason as values – some respondents framed the valuation of their trust to different institutions by the problem of environmental protection. We used a European Social Survey question to measure **institutional trust**, but this question is modified in the final questionnaire, as it did not include general social trust but focused only on institutional trust. We also excluded some



institutions from the battery since we can assume they are not relevant for environmental policy (e.g. police or political parties).

We developed a battery of variables measuring **awareness of consequences** from open-ended questions on climate change and its impacts. This battery consists of several statements corresponding with pre-survey participants' ideas and several statements adapted from studies using the VBN model (Steg, Dreijerink, and Abrahamse 2005; Stern et al. 1999). The items cover possible general and more specific consequences for respondents themselves and their families, their neighbourhood, country, and for nature represented by living animal and plant species.

A measure of **personal norm** (Stern et al. 1999) is included at the end of the questionnaire, since once respondents confirm they feel morally obliged to reduce their GHG emissions, they are likely to over-estimate their own efforts and willingness to act in following questions. The battery of questions on personal norm contains also questions on **ascription of responsibility**. While personal norm is focused more on feelings of moral obligation, ascription of responsibility also concerns other entities or institutions (government and business in particular) and is formulated in terms of contribution to climate change and its mitigation. The last battery of the second section of the questionnaire is the NEP scale, commented above. No participant had any troubles answering the scale, even though it is quite long and placed at the end of the questionnaire.

### *ii) Discrete choice experiment*

Since the literature on public scepticism about climate change and mental models of climate change (e.g. Reynolds et al. 2010; Whitmarsh 2009) and our qualitative research have pointed to a lack of knowledge about climate change causes and impacts, we first included quiz questions to measure knowledge about climate change. Respondents are provided with several statements to which they indicate whether they think them to be true or false. Correct answers are summed up, incorrect are subtracted forming an index. Second, we provided respondents with informative texts about some facts about climate change prepared by the European Environmental Agency after questions on knowledge and beliefs about climate change. Further, we give respondents brief information on the Europe 2020 Targets in the questionnaire because all three objectives (20-20, 40-30, and 80-50) are to be evaluated regarding their strictness separately.

A starting point for the discrete choice experiment (DCE) is that respondents are asked to imagine that a **referendum on different policy options to reduce greenhouse gas emissions by 80% by 2050** (compared to 1990) would take place in the EU states, respondent's country included. It is explained that if other non-EU countries would cooperate too, our climate would be approximately the same as we know it today. Further, respondents are informed that measures necessary to reach this goal would have to be implemented by companies, public administration and all citizens, which can lead to: i) more efficient production and adaptation of economy to new natural conditions, and ii) higher expenses for companies and the state, which would reflect in higher prices of consumer goods bought by households.

We included 5 attributes in the DCE: removal of perverse incentives, relocation of taxation to high emission behaviour, financial support for environmental friendly behaviour, the cost distribution among the citizens of the country, and costs. The attributes with their levels are summarized in Table 8.

In the pre-survey, participants struggled with informative text explaining cost distribution options and had difficulties to understand which impact these options will have on their budget. Yet, they were able to understand the differences of the policy options in the choice task when presented with a choice set (see Figure 4).

When deciding between the policies, respondents mainly paid attention to the cost distribution attribute, which was for them clearly most relevant. They connected the cost distribution attribute with the costs, yet they mostly commented on the distribution, while leaving the absolute costs as such aside.

Respondents were somewhat divided in their attitudes towards progressive cost distributions. While one respondent favoured a policy option because it included the progressive level of cost distribution attribute, several others chose differently for the same reason and noted that they do not see this distribution as fair. One of them had higher income – this could suggest an effect of self-serving bias. However, a female middle-class respondent in her fifties mentioned the unfairness of such a distribution despite her lower income. She explained that people with higher income may buy more expensive environmentally friendly goods, which she cannot afford. Thus, they may pay more.

In the end, they made an informed choice, but they sometimes omitted some attributes in their decision-making and focused only on one or two. Therefore, we revised the text and attribute labels to make them easier to understand and account for.

**Table 8: Design of conjoint choice experiment for acceptability of policy instruments**

Attribute	Number of levels
Removal of perverse incentives	2
Relocation of current taxation on high emission behaviour or products	2
Subsidies, financial support or tax allowances for environmental friendly behaviour or products	3
The cost distribution among citizens of the country	2
Increase in household’s monthly expenditures for the following ten years and total costs	4

We tested two types of explanation of the task in the pre-survey and two versions of the DCE. While costs are fixed bids in the first version of the DCE (Experiment A; see Figure 4), the cost attribute was formulated in percentage of household’s monthly expenditures and in case of progressive cost distribution the percentage level depended on the household income in the second version of the DCE (Experiment B). The design of the DCE remains the same as in the Experiment A in the final questionnaire, but the description is illustrated by an example of impacts of social distribution of costs on expenditures of two households.

Figure 4: Example of a choice set (Experiment A)

Policy option characteristics	Policy A	Policy B	None
Removal of financial support or tax allowances for economic sectors with high emission levels	No	Yes	None
Relocation of current taxation on high emission behaviour or products (the total amount of tax remains the same)	Yes	No	None
Subsidies, financial support or tax allowances for environmental friendly behaviour or products	High	Low	None
The cost distribution among citizens of [COUNTRY]	All households pay an equal share of their expenditures	Households with higher income pay relatively larger share of their expenditures	Same as current
Increase in your household’s monthly expenditures for the following ten years	€78 monthly for 10 years	€39 monthly for 10 years	€0
Total cost	€9,360	€4,680	

Which option would you prefer?

Note: Exchange rate (30.08. 2013) equals to CZK 25,735 for Euro.

The pre-survey has shown that the hypothetical referendum on different policy options to reduce greenhouse gas emissions seems to be acceptable for respondents. Only one respondent refused to provide answers because she did not understand the DCE. We treat

this choice as a protest zero. Other respondents were able to comprehend the scenario. All except one respondent stated a positive willingness to pay for a climate change policy increasing household’s monthly expenditures for the following ten years. One respondent chose status quo option due to her belief that global climate change does not exist. We treat this choice as legitimate zero because she dislikes the product (see Table 9).

To select bids for the pilot of the stated preference survey, we asked an open-ended WTP question in the pre-survey. We tried to find out the maximum WTP for the most favoured policy option of a respondent to reduce greenhouse gas emissions by 80% by 2050. The average WTP for the 2050 target is EUR 42 per month over 10 years, in total EUR 5 031 (excluding one protest zero, see Table 10).

In general, 6 respondents favoured policy option A in the DCE (see Table 9). Only one respondent favoured option B. This general preference for more expensive policy option is interesting, particularly when compared with the results of the open-ended WTP question, where the average WTP was EUR 42 per month over 10 years. This sum is lower than is the level of the cost attribute in policy option A in the first experiment (i.e. EUR 78) and the individual bids are mostly lower too. This may suggest that the costs were not the primary decisive factor in the choice experiment. No respondent also commented directly on the cost of the policy and no one also preferred status quo due to higher costs. This, however, might also point to the problem of our first selection of bids. The extent of the bids was rather diverse – the minimum amount respondents were willing to pay (except zero) was EUR 6 per month (i.e. EUR 720 in ten years) and the maximum was EUR 136 per month<sup>5</sup> (i.e. EUR 16 320 in ten years). It is reasonable to assume large diversity also in representative sample of general population.

**Table 9: Number of respondents in favour of policy options or status quo (n=14)**

Experiment version	Policy options	Number of choices
Experiment A (see Figure 4)	Policy A (€78; €9,360)	6
	Policy B (€39; €4,680)	1
	Status Quo	2
Experiment B ( <i>change in monthly expenditures and total costs</i> )	Policy A (10%)	3
	Policy B (5% to 15% depending on household income)	0
	Status Quo	1

<sup>5</sup> The amount is an average of the interval respondent indicated (i.e. €117 - €155 per month; see Table 10).

Note: Ten respondents were surveyed with versions of the Experiment A with fixed costs. Other four respondents were presented with price calculated based on their income (Experiment B). One respondent did not provide an answer. She did not understand the DCE exercise and was reluctant to answer anything connected with it. One another stated that she would not vote because she thought that climate change is not happening, therefore we treat her answer as status quo.

Exchange rate (30.08. 2013) equals to CZK 25,735 for Euro.

**Table 10: The maximum WTP for GHG emissions reductions by 80 % by 2050 (compared to 1990) elicited using an open-ended question in the pre-survey**

	Per month over 10 years in CZK (EUR)	Total in 10 years in CZK (EUR)
Respondent 1	500 (19)	60 000 (2 280)
Respondent 2	500 (19)	60 000 (2 280)
Respondent 3	200 (8)	24 000 (960)
Respondent 4	1 700 (66)	204 000 (7 920)
Respondent 5	0	0
Respondent 6	1 000 (39)	120 000 (4 680)
Respondent 7	2 000 (78)	240 000 (9 360)
Respondent 8	1 000 (39)	120 000 (4 680)
Respondent 9	500 (19)	60 000 (2 280)
Respondent 10	0	0
Respondent 11	400 (16)	48 000 (1 920)
Respondent 12	100 – 200 (4 – 8)	12 000 – 24 000 (480 – 960)
Respondent 13	3 000 – 4 000 (117 – 155)	360 000 – 480 000 (14 040 – 18 600)
<b>min. – max.</b>	<b>0 – 4 000 (0 – 155)</b>	<b>0 – 480 000 (0 – 18 600)</b>
<b>Mean (excluding one protest zero)</b>	<b>1 079 (42)</b>	<b>129 484 (5 031)</b>

Note: Exchange rate (30.08. 2013) equals to CZK 25,735 for Euro.

One respondent did not provide an answer. She did not understand the previous DCE exercise and was reluctant to answer anything connected with it.

The last two respondents were instructed to provide an interval (others the amount).

## 4 Chapter: Acceptance of the EU's Europe 2020 Targets

This chapter aims at identifying segments of the EU inhabitants that are more likely to accept the EU's 2020 targets and climate change policies. In addressing this issue, the objective of this chapter is to identify socio-demographic factors that affect support of climate change policies in the EU. To fulfil this objective it analyses data on attitudes of the EU inhabitants with respect to climate change from the Eurobarometer surveys, especially Eurobarometer 78.1 (European Commission 2012) and Eurobarometer 80.1 (European Commission 2014).

### 4.1 Trends in Acceptance of the EU's Europe 2020 Targets

The Eurobarometer surveys periodically monitor the EU citizens' views on targets set by the European Commission for the Europe 2020 strategy in employment, education, science and protection of the environment since 2010. Two indicators of the citizens' opinions are monitored: importance of the initiatives and adequacy. Respondents were asked to assess these targets either as 'about right', 'too ambitious' or as 'too modest' (see Figure 5, Figure 6, and Figure 7).

As for the importance, the initiative 'to support an economy that uses less natural resources and emits less greenhouse gases' was rated in autumn 2013 as important by 75 % of respondents (only two other initiatives, helping poor and those in need and modernising labour markets while raising employment levels, were seen as important by higher percentage of respondents).

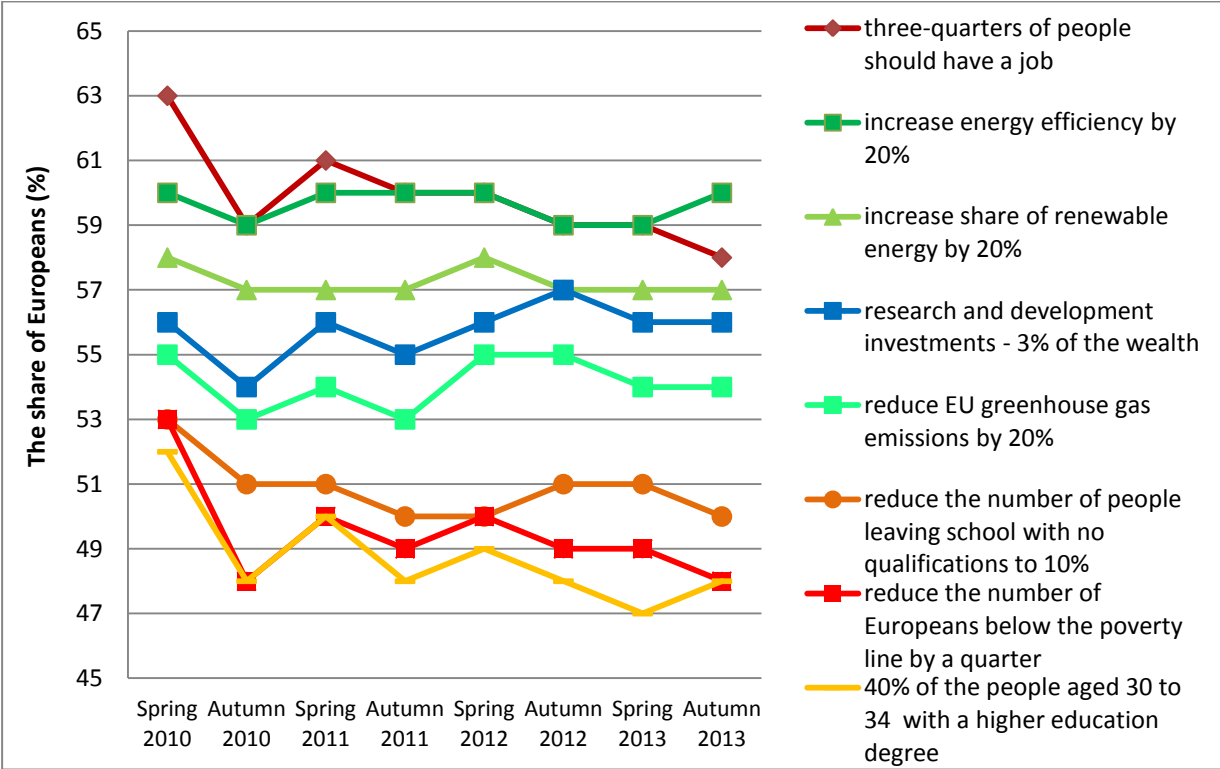
Assessing the achievability of the targets in general, majority of the EU citizens perceived all them as 'about right' (realistic and attainable), while an absolute majority of respondents (above 50 %) considered six of the eight targets credible in 2013 (the results have changed only minimally between the spring and autumn waves). This finding has been similar from autumn 2010 to autumn 2013 except the first survey in spring 2010, when all the eight targets were perceived by absolute majority as rightly set (see Figure 5).

The three environmental targets, i.e. 'increasing energy efficiency in the EU by 20 % by 2020', 'increasing the share of renewable energy in the EU by 20 % by 2020', and 'reducing the EU greenhouse gas emissions by at least 20 % by 2020 compared to 1990' (depicted in shades of green), were all seen as 'about right' by an absolute majority of citizens in all surveys from spring 2010 to autumn 2013 (60 %, 58 % to 57 %, and 55 % to 54 % respectively). The percentages have changed very slightly over the period, indicating that the opinions are quite stable.

Interestingly, reducing the EU greenhouse gas emissions by 20 % compared to 1990 is considered the least realistic target in comparison with other environmental targets over all surveys. In autumn 2013, more people also stated that the emissions reduction target is too

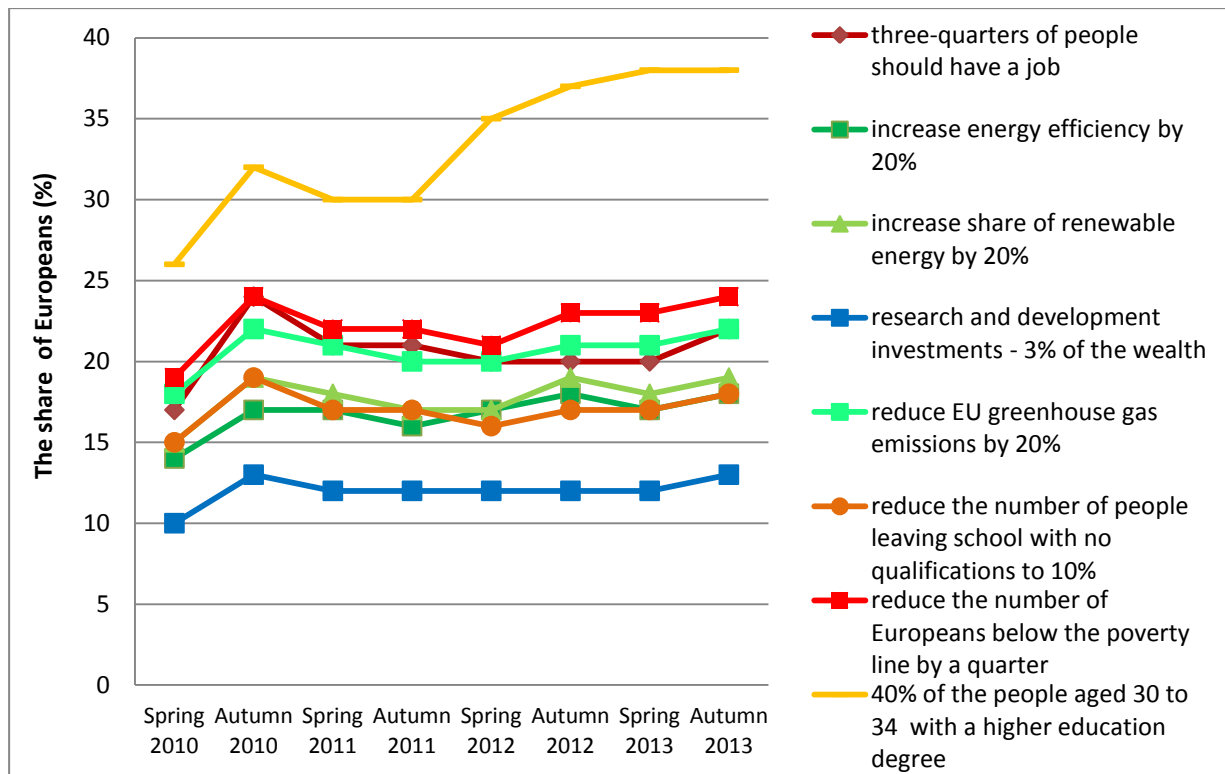
ambitious, than they did for other environmental targets (see Figure 6), while 17 % perceived it as too modest (see Figure 7). The increased energy efficiency target was evaluated as too ambitious by 18 % of respondents, while 14 % deemed it too modest. Similarly, the 20 % increase in share of renewable energy by 2020 was assessed as too ambitious by 19 %, while as too modest by other 17 % of respondents.

Figure 5: The share of Europeans perceiving the EU objectives by 2020 as "about right" (%)



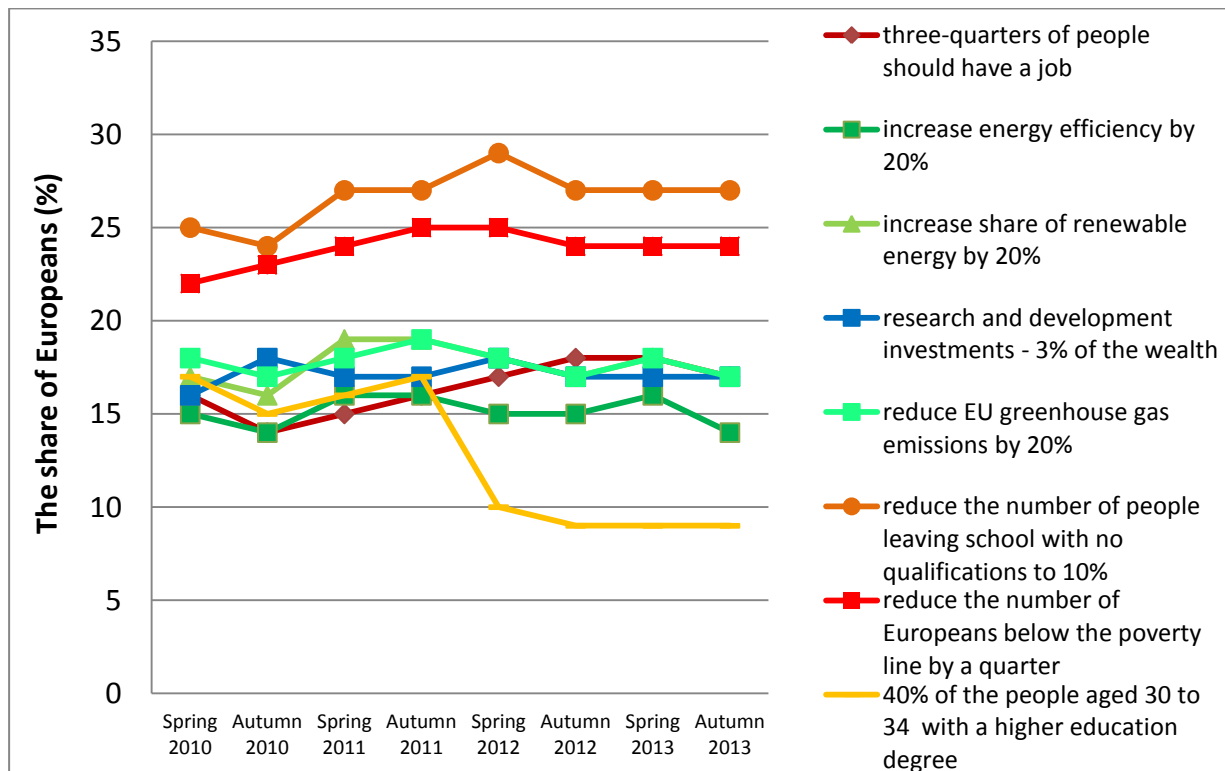
Question wording: *Thinking about each of the following objectives to be reached by 2020 in the EU, would you say that it is too ambitious, about right or too modest?*

Figure 6: The share of Europeans perceiving the EU objectives by 2020 as "too ambitious" (%)



Question wording: Thinking about each of the following objectives to be reached by 2020 in the EU, would you say that it is too ambitious, about right or too modest?

Figure 7: The share of Europeans perceiving the EU objectives by 2020 as "too modest" (%)



Question wording: Thinking about each of the following objectives to be reached by 2020 in the EU, would you say that it is too ambitious, about right or too modest?



## 4.2 Which Segments of the Population Accept the EU's Target to Reduce the GHG Emissions by 20 % by 2020?

The objective of this subchapter is to identify socio-economic and demographic characteristics that influence acceptance of the EU's objective to reduce the EU greenhouse gas emissions by 20 % by 2020 compared to 1990 levels.

We have estimated several models, including multinomial logit models and ordered logit models, with three levels of the dependent variable: *'too modest'*, *'about right'*, and *'too ambitious'*.

Further we interpret only the multinomial logit models (see Table 11 in the Appendix) that outperform ordered logit models because the proportionality (equality of the slopes) is rejected. In the first multinomial logit model, the dependent variable was coded 1 if a respondent perceived the target as *'too ambitious'* and 2 if a respondent thought that the target is set *'about right'*, having *'too modest'* as the reference category. The second multinomial logit model was used to model whether the target is *'too modest'* (the dependent variable being 1) or *'about right'* (=2), having now *'too ambitious'* option as the reference category. We included socio-economic and demographic variables in the models that are listed in Table 12 in the Appendix.

The results of the multinomial logit model estimations show that the respondent's gender, education, age, difficulties in paying bills, level in the society, employment status, presence of children in the household and size of place of residence have a significant effect on acceptance of the GHG emissions reduction target.

**Females** are more likely to evaluate the GHG emissions reduction goal as *'too modest'* and *'about right'*, while males tend to perceive this target as *'too ambitious'*. **University educated people, living in a large town, placing themselves in higher level in the society, students, employed and aged between 40 and 54** in contrast to the oldest age category more likely assessed this target as *'too modest'*. Households with children younger than 18 years and respondents who almost never or never had difficulties in paying bills rather stated that the target is *'about right'*.

The results that higher educated and females have more favourable attitudes and the older people have less favourable attitudes towards GHG emissions reductions are in accordance with the general trend in the previous literature. The effects of other socio-demographic characteristics that we found to be significant have been analysed only rarely, thus we cannot compare them.

Further, we identified significant differences in evaluation of the target between inhabitants of various EU countries. Whereas the target is more likely considered as *'too ambitious'* by people from Bulgaria, Lithuania, the United Kingdom, and Finland in comparison to other countries, respondents from Sweden (38%), Western Germany (41%), Austria (33%) and Belgium are more likely to perceive the objective as *'too modest'*.

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## 6 Appendix

Table 11: Effects of socio-economic and demographic characteristics on perception of adequacy of the EU's Europe 2020 targets (multinomial logit (MNL) model)

QB2_3	too ambitious		about right			too modest		about right	
<b>Intercept</b>	0,569	***	1,362	***	<b>Intercept</b>	-0,569	***	0,793	***
<b>AT</b>	-1,084	***	-0,818	***	<b>AT</b>	1,084	***	0,266	
<b>BE</b>	-0,360	*	-0,692	***	<b>BE</b>	0,360	*	-0,331	*
<b>BG</b>	0,547	**	0,564	***	<b>bulg</b>	-0,547	**	0,017	
<b>cyp</b>	-0,110		-0,593	***	<b>cyp</b>	0,110		-0,483	**
<b>cz</b>	-0,031		-0,336	*	<b>cz</b>	0,031		-0,305	*
<b>dee</b>	-0,369		-0,484	**	<b>dee</b>	0,369		-0,115	
<b>dew</b>	-0,661	***	-0,578	***	<b>dew</b>	0,661	***	0,083	
<b>dk</b>	0,082		-0,226		<b>dk</b>	-0,082		-0,308	*
<b>el</b>	-0,235		-0,701	***	<b>el</b>	0,235		-0,465	***
<b>es</b>	-0,009		0,372	*	<b>es</b>	0,009		0,382	**
<b>est</b>	0,057		0,363	*	<b>est</b>	-0,057		0,306	*
<b>fin</b>	0,405	*	0,223		<b>fin</b>	-0,405	*	-0,182	
<b>fr</b>	0,002		-0,248		<b>fr</b>	-0,002		-0,251	
<b>hun</b>	-0,223		-0,300		<b>hun</b>	0,223		-0,077	
<b>ir</b>	0,111		0,255		<b>ir</b>	-0,111		0,144	
<b>ita</b>	-0,128		0,329	*	<b>ita</b>	0,128		0,458	***
<b>lat</b>	-0,305		0,549	***	<b>lat</b>	0,305		0,854	***
<b>lit</b>	1,061	***	1,396	***	<b>lit</b>	-1,061	***	0,335	*
<b>lux</b>	-0,101		-0,637	***	<b>lux</b>	0,101		-0,536	***
<b>mal</b>	0,477		1,031	***	<b>mal</b>	-0,477		0,554	***
<b>nl</b>	-0,141		-0,351	*	<b>nl</b>	0,141		-0,210	
<b>pol</b>	0,110		0,499	**	<b>pol</b>	-0,110		0,390	**

<b>por</b>	-0,197		-0,032		<b>por</b>	0,197		0,165	
<b>rom</b>	0,377		0,760	***	<b>rom</b>	-0,377		0,383	**
<b>slo</b>	-0,054		0,213		<b>slo</b>	0,054		0,267	
<b>Continuing of Table 11</b>	<b>too ambitious</b>		<b>about right</b>			<b>too modest</b>		<b>about right</b>	
<b>svk</b>	-0,098		-0,109		<b>svk</b>	0,098		-0,012	
<b>swe</b>	-1,151	***	-1,031	***	<b>swe</b>	1,151	***	0,120	
<b>uk</b>	0,542	**	0,361	*	<b>uk</b>	-0,542	**	-0,181	
<b>female</b>	-0,122	***	0,042		<b>female</b>	0,122	***	0,164	***
<b>child</b>	0,029		0,105	**	<b>child</b>	-0,029		0,076	*
<b>university</b>	-0,162	***	-0,254	***	<b>university</b>	0,162	***	-0,092	**
<b>student</b>	-0,275	**	-0,288	***	<b>student</b>	0,275	**	-0,013	
<b>age1524</b>	-0,074		-0,087		<b>age1524</b>	0,074		-0,013	
<b>age2539</b>	-0,095		-0,188	***	<b>age2539</b>	0,095		-0,093	*
<b>age4054</b>	-0,108	*	-0,163	***	<b>age4054</b>	0,108	*	-0,055	
<b>selfemp</b>	0,089		0,034		<b>selfemp</b>	-0,089		-0,055	
<b>employed</b>	-0,050		-0,088	*	<b>employed</b>	0,050		-0,038	
<b>higher</b>	-0,115	*	-0,038		<b>higher</b>	0,115	*	0,077	
<b>middle</b>	-0,020		0,004		<b>middle</b>	0,020		0,025	
<b>largetown</b>	-0,261	***	-0,216	***	<b>largetown</b>	0,261	***	0,044	
<b>smalltown</b>	-0,082		-0,040		<b>smalltown</b>	0,082		0,042	
<b>incnever</b>	0,177	**	0,208	***	<b>incnever</b>	-0,177	**	0,031	
<b>incsometim</b>	0,054		0,106	*	<b>incsometim</b>	-0,054		0,053	

Note 1: Significance levels: \*\*\*p<0.01; \*\*p<0.05; \* p<0.1

Note 2: Several other models were estimated. MNL outperforms Ordered Logit model because the proportionality (equality of the slopes) rejected.

Note 3: Likelihood Ratio: 24428.56 (Sig.: 0.0006); -2 Log Likelihood: 43736.214

The likelihood ratio goodness-of-fit test is significant. The analysis of variance shows that the model fits.

Source: own estimates using data from Eurobarometer 78.1 (European Commission 2012)

**Table 12: Independent variables used in the previous multinomial logit models**

Independent variables	Description of variables
<b>female</b>	dummy indicator for females
<b>child</b>	dummy indicator of presence of children younger than 18 years in the household
<b>university</b>	dummy indicator of university degree
<b>student</b>	dummy indicator for students
<b>age1524</b>	dummy indicator for age under 24
<b>age2539</b>	dummy indicator for age between 25 and 39
<b>age4054</b>	dummy indicator for age between 40 and 54
<b>selfemp</b>	dummy indicator for self-employed workers
<b>employed</b>	dummy indicator for employed workers
<b>higher</b>	dummy indicator of higher level in the society (self-placement)
<b>middle</b>	dummy indicator of middle level in the society (self-placement)
<b>largetown</b>	dummy indicator of large town/city
<b>smalltown</b>	dummy indicator of small or medium-sized town
<b>incnever</b>	dummy indicator for respondents who almost never or never had difficulties in paying bills
<b>incsometim</b>	dummy indicator for respondents who occasionally had difficulties in paying their bills
<b>AT</b>	Austria
<b>BE</b>	Belgium
<b>BG</b>	Bulgaria
<b>CY</b>	Cyprus (Republic)
<b>CZ</b>	Czech Republic
<b>dee</b>	GERMANY EAST
<b>dew</b>	GERMANY WEST
<b>DK</b>	Denmark
<b>GR</b>	Greece
<b>ES</b>	Spain
<b>EE</b>	Estonia
<b>FI</b>	Finland

<b>FR</b>	France
<b>HU</b>	Hungary
<b>IE</b>	Ireland
Continuing of Table 12 Independent variables	Description of variables
<b>IT</b>	Italy
<b>LV</b>	Latvia
<b>LT</b>	Lithuania
<b>LU</b>	Luxembourg
<b>MT</b>	Malta
<b>NL</b>	Netherlands
<b>PL</b>	Poland
<b>PT</b>	Portugal
<b>RO</b>	Romania
<b>SI</b>	Slovenia
<b>SK</b>	Slovakia
<b>SE</b>	Sweden
<b>UK</b>	UNITED KINGDOM

Source: data from Eurobarometer 78.1 (European Commission 2012)