



Smart Mobility

Encouraging sustainable mobility behaviour by designing and implementing policies with citizen involvement

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Abstract: *The paper discusses the theoretical concepts, design considerations and preliminary findings from Smart Mobility, a research project currently being undertaken by the Institute with the City of St. Gallen. The project aims at designing measures to encourage the increased use of public and non-motorised transport by integrating behavioural economic principles into public policy. The extensive involvement of citizens and their participation in the design of the measures are to support their democratic legitimization and later acceptance. The paper describes the energy policies behind the project and outlines the theoretical framework for integrating behavioural insights into the design of technology and into public policy. The strategies envisaged include participatory instruments and methods, especially the use of existing social media channels, capitalizing on social norms and commitments to increase the motivation of individuals to use public transport, creating an open innovation space by means of crowdsourcing as well as the proper framing of political communication to achieve changes in mobility patterns.*

Keywords: behavioural economics, e-participation, social media, democratic legitimization, open innovation space, sustainable development, energy efficiency

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In 1998, the Board of The Swiss Federal Institutes of Technology promoted the vision of a “2000 Watt per capita society by the middle of the 21st century” (in brief: 2000 Watt Society). This corresponds to roughly a third of today’s per capita primary energy use in Europe. This goal has gained wide-spread acceptance and has been integrated into energy strategies and policies at federal, regional and local levels.

Various cities and regions (e.g. Basel, Zurich, Winterthur, St. Gallen) have adopted the vision and integrated it into their own energy strategies. Within the pilot regions the projects in progress include demonstration buildings constructed according to low-energy standards, electricity generation from renewable energy sources, and vehicles using natural gas, hydrogen and biogas. Pilots include innovative business models in the field

of energy supply (e.g. dynamic pricing which is already being experimented with by some utilities) or new mobility models based on sharing.

However, the diffusion of such sustainable innovations is faced with a dual challenge:

- They affect people's daily lives and require behavioural changes many people are reluctant to make .
- Although saving energy may be considered a virtue, 'sustainable' solutions tend to offer no immediate user benefits but only pay off in the long run.

Apart from having far-reaching consequences for people's living conditions, policy decisions in the energy sector have to consider current conditions whilst at the same time taking into account long-term aspects, such as the lifetime of infrastructures, as well as changes of habits and social norms. The political decisions and measures have to be accepted by those who are directly affected by them; otherwise they are bound to fail. It is therefore essential to engage citizens and stakeholders actively in the decision-making process and thus enhance the acceptance of policy decisions. In the framework of our project Smart Mobility, the active involvement of citizens serves different purposes:

- Democratic legitimization of policies that have an impact on people's lives
- Creating an open innovation space (crowdsourcing) that might lead to policies more adapted to people's preferences
- Capitalizing on social processes to increase the motivation of individual households to save energy and money

Smart Mobility, therefore, aims at developing and applying an approach that combines behavioural economics, (e-)participation and crowdsourcing to enhance the transition to reduced energy consumption in both economy and society. The Project was initiated in February 2012 and will run for one year. Phase 1 has dealt with the state-of-the art of applying behavioural principles to public policy and evaluating past actions in St. Gallen as well as comparable projects in other cities or countries. Phase 2, which started in August 2012, focuses on elaborating an implementation plan with concrete recommendations for the Office for Environment and Energy of the City of St. Gallen to support its ambitious energy policy. If implemented, the impact of the proposed measures will be measured with user acceptance and involvement as the most important evaluation criteria.

Section 1 describes the background and political context behind the project, in particular the energy policies at both the federal and municipal levels, and outlines the main research questions and objectives. Section 2 explores the main behavioural and socio-psychological principles that may play a role in citizens' energy use and mobility patterns. It also discusses concepts and principles of behavioural economics and how they can be incorporated into the design of technology. Besides, it presents possible frameworks that show how behavioural insights can be integrated into public policy especially in the environmental field to support our objectives.

Section 3 outlines the main ideas, instruments and channels for citizen participation with a focus on Switzerland, the use of social media for crowdsourcing and political participation in environmental policy. We also examine which digital platforms or

channels would be most appropriate for creating an open innovation space. Subsequently, Section 4 outlines our approach to smart mobility based on the insights gained from the literature review as well as from expert interviews and an evaluation of environmental actions already undertaken. Finally, Section 5 looks at the next steps such as linking up with the emerging open data community in Switzerland.

1. Background and research questions

1.1. Energy policy at federal and municipal levels

As mentioned in the Introduction, the vision of a “2000 Watt per capita society” has been adopted into energy policy in Switzerland in response to concerns about climate change, energy security, and the future availability of energy supplies. It is supported by the Swiss Federal Office of Energy, the Association of Swiss Architects and Engineers, and other bodies. The new strategy of the Swiss government with regard to energy policy includes the goal to contain and – from 2020 onwards – actually reduce overall energy consumption.

In a pre-study published under the title “Steps towards a sustainable development” and edited by Jochem (2004)¹, the experts from the Swiss Federal Institutes of Technology, examined if the vision of a 2000 Watt per capita society would be technically feasible without reducing the levels of comfort. They reached the conclusion that it was, despite a projected 65% increase in economic growth by 2050, by using new low-carbon technologies and techniques as well as contributions of energy and material efficiency. This is an important message as these contributions to a sustainable development are very often underestimated.

In addition to the vision of the 2000 Watt Society the Fukushima accident led to the decision of the Swiss Government to phase out nuclear energy by 2050. Although the legal regulations to implement the new energy strategy are still to be defined, reducing energy consumption is considered not only highly desirable but is actually an explicit objective.

As mentioned above, various cities and regions including the City of St. Gallen have adopted the vision of the 2000 Watt Society and integrated it into their own energy strategies. In the so-called “Energiekonzept 2050” (Energy Master Plan 2050) the vision has been translated into concrete policies and measures. Overall, 145 measures have been defined by a special working group of the Office for Environment and Energy in collaboration with representatives from local utilities and power plants, traffic planners and other planning agencies (City of St. Gallen, Nov. 2011).

The measures fall into three impact categories: electricity/power, energy-efficiency of buildings and mobility. This so-called “three-dimensional energy model” is the first of its kind in Switzerland. The move towards more energy efficiency is expected to be achieved

¹ The pre-study or White Book was sponsored by novatlantis, an organisation that takes the findings and results of recent research within the ETH domain and applies them to projects designed to promote sustainable development in major urban settlements (see www.novatlantis.ch).

by means of three mechanisms at the policy level: regulations, incentives and communication (see Figure 1).

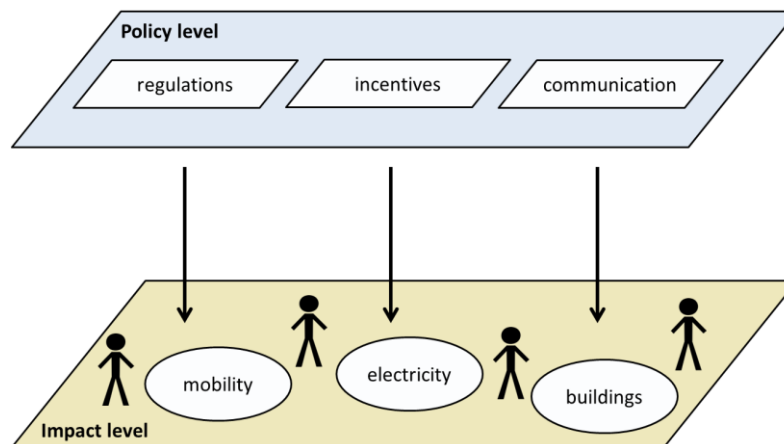


Figure 1: Energy Master Plan of the City of St. Gallen

The initial phase of the master plan focused on improving the energy efficiency of buildings, which accounts for 40% of energy demand. A study commissioned by the City, however, found that transport may soon become the biggest consumer of energy (City of St. Gallen, Nov. 2011). In 2009, it accounted for 35% of energy demand and roughly 37% of carbon emissions, private motorised transport, i.e. the use of passenger cars, increased by 16% between 1990 and 2009, freight traffic by 45% (Department for Spatial Planning, 2012).

These findings caused wide-spread concern which is why in March 2010 the citizens of St. Gallen approved of the “Regulation for sustainable mobility” which aims at fulfilling the increasing mobility demands in an environmentally friendly way, e.g. by public and non-motorised transport such as cycling. The City has also committed itself to further expanding public transport facilities and improving the conditions for cyclists and pedestrians.

Whilst the measures and policies in the power and building efficiency areas are quite advanced, mobility policy is still in its infancy. Despite wide-spread acceptance of public support, measures tend to be highly controversial as testified by the vociferous protests triggered by a recent announcement that the tax deduction for the use of private cars by commuters may be reduced.

Besides, people are reluctant to change their habits and routines. Switching to public and non-motorised transport may imply a profound change in lifestyles and attitudes since many still associate the use of their private cars with freedom of movement and independence. From a sociological and cultural perspective, the use of private passenger cars has increased along with general consumption. The ownership of a private car has become almost a near universal aspiration, and often constitutes a primary marker of status and success. Policies aimed at changing mobility behaviour are therefore highly controversial since they affect deeply rooted attitudes.

1.2. Main research questions and objectives

The project seeks to address the question how the energy transition can be enhanced by steering people towards more energy efficient behaviour in the mobility realm. It is based on the assumption that we can encourage the uptake of sustainable mobility patterns and ensure that government policy in this area will be as effective as possible by:

- taking into account behavioural insights when designing and implementing appropriate measures,
- using collective intelligence (the “wisdom of the crowd”) to create an open innovation space to extend and enrich our repertoire of policies and models.

By involving citizens actively in the design of policies and integrating their feedback to increase future acceptance, we expect to gain valuable information about policy design and policy framing for the envisaged energy transition.

Research questions that we hope to answer by the end of the project:

- Identification and evaluation of measures and policy instruments aimed at sustainable mobility behaviour
- What are potential business models that are viable for (energy and mobility) providers and consumers?
- Under which conditions are they perceived as attractive and beneficial (acceptance)?
- What are the necessary incentives, regulations or communication policies to encourage the uptake of measures?
- How can citizens and stakeholders be involved in designing and evaluating these policies?
- How can traditional communication and participation channels be best combined and/or complemented with new online channels?
- How can behavioural principles be incorporated into the design of online channels?
- How can we leverage the potential of social media for crowdsourcing?
- How can this involvement be designed to provide valid feedback for government and interested stakeholders?
- Since the final report and implementation plan will not be available until the beginning of 2013, this paper discusses the findings of Phase 1 and provides tentative answers to some of the research questions above.

2. The role of behavioural economics

2.1. Main concepts and principles

Behavioural economics is founded on the premise that human beings tend to act irrationally and are motivated by unconscious cognitive biases (Ariely, 2009). This is in contradiction to the standard (neoclassical) economic model which assumes that humans are rational and behave in a way to maximize their individual self-interest. Such an approach is closely linked with “rational choice theory” and can lead to unrealistic

economic analysis and policy-making which is why it has increasingly come under attack in recent times, especially because it has failed to predict and cannot explain the various economic and financial crises and because experimental psychologists such as Kahneman have demonstrated extensively that these assumptions simply are not true (see e.g. Kahneman, 2003). An important milestone in the ascent of behavioural economics was in 2002, when Kahneman was awarded the Nobel Prize for integrating psychological aspects into economics and for establishing experimental lab studies as an instrument of empirical economic analysis. The homo oeconomicus of classical economic theory has therefore been giving way to a more realistic image of human behaviour which draws on other disciplines such as psychology, neurobiology and genetics. The new man is characterized by bounded rationality, bounded willpower, and bounded selfishness (Dilk, 2011).

In his recent book *Thinking Fast and Slow*, Kahneman (2011) juxtaposes two cognitive systems that characterize human thought referred to as the "Reflective System" and the "Automatic System" (see Table 1).

Table 1: Juxtaposition of two cognitive systems (after (Thaler & Sunstein, 2008))

<i>Automatic System</i>	<i>Reflective System</i>
Intuitive	Rational
Uncontrolled	Controlled
Effortless	Effortful
Associative	Deductive
Fast	Slow
Unconscious	Self-aware
Skilled	Rule-following

The Automatic System is rapid and instinctive; the Reflective System of thought is deliberate and self-conscious. Because of these differences and conflicts between these systems, people are often subject to making mistakes that are the result of widely occurring biases, heuristics, and fallacies.

Another milestone in the history of behavioural economics, especially with regard to making the field known to the wider public, was the publication of *Nudge: Improving Decisions about Health, Wealth, and Happiness* written by Richard Thaler and Cass Sunstein (2008). The authors are equally critical of the homo oeconomicus view of human beings and cite many examples of research which raise questions about the rationality of many judgments and decisions that people make. They state that people make predictable mistakes because of the way they are influenced by their social interactions and because of their biases and use of heuristics. These include:

Anchoring: This means a cognitive bias wherein people rely too heavily on one trait or piece of information.

Availability heuristic: People predict the frequency of an event based on how easily an example can be brought to mind. The authors state that this could help explain why people think that homicides occur more than suicides, as examples of homicides are more readily available.

Representativeness heuristic: People judge the probability or frequency of a hypothesis by considering how much the hypothesis resembles available data. An example would be perceiving meaningful patterns in information that is in fact random.

Status quo bias: People are very likely to continue a course of action since it has been traditionally the one pursued, even though this course of action may clearly not be in their best interest.

Herd mentality: People are heavily influenced by the actions of others. A famous study by Solomon Asch (cited in (Sunstein and Thaler, 2008)) showed that people, due to peer pressure, answered certain questions in a way that was clearly false.

Because human beings are subject to these various errors and flawed thinking patterns, they make choices that seem contrary to their best interests. The idea of nudging is based on research that shows it is possible to steer people towards better decisions by presenting choices in different ways. The authors have coined the term “choice architecture” to describe the way in which decisions are influenced by how choices are presented or framed. They propose that default outcomes of a situation can be arranged to be the outcome desired by the person or organization presenting the choice.

Another principle suggested is laying out various outcomes of a decision in a way that is easy for the choice-maker to understand or follow. This is closely connected with the role that inertia plays in decision-making and people’s tendency to pick the default option in a range of choices. Choice architecture has a wide range of possible applications, from personal decision making, to medical or health options, to social policy and the design of technology. Cartwright provides a good summary of the principles of Choice Architecture and Nudging based on Thaler and Sunstein (2008) (see Table 2).

Table 2: Principles of Choice Architecture and Nudging (Cartwright, 2011, p. 452)

<i>Principles</i>	<i>Brief description</i>
Incentives	People do respond to incentives like price and cost, but only if these are salient.
Understand mappings	People may need help understanding the mapping from the choices they may make to the outcomes they will get.
Defaults	Defaults matter a lot because of present bias and choice overload, so think carefully about them.
Give feedback	People do learn so give feedback on when things are going well or badly.
Expect error	People make mistakes, so we need something that is as

Structure complex choices	<p>forgiving as possible to mistakes they may make.</p> <p>The more complex the choice the more problems a person has, and the more likely context effects will matter. So, keep things simple.</p>
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A comprehensive overview of behavioural economics is provided by Camerer, Loewenstein und Rabin (2004) and more recently, by Wilkinson (2008) and Cartwright (2011). A less academic introduction to the field is given by the already mentioned books Nudge by Sunstein and Thaler (2008), Predictably Irrational by Ariely (2008) and Thinking, Fast and Slow by Kahneman (2011).

In Switzerland, behavioural economics received a tremendous boost only quite recently, when UBS, one of the largest Swiss banks, awarded a grant of more than 100 million Swiss francs to the Department of Economics at the University of Zurich which is headed by one of the leading representatives of the field, Ernst Fehr (Bernet, 20.04.2012, p.15). Fehr has made significant contributions to the new field of neuroeconomics, as well as to behavioural finance and experimental economics (e.g. Fehr and Fischbacher, 2004; Fehr and Schmidt, 1999).

2.2. Integrating behavioural economics into the design of technology

Increasingly, behavioural economic principles have come to influence the design of technology as testified by the emergence of the fields of persuasive computing and persuasive systems design. The underlying postulate is that technology is never neutral, but is always guiding the individual. As discussed in the previous section, there is growing awareness that cognitive biases play a significant role when making decisions, therefore it does not come as a surprise that designers and their employers are wondering how to exploit them in the design of technology, be it mobile applications, e-commerce websites, digital social networks or virtual self-help communities.

Though many designers may use some of these psychological techniques intuitively, so-called “persuasion architects” (Travis, 2010) use them intentionally to influence the behaviour of users. Like the choice architects we are going to encounter in the public policy realm in section 2.3, they tend to be motivated by a desire to make people act for a good cause or help them “do better”. BJ Fogg, the founder of Stanford’s Persuasive Technology Lab and an experimental psychologist, puts it like this (2010):

... for that is, indeed, my hope for persuasive technology and for the innovations in this arena: that we can use the power of digital technologies, we can leverage the scale and speed of social networks to bring about positive changes in relationships, in environmental behaviour, and in our health, both at local and global levels.

Apart from Fogg, numerous researchers and practitioners such as Consolvo, McDonald & Landay (2009), Oinas-Kukkonen & Harjumaa, (2009), Travis (2010) and Torning & Oinas-Kukkonen (2009) have translated the principles of choice architecture as shown in Table 2 into persuasive design options. These include primary task support including self-monitoring, reduction, tunnelling, tailoring, personalisation and social comparison. Travis

lists reciprocity, commitment, social proof, authority, scarcity, framing and salience as “weapons of influence in the persuasion architect’s arsenal” (2010:1).

Legislators, too, appear to have taken note of the influential role of technology. The Directive on Privacy and Electronic Communications (the so-called “E-Privacy Directive”), for example, recognizes the importance and usefulness of cookies for the functioning of modern Internet, but requires that the consumer must give his or her consent before cookies or any other form of data is stored in their browser. To comply with the Directive, a site has to be set up as an opt-in regime, whereas marketers have traditionally favoured the opt-out option, where the default (an unticked “opt-out” box) indicates a failure to register an objection.

Table 3 attempts to correlate behavioural economic principles including some taken from MINDSPACE (see Table 4) with design principles documented and guidelines found in the persuasive technology literature mentioned above.

Table 3: Behavioural Principles in the offline vs. the digital realm

Offline	Online
Incentives	Persuasion architects give users small gifts – a sample chapter of a book, a regular newsletter etc. – knowing that users will feel a commitment to offer something in return (Reciprocity)
Salience	Provide information when directly relevant to the user’s behaviour, e.g. electronic triggers or alerts
Defaults	Adjust default settings to encourage the desired behaviour, e.g. opt-in vs. opt-out (cp. the E-Privacy Directive)
Give feedback	Self-tracking or self-monitoring of progress as provided in many ehealth applications
Social proof / comparison	All the various recommender systems (e.g. Amazon’s “People who shopped for this product also looked at...”) exploit this principle.
Structure complex choices	Tunneling principle - to guide a user through a complex experience and persuade along the way;

The last principle is also termed “Reduction” or “Keeping things simple” and is emphasised by all authors. Fogg has identified six factors that affect simplicity, namely time, money, physical effort, brain cycles, social deviances and non-routine (2010). According to Fogg, designers need not know the details but should be aware of the fact that behaviour change occurs only when the behaviour is easy to do and choose the appropriate channel, e.g. some channels such as online video or social networks may be

effective at increasing motivation, others such as specialised devices may excel at making a particular behaviour such as measuring heart rate easier.

Not everybody shares Fogg's optimism and some researchers such as Purpura et al. (2011) have pointed out the ethical limits and dangers of persuasive computing. Among the critical issues they highlight are

- the extent to which persuasion can turn into coercion,
- the mutually reinforcing relationship between persuasive computing with cultural trends to control and optimise human behaviour, and
- the issues around surveillance and the ascendancy of data collection over personal experience.

The critical issues raised by Purpura and his colleagues relate primarily to mobile health applications that include continuous monitoring and feedback based on sensor data. Whilst their reservations should definitely be considered and discussed by design practitioners and theorists, they do not apply to our project which aims to use digital platforms mainly for crowdsourcing and communicating the message.

2.3. Integrating behavioural economics into public policy

One of the criticisms that used to be levelled against the emerging field of behavioural economics was the experimental character of some of the early studies (e.g. (Anger & Loewenstein, 2007), (Levitt & List, 2008)). Recently, however, an increasing number of studies and reports have been testifying to the practical relevance of the various models and mechanisms (e.g. (Etzioni, 2011)). In the following paragraphs we describe three examples that demonstrate how to apply behavioural insights to real-life settings.

A. MINDSPACE

Influencing behaviour through public policy, a report published by the Institute for Government and the Cabinet Office on 2 March 2010, is an excellent example of how to integrate scientific findings from behavioural economics into policy-making. The report explores how behaviour change theory can help meet current policy challenges, such as to ensure environmental sustainability. It draws on new insights from science and behaviour change that could lead to significantly improved outcomes, and at a lower cost, than the way many conventional policy tools are used. The authors argue that today's policy makers are in the business of influencing behaviour and therefore need to understand the effects their policies may be having.

MINDSPACE consists of nine elements that influence human behaviour, most of which concerning the Automatic System as described above. MINDSPACE is the acronym of all these elements (see Table 3). Captured in a simple mnemonic, MINDSPACE can be also used as a quick checklist by policy makers, and has been seen in Section 2.2, by designers of technology.

Table 4: MINDSPACE elements (Summary based on (Cabinet Office, 2009, p.19-28))

Messenger	We are heavily influenced by who communicates information.
Incentives	Our responses to incentives are shaped by predictable mental shortcuts such as strongly avoiding losses.
Norms	We are strongly influenced by what others do.
Defaults	We “go with the flow” of pre-set options.
Saliency	Our attention is drawn to what is novel and seems relevant to us.
Priming	Our acts are often influenced by sub-conscious cues.
Affect	Our emotional associations can powerfully shape our actions.
Commitments	We seek to be consistent with our public promises, and reciprocate acts.
Ego	We act in ways that make us feel better about ourselves.

When applying MINDSPACE in practice, the authors rely on existing methods of policy-making such as those originally developed by DEFRA², the so-called “4Es” - Enable, Encourage, Engage and Exemplify. These four actions should underpin governmental attempts to change behaviour. They require two supporting actions: Explore, which takes place before policies are implemented, and Evaluate, which judges the success of the policy. Figure 2 illustrates how to build MINDSPACE into policy-making.

² DEFRA is the UK government department responsible for policy and regulations on the environment, food and rural affairs.



Figure 2: The 6 E's framework for applying MINDSPACE (Cabinet Office, 2009, p.9)

The Report stresses that the use of “nudge”-type policy tools requires democratic legitimization and states that “...in essence, the public need to give permission and help shape how such tools are used. With this in mind, we consider issues around gaining democratic permission for behaviour change policies.” (Cabinet Office, 2009, p.10). This is particularly relevant because behaviour change may be seen as government intruding into issues that should be the domain of personal responsibility.

B. The Seven Key Principles for Environmental Policy

Apart from MINDSPACE, the Seven Key Principles for Environmental Policy defined by Dawney and Shah (2011) provide a theoretical underpinning as well as useful advice about how behavioural insights can be applied to environmental policy. Their briefing distils many concepts from behavioural economics and psychology down to seven key principles, which highlight the main shortfalls in the neoclassical economics model of human behaviour. The seven principles comprise:

Other people's behaviour matters: People do many things by observing others and copying; people are encouraged to continue to do things when they feel other people approve of their behaviour.

Habits are important: People do many things without consciously thinking about them. These habits are hard to change – even though people might want to change their behaviour, it is not easy for them.

People are motivated to “do the right thing”: There are cases where money is demotivating as it undermines people’s intrinsic motivation, for example, you would quickly stop inviting friends to dinner if they insisted on paying you.

People’s self-expectations influence how they behave: They want their actions to be in line with their values and their commitments.

People are loss-averse and hang on to what they consider “theirs”.

People are bad at computation when making decisions: They put undue weight on recent events and too little on far-off ones; they cannot calculate probabilities well and worry too much about unlikely events.

People need to feel involved and effective to make a change: Just giving people the incentives and information is not necessarily enough.

The last principle mentioned by Dawnay and Shah (2011) confirms once more the importance of citizen involvement and participation in achieving behavioural change. The following guide also relates to environmental policy but focuses on political communication.

C. The Psychology of Climate Change Communication

“The Psychology of Climate Change Communication” published by the Center for Research on Environmental Decisions at Columbia University (2009) is a research-based guide aimed at narrowing the gap between information and action.³ It is a guide for scientists, journalists, educators, political aides, and the interested public, which is focused on communication.

The guide details many of the biases and barriers to scientific communication and information processing and describes eight principles, which should be taken into account when making the case for energy efficient behaviour. Figure 3 illustrates these principles.

³ The complete guide can be downloaded from <http://guide.cred.columbia.edu/>.



Figure 3: Eight Principles of Climate Change Communication
(Center for Research on Environmental Decisions, 2009, p.49)

For the purposes of our Smart Mobility Project the relevance of framing of communication – both offline and online - is of special interest. According to the authors, there is no such thing as “unframed” information. Whether you are a scientist, a public information officer, or a journalist, the choice is not whether to frame or not to frame, but rather how to frame a complex and uncertain issue for the public and with what goals in mind.

The guidelines drafted by the Columbia research centre are relevant to our own application scenario, i.e. mobility, which – like climate change – is a highly complex issue bedevilled by a multitude of interests and lobbying groups. Translating the scientific data into concrete experience and framing the message to suit different target groups will constitute major challenges. At the same time, social networks will offer an excellent platform for tapping into social identities.

Taken together, the three examples presented provide a range of options and repertoire of strategies and activities to make public policy more effective. They may differ in the terms they use but they all recognise the importance of user-orientation and empowerment to be achieved primarily by citizen involvement and participation. The following section therefore explores the different concepts, methods and channels of (online) participation, in particular, social media, and their use for crowdsourcing.

3. The role of participation and crowdsourcing

3.1. Basic concepts and goals of (e-)participation

As mentioned in the Introduction, the active involvement of citizens serves the following purposes:

- Democratic legitimization of policies that have an impact on people's lives
- Creating an open innovation space (crowdsourcing) that might lead to policies more adapted to people's preferences
- Capitalizing on social processes to increase the motivation of individual households to save energy and money

Ann Macintosh, a leading researcher in the field, distinguishes between three basic modes of contact between government and citizens: providing information, consultation and participation (Whyte & Macintosh, 2008). She proposes a working definition of e-participation as "the use of ICTs to support information provision and "top-down" engagement, i.e. government-led initiatives, or "ground-up" efforts to empower citizens, civil society organisations and other democratically constituted groups to gain the support of their elected representatives" (Macintosh, 2006).

What is important is that new technologies, especially social software applications, may change the nature of the relationship and affect the attitude of government to citizens. Many governments, as well as other organisations which have a duty or wish to involve their constituencies, are striving to use new innovative ICT to broaden and deepen the democratic and participative processes, making them more transparent, inclusive, accessible and effective.

Besides, we assume that by using social media we can create an open innovation space that might lead to policies more adapted to people's preferences. This is particularly important in areas such as mobility which are highly complex and controversial at the same time. By combining them with traditional channels of citizen participation and involvement such as referenda or focus groups we intend to make the design and implementation of public policies in this area more effective.

3.2. The use of social media for political participation

The recently published study of the Swiss Foundation for Research in Social Sciences (FORS) (Rothenbühler et al. 2012) shows that 18-25 year-olds in Switzerland are involved politically in many ways: apart from participation in referenda and elections, new forms such as smart mobs, the boycott of products, signing online petitions, and joining political groups on Facebook play an increasingly important role. Generally speaking, young people in Switzerland prefer issue-specific, short-term, informal, and individual forms of participation that may be associated with leisure activities and provide a mix of online and offline participation.

Based on the data collected, six types of political participation can be identified:

The passive are characterized by political apathy and political abstinence. They tend to be younger and have a lower level of education.

Minimalists participate in elections and referenda and may sign initiatives.

Issue-specific engagers prefer short-term focused activities to express their opinions and influence political decisions. They may use a wide range of channels or forms of political participation.

Conventionalists are sceptical towards non-institutional and new forms of participation and tend to rely on conventional forms of participation. They may discuss political issues with friends and family members, but tend to stay away from associations and NGOs.

Protesters are politically very active and may even use illegal forms of participation. They are politically more interested and generally have a greater political knowledge.

Activists are characterized by high and very diverse political participation. They often get involved in associations and NGOs, but tend to be sceptical towards political institutions (parliament, federal council, political parties).

The diversity of political participation that emerges from the FORS study (Rothenbühler et al. 2012) shows that the notion of an apolitical young generation does not correspond to reality. It is only possible to assess the political participation of young adults if one adopts a broad understanding of political participation that also considers newly emerged and continuously evolving forms and channels of political articulation.

Active membership in an NGO, the belief that institutional, but also non-institutional activities are efficient, scepticism about the political system, as well as the political commitment of the social environment have a direct impact on political participation. The same applies to age and educational level. According to the authors, three conclusions can be drawn from their study:

1. The political potential of non-institutional political participation has increased in importance. New forms of political participation (e.g. groups on Facebook) offer young people opportunities that are better suited for expressing their ideas and concerns.
2. Simple and clear communication is important if one is to address wider groups of young adults, especially those with a lower level of education.
3. The introduction of online voting and online elections, which in Switzerland is already being tested in pilot projects, can significantly contribute to greater participation among young adults.

The City of St. Gallen has been quite aware of these developments. Since January 2011 the municipality has been present on Facebook after having experimented with Twitter and Flickr for two years. The website of the City of St. Gallen⁴ reflects its commitment to create an open and accessible administration by providing detailed information about the workings of the administration and engaging in a dialogue with citizens by including interactive social media applications such as blogs where members of the City Council voice their opinions or comment public affairs. Online visitors can follow St. Gallen-related news and events on Facebook, Google+, Twitter, look for pictures on Flickr, or exchange news on the interactive platform MySG (www.mysg.ch). Besides, Foursquare offers a virtual tour guide around the city, especially the old part with its famous

⁴ See http://www.stadt.sg.ch/news/14/2011/01/stadt_st_gallen_offiziell.html

monastery, which can be used via smartphone.⁵ Also, the authorities encourage people to contribute their comments, ideas or questions and take an active part in public affairs. We therefore intend to use or build on the existing channels to engage citizens in designing policies and measures that steer people towards more sustainable mobility patterns.

3.3. Participation in environmental policy

As shown in Section 2.2, various attempts have been made at integrating behavioural economics into environmental policy-making. The Seven Key Principles for Environmental Policy by Dawnay and Shaw (2011) as well as The Psychology of Climate Change Communication published by the Center for Research on Environmental Decisions at Columbia University (2009) focus on this policy area.

Both guides also emphasise the role of citizen involvement and participation. Whilst Dawnay and Shaw (2011) stress that people need to feel involved and effective to make a change, the experts from Columbia University point to the importance of encouraging group participation and to tapping into social identities and affiliations (see Figure 3).

Recent work indicates that social processes are critical to the widespread, sustained adoption of pro-environmental behaviour (Moloney, Horne & Fien, 2010). Recent research also suggests that engaging individuals as members of a community rather than only as individuals or commuters, is an important strategy for changing energy-related behaviours (Hoffman & High-Pippert, 2010). One way of implementing this mechanism might be to encourage the use of public transport or cycling through social networks.

Other studies and/or experiments that have integrated behavioural insights for motivating environmental action include the experimental study by Feldman and Perez (2011) who write on framing, crowding out and institutional effects in the context of recycling policies, as well as Gowdy (2008) who focuses on climate change policy. In the author's opinion, building up intrinsic motivation and gaining public acceptance through participation is more important than trying to influence behaviour via pecuniary incentives.

In a recent study published by Heidbrink and Reidel (2011), the authors warn against the "privatisation" of sustainable behaviour and argue that in the final analysis the government is responsible for ensuring sustainability and not the consumers. In their opinion public authorities should point out to citizens the benefits of sustainable behaviour and take appropriate measures.

An instrument that is very relevant to participation in the environmental realm is the Strategic Environmental Assessment (short: SEA) introduced through the EU Directive 2003/35/EC. In its preamble, the Directive states:

"Effective public participation in the taking of decisions enables the public to express, and the decision maker to take account of, opinions and concerns which may be relevant to those decisions, thereby increasing the accountability and transparency of the decision-making"

⁵ For an overview of social media channels available see <http://www.stadt.sg.ch/home/stadtkanzlei/kommunikationsdienst/medienmitteilungen0.html>

process and contributing to public awareness of environmental issues and support for the decisions taken.” (Preamble of EU Directive 2003/35/EC)

According to Molinari (2012) the SEA has become the de facto means to introduce participatory processes into planning procedures in this area.

4. Our approach to smart mobility

Our approach has to be in line with the Energy Master Plan 2050 that states the main objectives to be achieved within the next few decades. Whilst policies in the spheres of energy efficient building and power generation are well under way, policies and measures related to mobility are still in the process of being defined and/or refined. The research project Smart Mobility is expected to support this process and make public policy as effective as possible. At the level of policy, the Energy Master Plan 2050 (see Figure 1) includes regulations, incentives and communication. The project focuses on the last two policy categories since regulations are beyond our control.

Based on the expert interviews and lessons learned that can be drawn from past or comparable initiatives such as e-bike promotions or walking audits, we describe our approach to smart mobility at three levels:

1. The use of behavioural principles and/or cognitive biases
2. The role of (e-)participation and crowdsourcing
3. Designing an effective communication strategy

Given that this paper reports on research in progress, the approach described in this section is still subject to change and may be revised in accordance with future findings.

4.1. The use of behavioural principles

The analysis of initiatives and projects aimed at fostering public transport in other countries and cities as well as on relevant projects undertaken in the City of St. Gallen so far, indicates that the following behavioural principles and cognitive biases appear to be the most relevant:

1. The power of social norms, or “Other people’s behaviour matters”
2. The status quo bias, or “Habits are important”
3. Commitment and Feedback or “People are motivated to do ‘the right thing’”

4.1.1. Leveraging the power of social norms

In many cases, sustainable mobility opportunities are not taken up by individuals or public institutions, even though they claim that are in favour. According to the pre-study of Novatlantis (Jochem, 2004) there are “numerous, not very well-known reasons for this fact which should be taken into account at the R&D stage” (Jochem, 2004, p. 47). From what we have learned so far, we can assume that most reasons are related to human behaviour or rather, people’s reluctance to change their behaviour.

Different patterns of behaviour and the consumption characteristics of various social groups are associated with different lifestyles. Mobility behaviour may vary tremendously with social network, sub-culture, community, and family. Clusters of

behaviours, beliefs, and values among householders make for numerous typologies of mobility orientations. For example, analysing “milieus” (liberal-intellectual, hedonistic, people with a particular migration background...) may yield rough estimates of the percentages of the population willing to accept the changes in behaviour or decision patterns required by a given energy or mobility policy.

In St. Gallen and other Swiss cities, various associations have been offering cycling courses for children. In the meantime, special courses are targeted at adults, especially migrants, because it has been found that they quite often lack this – what most Swiss would consider – basic skill. Also, migrants from certain countries regard owning and driving a car as an important signal of economic success. Enlisting the support of leading figures in relevant social groups is a strategy that is being considered to bring about a change in attitudes.

Capitalizing on social processes to encourage more sustainable mobility behaviour also ties in well with one of the strategies suggested in the novatlantis pre-study (Jochem, 2004) to achieve the energy-efficiency objectives stipulated by the vision of the 2000 Watt Society, namely ‘Reputation management by third parties’. According to the authors any waste of energy or unsustainable mobility could be stigmatised as showing a lack of responsibility or being ethically unacceptable. Therefore, driving to work in one’s private car (even though public transport is available) would become a threat to one’s social reputation.

4.1.2. Counteracting the status quo bias

One of the greatest challenges will be to overcome the inherent tendency of both individuals and institutions towards inertia as well as wide-spread misconceptions and misunderstandings, e.g. concerning innovation and economic growth. We assume that mobility behaviour is highly patterned, often routinised, and therefore stable over certain ranges within a single household. Unconscious habit plays an important role, and so does the “sunk cost” effect. A sunk cost, as defined by Arkes and Blumer (1985) involves any prior investment of “money, effort, or time” (p. 124). Sunk cost effects on decision-making are, of course, irrational from the perspective of both classical economic and normative decision theories and can therefore be subsumed under the behavioural economics category.

Translated into the context of mobility choices, many people reckon that once they have bought a car and paid the insurance premiums, actual driving comes free except for the petrol they pay for. This is why mobility and road pricing have proved so controversial. Mobility pricing is usually defined as direct charges levied for the use of infrastructure and services for individual and public transport designed to influence the demand for certain classes of mobility. The more common economic concept of “road pricing” tends to be used primarily for revenue generation, usually for road infrastructure financing, or as a transportation demand management tool to reduce peak hour travel and the associated traffic congestion. Despite various studies advocating mobility pricing, the

Swiss Parliament has decided to suspend any pilot studies in this area – at least for the time being – because of wide-spread opposition.⁶

A preliminary evaluation of various e-bike promotions in various Swiss cities by the association myblueplanet has shown that inertia and the reluctance to change one's habits are the main reasons for not taking up the offer of testing an e-bike for free during one month in exchange for depositing one's car keys with the bike dealer.⁷

Tackling the deeply ingrained status quo bias may actually require a “shove” rather than a “nudge”. Reducing the tax deduction for the use of private cars for commuting to one's place of work would constitute such a shove and help finance the transport infrastructure. If the proposal is followed through, it should have a major impact on commuter traffic in the City.

Whilst public authorities quite often are characterised by inertia rather than pro-active and innovative behaviour, seeking to be consistent with public promises is an important element of the MINDSPACE approach (see Table 3) and can serve to counteract the status quo bias, which leads us to the next point – Commitment.

4.1.3. Commitment and feedback

The City of St. Gallen has publicly committed itself to setting targets for reducing motorised transport, e.g. when it comes to commuting to their place of work, and monitoring the targets continuously in a transparent way. This has much in common with the second strategy promoted in the novatlantis pre-study, namely “Goal setting by voluntary action”. The mechanism of active goal setting by companies, public institutions or groups of people is considered a more positive strategy by the authors provided the monitoring of the target path is possible and accepted (Jochem, 2004).

The monitoring element is crucial since it stresses the importance of feedback on the one hand and acceptance by those who are immediately affected on the other. If we try and connect this strategy to the behavioural principles discussed in Section 2, “Commitment” and “Feedback” come to mind as close approximations. As we know from the vast literature on implementing change in organisations (e.g. Cohen, 2005), leadership and role models are crucial for long-term success.

In our project, we intend to enlist the support of the municipal employees in the change process, who are expected to act as champions for the cause of non-motorised transport, and test the efficacy and feasibility of the proposed measures first hand. This is line with the Energy Master Plan 2050, which includes the stipulation that the municipality should lead by example.

For this purpose, an online questionnaire has been sent to all the municipal employees aimed at raising awareness and motivating them to change their mobility behaviour. The questionnaire includes a preliminary list of policies aimed at encouraging non-motorised transport to ascertain which strategies enjoy the highest support and therefore stand the

⁶ See <http://www.astra.admin.ch/themen/00901/index.html>

⁷ Based on an internal document of myblueplanet (<http://www.myblueplanet.ch/bike4car-2012/>), communicated by Karin Witschi, CEO of myblueplanet.

greatest chance of being implemented. Among them are incentives for car sharing or teleworking, or installing showers for employees who cycle to work and may want to change into a more appropriate outfit before attending a meeting.

The results from the survey will be analysed and presented to the authorities. It will then be up to the city council to decide on which measures to focus on. This should happen in close collaboration with those in charge of communication strategy since it will be important to “market” the actions undertaken by the municipality. Achieving quick wins may well be a consideration when deciding on a particular course of action.

A posting from 8 June 2012 on the City blog under the heading “Energiestadt St. Gallen” (Energy City St. Gallen) shows how important it is for the authorities to act as role models:

*“St. Gallen spends millions on motorised traffic every year, but hardly anything on non-motorised transport which would be most suited to an urban setting in almost every respect.”
(own translation)*

If citizens have the impression that the authorities and their representatives only pay lip service to embracing energy efficient and human-powered modes of transport, they will balk at changing their own mobility behaviour.

4.2. The role of (e-)participation and crowdsourcing

So-called “pedestrian or walking audits” are among the most successful measures that have been conducted in St. Gallen. The audits focus on improving the conditions for pedestrians and involve the participation of citizens who are interested in the topic as well as representatives from municipal authorities. The itineraries tend to be prepared in the course of workshops beforehand, but can usually be adapted during the audit. Quite often the lay persons detect problem areas which the professional traffic planners did not think of.

To extend the reach of such measures, the next step might be to integrate social media and mobile technologies in the auditing process as has already been done in the German city of Frankfurt or the London district of Leisham. The aim is to allow citizens to indicate danger spots or zones via smartphone or on an interactive map in the Internet.

Whereas audits are usually organised by the municipal authorities, other participatory instruments have emerged “bottom-up”. An example is the “CrossCheck” app developed by the Swiss NGO RoadCross Schweiz, which encourages users to alert traffic planners about dangerous pedestrian crossings. Mobility issues also play an important role in the growing open data community (see <http://opendata.ch>). In April 2012, the second Open Government Data camp was dedicated to public transport. Within 24 hours the participants developed several applications to promote public transport, among them a Swiss Public Transport API and a RealTime PubSub Engine for Opendata based on HTML5 Websockets.⁸

⁸ See <http://opendata.ch/2012/04/02/innovationsschub-fuer-den-schienenverkehrs-verkehrsdienstleister-und-community-am-selben-tisch/>.

The open data community includes many activists whose interest in sustainable mobility can be seen as a reflection of a recent trend that can be spotted in certain social milieus (urban, well-off and well-educated) who voluntarily renounce the (frequent) use of private motorised transport. Although many people still associate their private cars with freedom of movement, independence, and status, there are indications that this may be changing. Whereas in the past a driving permit was considered an absolute must and an entry ticket to adulthood, an increasing number of young US citizens decide they can do without. Researchers such as Sivak and Schoettle (2011) assume that the declining enthusiasm for driving might be associated with the fact that more people live in big cities or that the average age is higher.

According to Sivak, there is also strong evidence for the hypothesis that this trend is due to the increasing use of social networks such as Facebook.⁹ Leveraging the power of social networks via social media would therefore serve a dual purpose:

- Targeting young people who have more affinity to this new channel for political participation and
- Testing Sivak's hypothesis that young adults who are highly active in social networks may be more inclined to support public policies aimed at reducing private motorised transport.

Hopefully, they in turn will act as a force for mobilising their respective peer groups or social networks in the real world. Furthermore, we would create an open innovation space eliciting ideas about policies, alternatives to existing or planned measures and how to frame choices that representatives from public authorities or academia might never even have thought of. At the same time, it may be a way to address not only the issue-specific engagers, but also the activists and protesters (Rothenbühler et al. 2012).

In this way we intend to create an infrastructure for innovation along the lines set out by Fogg (2010). This includes methods for team communication, designing interactions and describing the service to the public.

4.3. Designing an effective communication strategy

What is missing so far is the communication strategy to be applied to achieve behavioural change. As we know, people are strongly influenced by how the problem or information is presented to them. It is especially important to structure complex choices as is the case with mobility. For our purposes, we consider all the eight principles cited in The Psychology of Climate Change Communication Guide relevant (cp. Figure 3), namely

1. Know your Audience
2. Get your Audience's Attention
3. Translate Scientific Data into Concrete Experience
4. Beware the Overuse of Emotional Appeals
5. Address Scientific and Climate Uncertainties

⁹ Cited in the article "Vernetzt statt unterwegs: Junge US-Bürger verzichten auf den Führerschein." Spiegel Online, 07.04.2012.

6. Tap into Social Identities and Affiliations
7. Encourage Group Participation
8. Make Behaviour Change Easier

At present, the notion is often communicated that resource efficiency beyond that achieved by autonomous technical progress would actually hinder economic growth. To realise the vision of a 2000 Watt per capita society will need convincing arguments and a strong coherent policy that takes into consideration all the human-behaviour and policy-making elements (the six E's) outlined in the MINDSPACE approach and illustrated in Figure 2. When drafting the message it will also be important to take into account the 'sunk cost effect' by emphasising the real costs of using one's private car which are much higher than the cost of petrol for a particular journey.

Evaluations of financial incentive programmes offered by different institutions to encourage energy efficiency or conservation have found that non-economic aspects such as the type of communication channel, the credibility of and the trust in the communicators and the technology producers are of major importance within the decision-making process and consequently, the participation rates in such programmes (Egan, 2001). The aspect of non-economic motives, therefore, is not only valid, but at least as important when marketing and communicating energy efficiency or sustainable mobility behaviour.

At the same time it will be important to communicate the technological advances in the field in an easy to understand way which is tailored to different audiences. Switzerland can actually boast a number of R&D contributions to new forms of human-powered mobility for short-distance driving, e.g. hybrid solutions for bicycles. Besides, multi-modal passenger travel, combining public transport and car-sharing, could be made more attractive by providing information on route planning and by setting up interactive systems to reduce waiting times when switching between different modes of transport (e.g. Park & Ride). Some of the apps developed in the Open Data Camps fall into this category such as *GottaGo*, a tool which assists in finding the right time for catching a bus or train.

Apart from the Eight Principles of Climate Change Communication cited above, recent work on persuasion architecture in the virtual world, e.g. the guidelines drafted by the Stanford Persuasive Technology Lab¹⁰ or the article 'Persuasion Triggers in Web Design' by Travis (2010) will come in useful. Even though at present the majority of people still hear about various smart mobility actions via traditional communication channels such as local or regional papers¹¹, a growing number of people, especially in the younger age groups, can be reached through the Web.

¹⁰ See <http://credibility.stanford.edu/>

¹¹ Internal evaluation communicated by Karin Witschi, CEO of myblueplanet.

5. The next steps

Whilst municipal actions such as the walking audits have been quite successful, they have reached only a very limited number of people. Therefore we consider it important to undertake steps that will help us reach a wider audience and encourage participation. This we want to achieve by

- Linking up with the open government data community, and
- Exploiting the existing social media channels to increase participation

In outlining our approach to smart mobility, we already mentioned the Open Government Data community and its interest and involvement in mobility issues. By linking our efforts with this politically very active community, we expect to accelerate the process towards innovative solutions in the mobility realm. This is why members of the project team have joined the Opendata.ch association, which has been promoting opening up government data for creating new services and applications. The association acts as the Swiss Chapter of the Open Knowledge Foundation and has successfully organised several public events. It has a core team of local organizers and activists, communicates – currently only in German and French – on its regional discussion list and has documented its activities regarding projects and local actions on its public website <http://opendata.ch>.

The organization is supported by eZurich, the open government initiative of the City of Zurich¹² who also hosted the Open Government Data Camps 2011 and 2012. The first two-day camp in Switzerland to discuss the topic took place on 30 September 2011 and attracted a wide range of people, including innovators, designers and developers, who gathered at twin sites in Lausanne and at Zurich's University of the Arts to pool, debate and develop their ideas and implementation proposals on the topic.¹³

The second camp focused on mobility and resulted in a series of interesting apps (cp. 4.2 and 4.3). Overall, these activities have met with a positive response from the public authorities as well as the Swiss national railways (SBB). Members of the Swiss Parliament, for example, have also visited the Camp Days and voiced their support. Overall, these events have come to serve as a platform for the exchange between the different stakeholders and for promoting transparency in this field.¹⁴ By joining forces with the open data community we could reach a much wider audience and enlist the support of other researchers and developers.

At the same time, the traffic on the various social media channels is being observed to find out which might be most suited for initiating a discussion on public policy on mobility. To appeal to a more general audience we intend to use simulations and interactive graphics to enable users and stakeholders to experience the implications of different policy choices or mix of policies. The involvement of citizens in the definition of

¹² For more details, please go to <http://www.ezuerich.ch/content/ezh/en/index/cooperations/manifest.html>.

¹³ See <http://opendata.ch/2012/05/13/opendata-ch-2012-konferenz-das-programm/>

¹⁴ See <http://opendata.ch/2012/04/02/innovationsschub-fuer-den-schienenverkehr-verkehrsdienstleister-und-community-am-selben-tisch/>

possible development paths or mobility futures by means of crowdsourcing will help ensure that relevant policies find acceptance within society.

The feedback received from the virtual communities will result in a process where policies and measures are being defined in an iterative and incremental process by continuously integrating the feedback of users. It will be important to embed measures into a larger societal framework to ensure the full energy savings potential of transport. The system has to be considered as a whole, including customer preferences such as the trend towards off-road cars and longer distances between home and workplace. In the long run, only the compounded effect of regulatory measures, behavioural incentives and effective communication strategies – both online and offline – may lead to a gradual change in mobility habits and attitudes.

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