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**Swiss Federal Office of Energy SFOE**
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# Applying nudging techniques to promote fuel efficient car purchases

University of St.Gallen

UNIVERSITÉ DE GENÈVE
FACULTÉ DE PSYCHOLOGIE ET DES SCIENCES DE L'ÉDUCATION

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Swiss Federal Office of Energy SFOE
Research Programme Energie-Wirtschaft-Gesellschaft (EWG)
CH-3003 Bern
www.bfe.admin.ch
energieforschung@bfe.admin.ch

**Université de Genève**
Consumer Decision and Sustainable Behavior Lab
Boulevard du Pont d'Arve 40, CH-1205, Genève
https://www.unige.ch/fapse/decisionlab/

**Universität St.Gallen**
Institut für Wirtschaft und Ökologie
Tigerbergstrasse 2, CH-9000, St.Gallen
http://www.iwoe.unisg.ch

**Author:**
Mario Herberz, University of Geneva, mario.herberz@unige.ch
Jana Plananska, University of St.Gallen, jana.plananska@unisg.ch
Dr. Ulf Hahnel, University of Geneva, ulf.hahnel@unige.ch
Dr. Karoline Gamma, University of St.Gallen, karoline.gamma@unisg.ch
Prof. Dr. Tobias Brosch, University of Geneva, tobias.brosch@unige.ch
Prof. Dr. Rolf Wüstenhagen, University of St.Gallen, rolf.wuestenhagen@unisg.ch

**SFOE head of domain:** Dr. Anne-Kathrin Faust, Anne-Kathrin.Faust@bfe.admin.ch
**SFOE programme manager:** Dr. Yuliya Blondiau, Yuliya.blondiau@bfe.admin.ch
**SFOE contract number:** SI/501597-01

# Summary

The aim of this 3-year project, that officially started in October 2017 and was internally kicked-off in March 2018, is to identify and test effective low-invasive behavioral interventions, called *Nudges*, to motivate consumers to shift their preferences towards fuel-efficient vehicles. For this purpose, a theory-driven (top-down) and a practice-driven (bottom-up) approach have been combined. Towards the end of the first project phase, we have completed the bottom-up search of promising nudges and the top-down quantitative evaluation of nudges based on a comprehensive nudging classification. The quantitative evaluation will be extended by a meta-analysis. We have set up two additional complementary surveys on the mobility motives of consumers and the vehicle purchase process that will bring us additional insights and feed into the selection of promising nudges to be tested in the phase 2 (starting in December 2018). As a first transition from phase 1 to phase 2, we have conducted a successful test (experiment) of a nudge that we discuss later in the report.

This report summarizes the progress to date (i.e. the progress and conclusions of phase 1) and provides an outlook onto the phase 2 (running throughout 2019 until mid 2020).

# Zusammenfassung

Dieses 3-Jahres Projekts, das offiziell im Oktober 2017 gestartet ist und intern im März 2018 begonnen hat, hat das Ziel effektive niederschwellige Verhaltensinterventionen („Nudges“) zu identifizieren. Die identifizierten Nudges sollen die Verbraucher dazu motivieren, ihre Präferenzen hin zu effizienteren Autos zu verschieben. Zu diesem Zweck werden theorie- (top-down) und praxisgeleitete (bottom-up) Ansätze kombiniert. Im letzten Abschnitt der ersten Projektphase haben wir die praxisgeleitete Suche nach vielversprechenden Nudges sowie die quantitative Evaluierung von Nudges aus der Theorie auf Basis einer umfangreichen Klassifizierung abgeschlossen. Die quantitative Evaluierung wird durch eine Meta-Analyse erweitert. Zusätzlich haben wir zwei komplementäre Untersuchungen zu den Mobilitätsmotiven und dem Autokaufprozess von Verbrauchern durchgeführt. Diese geben uns weitere Einblicke, die uns dabei helfen die vielversprechendsten nudges für eine Evaluierung in Phase 2 des Projektes (Start Dezember 2018) auszuwählen. Als erster Übergang von Phase 1 zu Phase 2 wurde bereits ein Nudge erfolgreich in einem Experiment getestet.

Dieser Bericht fasst unsere bisherigen Fortschritte und Schlussfolgerungen aus Phase 1 zusammen und gibt einen Ausblick auf Phase 2, die sich über das Jahr 2019 bis in das Jahr 2020 erstrecken wird.

# Contents

# List of abbreviations

| | |
|---|---|
| SFOE | Swiss Federal Office of Energy |
| EV | Electric vehicle |
| HEV | Hybrid-Electric vehicle |
| SUV | Sports-Utility vehicle |
| ICE | Internal combustion engine vehicle |
| UNIGE | University of Geneva |
| UNISG | University of St. Gallen |

# 1 Introduction & Context

$CO_2$-emissions from the private transport sector represent one of the main contributors to Swiss greenhouse gas emissions (SFOE, 2015). In order to reach environmental goals, a change of mobility behavior towards more efficient options is thus crucial (Vuille et al., 2015). Nevertheless, their promotion and uptake still remain very limited (EnergieSchweiz, 2018). Of particular importance are long-term, high impact decisions like car purchase decisions, because they strongly determine daily mobility behavior for a long-time frame (Fujii & Gärling, 2003). Even though it appears obvious that if one possesses a fuel-efficient car, one will necessarily emit less $CO_2$ during a considerable period, research of the promotion of fuel-efficient car purchases remains scarce.

## 1.1 Relevance of nudging for car purchase behavior

As the political processes of implementing traditional approaches of behavior change (e.g. norms and legislation) can be difficult and slow, behavioral interventions that preserve consumers freedom of choice (*i.e. nudges*) can be a promising complementary tool (Thaler & Sunstein, 2008; Reisch & Sunstein, 2016). In various domains of human behavior, such as health and nutrition, nudging has been shown to be of a considerable effectiveness (Sunstein, 2015). Nevertheless, there is still a lack of systematic synthesis of evidence and analysis of transferability to different domains like mobility behavior in the private transport sector. In this project we aim to fill this gap in the scientific literature, by considering theoretical as well as practical evidence of nudging to promote fuel-efficient vehicle purchases and which will result in guidance for policy and industry.

# 2 Goals

The goals of this research project are:

1. Synthesize and classify evidence of nudging techniques relevant for the mobility sector, both in the scientific literature and current practice. To achieve this, we set out to acquiring as much evidence as possible through a systematic literature search and wide spread contact to practitioners and other important stakeholders in the mobility sector.
2. Understand the underlying processes (e.g. motivations) of why and how consumers choose a more or less efficient car.
3. Identify and adapt or improve existing nudges and develop new promising nudges. We aim at distilling a small set of nudges that we identified as most promising to change behavior from the evidence we collect in laboratory, online, and field studies.
4. Provide precise recommendation on the implementation of nudges for policy and industry in Switzerland as well as publications in scientific journals.

# 3 Approach and methodology

## 3.1 Top down & Bottom up approach

In the first phase of the project we have finished collecting best-evidence from practice and have considerably progressed on the systematic comprehensive analysis of the scientific evidence on nudging in the literature.

### 3.1.1 Details Top-down approach

The Top-down approach was led by the project members of UNIGE and aimed to synthesize all existing literature on nudging in order to identify the most effective and applicable interventions for the mobility domain. This approach resulted in a comprehensive classification of nudging techniques (cf., Table 1). In addition, we decided to extend our approach by means of a meta-analysis, which reflects the best-practice method in this area. It allows the comparison of effect sizes and the influence of different variables (such as characteristics of the studies or the sample) that might moderate the effectiveness of a nudge.

### 3.1.2 Details Bottom-up approach

The Bottom-up approach was led by the project members of UNISG. The goal of this approach was to identify the existing low-invasive behavioral interventions (nudges) to promote fuel-efficient car purchases in practice. To this end, a mixed-method research approach was applied, combining qualitative analysis of relevant documents (websites, academic articles etc.), semi-structured interviews with involved stakeholders, and ethnographic observation at related events. This combination of research methods has been concluded by the researchers to be the most appropriate to encompass the plurality of stakeholders and strategies implemented.

# 4 Results

## 4.1 Top down approach: Classification

After reviewing prominent classifications of nudges (Johnson et al., 2012; Dolan et al., 2012, Münscher et al., 2016), we have decided to adapt one existing and comprehensive classification that was recently published (Münscher et al., 2016) to our goals formulated in our project proposal. The resulting classification of nudges is based on three general classification categories that encompass more specific nudging techniques:

- **Decision information:** Translate information, make information visible, provide social reference point
- **Decision structure:** Change choice defaults, change option-related effort, change range or composition of options, change option consequences
- **Decision assistance:** Provide reminders and facilitate commitment

The usefulness of the classification has already been underlined within a systematic review (Szaszi et al., 2017). As a first step, we extended the classification by categories relevant to

the present project. This extension included the decision mode, the distinction between nudges that target rational, mostly controlled, decision-making and predominantly automatic, emotional decision making. Additionally, we included the stakeholder who could most likely apply the nudge in the classification (policy vs. industry). Furthermore, we evaluated the difficulty (easy, medium, difficult) by which a given nudge could be applied in practice to promote fuel-efficient car purchases. The short descriptions of the nudges presented in Table 1 aim to reflect an adaptation to the car sector. As a second step we validated our adapted classification on our collection of nudges from theory and practice. This approach resulted in a comprehensive classification of nudging techniques that can be applied in the car domain (see Table 1).

Table 1. Classification of prominent nudges from the literature and those resulting from our bottom-up and top-down approach. Nudges that have been identified as promising to be tested in phase 2 of the project are marked in bold and explained more in detail further below.

| **Category** | **Techniques** | **Nudge** | **Description** | **Decision mode** | **Stakeholder** | **Applicability to car purchases** |
|---|---|---|---|---|---|---|
| A. Decision information | A1 Translate information | **Unit effect** | Change the unit of fuel consumption of fuel-efficient vehicles (e.g. EV) to make their advantages salient | Rational | Policy & industry | Easy |
| | | **Attribute translations** | Translate EV range (km) into everyday life situations (e.g. percentage of trips feasible) | Rational | Policy | Medium |
| | | Framing | Change how information is presented to consumers. E.g., consumers react more sensitively to losses than to gains | Emotional | Policy & industry | Difficult |
| | | Information provision | Provide different forms of information materials (written information, personal advisory, promo action presentations) | Rational | Policy & industry | Easy |
| | A2 Make information visible | Total cost of ownership | Include running costs into the purchase price of cars in order to increase financial attractiveness of fuel-efficient cars | Rational | Policy | Medium |

| Category | Techniques | Nudge | Description | Decision mode | Stakeholder | Applicability to car purchases |
|---|---|---|---|---|---|---|
| A. Decision information | A2 Make information visible | Feedback | Give consumers instantaneous feedback about fuel/energy consumption | Rational | Industry | Easy |
| | | Mental accounting | Reveal the environmental impact of buying a fuel-efficient car in comparison to other environmental behavior | Rational | Policy | Easy |
| | | Test drives | Make the driving experience more salient | Emotional | Industry | Medium |
| | A3 Provide social reference point | **Dynamic social norms** | Communicate projected norms (e.g. 15% EVs in 2022 in CH) | Emotional | Policy | Medium |
| | | **Initiator of a nudge** | Adapt the source of a nudge to the target group (e.g. scientist vs. car dealer) | Emotional | Policy & industry | Difficult |
| | | **Descriptive social norms** | Communicate updated norms (e.g. “10 more people are currently looking at this EV offer”) | Emotional | Industry | Easy |
| B. Decision structure | B1 Change choice defaults | Presentation default | Preset first car presented on the website of a car seller to be electric | Emotional | Industry | Difficult |
| | | Efficient car configuration default | Preset car configurations in online car configurator to $CO_2$ efficient | Emotional | Industry | Medium |

| Category | Techniques | Nudge | Description | Decision mode | Stakeholder | Applicability to car purchases |
|---|---|---|---|---|---|---|
| B. Decision structure | B1 Change choice defaults | Public transport default | When moving to a new city, make buying the public transport ticket the default | Emotional | Policy | Difficult |
| | B2 Change option-related effort | **Power of free** | Provide free or discounted charging stations/km packages for EVs | Rational & emotional | Industry | Medium |
| | | Evaluative conditioning | Repeat pairings of positive images with fuel-efficient options to reduce choice effort | Emotional | Policy & Industry | Difficult |
| | | Positioning | Physically place fuel-efficient cars in closer (psychological) distance (e.g. webpages, car dealers) | Emotional | Industry | Difficult |
| | | Development of public charging infrastructure | Set-up of charging stations in the public sphere – decreasing the effort attached to electric vehicle operation | Rational | Policy & Industry | Difficult |
| | B3 Change range or composition of options | **Convenience of a purchase** | Provide consumers with combinations of EV related offers (e.g. EV + charging network access) | Rational & Emotional | Industry | Medium |
| | | Choice overload | Reduce choice set of cars for sale to a few fuel-efficient ones with probably one recommended one. | Emotional | Industry | Difficult |

| Category | Techniques | Nudge | Description | Decision mode | Stakeholder | Applicability to car purchases |
|---|---|---|---|---|---|---|
| B. Decision structure | B3 Change range or composition of options | 1 / N heuristic | Introduce categorization of fuel-efficient vs. inefficient options in order to promote equal distribution of choice | Emotional | Industry | Difficult |
| | B4 Change option consequences | Punishing scheme | Commit to punishment when surpassing a certain limit of $CO_2$ emissions | Rational | Policy | Medium |
| | | Generation responsibility | Communicate how following generations (will) suffer from ($CO_2$-) emissions | Emotional | Policy | Difficult |
| | | Financial incentives | Provide information on direct benefits of fuel-efficient vehicle purchase (financial contribution, tax cuts) | Rational | Policy | Medium |
| C. Decision assistance | C1 Provide reminders | Prompted choice | Simply ask people if they had considered buying a fuel-efficient car increases their choice | Emotional | Policy & Industry | Medium |
| | | Priming | Create a “green” context to promote the activation of environmental values and purchases | Emotional | Industry | Easy |
| | | Provoking emotions | Evoke negative emotions (e.g. disgust) with the emissions of inefficient cars | Emotional | Policy | Difficult |

| Category | Techniques | Nudge | Description | Decision mode | Stakeholder | Applicability to car purchases |
|---|---|---|---|---|---|---|
| C. Decision assistance | C1 Provide reminders | Injunctive norms | Communicate that preserving the environment is the task of everyone | Emotional | Policy | Medium |
| | C2 Facilitate commitment | Gamification | Let employees commit to an environmental goal (e.g. number of bike rides to work per year) | Emotional | Policy | Difficult |
| | | Social media | Suggest committing to buying a fuel-efficient car via social media | Emotional | Policy & Industry | Difficult |
| | | Foot in the door | Let people state their valuation of the environment and then move to the product choice | Emotional | Policy & Industry | Medium |

## 4.2 Top-down approach: Meta-analysis

In order to get a thorough overview of the existing literature on nudging and the effectiveness of different nudges (effect sizes) in different domains we decided to extend the classification of nudges by means of a meta-analysis. We first conducted a thorough literature search (see Figure 2) and consequently retrieved a sample of primary studies of $N = 797$. At this point we have advanced coding to two times 25 studies double-coded to attain high inter-rater reliability. In this process we have created a comprehensive coding guideline, which will allow us to include further work force in the upcoming coding of all studies.

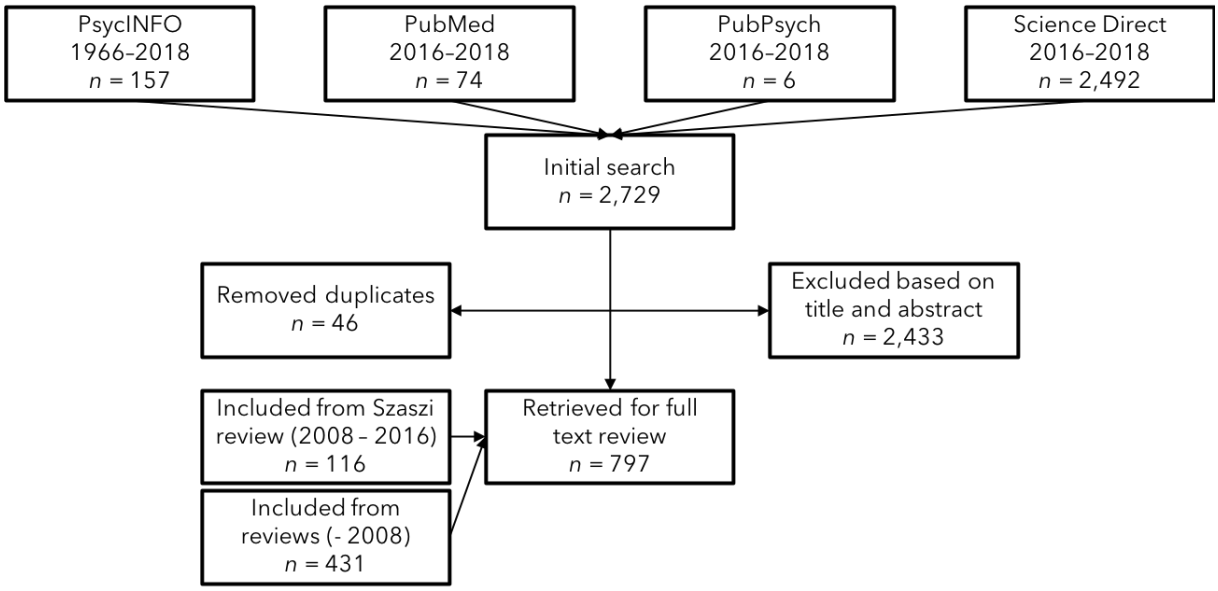


Figure 1. Sources of primary studies on nudging and steps taken to reduce final sample to the relevant. Search terms used for the primary literature search were "choice-architecture" OR "nudge" (see Szazi et al., 2017); for the secondary literature search (reviews) the terms "review" OR "meta-analysis" were added.

## 4.3 Bottom-up approach: Mixed method approach

### 4.3.1. Details of the research method chosen

The bottom-up analysis was conducted by combining qualitative analysis of relevant documents, semi-structured interviews and ethnographic observation at related events. As such, approximately 150 documents were analyzed (websites of relevant stakeholders, academic articles, promotional materials etc.), 30 semi-structured interviews with relevant stakeholders were held (in person, via phone or email; 20 of them were conducted as part of a Master Thesis; stakeholders included representatives from public administration, research institutions as well as private sector associations and companies). Moreover, 12 sector-wide events were visited (i.e. internal and external promotional events, car salons, academic conferences) to observe the evolutions in the field.

Detailed list of conducted interviews and events visited can be seen in the Appendix 1 and Appendix 2.

4.3.2. Results of the bottom-up analysis, phase 1

Firstly, the support of fuel-efficient vehicles has been significantly increased, proven by an increasing number and types of implemented strategies. In accordance, besides the more traditional information provision (in print, online etc.), measures such as financial incentives, gamification and test drives have proliferated. A special attention has been dedicated to electric mobility, with the majority of initiatives and car companies focusing in their strategies on electric vehicles (offers, targets of the programs etc.). As such, this technology seems to be getting the decisive lead over other alternative fuel technologies.

Secondly, there is an increasing plurality of actors involved in relation with fuel-efficient mobility. Besides the actors coming directly from the transport sector (i.e. car manufacturers, car dealers, car importers etc.), "new" actors are entering the field, such as electric utilities, that try to penetrate the emerging market of charging stations for electric vehicles. The schematic outline of the actors involved is outlined in table 2.

Table 2: Schematic outline of the plurality of actors involved

| Sector of activity | Type of actor | Sub-type | Example |
|---|---|---|---|
| **Public governance** | Public | Federal level | BFE |
| | | Cantonal level | Canton Basel-Stadt |
| | | Municipal level | St.Gallen, Nyon |
| **Transport** | Private | Car manufacturers | Tesla, BMW |
| | | Car dealers | Christian Jakob AG |
| | | Car importers | AMAG |
| | | Charging stations developers | Alpiq |
| | | Associations | E'Mobile |
| | Public | Associations | EnergieSchweiz (BFE) |
| **Research** | Public | Academia | UNISG, UNIGE |
| **Energy** | Private | Electric utility | REPOWER |
| **Appliances** | Private | Electric hardware provider | Elektro-Material AG |
| **Finances** | Private | Banking and insurance | Allianz |
| **Property market** | Private | Property owners | Charging facilities |

Thirdly and finally, a large number of interventions is currently being implemented by the actors to promote fuel-efficient vehicle purchases. While some of them can be categorized strictly as nudges (such as the Ökostrom Vignette of Repower), most of them, targeting fuel-efficient car purchases, are merging nudging with the more traditional marketing techniques, such as information provision and financial incentives for car purchases. As such, the most common strategies to promote fuel-efficient car purchases in Switzerland have been identified to be:

- **Provision of information**
    - Many different forms; from the more traditional ones (leaflets, advertisement) to more interactive (such as Energy Challenge of EnergieSchweiz)
- **Test drives**

- Offered by many different actors – from car manufacturers directly (TESLA), car dealers to associations at promo-actions (CO2tieferlegen, E'Mobile Informationstage)

- **Development of public charging infrastructure**
  - Mostly by public sector actors (city and cantonal municipalities)
  - Increasing amount of private sector actors, especially electric utilities (for example Repower, SAK) are getting involved in charging infrastructure provision
- **Financial incentives**
  - Direct financial contributions on the car purchase or tax incentives, mostly delivered by public sector actors (for example city of St.Gallen providing up to 5000 CHF on a purchase of a new electric vehicle; many cantons, such as Basel-Stadt, providing lower or no motor tax vehicles)
  - Since they in most cases do not represent a significant share of the vehicle price they can be categorized as nudges

## 4.4 Complementary steps – Motives analysis

In order to understand the underlying motives why consumers choose different types of mobility (e.g. EV, HEV, SUV) we conducted a survey of mobility motives based on previous literature (Hahnel et al., 2014; Steg, 2005). We considered this complementary step as necessary in order to match effective nudges with consumer motives relevant in the mobility domain. The sample of this survey consisted of 503 participants currently living in Switzerland (only German part) and possessing a driver's license. Data collection is completed. The analysis of the data is currently in progress.

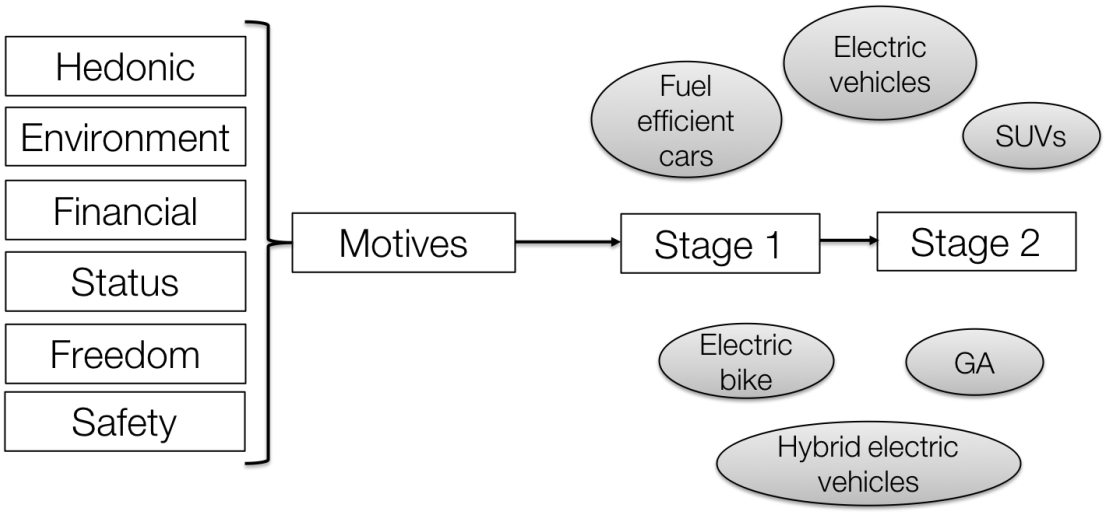


Figure 2. Schema, illustrating the hypothesized connection of different mobility motives and the two decision stages, corresponding to purchase consideration and purchase intention.

## 4.5 Complementary steps – Purchase process survey

The bottom-up analysis showed the need to understand not only what measures are currently being implemented to promote fuel-efficient car purchases but also how they relate to the purchase process with regard to fuel-efficient vehicles. That is, this study aims to identify at what stage of the purchase process specific nudging techniques are most effective. To this end, the vehicle purchase process has to be understood in itself. This analysis also encompasses the question what sources of information (online information, car dealer, peers etc.) at which stage of the purchase process (early to constitute the choice set or final purchase decision) do people consult when making vehicle related choices?

Consequently, the UNISG team has decided to conduct a survey on vehicle purchase process, with its composite parts looking at the car ownership of the participants, the purchase process of their currently held cars, the role of Swiss Energy label and car dealers on the final decision and the possibilities to increase fuel-efficient vehicle purchases. As such, these two complementary surveys of UNISG and UNGE build on each other and will deliver useful information for the analysis of specific nudges in phase 2.

The sample of this study corresponds to that of the motive survey of UNIGE (for even a better comparison of results). As such, an online survey of 500 Swiss participants who own a car is planned to be conducted; versions in German and French will be prepared so that residents of both German and French part of Switzerland could be targeted. Being in its final stage of preparation, the results are expected to be delivered by the end of 2018.

## 4.6 Identification of promising nudges for phase 2

In this section we will present a set of promising nudges resulting from phase 1. This is a selection of the classification of nudges presented in Table 1. Please note that the selection is not final and largely corresponds to the nudges presented at our meeting with BFE on 2nd November 2018. Based on our discussions at the BFE, the selection of promising nudges will continue and further specified (to be consecutively narrowed down as the phase 2 progresses).

1. **Attribute translations**. The motivation behind this nudge is that some information about fuel-efficient cars is not intuitive for consumers (e.g. range or battery size of EVs). Consequently, it is useful to translate non-intuitive information into more accessible and meaningful information for the consumer.
    - One option is to translate the consumption of a car, into a meaningful unit for the consumer (Lembregts & Pendelaere, 2012; Unit effect). We suggest that consumption of alternative and more fuel-efficient power trains (e.g. kWh) should be translated into the more familiar unit of liters (l/100 km) in order to increase perceived advantages of fuel-efficient cars.
    - Another option could be to deduce from the size of a battery in kWh which percentage of trips of an average car driver in Switzerland could be feasible. This can be expected to reduce consumers' fear of a restricted range of more fuel-efficient cars (EVs in particular) and thus enforce their preference (Hahnel et al., 2014).

2. **Descriptive social norms**. The idea behind this nudge is to use descriptive social norms (Schultz et al., 2007) to nudge people to increase their preference of fuel-efficient purchase options. This could be done by communicating a descriptive norm via campaigns, advertisements, or online interfaces (e.g., car purchase platforms).
    - One option could be to communicate the increasing number of users of charging stations or the number of downloads of smart phone applications providing information about charging opportunities (e.g., 11,523 people have already downloaded this particular App). Others options could be to inform potential consumers about the (large) amount of people interested in EVs, the targets for EV adoption rates, or the relative increase in EV uptake (i.e. sales of EVs are expected to annually increase by 200%).
    - Another option would be to project and communicate the average future $CO_2$ emissions of cars with respect to a relevant social reference group (e.g. citizens of the same Kanton; see also Sparkman & Walton, 2017). On online car configurators (i.e. Verbrauchskatalog of TCS/EnergieSchweiz), this information about future conditions could replace the average of all new vehicles in the respective year. The projection of $CO_2$ emissions would guarantee a fairly low average on the scale of $CO_2$ emissions and the motivation of consumers to converge with the norm would nudge them to prefer a more fuel-efficient car.
3. **Power of free.** Another promising nudge to promote fuel-efficient car purchases is to use the "power of free effect". This effect is based on the principle that providing some small incentives (e.g., free EV charging for a certain amount of time) can motivate behavior. The incentives should be small to not disqualify the intervention from being a nudge. Although the financial incentives are phased out after some initial period, the desired behavior is expected to persist (thanks to its other benefits or the development of a habit). Such interventions are seen as efficient also in relation to promotion of fuel-efficient mobility. A purchase of EVs can be thus incentivized by, for example, providing a discount on private charging station installation, access to public charging networks for a limited period of time for free, or with a discount. Consequently, the range anxiety (still perceived among Swiss population) could be overcome. A discussion on a potential field test with an industry partner are ongoing; conclusions on its feasibility should be achieved by spring 2019. The concrete set-up of the power of free offer will be also informed by the results of the purchase process survey, where the desirability of different offers will be tested.
4. **Convenience of purchase.** One potential barrier to purchase EVs is the complexity of the purchase, necessitating the interested consumers to think about the charging needs and options. An idea behind this intervention would be to facilitate the purchases of EVs by combining it with the provision of charging stations (depending on individual decision either public or private), thus facilitating the decision process. Based on the results of the purchase process survey, where the desirability of different combinations of EV and charging options will be tested, discussions with the project partner on the exact set-up of the test will continue.
5. **Initiator of the nudge.** The source of a nudge (e.g. SFOE, scientists, car dealers or friends) plays an important role in how important the provided information is taken by consumers (Terwel et al., 2009) and hence how likely they are to integrate the information into their decision process. In this respect, trust in the communicator is of a crucial importance. Information provided by government officials or scientists is

sometimes seen sceptically which can lead to reactance (Brehm, 1966), whereas information from peers (people close to the target group in question) tends to be perceived as more trustworthy.

6. **Power of different nudges – comparison.** Similarly to the nudge 5 on the list, not only the source, but also the form and type of nudge influences how important and thus influential the concrete information is for the decision process of consumers. The final list of nudging techniques to be tested by this exercise will be determined as the phase 2 of the project progresses. Nevertheless, if conducted, a conjoint analysis pitching different nudges endorsing (or not) different vehicles and mobility scenarios can illustrate what nudge can be the most influential towards which target group and their intention to purchase fuel-efficient vehicles.

7. **Out of the box thinking.** Besides the previous nudges proposed for a potential test in phase 2 of the project, there is a possibility to bring some completely new, until now not thought of, perspectives into consideration. Such interventions could relate fuel-efficient mobility to improved health of one's peers or present emotional messages (such as seen on the attached picture, cf., figure 3). These more "out of the box ideas", while harder to be implemented in practice, might bring some new promising insights. Thus, the project team will continue thinking about new perspectives and ideas potentially to be tested in the phase 2.


Figure 3: Advertisement of the Transport for London, Fall 2018 (own photo).

### 4.6.1 Transition to phase 2: A first test of a nudge

As a transition to phase 2, we have already run a first test of a nudge (see first sub-point of attribute translation in 4.6). This first nudge targets the in-congruence of the unit of consumption of alternative power trains with the common unit of liters/100 km. In the experiment, participants evaluated different pairs of cars on the basis of their fuel consumption either presented in terms of liters/100 km or in terms of kWh/100 km, the unit used for EV energy consumption (see Figure 2, between subject design). From previous research (e.g. Cadario et al., 2016), we predicted that the presentation in kWh/100 km, as being numerically larger numbers, results in larger perceived differences between levels of

consumption and therefore stronger differences in evaluations of environmental friendliness. However, this account disregarded the familiarity that consumers have with a given unit (Lembregts & Pendelaere, 2012). The results showed that indeed, contrary to the unit effect hypothesis, evaluations of participants differed more when consumption was displayed in terms of kWh/100 km than in liters/100 km. This leads us to the conclusion that in order to make the advantages of fuel-efficient cars with alternative power trains (e.g. EVs) salient, they should always be presented in terms of liters fuel equivalence per 100 km.

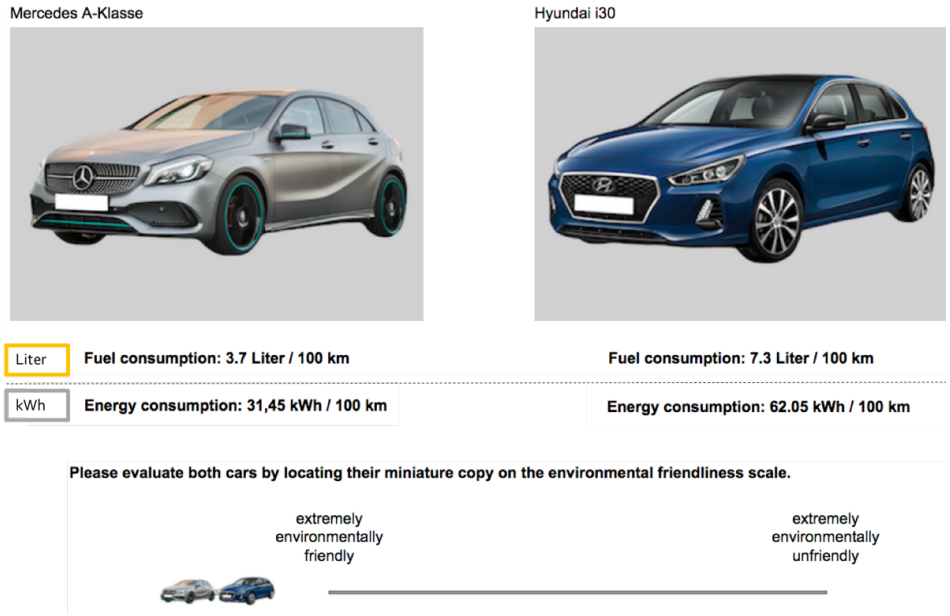


Figure 4: Example of evaluation task presented to participants during the first test of a nudge. Note that consumption was only presented in terms of liter OR kWh, which both appear in this picture.

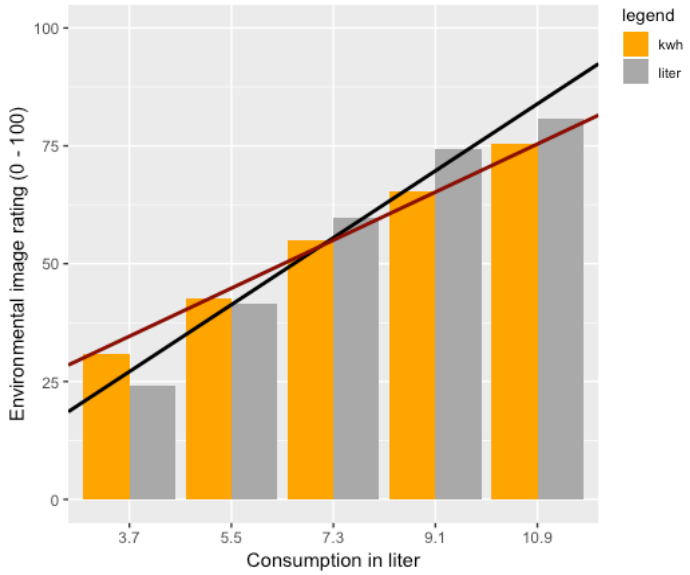


Figure 5: Results of the evaluation of environmental friendliness of cars with different levels of consumption and presented either in liters or kWh / 100 km. Note that goes from 0 (extremely environmentally friendly) to 100 (extremely environmentally unfriendly).

# 5 Discussion of results

The information presented in this report suggest that the results of phase 1 of the project are promising, enlightening trends within the sector and guiding the way towards the phase 2 of the project. The findings can be summarized as following:

Firstly, the bottom-up analysis showed a significant increase in the support of fuel-efficient mobility, with an increasing number of strategies implemented by a growing number of actors. While many interventions can be categorized as nudges (such as Ökostrom-Vignette of Repower), they are in most cases merged with the more traditional marketing techniques (i.e. financial incentives or information provision). While not harmful for their effectiveness, projects like this one may enlighten the role and potential impact of the use of mere or combined nudging techniques to promote purchases of fuel-efficient vehicles. Secondly, this research confirmed the emerging electric mobility as the upcoming dominant technology, on which the majority of interventions as well as manufacturers are increasingly focusing. For an even increased effectiveness of implemented measures, a stronger emphasis on this technology could be thus further suggested. Finally, the bottom-up analysis indicated the large plurality of actors involved in the fuel-efficient and electric mobility sector, ranging from the traditional transport-related actors (car manufacturers, dealers, importers etc.) to the actors such as energy utilities, property owners or insurance and banking. To successfully promote fuel-efficient transport transition, an active involvement of all these actors (as nudge recipients or initiators) and their mutual understanding should be further investigated and fostered (as proposed by the nudge 8 and 9 of the promising nudges to be tested).

From a theoretical point of view, there has been a considerable increase of work in the scientific literature about nudging. Because of the broad diversity of the application of the concept a classification of different nudges is indispensable and has been developed in this project. Applying a meta-analysis approach as an additional step, we target the complexity of transferring the insights from one field (i.e. health or nutrition) to the other (in this case transport sector) and furthermore evaluate quantitatively which nudges across fields are the most promising. Especially, because nudging interventions in the transport domain have mainly focused on frequent transport behavior (e.g. taking the car vs. the bus to work), the transfer of insights from different domains, that also target purchase behavior, seem to be especially promising. Constructing controlled experiments that evaluate the effectiveness of nudges on consumer preference for fuel-efficient cars will not only result in hands-on advice for policy makers and industry, but also contribute to the nudging theory and how transferrable their effects are into different domains.

Finally, results from the first experiment show that consumers' familiarity with a unit of car consumption (e.g. kWh for electric vehicles) plays an important role for consumer evaluations. Consumption of fuel-efficient cars that use different power trains beyond the classic combustion engine should be presented in terms of fuel equivalence to increase consumer evaluations of fuel efficiency and thus potentially facilitate their acceptance. This insight will be further explored and will lead to applied suggestions on how to present information on cars communicated by involved stakeholders, like for example the energy label by the SFOE.

# 6 Evaluation 2018 and outlook for 2019

The evaluation of project's progress in 2018 is overall positive. The intended project goals were met. The bottom-up analysis came up with an extensive list of currently implemented strategies and nudging techniques to promote fuel-efficient mobility in Switzerland, highlighting the most important ones and significant trends in this report (for a full list of insights gained in the bottom-up analysis a supplementary material can be obtained from the authors). The top-down analysis resulted into an adapted classification tool of nudges promising for their use in the transport sector (Table 1) and made a significant progress on the related meta-analysis – an additional measure to provide even more quantifiable information. Coordinating the work of both research teams, a list of 7 possible nudges has been proposed, from which a selection will be tested in the second phase of the project, with one survey on the unit effect already conducted, thus being even ahead of schedule. Finally, two complementary surveys, namely on motives and purchase process of vehicles, have been completed and outlined, respectively. Being of a complementary nature (to the project as well as to each other) they will deliver on the identified information gaps and thus bring important information on which the final choice of nudges to be tested in the phase 2 will be undertaken.

Consequently, the outlook for 2019 expects the analysis of the results of both surveys (motives and purchase process) to be finalized. Secondly, discussions with project partners (ongoing since 2018) are expected to be concluded in the first quarter of the year with the possibility to conduct one to two field tests. Moreover, further progress on the meta-analysis is expected, with an increased number of promising nudges to be identified. As a result of all these activities, by the end of 2019 (and thus in the middle of phase 2) a set of experimental studies (online surveys, field-tests and laboratory studies) are expected to be agreed upon and partly conducted.

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