



**Energy**

National Research Programmes 70 and 71

# Synthesis

## Mobility Behaviour





## Mobility Behaviour

Managing energy consumption in the transport sector is often associated with greater challenges than in other action fields. This thematic synthesis integrates the findings from projects that primarily focus on mobility behaviour. Technological innovations such as electric and autonomous vehicles or traffic management were not addressed in NRP 70 and NRP 71.

# 1. Means of achieving sustainable mobility

How can the high share of Swiss energy consumption accounted for by transport be reduced to the extent required for the transformation of the energy system? On the basis of the mobility-related results of the NRP Energy, this synthesis identifies the key challenges, bringing them together to make recommendations for action.



# Public administration    # Associations and NGOs    # Population    # Politics (federal government, canton, municipality)

## 1.1. Three key messages



More than one-third of our energy consumption is accounted for by transport. Measures that make our mobility behaviour more energy-efficient are therefore assigned great importance with respect to the transformation of the energy system. The following three key messages can be derived from the results of the NRP Energy:

○ **Voluntary action alone will not suffice** There are now numerous possible courses of action based on voluntary measures that allow for energy-saving mobility behaviour. These include, for example, sharing and pooling concepts. The results of the NRP Energy show, however, that voluntary action only works to a limited extent. Rather, in order for new products and offers to achieve energy savings overall, corresponding regulations are required.

○ **New technologies are used too little for energy-saving objectives** Digital technologies are turning mobility into a service that allows for public transport as well as bike-, scooter- and carsharing offers to be combined in a completely individual fashion that provides for the most environmentally friendly solution possible. Until now, however, energy saving has only taken centre stage on rare occasions when it comes to the designing and utilisation of digital tools. The same goes for energy-efficient logistics. While digital automation technologies are likewise the key to success here, there have also been too few really helpful energy-saving tools available in this area to date.

○ **The impact of new offers is limited by rebound effects** Measures in the transport sector





## **Energy**

National Research Programmes 70 and 71

are extremely susceptible to so-called rebound effects – not least due to the high share of leisure mobility. What is meant here is that the energy and money savings are (more than) offset by higher consumption in another area. For this reason, the results of programmes and activities have to be scrutinised on an ongoing basis and, where necessary, supplemented by accompanying measures. Only in this way can a situation be avoided in which on balance more energy is consumed than the amount of the intended energy savings.

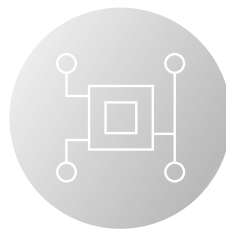
# Public administration    # Associations and NGOs    # Population    # Businesses    # Politics (federal government, canton, municipality)

## 1.2. The key recommendations for stakeholders



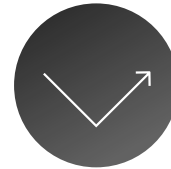
### Use both push and pull measures!

To ensure mobility behaviour changes in a way that brings about energy savings, it must be supported by two complementary sets of measures, namely push and pull.



### Use the potential offered by digitalisation at all levels!

The energy-saving potential offered by digital technologies has not been exhausted to date. For example, the tools currently available in the area of everyday mobility are not designed in a manner that gives rise to targeted energy savings in this area.



### Prevent rebounds with clever measures!

Energy consumption caused through the use of transportation must be reduced per capita in absolute terms.

The various recommendations for action with respect to mobility behaviour that we can derive from the results of the NRP Energy can be aggregated into three key recommendations:

1. **Use both push and pull measures!** To ensure mobility behaviour changes in a way that brings about energy savings, it must be supported by two complementary sets of measures, namely push and pull. On the one hand, attractive offers are required that encourage people to modify their behaviour. These need to be communicated in a target-group-specific manner. While it is primarily business and commercial stakeholders that are called on here, semi-public players such as public transport operators also have a role to play. On the other hand, however, intelligent accompanying regulations are also required to provide incentives and stipulate sanctions. This is where the state, the cantons and municipal authorities come into play.
2. **Use the potential offered by digitalisation at all levels!** The energy-saving potential offered by digital technologies is still a long way from being exhausted. For example, the tools currently available in the area of everyday mobility are not designed in a manner that gives rise to targeted energy savings in this area. The story is similar for urban freight logistics. Energy-efficient, CO<sub>2</sub>-free urban freight logistics can, however, only be achieved with correspondingly designed digitalisation technologies. This necessitates cooperation between the private sector and public bodies. The companies develop the digital offers and the state steers the developments in the right direction with promotional conditions and regulations.



3. **Prevent rebounds with clever measures!** Energy consumption caused through the use of transportation must be reduced per capita in absolute terms. It is therefore key that possible rebound effects, which see energy savings give rise to greater consumption in other areas, are analysed and prevented with clever measures. Digital feedback systems that arouse an individual's personal ambition to achieve savings can help us get closer to achieving this goal on a voluntary basis. The state must allow for the rebound effects to be investigated by the scientific world and introduce promotional formats that encourage companies to avoid rebounds.

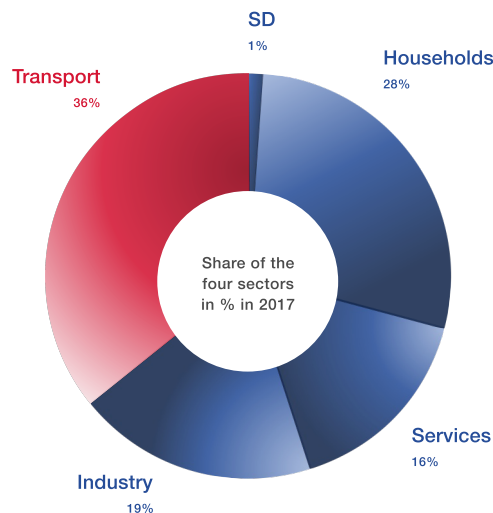
## 2. Mobility: a key aspect given too little consideration

Despite the large share of energy consumption for which it is responsible, transport only plays a secondary role in the area of energy policy. Swiss mobility is characterised by a number of features such as the high degree of motorisation and widespread multimodality. Fundamental technological changes are now in the pipeline.



# CO2 / greenhouse gases    # Population    # Businesses    # Politics (federal government, canton, municipality)

## 2.1. Mobility as an essential component of energy strategy



SD statistical difference including agriculture

### Distribution of final energy use by consumer group Source: Swiss Overall Energy Statistics 2017, p. 5

At 36.3 %, the share of Swiss energy consumption accounted for by transport<sup>1</sup> is high and is tending to rise further<sup>2</sup>. It is therefore clear that a substantial contribution must be made in this area in order for it to be possible to achieve the necessary savings for the transformation of the Swiss energy system. On the one hand, improved efficiency and new drives in the transport sector not powered by fossil fuels are required<sup>3</sup>. On the other, however, mobility behaviour also needs to change. Otherwise, continuously growing transport volumes will repeatedly unravel the gains made through technical improvements and better infrastructure.

In order to achieve the greatest possible effect, leverage must be applied in the right place: domestically, 95 % of energy consumption accounted for by transport can be assigned to motorised private transport<sup>4</sup>. And this in turn makes up 80 % of all passenger transport. Air traffic emissions dominate when it comes to the trips of the Swiss population abroad. Both forms of transport primarily use fossil fuels and thus are at odds with climate policy goals.

In particular, the measures stipulated to date in the area of private transport focus almost exclusively on increasing energy efficiency. For example, the CO<sub>2</sub> Act, in accordance with the European Union, envisages a tightening of emission regulations for cars by the end of 2020 to 95 g of CO<sub>2</sub>/km<sup>5</sup>. These will now also be extended to apply to the growing fleet of delivery vans and articulated lorries.

Yet measures aimed at promoting energy-saving mobility behaviour are not explicitly part of Energy Strategy 2050. They are, however, envisaged by specific programmes (SwissEnergy) and related policy areas<sup>6</sup> and have been implemented in some cases<sup>7</sup>. Furthermore, at a cantonal and municipal level, many activities are aiming to bring about greater energy efficiency through the promotion of walking, cycling and public transport. Nevertheless, overall it is to be expected that without additional measures the transport and mobility sector will be unable to make its energy-saving contribution.

## Notes and References

- 1 The term “mobility” here refers to the potential for people and goods to change location, while the term “transport” refers to the actual locational changes of people and goods.
- 2 Swiss Federal Office of Energy (no year): Swiss Overall Energy Statistics 2017, Berne.
- 3 See in this regard the research work conducted as part of the Swiss Competence Center for Energy Research (SCCER) and the Competence Center for Research in Energy, Society and Transition (CREST)
- 4 Federal Office of Transport (2018): Umsetzung der Energiestrategie 2050 im öffentlichen Verkehr. Zahlen und Fakten, Berne.
- 5 However, this reduction will likely only be achieved with a significant increase in the share of electric cars relative to today, a change that would stimulate development that goes beyond a pure increase in efficiency.
- 6 For example, see the following in this regard: Umsetzung der Energiestrategie 2050 im öffentlichen Verkehr. Zahlen und Fakten, Berne  
<https://www.bav.admin.ch/bav/en/home/topics/environment/energie-2050/programm.html>
- 7 Federal Statistical Office/Federal Office for Spatial Development (2017): Population’s transport behaviour. Mobility and transport microcensus 2015. Neuchâtel and Berne.

# Guidance    # Public administration    # Associations and NGOs    # Politics (federal government, canton, municipality)

## 2.2. Juxtaposition of energy and transport policy



The connections between energy and transport policy have traditionally been rather weak in Switzerland<sup>1</sup>. On the one hand, energy policy focusses for the most part on industry and households, while devoting scant attention to the energy consumption of transport. On the other, the transport policy of the federal government, cantons and municipalities chiefly focusses on the provision of infrastructure and undesirable side effects such as air pollution control and noise. It hardly addresses the issue of energy consumption.

Implementation of the energy strategy 2050 in public transport, programme ESÖV 250, activities 2017





Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Eidgenössisches Departement für Umwelt,  
Verkehr, Energie und Kommunikation UVEK  
**Bundesamt für Verkehr BAV**



Source:

Even though efforts are now being made with respect to the greater coordination of the two policy areas<sup>2</sup>, currently too few political players are campaigning strongly enough for greater energy efficiency in the transport sector. Whether the issue will attract greater attention in



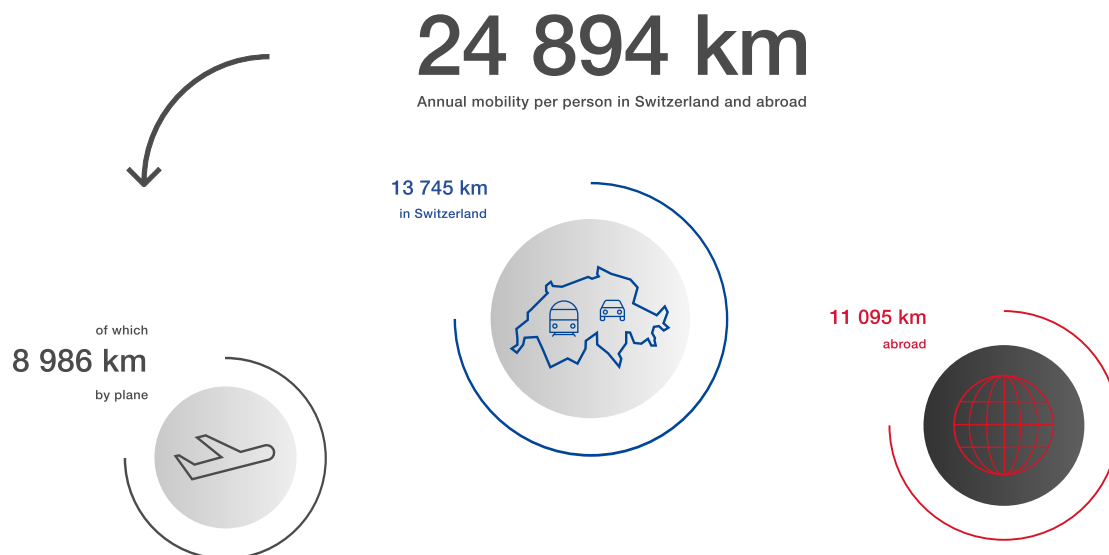
future is likely to depend primarily on developments in policy areas outside actual transport policy. Climate policy and the phasing out of nuclear power as well as policy in the field of spatial development all have the potential to provide the required impetus.

#### Notes and References

- 1 Haefeli, Ueli; Arnold, Tobias (2013), Der Energieverbrauch des Verkehrs, in *Traverse Zeitschrift für Geschichte*, 3/2013, 64-77
- 2 Federal Office of Transport (2017): Umsetzung der Energiestrategie 2050 im öffentlichen Verkehr. Programm ESÖV 2050, Aktivitäten 2017

# Europe / EU    # Public administration    # Population    # Politics (federal government, canton, municipality)

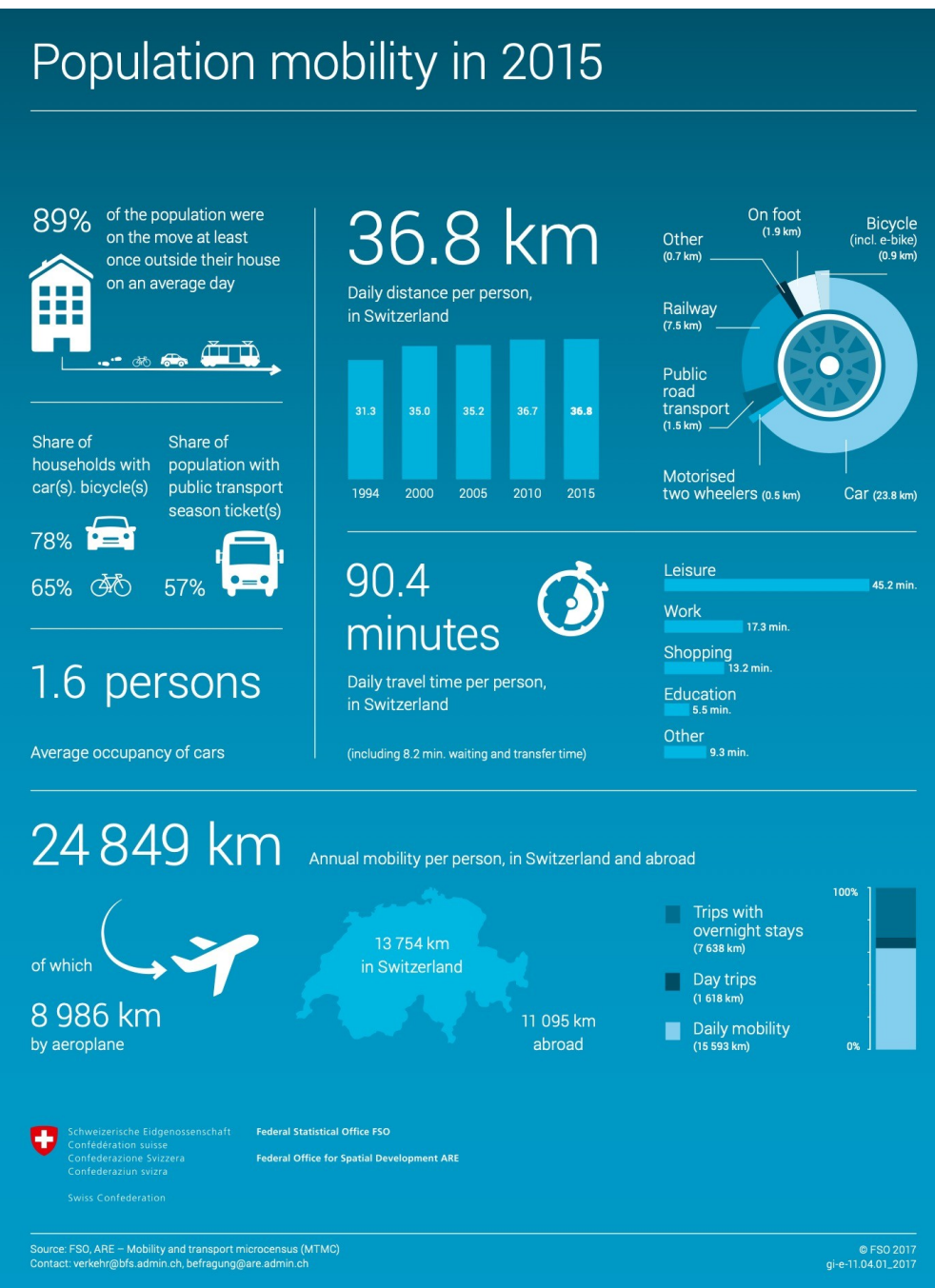
## 2.3. Extremely high and multimodal mobility



**Population mobility 2015** Source: <https://www.bfs.admin.ch/bfs/en/home/statistics/mobility-transport/passenger-transport/travel-behaviour.html>

The people of Switzerland are extremely mobile. In 2015, they travelled an average of almost 25,000 kilometres, some 45 % of which were covered abroad. Within Switzerland, the daily distance travelled per person has hardly changed since 2010. However, very significant growth is still being observed in the distances covered abroad. In 2015, the population of Switzerland flew an annual distance of 9,000 kilometres per person. The most important means of transport domestically remains the car, accounting for 65 % of the distances travelled. The share accounted for by rail has increased slightly to 20 % in recent years<sup>1</sup>.

Population mobility 2015 - Infographic



Source:

Switzerland's prosperity manifests itself, for example, in its society's high level of motorisation relative to other countries. This applies both to the transportation of people and goods. There are 543 cars for every 1,000 inhabitants. Compared to the EU average, these emit 15 % more CO<sub>2</sub> and in 2017 these emissions did not decline relative to 2016, but rather increased slightly<sup>2</sup>. In the absence of additional regulatory measures, the rise in social and personal

prosperity will lead to a further increase in motorised transport and the associated emissions – this is the finding of all empirical studies<sup>3</sup>.

At the same time, however, the willingness to combine various means of transport (intermodality and multimodality) is relatively high<sup>4</sup>. In urban centres, in particular, the share of the population who go without their own car and cover their mobility needs with the flexible combination of public transport, walking and cycling, also making use of carsharing vehicles on a selective basis, has increased in recent years<sup>5</sup>. It can be observed that people without their own car also tend to be willing to forgo consumption in the interests of sufficiency in general. Their main driver is the opportunity to gain free time<sup>6</sup>.

## Notes and References

1 Federal Statistical Office/Federal Office for Spatial Development (2017): Population's transport behaviour. Mobility and transport microcensus 2015. Neuchâtel and Berne.

2 Swiss Federal Office of Energy (2018): <https://www.bfe.admin.ch/bfe/de/home/news-und-medien/medienmitteilungen/mm-test.msg-id-71338.html>.

3 There are also further influencing factors, such as the ageing of society and the growth in transport. For example, see in this regard: Buffat, Marcel et al. (2018). Individualisierung des ÖV-Angebots. Analyse der Auswirkungen der Individualisierung und weiterer angebots- und nachfragerrelevanten Trends auf die zukünftige Ausgestaltung des ÖV-Angebots, Forschungsprojekt SVI 2014/004 completed on behalf of the Swiss Association of Transport Engineers (SVI).

4 See in this regard: SCCER Mobility (2017): Towards an Energy Efficient and Climate Compatible Future Swiss Transportation System as well as Federal Office of Transport (2018): Digitalization of the energy sector. Dialogue paper on the transformation process, Berne.

5 See with respect to transport sharing: Swiss Economics SE AG, Lucerne University of Applied Sciences and Arts – Department of Economics (2018): Shared economy und der Verkehr in der Schweiz, published by: Federal Roads Office.

6 Project “Soft incentives and energy consumption”

# Digitalisation    # Population    # Politics (federal government, canton, municipality)

## 2.4. Leisure travel as the most important reason for transport



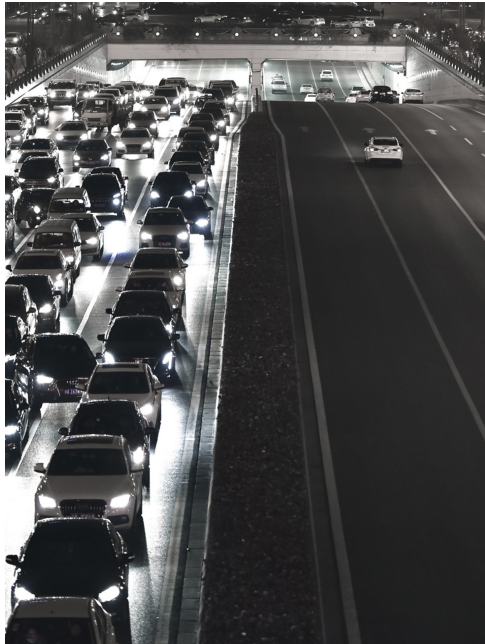
For the people of Switzerland, by far and away the most important reason for transport is leisure. In 2015, around 44 % of the daily distances covered domestically related to leisure activities. Leisure even just about remains the most important reason for transport when taking into account only the period from Monday to Friday. Work commutes follow with a share of 24 % ahead of shopping trips which account for 13 %.

At present, it is still difficult to foresee what impact technological developments such as networking and automated driving as well as innovative new mobility-as-a-service offers will have on the distances covered. Especially in the area of leisure, it is well possible that these new technologies and offers – if the state does not make regulatory interventions – will lead to a further increase in the distances travelled via motorised private transport. The possible consequences associated with the demographic ageing of the population also point in the same direction. Thanks to self-driving means of transport, private transport will in future no longer be dependent on physical fitness. Without accompanying measures, the daily distances covered by older individuals are likely to increase considerably.



# Digitalisation    # Public administration    # Population    # Businesses    # Politics (federal government, canton, municipality)

## 2.5. Disruptions meet continual development



It is becoming ever clearer that digital technology in the field of mobility - as in all economic and social segments – will trigger disruptive developments in the foreseeable future. Innovation in the areas of automated driving, e-mobility and drones as well as internet- and mobile-based services will plough up existing markets and help innovative business models to break through. In Switzerland, these will encounter an environment that has been characterised by a great deal of continuity in recent decades. The distances covered per person have increased steadily, in the recent past primarily due to the significant increase in air traffic. At the same time, the relationship (modal split) between car and rail travel has remained extremely stable. The potential offered by moving away from the basic technical principle of the combustion engine has not been exhausted to date.

At present, it is still difficult to predict what impact the new technologies will have on the existing system. Autonomous vehicles may, for example, either create new benefits for private transport relative to collective transport or provide new impetus to public transport thanks to the gains in efficiency<sup>1</sup>.

Mobility as a service (MaaS) promises to link all modes of transport in an optimal manner<sup>2</sup>. Thanks to platform-based mobility services from door to door, the private ownership of vehicles is replaced by usage rights<sup>3</sup>. Ideally, this leads to a more needs-based and efficient use of transport. On the other hand, optimised offers could, however, lead to an additional increase in transport use. Initial research results relating to free-floating carsharing in Germany and Switzerland point to effects of this kind, for example<sup>4</sup>.



The fact that there is already a need for careful regulation applies to both automated driving and MaaS. Should this regulation not be put in place, there is a risk that these disruptions will generate a large volume of new traffic and thus considerably increase energy needs in the transport sector.

#### Further material

- Self-driving “SmartShuttle” buses on public roads
- Hello, my name is “SmartShuttle”!

#### Notes and References

- 1 Einsatz automatisierter Fahrzeuge im Alltag - Denkbare Anwendungen und Effekte in der Schweiz. Schlussbericht Grundlagenanalyse (Phase A) (2017), published by BaslerFonds, Swiss Association of Cities and other partners, Basel.
- 2 Matyas M., & Kamargianni M. (2018). The potential of mobility as a service bundles as a mobility management tool. Transportation. <https://doi.org/10.1007/s11116-018-9913-4>.
- 3 Generally speaking, individuals who have their own car exhibit a lower level of environmental awareness than people who do not have their own car within their household. Project “**Soft incentives and energy consumption**”
- 4 See Hülsmann, F., J. Wiepking, W. Zimmer, G. Sunderer, K. Götz, Y. Sprinke (2018): share - Wissenschaftliche Begleitforschung zu car2go mit batterieelektrischen und konventionellen Fahrzeugen.. Forschung zum free-floating Carsharing Final report. Berlin/Frankfurt am Main: Öko-Institut/ISOE [http://www.isoepublikationen.de/fileadmin/redaktion/Projekte/share/share\\_Endbericht.pdf](http://www.isoepublikationen.de/fileadmin/redaktion/Projekte/share/share_Endbericht.pdf) und Henrik Becker, Francesco Ciari, Kay W. Axhausen (2017) Comparing car-sharing schemes in Switzerland: User groups and usage patterns, Transportation Research Part A 97 (2017) 17–29, <http://dx.doi.org/10.1016/j.tra.2017.01.004>.

# Decentralisation   # Households   # Population   # Businesses   # Politics (federal government, canton, municipality)

## 2.6. Causes of mobility behaviour and transport



People's choice of transport has a considerable effect on energy consumption. This applies to work commutes as well as to leisure trips, school runs and shopping outings. Decisions with respect to an individual's choice of transport always have to be taken. The decision taken in each case is dependent on both transport-related factors and considerations relating to other areas<sup>2</sup> such as spatial structure, infrastructure, the individual's family situation and their stage of life. Emotional and attitudinal factors also play a role. Upstream decisions, including whether to purchase a car or not, likewise have a considerable impact on the choice of transport.

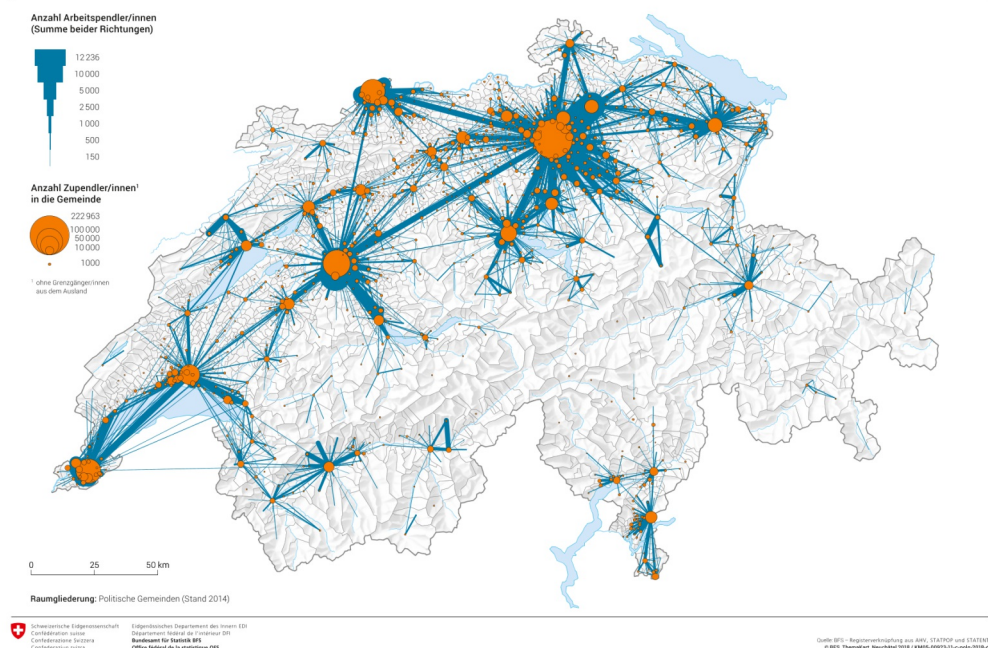
The need to overcome distance has developed due to a disperse settlement structure that has arisen due to the spatial separation of our work and home lives as well as our leisure activities. For example, if a family member in St. Gallen decides to work in Zurich, this individual must either commute or move their family to their new place of work. Factors that speak against relocating include, for example, existing friendships and neighbourhood networks, prices in Zurich or the preference for a more rural lifestyle. This example makes clear that negotiation processes within an individual family environment as well as work relations, friendships, neighbourhood networks, lifestyle preferences and leisure activities lead to certain transport decisions<sup>3</sup>.

The level of commuting in Switzerland is high. Some 70 % of the Swiss population cross a municipal boundary on their way to work and cover an average distance of around 30 kilometres. In 2016, 31 % used public transport, 52 % drove, 7 % cycled and 9 % walked to reach their place of work. In many cases, so-called intermodal trip chains are formed as part

of which, for example, individuals may cycle to the train station, travel to another city by rail and then finally use a tram before arriving at their workplace. Domestic leisure travel is also dominated by the car. In 2015, the car was used for 45 % of all trips (and this mode of transport accounted for 64 % of all distances covered). Some 35 % of leisure trips were completed by foot, while 11 % were made with public transport and 7 % by bike.

Most important commuter flows between municipalities in 2014. Source: Federal Statistical Office (2018): Commuting in Switzerland, Neuchâtel<sup>1</sup>

Wichtigste Pendlerströme zwischen den Gemeinden, 2014



Source: <https://www.bfs.admin.ch/bfs/en/home/statistics/mobility-transport/passenger-transport.html>

## Notes and References

1 <https://www.bfs.admin.ch/bfs/en/home/statistics/mobility-transport/passenger-transport/commuting.assetdetail.5827316.html>.

2 Widmer et al. 2016 <https://www.ethz.ch/content/dam/ethz/special-interest/baug/ivt/ivt-dam/vpl/projects/svi-2015-007/projektbeschreibung.pdf>

3 See also in this regard: Moser, C., Frick, V., Seidl, R., & Blumer, Y. B. (2019). Teaming up for sustainability: Promoting sustainable mobility behaviour through sports clubs in Switzerland. *Energy Research & Social Science*, 53 (February), 89–97.

<https://doi.org/10.1016/j.erss.2019.02.016>.

# Information / communication    # Acceptance    # Costs / benefits    # Population    # Businesses

## 2.7. Toolboxes for influencing mobility behaviour



One option for saving energy in the area of personal mobility is to completely forgo journeys or to shorten their distance. Another possibility is to switch to more economical modes of transport. However, this requires that these modes of transport are accepted by the users<sup>1</sup>. Fundamental components for the acceptance of transport systems include availability, reliability and efficiency. Pricing, convenience and the subjectively perceived attractiveness of the offers likewise play an important role. It can be seen in Switzerland, for example, that an attractive offer combined with a dense settlement structure leads to a higher level of acceptance of public transport. On the other hand, the many large saloons and SUVs on the road make clear that symbolic and emotional factors also determine our choice of transport.

In order to be able to influence mobility behaviour, both hard and soft factors need to be taken into account. As part of the NRP Energy, starting points on the supply side as well as in the areas of communication and the use of digital aids have been identified that can be linked together to form a toolbox.

On the supply side, these include, among others, carsharing and carpooling systems. These can either form an alternative to car ownership or act to supplement it and can be combined with other modes of transport. In the area of communication and information strategies, international research shows that – in addition to target-group-specific communication and emotionally appealing campaigns – it is important that the actual offer is in line with the promises made<sup>2</sup>. A positive example is the “ticket for everything” campaign of the Zurich Transport Network (ZVV) that encouraged people to think about intermodal offers with attention-grabbing images.

The “ticket for everything” campaign



Source: © Zurich Transport Network (ZVV)

Digital applications are one trend aimed at supporting sustainable mobility. The numerous apps of public transport providers are well known. However, there are now also smartphone applications that want to bring about a behavioural change among drivers.

### Notes and References

1 See in this regard the synthesis on the focus area of acceptance

2 See Michie, Susan; van Stralen, Maartje M.; West, Robert (2011) The behavior change wheel: A new method for characterizing and designing behavior change interventions. In: Implementation Science 6:42. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3096582/>.



## 2.8. Multi-stage synthesis process



This synthesis on the main topic of “Mobility Behaviour” was created as part of a multi-stage process. In October 2016, when the researchers were still in the middle of conducting their project work, those responsible for the projects addressing the topic of mobility behaviour came together. During a workshop, they exchanged information on their research questions, methods and solutions in order to identify interdependencies and potential synergies. Half a year later, the researchers met with representatives from associations, federal offices, cantons and relevant NGOs in order to find out more about the expectations placed on the research results and their dissemination.

On the basis of these findings, the Steering Committees of the NRP “Energy” developed a synthesis concept for each of the six main topics. An initial draft of the synthesis on “Mobility Behaviour” was developed on the basis of this concept by Konrad Götz and Ueli Haefeli, scrutinised within the Steering Committees of the NRP “Energy” and edited by a science journalist.

In January 2019, an echo group comprising seven specialists from the worlds of administration and business came together in order to reflect on and assess the draft synthesis (see “[Publication details](#)”). They also evaluated the recommendations with a view to their impact and feasibility. Following further revisions and additions, the synthesis was approved in September 2019 by the Steering Committees of the NRP “Energy”.

### 3. Four decisive areas identified



From the factors identified in the NRP Energy that have an impact on mobility behaviour, key challenges in the four areas of motivation and information, carsharing, public transport occupancy rates and the energy efficiency of freight transport can be derived.

#### 3.1. The impact of motivation and information

In order to change mobility behaviour in the direction desired, information and activities must be tailored as closely as possible to the target groups if they are to be effective. Used correctly, specific toolboxes and playful apps can provide support.



### 3.1.1. Target-group-specific information and activities

#### Public transport



**150 stops**  
Located near you



**47 bus lines**  
**20 rail lines**



**Night service**  
12 lines



**GA travel card for a day**  
18 day tickets

#### Bike



**Bike + Ride**  
12 sites with 3,406 places



**Bike-Sharing**  
72 stations with 179 bikes

#### Car



**Park + Ride**  
4 sites with 144 parking spaces



**Car-Sharing**  
54 locations

**The website [luzernmobil.ch](http://luzernmobil.ch) provides information on all public transport stops; night transport possibilities; bike + ride as well as park + ride locations as well as further public transport offers and the structure of the public transport system. Source: [luzernmobil.ch](http://luzernmobil.ch)**

Advertising has worked with lifestyles, attractive images and original stories for some time now. Also implementing these instruments in the provision of effective communication and information aimed at bringing about sustainable mobility behaviour is a challenging task<sup>1</sup>. The fact that there is a deficit in terms of the information possessed by the population can be deduced, for example, from the finding that 61 % of contacted households that participated in a household survey could not state the efficiency class of their vehicle<sup>2</sup>.

In a world of individualisation, different ways of life and varying lifestyles, communication can never address all people at the same time. Instead, a target-group-specific approach needs to be adopted<sup>3</sup>. In the area of mobility behaviour, sociodemographic attributes are frequently used to this end. For example, the mobility behaviour of women is different to that of men, children do not exhibit the same mobility traits as adults and people with high incomes travel differently to those from lower income classes. Mobility target groups can also be described based on the specific situation at hand: school children on their way to school have different needs to commuters heading to their place of work, football fans making their way to their team's stadium or shoppers popping out to a shopping centre. There are also target group segmentations that take account of the basic attitudes of the social milieus<sup>4</sup> or lifestyle<sup>5</sup> in question<sup>6</sup>. Based on models of this kind, it becomes possible to address personal values and basic viewpoints with target-group-specific campaigns<sup>7</sup>.

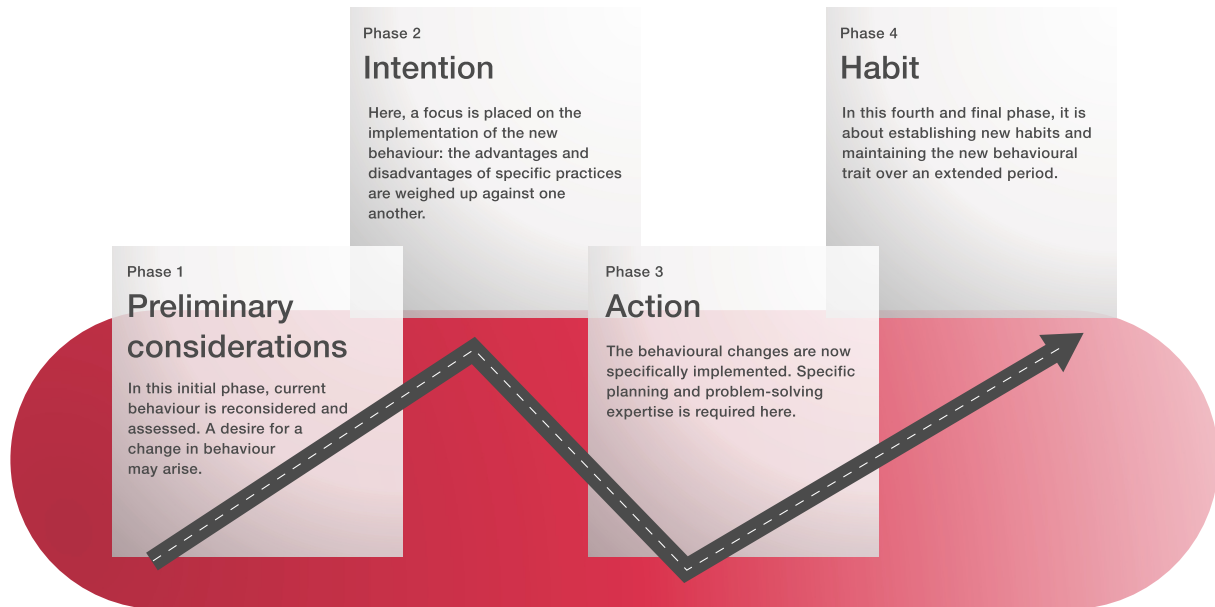
In the project “Sustainable lifestyles and energy consumption”, a social-psychological phase model aimed at promoting and supporting energy-saving behaviour within households was developed on the basis of the theoretical principles outlined above<sup>8</sup>. Using this model, 1,800 people in the city of Lucerne were surveyed and divided into groups with different “energy-use lifestyles” using a cluster method.

## Notes and References

- 1 See Götz K, Sunderer G (2019): Neue Wege in die Verkehrswende. Impulse für Kommunikationskampagnen zum Behaviour Change. Herausgegeben von Agora-Verkehrswende, Berlin
- 2 [https://www.sccer-crest.ch/fileadmin/user\\_upload/Energiekonsumverhalten\\_in\\_der\\_Schweiz\\_07032018\\_final.pdf](https://www.sccer-crest.ch/fileadmin/user_upload/Energiekonsumverhalten_in_der_Schweiz_07032018_final.pdf).
- 3 See Kotler P, Lane Keller K, Bliemel F (2007): Marketing-Management, Pearson Studium 2007
- 4 With respect to social milieus in Switzerland, see Sinus 2018: <https://www.sinus-institut.de/sinus-loesungen/sinus-milieus-schweiz/>.
- 5 With respect to lifestyles in mobility research, see Ohnmacht et al. 2008, Götz et al. 2011/2016
- 6 Project “Sustainable lifestyles and energy consumption”
- 7 See in this regard the synthesis on the focus area of acceptance
- 8 Project “Sustainable lifestyles and energy consumption” Timo Ohnmacht, Dorothea Schaffner, Christian Weibel, Helmut Schad (2017), Rethinking social psychology and intervention design: A model of energy savings and human behavior, Energy Research & Social Science 26, 40–53.

# Information / communication   # Steering / promotion   # Public administration   # Population   # Businesses

### 3.1.2. Toolboxes for promoting cycling and public transport



**Relevant behavioral phases** Source: *Brochure of the Lucerne University of Applied Sciences and Arts*, p. 8

Working together with the city authorities, researchers at the Lucerne University of Applied Sciences and Arts have developed marketing measures aimed at promoting energy-saving behaviour. These included efforts to support the increased use of bikes and public transport. On the basis of the target-group model and the set of measures, a toolbox was developed in each case that can also be applied in other regions of Switzerland and by other stakeholders<sup>1</sup>. Here, a differentiation was made between the following four phases in the process of bringing about behavioural change:

- *Preliminary considerations*: In this initial phase, current behaviour is reconsidered and assessed. A desire for a change in behaviour may arise.
- *Intention*: Here, a focus is placed on the implementation of the new behaviour. The advantages and disadvantages of specific practices are weighed up against one another.
- *Action*: The behavioural changes are now specifically implemented. Specific planning and problem-solving expertise is required here.
- *Habit*: In this fourth and final phase, it is about establishing new habits and maintaining the new behavioural trait over an extended period.

Depending on the phase in which the target group finds itself, it needs to be addressed in a completely different way. Campaigns should also utilise social trends as these have a



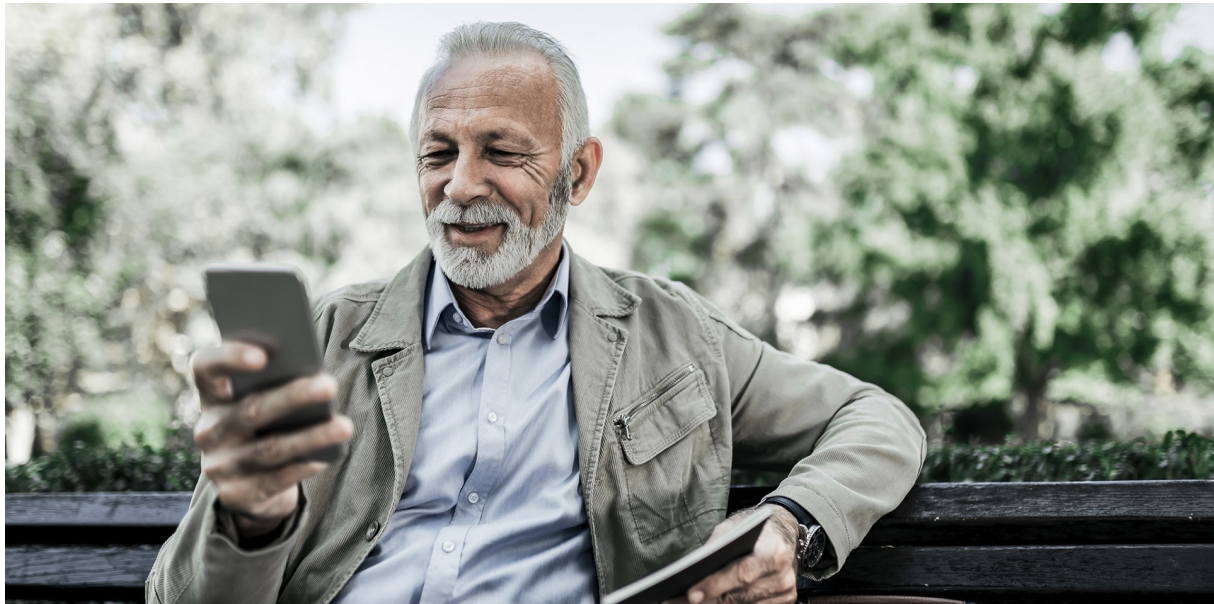
considerable impact on consumer behaviour.

#### Notes and References

1 Project “Sustainable lifestyles and energy consumption” Competence Centre for Mobility of the Lucerne University of Applied Sciences and Arts – Department of Economics (no year stated), Velofahren – Massnahmen für die Reduktion des Energieverbrauchs – Ein Leitfaden mit zielgruppenorientierten Empfehlungen, Lucerne. Competence Centre for Mobility of the Lucerne University of Applied Sciences and Arts – Department of Economics (no year stated), Förderung des öffentlichen Verkehrs – Massnahmen für die Reduktion des Energieverbrauchs – Ein Leitfaden mit zielgruppenorientierten Empfehlungen, Lucerne.

# Information / communication   # Acceptance   # Steering / promotion   # Public administration   #  
Population   # Businesses

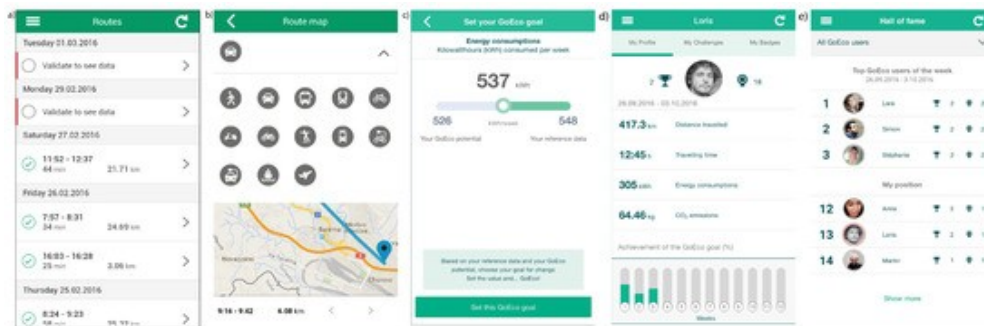
### 3.1.3. Bringing about behavioural change with playful apps



As part of the project “Virtual competition for energy-efficient mobility”, an app aimed at supporting energy-saving mobility behaviour was developed<sup>1</sup>. In an initial phase, individuals wanting to seek advice have their everyday mobility behaviour recorded using tracking software that recognises the utilised mode of transport. The participants are subsequently provided with feedback including suggestions for how they can change their behaviour. The tips are individually tailored to the respective users. These may relate to both more efficient routing as well as the use of more environmentally friendly means of transport. In line with the principles of gamification, the app works with playful elements in order to also make the whole experience fun.

The results of the study point to typical socio-cultural and infrastructural differences between Switzerland’s regions. In the case of the individuals from the Zurich pilot region, the use of the app did not give rise to any additional energy-saving effect. The greater Zurich area is home to a relatively well-developed public transport network and its local population thus already make considerable use of non-automotive forms of transport. In contrast, in the Ticino pilot region, which is characterised by a relatively high level of car use, the use of the app led to significant savings.

Screenshot of the GoEco app



Source: <https://www.mdpi.com/2071-1050/11/9/2674>

In order to achieve a relevant effect across the country as a whole, an app of this kind would chiefly also have to reach those individuals whose mobility behaviour is especially energy-intensive. Among these groups, in particular, it must be anticipated that they will have little interest in such an app – as their behaviour is tied to a high affinity to cars. What is therefore also especially wanted are incentives that are attractive to these individuals. Here, it would need to be examined whether, in addition to fun and competitive elements, financial elements could also have an impact, for example.

In both regions, the relatively low number of participants and the high dropout rate were striking. Among other factors, this was related to the high energy consumption of the tracking function. Apps that are to be used on a broad basis need to resolve this acceptance issue.

## Notes and References

1 Project “**Virtual competition for energy-efficient mobility**”

## 3.2. Carsharing: using vehicles together

The sharing of vehicles can significantly reduce both the number of vehicles on the road and the number of journeys. However, the degree of market penetration is still small and the various systems demonstrate differing levels of impact. One success factor is embedding such solutions in attractive public transport infrastructures.

# Digitalisation    # Population    # Businesses

### 3.2.1. Different systems and a low volume



On average, private cars go unused for 23 hours a day and take up parking space during this time. Decades ago, private individuals in Switzerland therefore already moved to come together and share their cars. In the meantime, several associations and companies such as Mobility and Catch a Car have now become active in this area. The biggest provider alone today offers around 3,000 cars at 1,500 locations. These cars are available in different sizes, in different price segments and with different engine types, with electric vehicles now also being included. Carsharing providers are also cooperating with public transport operators, developing tariff communities. This allows for intermodal trip chains as part of which different modes of transport are used flexibly for a journey.

Alongside this station-based carsharing approach, so-called free-floating systems have also been present in Switzerland for some time. Here, the vehicles are located on public road systems, can be rented spontaneously and then also returned here. In Zurich, electronic scooter sharing also functions in this way. In all current sharing variants, the availability and location of the vehicles can be ascertained with the help of a smartphone app.

However, carsharing does not always lead to energy savings everywhere in the world<sup>1</sup>. Nevertheless, in Switzerland a positive impact has been observed. In order for these effects to reach a relevant magnitude, however, carsharing will need to leave behind its niche status and tap into the mass market. At present, the level of overall market penetration is still low with only around 4 % of all holders of a driving license<sup>2</sup>.

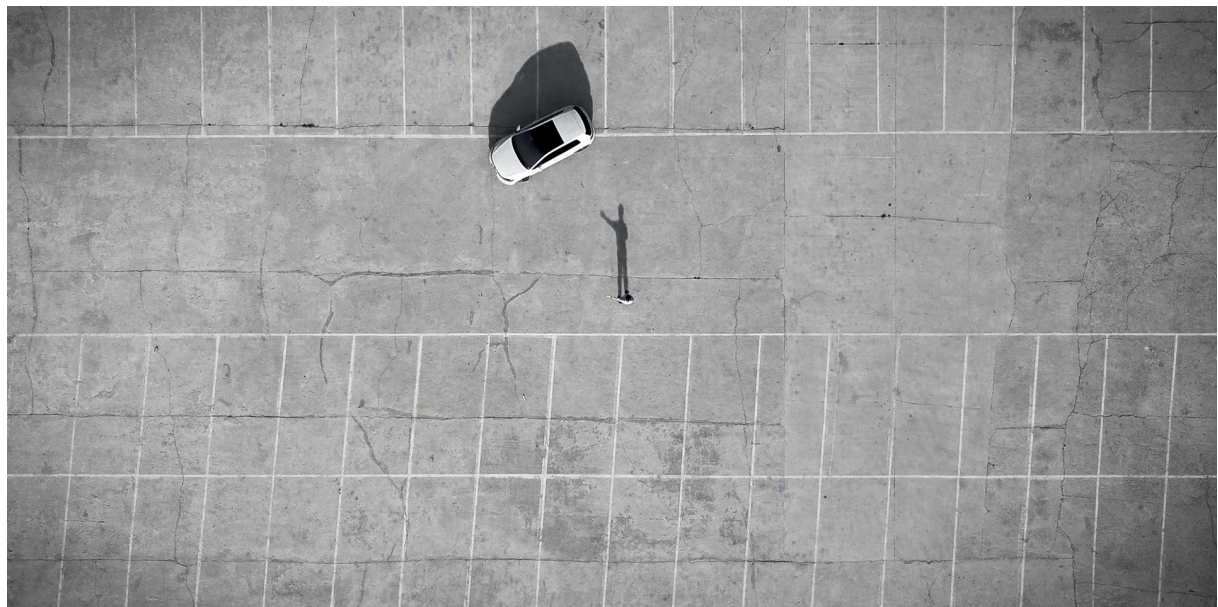


### Notes and References

- 1 In a German project, an overall negative energy balance was observed for the free-floating carsharing of car2go (see Hülsmann, F., J. Wiepking, W. Zimmer, G. Sunderer, K. Götz, Y. Sprinke (2018): share - Wissenschaftliche Begleitforschung zu car2go mit batterieelektrischen und konventionellen Fahrzeugen. Forschung zum free-floating Carsharing. Final report. Berlin/Frankfurt am Main: Öko-Institut/ISOE [http://www.isoe-publikationen.de/fileadmin/redaktion/Projekte/share/share\\_Endbericht.pdf](http://www.isoe-publikationen.de/fileadmin/redaktion/Projekte/share/share_Endbericht.pdf)).
- 2 Ohnmacht (2017) Carsharing in Switzerland. Second Basel Sustainability Forum: Mobility. 15 September 2017.

# Acceptance    # Population    # Businesses

### 3.2.2. A massive reduction in cars required through carsharing



Apart from the fact that carsharing is far from accepted by all car drivers<sup>1</sup>, it is important to know just how many sharing vehicles would be required in order to handle transport needs objectively. In simulations performed by the ETH Zurich<sup>2</sup>, it has been calculated that all journeys performed by the 240,000 cars currently in the greater Zurich area could be covered by 60,000 free-floating vehicles. The number of vehicles could thus theoretically be reduced to a quarter of the present level. This would be on condition, however, that users would be prepared to walk up to 15 minutes to the next available sharing vehicle, although in 60 % of cases this walk would take less than 5 minutes.

Other studies make clear that a particular proximity to a carsharing location is an important condition for the use of the service and energy saving<sup>3</sup>. These findings correspond to the results of the NRP Energy synthesis on “acceptance” which reveal that the people of Switzerland attach considerably more significance to convenience and other issues relating to personal quality of life than they do to environmental arguments.

Whether and under which conditions carsharing leads to a reduction in energy consumption when applied in reality depends on the system in practice. Here, it must be taken into account that different systems attract different target groups<sup>4</sup>. To date, it has been observed that station-based carsharing indeed leads to savings<sup>5</sup>, while research on free-floating carsharing gives rise to conflicting results<sup>6</sup>.

#### Notes and References

1 Becker Henrik, Loder Allister, Schmid Basil, Axhausen Kay W. (2017), Modeling car-sharing

- membership as a mobility tool: A multivariate probit approach with latent variables, in travel behaviour and society, 8, 26-36. Maria Juschten, Timo Ohnmacht, Vu Thi Thao, Regine Gerike Reinhard Hössinger (2017), Carsharing in Switzerland: identifying new markets by predicting membership based on data on supply and demand, Transportation, DOI 10.1007/s11116-017-9818-7
- 2 Project **"Sharing is saving"**
- 3 Ohnmacht (2017) Carsharing in Switzerland. Second Basel Sustainability Forum: Mobility. 15 September 2017
- 4 Henrik Becker, Francesco Ciaria, Kay W. Axhausen, Comparing car-sharing schemes in Switzerland: User groups and usage patterns, Transportation Research Part A 97 (2017) 17–29
- 5 Haefeli U, Matti D, Schreyer Ch, Maibach M, Swiss Federal Office of Energy (ed.): Evaluation Car-Sharing. Final report. Berne, September 2006
- 6 For Switzerland: Henrik Becker, Francesco Ciaria, Kay W. Axhausen Measuring the car ownership impact of free-floating car-sharing, Transportation Research Part D 65 (2018) 51–62 A case study in Basel, Switzerland. For Germany: Hülsmann, F., J. Wiepking, W. Zimmer, G. Sunderer, K. Götz, Y. Sprinke (2018): share - Wissenschaftliche Begleitforschung zu car2go mit batterieelektrischen und konventionellen Fahrzeugen.. Forschung zum free-floating Carsharing Final report. Berlin/Frankfurt am Main: Öko-Institut/ISOE [http://www.isoe-publikationen.de/fileadmin/redaktion/Projekte/share/share\\_Endbericht.pdf](http://www.isoe-publikationen.de/fileadmin/redaktion/Projekte/share/share_Endbericht.pdf)

# Acceptance    # Sufficiency    # Population    # Businesses    # Politics (federal government, canton, municipality)

### 3.2.3. Carsharing requires the right environment



Carsharing alone does not induce people to go without their own vehicle. Only when a good sharing offer is embedded in an attractive public transport and bike infrastructure does this combination lead to a situation in which fewer people than before purchase their own vehicle. In this case, significant energy is saved, as shown by research: households without a car generally demonstrate more environmentally friendly mobility behaviour. In such cases, there is no incentive to simply use the car as it is already, so to speak, available at no cost. In the case of free-floating carsharing, it has been shown in Basel that 6 % of clients have reduced their own private car fleet following the introduction of the offer<sup>1</sup>.

For the effect of carsharing to be fully realised with respect to the number of cars on Swiss roads, the systems need to be cleverly regulated by the city authorities and embedded within other measures. These include, for example, restrictions and cost hikes for the use of personal cars. Measures that thus serve to motivate people to use either their private vehicle less frequently or even give it up completely.

#### Notes and References

1 Project “**Sharing is saving**” Henrik Becker, Francesco Ciaria, Kay W. Axhausen, Comparing car-sharing schemes in Switzerland: User groups and usage patterns, Transportation Research Part A 97 (2017) 17–29

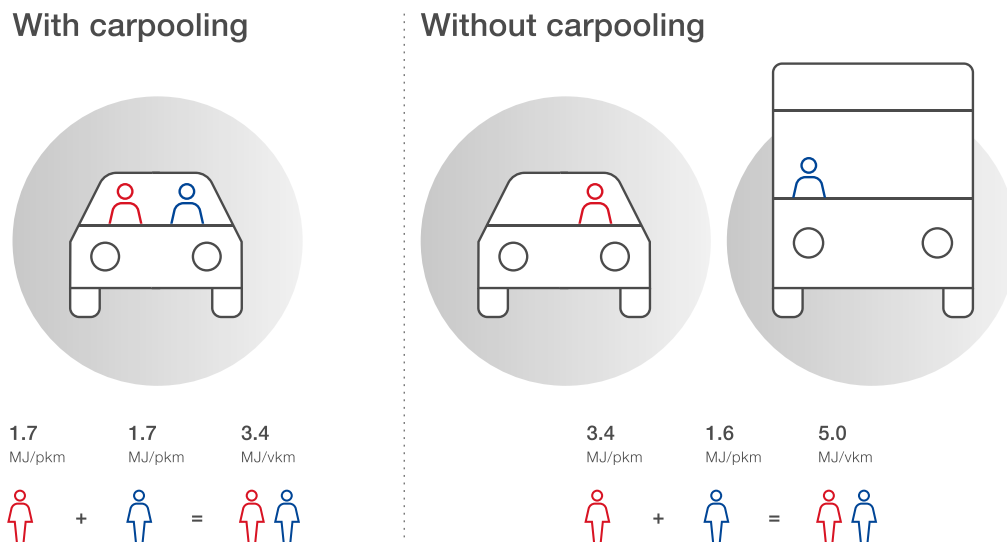


### 3.3. Occupancy levels in private transport are too low

Generally speaking, occupancy levels for private modes of transport are low. In the case of commuter traffic in Switzerland, each car on average carries just 1.1 people. From an energy-saving perspective, the challenge therefore lies in increasing vehicle occupancy rates with appropriate measures.

# Digitalisation    # Acceptance    # Population    # Businesses

### 3.3.1. Increasing willingness with respect to carpooling



**Energy balance of carsharing.** The left-hand side shows the sharing of a car by two people for their journey to work, the right-hand side shows one person travelling by car and the other with public transport. Source: Arnold, Tobias Arnold, Bachmann Friedel, Haefeli Ueli (2017), *Sharing Economy: Hype or Promise?* in: *Strasse und Verkehr* 6/2017, 27-33.

Even though it is clear that vehicles with improved occupancy rates could make a major contribution to increasing energy efficiency – the acceptance of carsharing (also referred to as ridesharing) has to date been low in Switzerland. New digital applications provide hope, however, that such solutions can become more “low-threshold” and designed more attractively.

The project “Sharing economy: hype or promise?”<sup>1</sup> concludes that an energy saving of 1,500 megajoules per person can theoretically be expected through carpooling. This corresponds to 8 % of the average electricity consumption of Swiss households<sup>2</sup>. In a representative survey, 6.8 % of respondents also indicated that they would offer a carpooling option in the next six months. Extrapolated for the country as a whole, this would give rise to up to 480,000 carpooling places. This would lead to a calculated energy saving of 490,000 gigajoules per year, equating to the electricity consumption of 26,250 single-person households.

The study makes clear that under the currently prevailing framework conditions the use of carpooling options will, however, remain low. From an energy policy perspective, the increased use of carpooling for commuter traffic would be the most promising<sup>3</sup>.





## Notes and References

1 Project “Sharing economy: hype or promise?”

2 Here, potential rebound and spillover effects were taken into account, see in this regard the keyword “rebound”

3 Arnold, Tobias Arnold, Bachmann Friedel, Haefeli Ueli (2017), Sharing Economy: Hype or Promise? in: Strasse und Verkehr 6/2017, 27-33

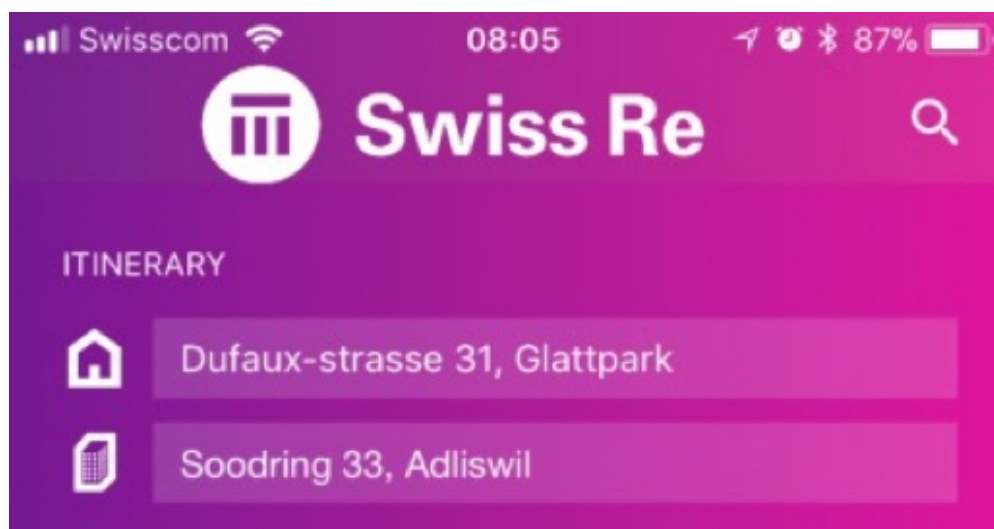
# Digitalisation    # Population    # Businesses    # Politics (federal government, canton, municipality)

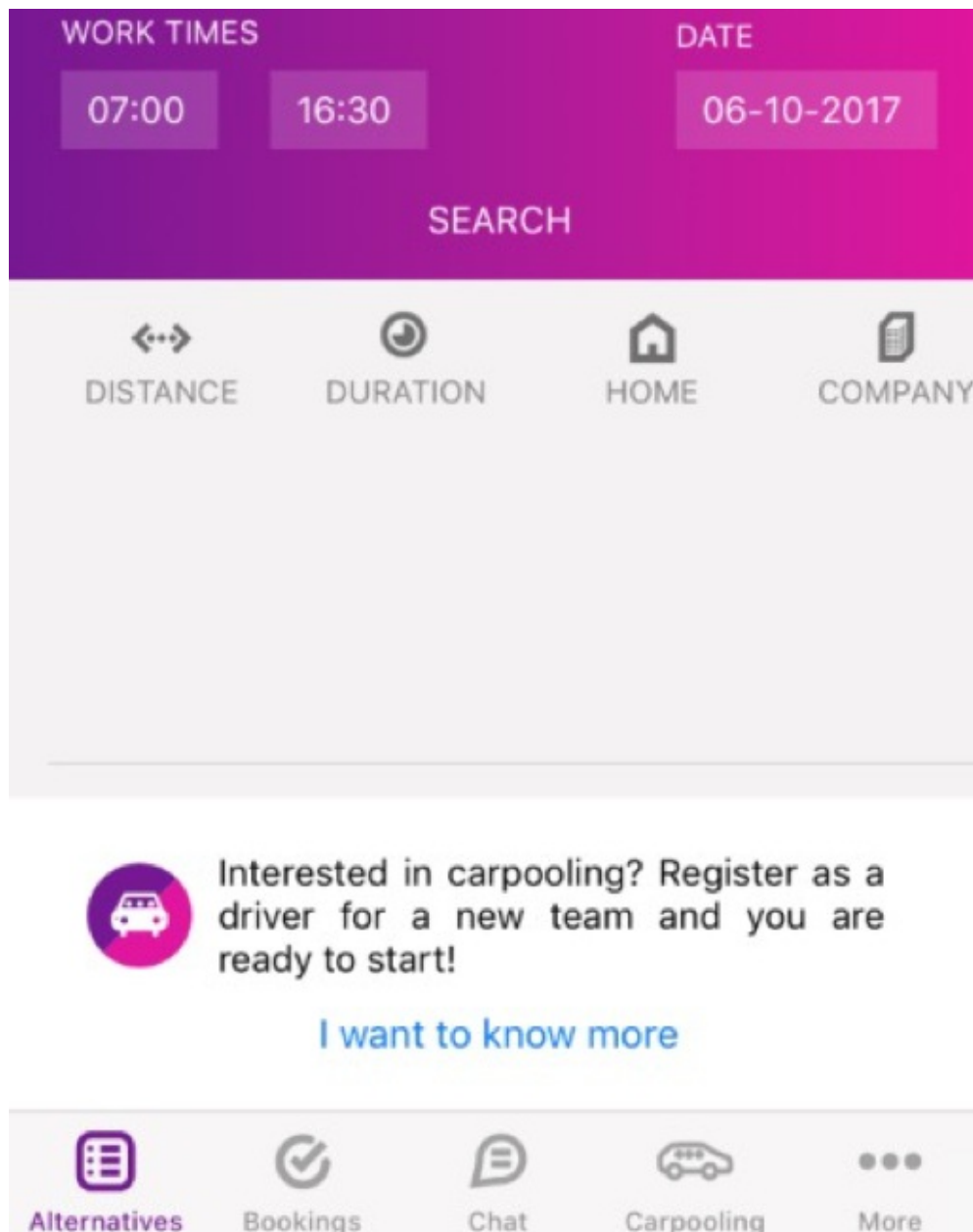
### 3.3.2. Opportunities provided by carpooling options for commuter traffic



From an energy-policy perspective, carpooling must primarily be promoted in the area of commuter traffic<sup>1</sup>. Here, the occupancy rate of 1.1 people per car is especially low. In a practical test, the carpooling concept was therefore tried out in the Zurich area by a major Swiss firm (SwissRe) with 4,000 employees. Staff members were informed about the purpose and practical possibility to participate as well as about the option to download a carpooling app<sup>2</sup>.

Screenshot of the SwissRe app for internal company carpooling





Source:

In the subsequent survey, it turned out that 31 % were informed about the option to offer or make use of carpooling. While 7 % downloaded the app, only 0.3 % then made use of carpooling on at least one occasion. The researchers see the following reasons for the low level of acceptance: the only system that can compete with private cars is public transport and in the Zurich area this is so well developed thanks to intensive state support that carpooling does not currently represent an attractive alternative. The lack of acceptance is certainly also impacted by the fact that in the case of carpooling the advantage of being able to use the personal time offered by travelling alone whatever way an individual wishes no longer exists.

There is also the issue that carpooling requires coordination in terms of timing.

Either way, carpooling concepts can only work if a sufficiently large pool of potential participants come together. This is the requirement for adequate reliability and flexibility. Here, it is not enough to introduce carpooling at individual major companies. Instead, several firms in the same location should work together in order to achieve a critical mass. To this end, large firms could be enabled or even obligated by politicians to conduct holistic mobility management. Companies that are prepared actively to promote carpooling concepts should also be able to count on state support.

## Notes and References

1 Project “Sharing economy: hype or promise?”

2 Haefeli, Ueli; Artho, Jürg; Roose, Zilla; Bachmann, Friedel; Marconi, Davide, Arnold, Tobias (2018): Carpooling im Pendlerverkehr, final report. Follow-up project to the NRP 71 project “Hype or promise? The Contribution of Collaborative Consumption to Saving Energy” as part of a pilot project with SwissRe, Adliswil/Zurich. Report for the SNSF and the Swiss Federal Office of Energy, Interface Politikstudien Forschung Beratung, Lucerne, and the Social Research Unit of the University of Zurich.

## 3.4. Energy efficiency of freight transport

Global flows of goods have increased significantly with globalisation. At a local level, keywords such as same-day delivery and the growing volume of delivery vans make this clear: the importance of logistics will increase yet further in the foreseeable future. Freight transport will thus also become a challenge in terms of energy policy.

# Acceptance   # Sufficiency   # Public administration   # Population   # Businesses

### 3.4.1. A vision for the energy-efficient freight transport of the future



The project “Smart urban freight logistics” has formulated a vision for energy-efficient and CO<sub>2</sub>-free urban freight transport by 2050 and developed a corresponding action plan. It has been shown that this objective can be achieved through the bundling of measures. This would make a considerable contribution to the sustainable development of the country. If all urban freight and logistics transport in Switzerland was CO<sub>2</sub>-free, 7 % of the goals of the energy strategy and 9 % of the objectives aimed at CO<sub>2</sub> reduction could be realised<sup>1</sup>.

Cargo bikes as a gentle alternative





Source: Sun21 presentation of the Basel freight transport concept

[https://www.sun21.ch/images/pdf/2018/G %C3 %BCterverkehrskonzept\\_Letzte\\_Meile\\_Olivieri\\_Luca.pdf](https://www.sun21.ch/images/pdf/2018/G%C3%BCterverkehrskonzept_Letzte_Meile_Olivieri_Luca.pdf)

In order to be able to implement the action plan, however, a much more comprehensive understanding of mobility behaviour is required than is generally the case today. From the state and companies to consumers, all stakeholders need to change their behaviour fundamentally. The latter, for example, need to focus increasingly on the sharing of products, repairing items rather than purchasing new ones and extending the service life of products. This would lead to a reduction in production, consumption and transportation. Results from other projects indicate that an increased focus on sufficiency of this kind among the population is absolutely feasible provided this is not perceived as a restriction of their own quality of life<sup>2</sup>. According to the synthesis on “acceptance” of the NRP Energy, this consideration, in particular, is at the top of the list of **priorities of the Swiss population**. Accordingly, sufficiency should where possible be linked to personal co-benefits, for example in the areas of health or wellbeing.

## Notes and References

1 Project “**Smart urban freight logistics**” Rapp Trans AG, Interface Politikstudien Forschung Beratung (2018): Smart urban freight logistics. How we supply the towns of tomorrow – with energy efficiency and CO<sub>2</sub>-free.”

2 Project “**Exploring ways towards societal consensus**”, Project “**Promoting energy-sufficient behaviour in cities**”



# Digitalisation    # Population    # Businesses

### 3.4.2. Automation tools have been used too little until now

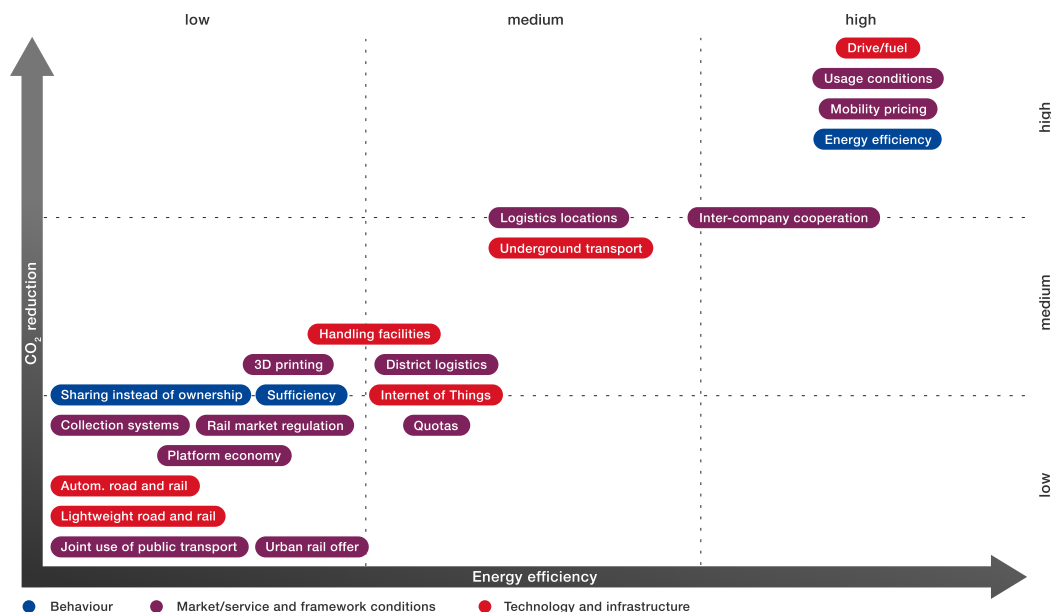


**Swiss Post delivery robots as part of a pilot project**Source: Thomas Schmid

A significant contribution to energy-efficient and low-CO<sub>2</sub> urban freight transport can be made by modern technologies in the area of automated vehicles and transport systems. According to a finding from the project “Smart urban freight logistics”, they need to be used as comprehensively as possible in order to generate the maximum effect. For example, the entire freight transport infrastructure and all vehicles need to be switched to electronic drives with renewable energies. There is also the need for the extensive automation of both rail freight transport and urban freight transport. Underground transport systems exclusively designed for goods would ensure efficient primary distribution. Transport over the last stretch of the goods’ journey could either be performed by delivery robots or be handled by district-based distribution centres. The digital automation platforms that could make a contribution also include sharing platforms. An economically attractive sharing economy should not only be developed for private individuals (C2C), but also for companies (B2B and B2C).

# Regulation   # Digitalisation   # Public administration   # Businesses   # Politics (federal government, canton, municipality)

### 3.4.3. Importance of state framework conditions



**Smart regulation could target the following: the contribution of various measures aimed at achieving CO<sub>2</sub>-free and energy-efficient logistics in 2050. Measures in the top-right field make the biggest contribution.** Source: Project “*Smart urban freight logistics*”.

*The price signals with respect to a mileage-dependent car toll or a reduction of public transport prices.*

A transformation process towards CO<sub>2</sub>-free and energy-efficient urban freight transport represents a major challenge for companies. In order to manage this challenge, the state needs to introduce reliable and fair guidelines and support businesses in implementing them. The project “Smart urban freight logistics”<sup>1</sup> proposes, for example, the mandatory labelling of all products with respect to the energy used during their production and transportation. This increases transparency vis-à-vis consumers and ensures equal conditions for all market participants.

At a spatial planning level, the state must ensure that companies have access to adequate space for deliveries and the handling of goods. In the past, regional developments in urban areas increasingly led to the squeezing out of central trans-shipment centres to peripheral locations and thus to longer supply routes with greater energy consumption.

In order to support the transformation process, the state should also set an example with a long-term and transparent tariff policy for its own transport. This will motivate the goods and freight industry and its clients to change their business decision-making behaviour and to increasingly to address energy-saving objectives. To this end, their management must be provided with the relevant resources.



## Energy

National Research Programmes 70 and 71

### Notes and References

1 Project “Smart urban freight logistics”

## 4. Seven recommendations for sustainable mobility

A whole range of measures can be derived from the NRP Energy projects on mobility behaviour. This synthesis has aggregated these into seven key recommendations which provide impetus for the initiation of the change required to achieve sustainable and energy-saving mobility.



# Behaviour    # Steering / promotion    # Public administration    # Associations and NGOs    # Politics  
(federal government, canton, municipality)

## 4.1. Behavioural change – voluntary action does not suffice!



*Every behavioural change must first overcome human inertia. In the absence of incentives and targeted regulations, a fundamental change, as is required for the achievement of the goals of Energy Strategy 2050, is not possible.*

While the theoretical potential offered by behavioural change is considerable, when it comes to practical implementation voluntary action is not enough. The projects of the NRP Energy have clearly confirmed this basic finding, long known in the research community, with respect to the opportunities and limitations of voluntary behavioural change in the area of mobility. For example, company carpooling offers significant theoretical energy-saving potential. However, under the current framework conditions it is apparent that there are insufficient incentives for people to change their behaviour in the desired direction in practice.

Likewise digital offers do not automatically lead to significant energy saving. Coupled with false price signals and a lack of political levers, there is instead a risk that they could give rise to a significant increase in transport volumes rather than a reduction.

With respect to making a contribution towards closing the Energy Strategy 2050 target deficit that can be activated in the short term, the project results are therefore at present modest. Only when the framework conditions in the area of mobility are brought into line with the requirements of energy policy through the implementation of intelligent and courageous regulations will it also be possible to realise the opportunities for energy savings, identified theoretically, to a sufficient extent.



## **Energy**

National Research Programmes 70 and 71

Politicians, in particular, are thus called upon here. The issue will not be resolved with appeals for voluntary behavioural change and information campaigns alone. Instead, measures and offers which are both promising and desirable must be accompanied by regulations and be combined with incentives.



# Information / communication    # Public administration    # Associations and NGOs    # Businesses

## 4.2. Target emotions and individual situations



*In order for information to be able to trigger a change of thinking, it must first reach the intended recipients. Communication must therefore be tailored precisely to the reality of individual citizens' lives and also address their emotions.*

The provision of information on the impact of current behaviour and possible alternatives marks the start of practically all behavioural change. Here, the following aspects need to be taken into account:

- The information must be directed towards specific target groups. These can be defined on the basis of institutional criteria (households, companies, administration), demographic groups (young and old, men and women) or different lifestyles (urban, affinity to nature, sport enthusiasts).
- The information must be communicated at the appropriate phase. An individual who is currently considering purchasing a car and is attracted to an electric vehicle requires different information to a person who already owns a car and is contemplating using it less.
- The linking of emotional elements means the persuasiveness of rational arguments can be increased decisively. The target group also plays a special role here. Younger people prefer a different kind of emotiveness to older generations. Companies tend to be more rational than emotional in their decision-making.
- Any information campaign is doomed to failure if it is unable to provide information on attractive behavioural alternatives. Campaigns must therefore never be launched if they are detached from concrete offers. As **investigations on the acceptance of measures** have



shown, environmental benefits alone rarely have a convincing effect. Where something is fun or healthy, saves time or is linked to attractive technology, the impact is usually much greater.

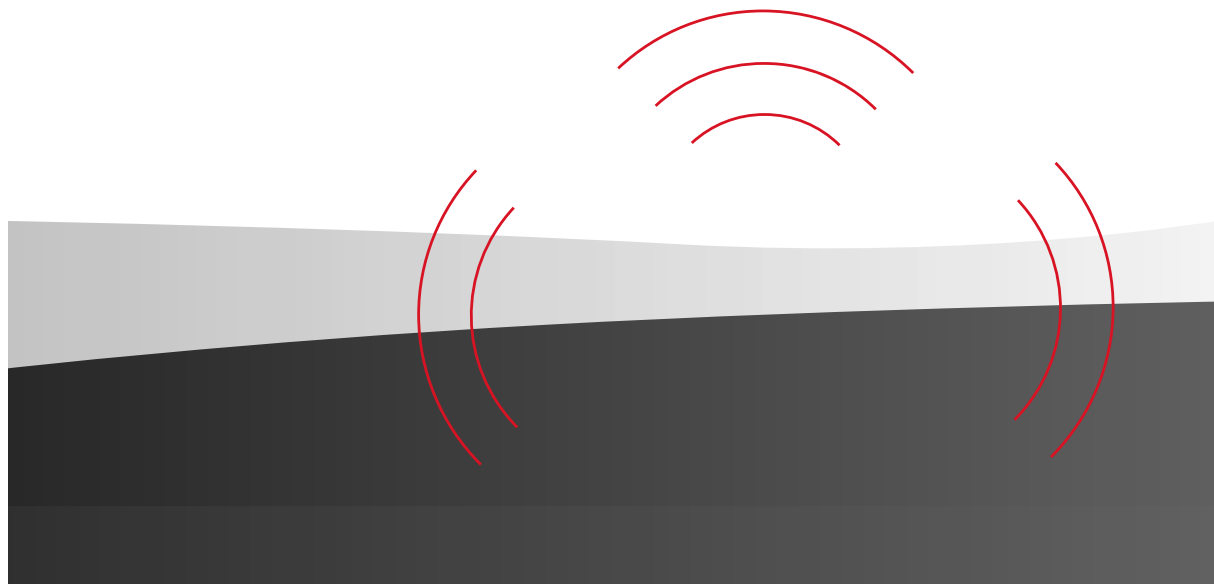
It is primarily those institutions and companies which have both a business and a social interest that come into consideration as vehicles for such information and communication strategies. Public transport and other mobility providers can, for example, position themselves as pioneers for a responsible economy. State institutions can also conduct communication campaigns at all federal levels<sup>1</sup>

### Notes and References

1 Project “Sustainable lifestyles and energy consumption” Competence Centre for Mobility of the Lucerne University of Applied Sciences and Arts – Department of Economics (no year stated), Velofahren – Massnahmen für die Reduktion des Energieverbrauchs – Ein Leitfaden mit zielgruppenorientierten Empfehlungen, Lucerne. Competence Centre for Mobility of the Lucerne University of Applied Sciences and Arts – Department of Economics (no year stated), Förderung des öffentlichen Verkehrs – Massnahmen für die Reduktion des Energieverbrauchs – Ein Leitfaden mit zielgruppenorientierten Empfehlungen, Lucerne.

# Digitalisation    # Incentives    # Businesses    # Politics (federal government, canton, municipality)

### 4.3. Make targeted use of digitalisation!



*Digital platforms provide ideal opportunities to integrate energy-policy requirements directly within processes and business models. This does not happen by itself, however, and instead requires corresponding incentives for the platform operators.*

The future is digital and this doubtlessly applies also to mobility. Here, it is by no means assured that this development will contribute to saving energy. It is clear, however, that the levers of future mobility policy can be found on digital platforms. MaaS (mobility as a service) and automated driving will radically redefine how we travel over the long term. And even though the diffusion processes usually take longer than promised by the technology manufacturers, many parameters that will have an impact over the long haul are already being set now. In most cases, these developments entail new business models – often platform strategies – that also make things easier for users. In contrast, energy savings are rarely the focus of such offers. Energy-policy requirements can, however, be effectively integrated within the platform designs. For example, mobility apps could be designed in such a way that the most energy-efficient combination of different modes of transport is the default setting.

As part of the NRP Energy, valuable experience was gathered with respect to the use of apps. Here, it was shown that numerous obstacles still need to be overcome before the apps become viable for the masses in the mobility sector. These obstacles relate to their design (attractive app layout), technical features (smartphone battery life) and, last but not least, regulations in the field of transport policy. There is a lack of incentives that provide motivation to make use of energy-saving technology. This cannot be achieved with individual measures. Policymakers need to show perseverance and actively support the digital mobility world



throughout the entire transformation process. For this reason, it is essential that energy efficiency is given a central role already as part of the current ongoing formulation of a federal policy on multimodal mobility<sup>1</sup>. If this occurs, an increasing number of private stakeholders and state-affiliated companies will align their business models accordingly.

### Notes and References

<sup>1</sup> See in this regard: [Swiss Federal Office of Energy \(2018\): Digitalization of the energy sector. Dialogue paper on the transformation process, Berne.](#)

# Planning    # Area    # CO<sub>2</sub> / greenhouse gases    # Public administration    # Businesses    # Politics  
(federal government, canton, municipality)

## 4.4. Tackle the area of logistics!



*Although energy consumption in the goods logistics sector is increasing significantly, it has until now been largely absent from spatial and local planning. With a mix of various measures, however, it would even be possible to achieve a CO<sub>2</sub>-free supply system for cities.*

The results of the NRP Energy point towards the large and, above all, rising share of energy consumption accounted for by logistics processes. Accordingly, both companies as well as administrative bodies and private households are called upon to make a contribution to more energy-efficient logistics.

In the past, the significance of this mobility area was underestimated and in the sphere of public administration hardly any resources have been created to date that serve to address this issue. On the contrary: regional developments in urban areas are increasingly leading to the squeezing out of central trans-shipment centres to peripheral locations and thus to longer supply routes with greater energy consumption. Furthermore, concerns about the energy-efficient provision of supplies to the population are generally still being ignored within the framework of new area developments based on comprehensive test plans that see the establishment of dense residential zones. Here, it is not least the stakeholders at state level who have failed.

The main message that comes out of the relevant NRP project is positive, however. The vision of energy-efficient and CO<sub>2</sub>-free urban freight logistics is by no means utopian and can certainly be realised by 2050 with a mix of various measures. This is on condition that the political will to do so exists. The private stakeholders in the logistics industry are absolutely willing to change their behaviour – this was also made clear in the project. In return, they want



## Energy

National Research Programmes 70 and 71

reliable regulations that allow for long-term investment planning for new infrastructure and updated business models<sup>1</sup>.

### Notes and References

<sup>1</sup> Rapp Trans AG, Interface Politikstudien Forschung Beratung (2018): Smart urban freight logistics. How we supply the towns of tomorrow – with energy efficiency and CO<sub>2</sub>-free.



# CO2 / greenhouse gases    # Combustible / fuel    # Associations and NGOs    # Population    # Politics  
(federal government, canton, municipality)

## 4.5. Finally also incorporate air traffic!



*Although more than one-third of distances travelled are already covered by aircraft, both politicians and the population continue to ignore the environmental footprint of air travel.*

Only one of the NRP Energy projects looked at measures aimed at more energy-efficient behaviour with respect to air travel. This is regrettable, as already in 2015 more than one-third of all distances covered by the Swiss population could be attributed to air travel. And – despite ever quicker train connections over medium distances – aviation travel is continuing to increase significantly. Between 2010 and 2015, the average number of flights per person and year increased by 43 %<sup>1</sup>. At the same time, air traffic enjoys tax benefits compared to other modes of transport as no mineral oil tax is levied on kerosene. The environmental survey conducted as part of a research project also revealed that the environmental footprint of flights continues to be largely ignored by Swiss citizens. Environmental awareness and the personal willingness to commit to the environment stated in surveys have no impact on the number of private and business flights. The approval of Energy Strategy 2050 is also not related to a lower number of air trips<sup>2</sup>. What needs to happen in order for fewer flights to be taken over short and medium routes has not been sufficiently researched in Switzerland. State research policy, in particular, is called upon here.

### Notes and References

1 Here, air trips are deemed to be trips with at least one overnight stay: The Swiss population's transport behaviour 2015: Source: Federal Statistical Office/Federal Office for



## **Energy**

National Research Programmes 70 and 71

Spatial Development (2017): Population's transport behaviour. Mobility and transport microcensus 2015. Neuchâtel and Berne.

2 Project "**Soft incentives and energy consumption**"

# Digitalisation    # Steering / promotion    # Public administration    # Associations and NGOs    # Politics  
(federal government, canton, municipality)

## 4.6. Set guidelines, incentives and sanctions!



*If the framework conditions are set correctly, it will be possible to change mobility behaviour in a direction that brings about greater energy efficiency. This will not take place, however, without additional state guidelines.*

The transformative power of the sharing economy, the promises of digitalisation and the advancing technological development of vehicles and infrastructures have in recent years aroused the expectation that mobility behaviour would change to bring about sustainable and energy-efficient transport even without new state guidelines.

The research results of the NRP Energy make very clear that this expectation is an illusion. The objectives of Energy Strategy 2050 in the area of transport cannot be achieved with purely technology-based and exclusively market-driven strategies. Only a few of the new digital applications are currently used with the objective of reducing energy consumption. The logistics sector is also unlikely to gear its activities towards energy efficiency in the absence of bold interventions. Furthermore, there is the transport-generating effect of new mobility offers. Sustainable mobility behaviour therefore requires both push and pull measures.

Here, the state, in its role as financial backer and operator of the infrastructure as well as a co-orderer of services, will play a key formative role. It needs to support actively new developments and rethink existing misplaced incentives such as is the case with the taxation of air traffic. To enable it to play its key role, however, the silo mentality we have seen to date needs to be overcome. It does not make sense for policymaking in the areas of public and private transport to take place in separate administrative departments, as both forms of transport will grow together with new, digital services. The same applies to spatial, energy and



## **Energy**

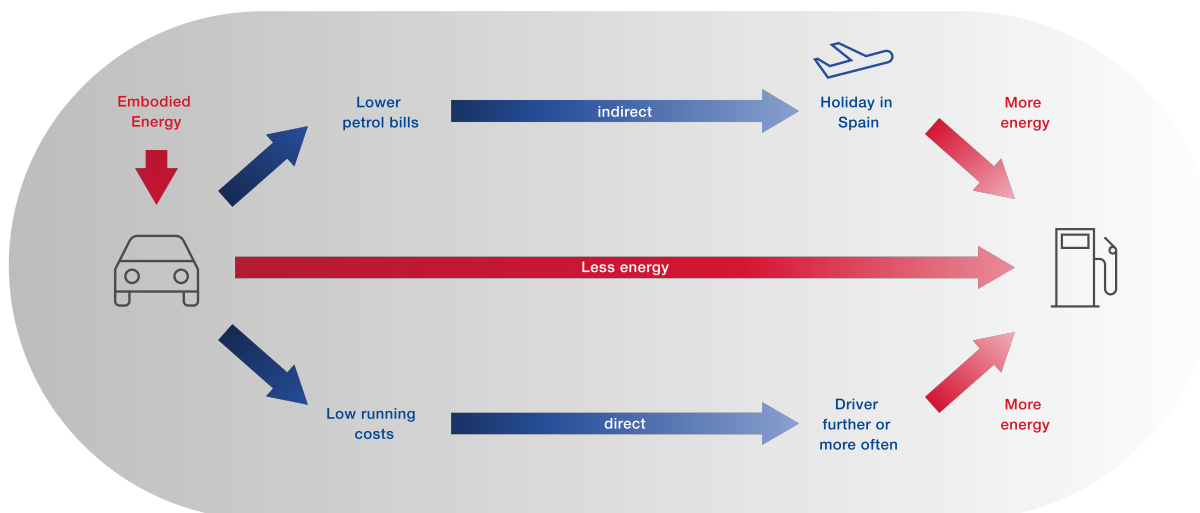
National Research Programmes 70 and 71

transport policy. These areas also need to be better linked in line with the energy strategy.

At the same time, the message of the NRP Energy is positive. With suitable political steering measures, carsharing and carpooling as well as smartphone apps can make our mobility more needs-oriented and at the same time more energy-efficient. Over the long term, urban freight logistics can also become CO<sub>2</sub>-free. And all of this will be possible without the feared major loss of prosperity.

# Guidance    # Public administration    # Associations and NGOs

## 4.7. Avoid rebound effects!



**Rebound effect - consumers** Source: Steven Sorrell: *The Rebound Effect: an assessment of the evidence for economy-wide energy savings from improved energy efficiency*; UK Energy Research Centre, London, 2007

*Savings often lead to greater consumption at different points. In the environment of mobility offers, in particular, rebound effects such as this must therefore be systematically investigated with countermeasures being taken where necessary.*

All new mobility offers entail the risk that the mileage-related energy saving may be (more than) offset by an increase in volume. In this respect, researchers talk about induced effects or, more generally, rebounds. Rebound effects occur, for example, if people purchase an especially economical car and take this as an opportunity to drive more or treat themselves to a longer flight. On balance, this thus does not lead to energy being saved, but rather greater consumption. When evaluating new offers, it is therefore necessary to investigate systematically potential rebound effects and, where required, implement countermeasures<sup>1</sup>.

New mobility service offers that are initially introduced in most cases with a view to boosting the economy should therefore be scrutinised in ever more detail with respect to their environmental impact. For evaluations such as these – for example in the case of sharing offers – it is not only direct effects that should be taken into account by pilot projects with a view to energy savings, but rather also rebound effects. Only offers that have a positive overall impact should receive state support over the long term. Here, it makes sense if institutions and cities (e.g. sharing cities) join forces at an early dissemination phase so that they can together prevent negative effects and increase the level of energy-saving potential.



## Notes and References

1 Such countermeasures can, for example, be designed as so-called “nudges”, i.e. suggested behaviour without obligation. For example: “If you travel by train today, you will save CHF 100 compared to driving. You can invest this money in a short-haul flight or purchase a concert ticket in your home city. Both are fun, but the second has greater benefits for the environment”.