



SimpliCITY Policy Recommendations

Deliverable 7.3

Project title:	SimpliCITY – Marketplace for user-centered sustainability services
Project acronym:	SimpliCITY
Project duration:	10/2018–06/2021
Project number:	870739
Work package/Task:	WP7 / T7.3
Project website:	www.simplicity-project.eu

Main author:

Guntram Geser, Salzburg Research

Contributions:

Veronika Hornung-Prähauser, Salzburg Research

Claudia Luger-Bazinger, Salzburg Research

Document versions:

Version	Date	Changes	Main author
V0.1	18.03.2021	Document structure and content outline	G. Geser (SRFG)
V0.2	14.04.2021	Thematic background sections and references	G. Geser (SRFG)
V0.3	21.05.2021	Draft recommendations	G. Geser (SRFG)
V1.0	15.06.2021	Final version	G. Geser (SRFG)

List of abbreviations:

ELTIS	European Local Transport Information Service
EPOMM	European Platform on Mobility Management
EU	European Union
GDPR	General Data Protection Regulation (EU) 2016/679
GPS	Global Positioning System
JRC	Joint Research Centre of the European Commission
OECD	Organisation for Economic Co-operation and Development
SUMP	Sustainable Urban Mobility Plan
UNECE	United Nations Economic Commission for Europe

Table of content

1	Executive Summary	4
2	Administrative Information.....	5
3	Introduction	6
4	SimpliCITY Policy Recommendations	8
4.1	City governance	10
4.1.1	Thematic background	10
4.1.2	Recommendations.....	11
4.2	Behaviour change methods.....	12
4.2.1	Thematic background	12
4.2.2	Recommendations.....	13
4.3	ICT and other services	14
4.3.1	Thematic background	14
4.3.2	Recommendations.....	15
4.4	Legal and ethical aspects.....	16
4.4.1	Thematic background	16
4.4.2	Recommendations.....	17
5	Appendix: Nudge Types and Ethics	18
6	References	21

1 Executive Summary

Cities often find that useful services they provide are being used by the citizens much less than expected. The SimpliCITY project addressed this issue with new methods for promoting the use of sustainable city services. These nudging methods are challenges, competitions and other game-like methods that encourage citizens to use the services. SimpliCITY focused on services for active mobility, local consumption and social inclusion. The main approach for engaging citizens to find and use available services was active mobility, particularly bicycling.

The SimpliCITY policy recommendations are based on a review of the literature and the project's own empirical research and experiences. The recommendations focus on the themes of city governance, behaviour change methods, digital and other services, and legal and ethical aspects. They address city policy makers, citizens, city services managers, external service providers, and researchers.

Overview of the recommendations:

City governance

Recommendations for all groups of stakeholders, particularly when considered in the development of a Sustainable Urban Mobility Plan or mobility related goals of a Smart City plan:

- Rec. 1: Embed and strengthen active mobility in city sustainable mobility policies and plans
- Rec. 2: Ensure appropriate involvement of citizens, local businesses and civil society organisation
- Rec. 3: Promote active mobility to achieve environmental targets and health benefits
- Rec. 4: Combine improvement of active mobility infrastructure with behaviour change methods

Behaviour change methods

Recommendations for city and external providers of services for behaviour change interventions:

- Rec. 5: Use behaviour change methods to promote a shift towards active mobility
- Rec. 6: Highlight positive effects of active mobility for the citizens and the community
- Rec. 7: Use behaviour change methods with a social dimension

ICT and other services

Recommendations for providers of digital services that support sustainable behaviours and other local services for urban sustainability:

- Rec. 8: Bring together on a platform available urban sustainability services
- Rec. 9: Use proven digital solutions for motivating behaviour changes
- Rec. 10: Make clear to the users who is responsible for the digital and other services

Legal and ethical aspects

Recommendations for providers of digital services that support sustainable behaviours, citizens who use such services, and researchers:

- Rec. 11: Ensure full compliance of the digital services with personal data protection regulations
- Rec. 12: Use only behaviour change methods that are acceptable in the context of public policy and services

2 Administrative Information

Basic information on the SimpliCITY project and the present deliverable:

Project title	SimpliCITY - Marketplace for user-centered sustainability services
Project coordinator	Salzburg Research Forschungsgesellschaft mbH (SRFG), Salzburg, Austria; project manager: Veronika Hornung-Prähauser
Project partners	Polycular OG, Hallein, Austria Stadt Salzburg (City of Salzburg), Austria Salzburger Institut für Raumordnung und Wohnen – SIR (Salzburg Institute for Regional Planning & Housing), Salzburg, Austria Uppsala Kommun (City of Uppsala), Sweden University of Uppsala, Sweden
Funding	JPI Urban Europe, Innovation Actions (Call: Making Cities Work) Funding is being provided by Vinnova (Sweden) for the Swedish project partners, and the Austrian Research Promotion Agency (FFG) for the Austrian project partners.
Project nr.	870739
Deliverable number	D7.3
Deliverable title	SimpliCITY Policy Recommendations
Main author	Guntram Geser, Salzburg Research
Contributions	Veronika Hornung-Prähauser, Salzburg Research Claudia Luger-Bazinger, Salzburg Research
Version & status	Version 1 - final
Date	15 June 2021

3 Introduction

City sustainable mobility challenges and the need for behavioural changes

Cities are challenged to effectively contribute to climate and environmental targets regarding CO₂ emissions, air quality, pollutants and noise from motorized vehicles while, at the same time, ensuring a balanced development and use of transport access and connectivity choices. Therefore, a core objective is to enable and encourage the necessary shift towards more sustainable mobility modes.

Cities have actively engaged stakeholder organisations and individual citizens in the development of Sustainable Urban Mobility Plans (Rupprecht Consult 2019), and citizens contributed ideas and initiatives. But the question remains if large numbers of citizens actually switch to more sustainable mobility modes such as low-carbon public transport, shared mobility approaches and active individual modes such as walking and cycling. There is still a large dominance of car use in the modal split of transport in cities and their surroundings (EPOMM 2018).

It appears that an increasing awareness of climate change, environmental and health issues alone does not motivate many citizens to adopt sustainable mobility options. This suggests that the increasing investments of cities in more sustainable transport systems and modes, including multimodal connectivity, support of personal or access to shared mobility solutions (e.g. e-bikes/scooters), need accompanying measures that effectively promote required changes of mobility preferences.

The high use of mobile devices (smartphones, tablets) and increasing familiarity of citizens with mobile applications allows ways of using digital methods to steer citizens towards adopting more sustainable mobility behaviours.

Digital nudging as a behaviour change approach

Cities that aim to achieve sustainable mobility behaviours can use different approaches – “hard” ones such as regulations as well as “soft” behavioural interventions. Effects of regulatory and infrastructural measures on mobility choices have been extensively studied (e.g. Goenka et al. 2016; Pucher & Buehler 2007; Sallis 2016). Actions addressing preferences on the demand side so far mostly inform people about negative effects of certain choices (e.g. individual car use) which could be avoided using instead environment-friendly mobility modes such as public transport, cycling or walking.

However, there is a growing awareness among urban transport managers that informational campaigns do not lead to sustained mobility changes. This is confirmed by behavioural research that has consistently shown that informational nudges are the most accepted by citizens, but also the least effective (Sunstein et al. 2018a/b).

Digital nudging has been proposed as a way to influence behaviours in different domains (Mirsch et al. 2017; Schneider et al. 2018; Weinmann et al. 2016), with concepts and experiments also in the area of urban mobility. In recent years various approaches have been designed, prototyped and trialled in this area, including informational campaigns, recommendations, challenges, games, among others (e.g. Anagnostopoulou et al. 2020; Bothos et al. 2015; Cellina et al. 2019; Di Dio et al. 2020). Trials with significant numbers of participants showed generally promising potential, including the results achieved in SimpliCITY.

The SimpliCITY project

The main objectives of the SimpliCITY project have been to raise awareness for a sustainable city lifestyle, make existing urban sustainability services better known by citizen, and increase the number of engaged citizens with nudges for using the services.

Cities often find that existing urban sustainability services they and other stakeholders provide are much less known and used by the citizens than expected. Therefore SimpliCITY built a platform that provides an online marketplace of urban sustainability services and allows cities to engage citizens in finding and using the services.

SimpliCITY focused on three areas of services, bicycling, local consumption and social inclusion.¹ The main approach for engaging citizens to find and use available services in the city was bicycling. As an active mobility mode bicycling provides many benefits including, among others, avoiding fuel consumption, CO2 emissions, air pollution and noise, while providing benefits regarding physical activity and health conditions.

The fully operational platform & app for promoting urban sustainability services allowed to trial and evaluate new methods for promoting the urban sustainability services. These are behavioural “nudging” methods such as challenges, competitions and other game-like methods that engage citizens in using the services. Nudges aim to steer people towards decisions or behaviours which are deemed preferable for the wellbeing of the individuals and society, e.g. cycling instead of using the car to improve health conditions as well as avoid environmentally negative effects.

In SimpliCITY only behaviour change methods have been used that are acceptable in the context of public policy and services. In the literature nudging is debated because methods can be used which are not transparent and exploit psychological processes with the effect that people take decisions in a non-reflected, quasi-automatic way (Hansen & Jespersen 2013; Hausman & Welch 2010; Ivanković & Engelen 2019; Sunstein 2015). In SimpliCITY none of such ethically questionable methods have been employed. The methods such as challenges or competitions are transparent regarding the aims (e.g. increase cycling of citizens instead of using the car) and means (e.g. a competition to promote that behaviour).

For engaging citizens to find and use urban sustainability services a series of themed cycling tours have been provided on the SimpliCITY mobile app, which included challenges, quizzes, etc., and a GPS-based mobility tracker. Users could collect „heartbeats“ for kilometers cycled, places visited, etc. and win a prize, e.g. a course on zero-waste cooking or urban gardening.

In a pilot carried out in Salzburg mid August–September 2020, 587 app users were registered on the SimpliCITY platform, and a total of 1493 km have been cycled (SimpliCITY 2021). To get an idea of the behaviour change potential, users were invited after a trip to indicate if they usually would have used their car or a city bus for the trip. For 324 of the 1493 km (22%) usually the car (207 km) or bus (117 km) would have been used. The demographics showed that most users of the SimpliCITY app were not students or other typical bicycle users. Indeed, only 24% of users were in the age range 14 to 25 years, while 68% in the age range 26 to 55 years, and 8% older than 55 years. Regarding the gender of the app users, around 60% were female and 40% male.

¹ The “Stadtmacherei” platform in Salzburg currently includes 116 services, <https://stadtmacherei-salzburg.at>

4 SimpliCITY Policy Recommendations

The SimpliCITY policy recommendations are based on a review of the literature and the project's own empirical research and experiences. Recommendations given by other projects have been considered, however, most of these are more generic or do not relate to digital methods for promoting behavioural changes (for example, CIVITAS SATELLITE Advisory Group Game Changers 2020: 29-33; PASTA 2017: 22-23; SaMBA 2018: 36-39; UNECE 2020: 188-189).

In the elaboration of the policy recommendations we found that it is more practical to group them under important themes rather than particular stakeholders addressed.

Main themes

The SimpliCITY recommendations are grouped under four main themes relevant for initiatives that aim to use digital methods for promoting behaviour change towards sustainable urban mobility, particularly active mobility. Related to each theme there are some topics which are important in this context.

Main themes	Related topics
<ul style="list-style-type: none"> • City governance 	<ul style="list-style-type: none"> ○ Sustainable urban mobility goals, policies and plans ○ Participation of citizens, businesses and civil society organisations ○ Sustainable mobility infrastructure and promotion of usage
<ul style="list-style-type: none"> • Behaviour change methods 	<ul style="list-style-type: none"> ○ Individual and social benefits of active mobility modes ○ Nudging as behaviour change intervention ○ Social behaviour change approach
<ul style="list-style-type: none"> • ICT and other services 	<ul style="list-style-type: none"> ○ Use of digital services for behaviour change interventions ○ Sustainable mobility and mobile applications ○ Other services for urban sustainability
<ul style="list-style-type: none"> • Legal and ethical aspects 	<ul style="list-style-type: none"> ○ Personal data protection ○ Informed consent ○ Transparent goals and means of nudging

Stakeholders addressed

The SimpliCITY recommendations are meant for five groups of stakeholders:

- City policy makers
- Citizens
- City services managers
- External service providers
- Researchers

Obviously some topics and recommendations are more important to one group of these stakeholders rather than others, while these may still be needed to carry out the activity suggested

by a recommendation. For example, while city governance is of course the realm of policy makers, the governance will not work without involving the citizens and stakeholder groups such as civil society organisations and businesses. Or, as another example, use of ICT such as a mobile app to support behaviour change will not work if citizens are not willing to use the app.

Furthermore, it is important to note the difference between city services managers and external service providers. City services managers take care for the implementation of policies set by the city government. They are part of the administrative city management acting in various roles. In recent years these also include the role of “smart city” manager, overseeing related city initiatives, often with a focus on using innovative information and communication technologies (ICTs). In this context often external providers supply the ICT solutions and services.

But there are also many other relevant services external to the city administration. The SimpliCITY marketplace of urban sustainability services indeed includes many civil society organisations and businesses which provide services related to bicycling, local consumption and social inclusion.

Structure of the recommendations

The SimpliCITY policy recommendations are structured as follows:

- The recommendations are grouped under four main themes,
- Each theme is introduced by thematic background information and literature references,
- For each theme there is a set recommendations, introduced by stating which stakeholder groups are addressed,
- A recommendation comprises of the recommendation statement (what is suggested) and a brief explanation of why the suggested activity is important, appropriate approaches or means, etc.

Regarding the topic of nudging as a behaviour change method the Appendix gives an introduction on different nudge types and ethical considerations.

4.1 City governance

4.1.1 Thematic background

Cities are challenged to effectively contribute to climate and environmental targets regarding CO₂ emissions, air quality, pollutants and noise from motorized vehicles while, at the same time, ensuring a balanced development and use of transport access and connectivity choices. Therefore, a core objective is to enable and encourage the necessary shift towards sustainable mobility modes, e.g. using bicycles instead of cars.

Reaching a higher share of cycling in the modal split of transport options used is generally understood as a good measure that a shift is taking place. Besides positive effects on the environmental and traffic situation (e.g. congestion) active mobility contributes to the health of citizens and makes the city more liveable.

This objective of increasing active mobility is often included in Sustainable Urban Mobility Plans (SUMP) which cities currently develop or are already implemented and monitored (ELTIS 2020; Kiba-Janiak & Witkowski J. 2019; Rupprecht Consult 2019). In June 2021, the ELTIS database reported 1,212 SUMPs of cities of the 27 EU Member States and the United Kingdom, although for 201 no document was accessible online.²

A SUMP is a strategic plan designed to satisfy the mobility needs of citizens and businesses in a city and its surroundings with a focus on sustainable mobility. Development of such a plan encourages cross-department coordination of city management and involvement of citizens, civil society organisation and businesses (CH4ALLENGE 2016; SHAPE-IT 2014; on involvement with digital tools see DYN@MO 2014).

With regard to cycling the plan should foresee a combination of measures, including appropriate infrastructure and services (e.g. bike lanes, safe road crossings, bicycle parking stations) as well as promotion of their usage. Improvement in infrastructure and services alone may not be sufficient to boost cycling, while behaviour change interventions in the absence of these will not be effective and questionable (e.g. regarding the safety of cyclists). Both, good cycling infrastructure and services as well as behavioural motivation are required.

Regarding the motivation to cycle more instead of using the car, initiatives can build on car drivers own dissatisfaction due to congestion, difficulty to find a parking place, etc., while cyclists are generally more satisfied with their active travel mode (Ettema et al. 2016; Willis et al. 2013). Research has also shown that many urban car journeys are shorter than five kilometres (e.g. 43% in seven cities studied by Raser et al. 2018), while cycling is often the most suitable mode for such short distance transport, i.e. holds much potential for switching to this sustainable mobility mode.

A concern that is often raised when promoting cycling is that this could lead to negative effects of air pollution and road traffic accidents suffered by cyclists. However, there is ample evidence that the health benefits of cycling greatly outweigh such risks (e.g. De Hartog et al. 2010; Mueller et al. 2015; Teschke et al. 2012). Nevertheless, cities could often do more to make streets safer for cyclists, encouraging more people to use a bicycle to commute and for leisure activities. Bicycle-friendly cities will also benefit from the “safety in numbers” effect, i.e. cycling gets safer the more people do it (CTC 2009; Jacobsen et al. 2015).

² ELTIS: City database, <https://www.eltis.org/mobility-plans/city-database>

4.1.2 Recommendations

The recommendations that follow are intended for all groups of stakeholders, particularly when considered in the development of a SUMP or mobility related goals of a Smart City plan. Obviously in the context of governance city policy makers and services managers have a leading role.

Rec. 1: Embed and strengthen active mobility in city sustainable mobility policies and plans

A city sustainable mobility plan enables the implementation and governance of policy-driven and integrated measures regarding urban transport choices. Active mobility should be embedded and play a core role in the plan, so that measures for a walkable and bicycle-friendly city are integrated with other measures to improve city transport solutions (e.g. multi-modal transport).

Rec. 2: Ensure appropriate involvement of citizens, local businesses and civil society organisation

Involve citizens, local businesses and civil society organisations in the definition and monitoring of measures for sustainable mobility, so that their needs and own contributions are considered.

Rec. 3: Promote active mobility to achieve environmental targets and health benefits

Cities should make active mobility modes such as walking and cycling an attractive choice for citizens. Active mobility contributes to achieving environmental goals (e.g. reduction of CO₂ emissions, air pollution, noise) while, at the same time, it supports public health and a liveable city. Therefore, wherever possible, active mobility modes should be prioritised in urban mobility policies and plans.

Rec. 4: Combine improvement of active mobility infrastructure with behaviour change methods

A city sustainable mobility plan should include a combination of improvements in active mobility infrastructure and services (e.g. bike lanes, safe road crossings, bicycle parking stations) as well as promotion of their usage. These should go hand-in-hand as improvement in infrastructure and services alone may not be sufficient to boost walking and cycling. Researchers with expertise in behaviour change can advise on appropriate methods to promote changes in mobility behaviour, i.e. use of a bicycle instead of the car.

4.2 Behaviour change methods

This section addresses general aspects of using behaviour change methods while use of information and communication services for such interventions (digital nudging) is covered in the next section.

4.2.1 Thematic background

In recent years use of behaviour change methods to steer citizens towards more environment-friendly and healthy behaviours has become a thriving field of research. The approach of “nudging” has also been made popular among policy makers through initiatives and reports by the World Bank (2015, 2017), the Organisation for Economic Co-operation and Development (OECD 2017), the European Commission’s Joint Research Centre (JRC 2016), the Nordic Council of Ministers (2016), and national governments and agencies.

These reports describe many examples of the nudge approach in different areas such as public health, energy and water saving, waste reduction. Regarding the area of personal transport see Mont et al. (2014: 54-61).

A common understanding among researchers and policy makers is that nudging allows to influence citizen’s behaviours with “soft” and low-cost methods instead of “hard” regulations such as laws, bans or taxes. Hard measures are often difficult to implement as these require political negotiation and overcoming resistance by affected parties, for example, when trying to restrict car use in city areas.

Instead of applying coercive measures nudging aims to influence citizens so that they change behaviours voluntarily, for example, use active mobility modes to contribute to making the city a more pleasant place to live and work and benefit regarding personal health and well-being. A report of the Netherlands Institute for Transport Policy Analysis (2018) present an excellent compilation of facts and figures on individual and social benefits of cycling.

A nudge basically is a recommendation to citizens together with information that both motivates and helps them follow the suggested behaviour, which is seen as beneficial for the wellbeing of the individuals as well as the social community. In practice a variety of nudging methods is being used, ranging from changes in the physical environment, e.g. narrowing the side-lines on a road to get drivers to slow down, to information-based methods such as enabling people to compare their energy consumption to those of others (see the overview in the Appendix).

Many behaviour change interventions focus on the individual or household-level (e.g. consumption of healthier food, household waste reduction, etc.), but motorized mobility effects the community as a whole through CO₂ emissions, air pollution and noise. Therefore behaviour change methods with a social dimension are preferable, taking into account that behaviours are often influenced by social approval and support by relatives, friends or colleagues.

The behaviour change methods favoured by SimpliCITY are online challenges, competitions and other game-like methods, which can be subsumed under the social influence methods, particularly social comparison where participants can compare their results to those of others (Abrahamse & Steg 2013; in the area of mobility Di Dio et al. 2020; Klieber et al. 2020; Pajarito & Gould 2017).

In addition to individuals this can be implemented for companies, city organisations or districts motivating citizens to do more for a liveable city, based on a sense of own responsibility and social dynamics, i.e. motivating others to participate.

4.2.2 Recommendations

The recommendations that follow are intended mainly for city and external providers of services for behaviour change interventions.

Rec. 5: Use behaviour change methods to promote a shift towards active mobility

Behaviour change methods such as nudging allow cities to influence citizen's behaviours with "soft" and low-cost methods instead of "hard" regulations such as laws, bans or taxes. Instead of applying coercive measures nudging aims to influence citizens so that they change behaviours voluntarily, for example, use active mobility modes instead of the car, thereby avoiding effects such as CO₂ emissions, air pollution and noise. A nudge basically is a recommendation to citizens together with information that both motivates and helps them follow the suggested behaviour, which is seen as beneficial for the wellbeing of the individuals as well as the community.

Rec. 6: Highlight positive effects of active mobility for the citizens and the community

Behaviour change initiatives should highlight the contributions active mobility of citizens makes to city goals regarding the environment, public health, and a liveable city in general. For example, cycling can improve the health and well-being of citizens and, at the same time, make the city a more pleasant place to live and work.

Rec. 7: Use behaviour change methods with a social dimension

Motorized mobility such as personal car use affects the community as a whole through CO₂ emissions, air pollution and noise. Therefore mobility change methods with a social dimension are preferable to methods that only address the individual or household-level. Approaches that allow social comparison, e.g. challenges, competitions and other game-like methods, can motivate individuals as well as companies, city organisations and districts to do more for a liveable city, based on a sense of own responsibility and social dynamics, i.e. motivating others to participate.

4.3 ICT and other services

This section addresses the use of information and communication services for behaviour change interventions (digital nudging) with a focus on sustainable mobility as well as other local services for urban sustainability.

4.3.1 Thematic background

The high use of mobile devices (smartphones, tablets) and increasing familiarity of citizens with mobile applications allows novel ways of using digital methods to steer citizens towards adopting more sustainable behaviours. These methods not only ease, but go beyond information and behavioural suggestions in that more effective interactive and game-like approaches can be employed. Thereby the use of a mobile information device can be coupled with a voluntary behaviour change approach and motivating activities such campaigns, challenges and competitions that make participation more appealing and engaging.

ICT services for motivating behaviour changes

Use of ICT services for digital nudging has been proposed as a way to influence behaviours in different domains (Caraban et al. 2019; Hummel & Maedche 2019; Karlsen & Andersen 2019; Meske & Potthoff 2017; Mirsch et al. 2017; Schneider et al. 2018; Weinmann et al. 2016). In recent years various digital nudging methods have also been trialled in the area of sustainable urban mobility (e.g. Anagnostopoulou et al. 2018; Andersson et al. 2018; Bothos et al. 2015; Cellina et al. 2019; Di Dio et al. 2020).

Use of digital nudging requires a platform to organise and run the activities and an app for the participants. The platform is needed for user registration and participation, i.e. receive notifications (alerts, reminders), guidance and encouragement to carry out proposed activities. Results can then be visualised to participants and compared, motivating them to do more personally, as a group or a city district.

In the area of mobility use of GPS-tracking allows to better understand citizen's mobility behaviours and make evidence-based decisions in urban transport planning focused on promoting more active mobility in the city. Beside proper use of GPS-tracking this of course requires a large number of app users (see the guidelines provided in TRACE 2018). The possibility for citizens to share information on travelled routes can provide a useful feedback channel for city service managers (e.g. on required maintenance of cycling infrastructure).

Developers of digital nudging services should take account of what citizens expect from an application aimed to support sustainable urban mobility. Meurer et al. (2019) interviewed citizens in this regard and found that they wished information on how such mobility is measured and monitored, respect for individual mobility situations and preferences, the expected scope of participation, and the sharing of responsibility between citizens and city services.

It must be noted that many digital nudging projects remained at the stage of a prototype and testing, often with only a small number of test users. Such research prototypes are of course not adequate for cities that require reliable and user-friendly solutions for regular operation.

It is advisable that the platform which supports behavioural interventions (e.g. a competition promoting cycling) is clearly separated from other information services (e.g. a city map of cycling routes) and of course physical services (e.g. the actual cycling routes). But these areas nevertheless are related as activities promoted on the platform are intended to increase the use of the services. This constellation requires being very clear regarding who is responsible for which service, e.g. city

services versus external services. This is important regarding citizen's trust in the services being provided and responsibilities such as personal data protection.

Involvement of other service providers

It is very useful to involve various service providers to create an eco-system of urban sustainability services of different city departments, civil society organisations and businesses. This enriches the digital platform and can contribute to the take-up and use of the service app. For example the SimpliCITY platform in Salzburg includes many services related to bicycling (e.g. bicycle repair shops, cargo bikes, bike couriers), local consumption (e.g. regional food, second hand shops, waste reduction and recycling), and social inclusion (e.g. civil society groups, support for families and people with impairments).

A common platform allows to increase the visibility of available urban sustainability services, promote synergies between them, and receive contributions from service providers to the operation of the platform and behaviour change campaigns. For example, some digital nudging projects involved local organisations and businesses to offer rewards to participants of urban sustainability campaigns, e.g. people who visited a service station or shop with relevant products. Such rewards can be a voucher (e.g. for a small discount) or participation in a prize draw when users have reached a certain number of active mobility points (i.e. entry into a virtual tombola). Such prizes can support sustainability goals, e.g. a course on urban gardening or zero-waste cooking as in the case of SimpliCITY.

4.3.2 Recommendations

The recommendations that follow are intended mainly for providers of digital services that support sustainable behaviours and other local services for urban sustainability.

Rec. 8: Bring together on a platform available urban sustainability services

Cities often find that available services that support sustainability goals are known and used by citizens much less than expected. One reason for this is that such services are dispersed over several city departments and no overview and central information access point is available to citizens. Therefore it is useful to bring the services together on one platform that allows to better promote their usage. Inclusion also of relevant services of local civil society organisations and businesses can create a rich eco-system of urban sustainability services.

Rec. 9: Use proven digital solutions for motivating behaviour changes

In recent years many digital solutions for motivating behaviour changes have been developed which remained at the stage of a prototype. Such prototypes are not adequate for cities. Cities should only use reliable and user-friendly solutions to organise, run and visualise the results of behaviour change activities. In the area of mobility the use of GPS-tracking can also allow cities to better understand citizen's mobility behaviours and make evidence-based decisions in urban transport planning focused on promoting more active mobility.

Rec. 10: Make clear to the users who is responsible for the digital and other services

Some city administrations wish to control any ICT service that concerns their responsibilities, i.e. implement it in-house, while others do not want to add a new system and therefore prefer to have it managed by an external provider based on a service contract. In any case it is very important making clear to the citizens who is responsible for the digital and other services.

4.4 Legal and ethical aspects

This section addresses legal requirements when using digital services that support sustainable behaviours, particularly personal data protection, and ethical aspects of behaviour change methods.

4.4.1 Thematic background

When using digital services to promote behaviour changes a major legal issue to address is the protection of personal data. In the member states of the European Union the General Data Protection Regulation (Regulation [EU] 2016/679), short GDPR, is the core legal framework in this regard. Digital platforms and apps cities or supporting external service providers use for promoting active mobility should fully comply with the rules set by the GDPR.

The regulation is quite complex, however, the main rule to follow is that users of the digital services should give informed consent regarding the use of the personal data they provide for the purposes of the services. A minimum age is necessary to give informed consent which should not be below 13 years (e.g. in Austria it is 14 years).

Users will have to register and provide personal information (e.g. e-mail address, mobile phone number, etc.) so that they can be informed about the progress of activities in which they participate; in advanced applications they will also have to agree to GPS-tracking of their mobility to fully benefit from the services.

This data should not be disclosed to third parties or, if shared with other services, provided only in anonymized form so that the identity of the citizen cannot be inferred from the data. Service providers must of course also put in place appropriate technical, organizational and procedural measures to ensure data protection and security. The ways data are being processed must be described in a Record of Processing Activities and, in case of a formal complaint, the document provided to the national Data Protection Agency.

Digital service providers should generally not collect and process any sensitive personal information as defined in Article 9 of the GDPR such as data “revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person’s sex life or sexual orientation”.

Ethical issues mainly concern the behavioural change methods digital platforms and apps may employ to nudge citizens towards sustainable mobility choices. In the literature nudging is debated because methods can be used which are not transparent and exploit psychological processes with the effect that people take decisions in a non-reflected, quasi-automatic way (Hansen & Jespersen 2013; Hausman & Welch 2010; Ivanković & Engelen 2019; Sunstein 2015).

The appropriate approach to avoid ethical concerns is to use only methods that are transparent regarding the aims (e.g. increase cycling of citizens instead of using the car) and means (e.g. a competition to promote that behaviour). More background on which methods are appropriate is given in the Appendix on nudge types and ethics.

4.4.2 Recommendations

The recommendations that follow are intended for providers of digital services that support sustainable behaviours, citizens who use such services, and researchers.

Rec. 11: Ensure full compliance of the digital services with personal data protection regulations

Digital platforms and apps cities or supporting external service providers use for promoting active mobility should fully comply with the personal data protection regulations that are in force. In the member states of the European Union the General Data Protection Regulation (Regulation [EU] 2016/679) is the core legal framework in this regard. In particular, users of the digital services will have to give informed consent regarding the use of the personal data they provide for the purposes of the services.

Rec. 12: Use only behaviour change methods that are acceptable in the context of public policy and services

Ethical issues when applying digital behaviour change methods to promote sustainable mobility can be avoided by enabling citizens to take a well-informed decision regarding the use of such methods and supporting tools. The appropriate approach for this is to use only methods that are transparent regarding the aims, e.g. a campaign aimed to increase cycling instead of using the car, and the means, e.g. a competition to promote that behaviour. Researchers and practitioners in sustainable mobility promotion should be aware of the legal and ethical requirements of appropriate digital nudging.

5 Appendix: Nudge Types and Ethics

Use of nudging in SimpliCITY

SimpliCITY explored the potential of nudges to increase the use of city services in areas such as sustainable mobility and consumption of local products. Nudges aim to steer people towards decisions and behaviours which are deemed preferable for the wellbeing of the individuals and society, for example, cycling instead of using the car to improve health conditions and avoid environmentally negative effects (e.g. CO2 emissions, air pollution and noise).

In the literature nudging is debated as potentially unethical because methods can be used that are not transparent and exploit psychological processes with the effect that people take decisions in a non-reflected, quasi-automatic way (Hansen & Jespersen 2013; Hausman & Welch 2010; Ivanković & Engelen 2019; Sunstein 2015). In SimpliCITY none of these methods have been employed. The methods used such as online challenges, competitions and other game-like methods are transparent regarding the aims and means that are being employed.

Distinguishing between different types of nudges

Nudges use different techniques to steer the decision-making of people in a particular direction or affect behaviours directly. Characteristics of these techniques provide the basis to distinguish different types of nudges and to evaluate if these are appropriate in ethical terms.

In the discussion of nudges researchers and practitioners often refer to two distinctions which characterize the techniques that are being employed:

- if the techniques address “System 1” (automatic) or “System 2” (reflective) cognitive processes, and
- if the techniques work in a Transparent or Non-transparent way.

We briefly explain the distinctions “System 1” / “System 2” and Transparent / Non-transparent, and then use a matrix of these distinctions to discuss the different types of nudges. Thereafter we explain where the methods are positioned which have been trialled in SimpliCITY to increase the use of sustainable city services.

System 1 (automatic) versus System 2 (reflective)

The two systems theory of cognitive processes has been developed by Kahneman (2003, 2011). According to this theory the human brain works in two different ways:

- “System 1”: processes information fast, uncontrolled and effortless in a quasi-automatic way,
- “System 2”: processes information slow, controlled and effortful in a reflective way.

It is assumed that people make most judgements and choices of daily life quasi-automatically, i.e. without really making a reflected conscious decision. Automatic here means based on cognitive biases, heuristics and mental shortcuts, while reflective involves following rules of logical thinking, weighing the costs and benefits of various options, or other ways to arrive at a well-considered decision.

Transparent versus Non-transparent

The distinction refers to the intention as well as the means employed in a nudge:

- *Transparent*: the intention is clear and people are made aware or can easily identify the means employed to influence their decision-making or behaviour,

- *Non-transparent*: the intention is not disclosed and the means by which a certain decision or behaviour change is pursued remain hidden.

Obviously nudges with non-transparent conditions combined with triggering System 1 (automatic) cognitive processes are highly manipulative, while addressing System 2 (reflective) transparently regarding the intention and means appears as a legitimate way of trying to persuade citizens to take a particular decision or change a behaviour.

Matrix of types of nudges

Hansen & Jespersen (2013) combined the two distinctions in a matrix that allows grouping and evaluating different types of nudges. Table 1 presents the matrix, in which we included techniques that are often used for certain types of nudges, and examples from the literature (e.g. Hansen & Jespersen 2013: 20-23; Nordic Council of Ministers 2016; Stanak & Winkler 2015).

Table 1: Matrix of types of nudges, adapted from Hansen & Jensen (2013).

	<i>System 1 (automatic)</i> <i>Nudge affects behaviour directly</i>	<i>System 2 (reflective)</i> <i>Nudge affects choice directly</i>
<i>Transparent (by design)</i>	<p>Transparent influence of behaviour</p> <p><u>Techniques:</u></p> <p>Typically in the form of a technical manipulation</p> <p><u>Examples:</u></p> <p>Car alarms for seat belts</p> <p>Provide larger household recycling than waste bins</p> <p>Change printer defaults from one-side to double-sided printing</p>	<p>Transparent facilitation of choice</p> <p><u>Techniques:</u></p> <p>Provide information, education and guidance</p> <p><u>Examples:</u></p> <p>Nutritional labelling of food products</p> <p>Information that most people pay their taxes in time (social norm)</p> <p>Comparison of own energy consumption to those of other people (social comparison)</p>
<i>Non-transparent</i>	<p>Non-transparent manipulation of behaviour</p> <p><u>Techniques:</u></p> <p>Change the environment (physical arrangements and/or objects) in which people make choices</p> <p><u>Examples:</u></p> <p>Narrow the side-lines on a road in order to get drivers to slow down</p> <p>Eliminate cues for smoking by keeping cigarettes and ashtrays out of sight</p> <p>Provide smaller plates in self-service restaurants to reduce food waste</p>	<p>Manipulation of choice</p> <p><u>Techniques:</u></p> <p>Various techniques, e.g. salience, framing, priming, default opt-in</p> <p><u>Examples:</u></p> <p>Making one option more salient than the alternative (salience)</p> <p>Framing one decision as involving a potential loss (activating people's loss aversion)</p> <p>Default opt-in, where one must actively opt-out to prevent enrolment in a programme</p>

An important general aspect is that nudges addressing “System 1” are intended to influence behaviours directly while “System 2” nudges concern decision-making.

“System 1” – *transparent nudges* typically come in the form of a technical manipulation and are warning people (e.g. car alarms for seat belts), while “System 1” – *non-transparent nudges* aim to change people’s behaviour by changing the environment of choices (e.g. re-ordering the food in a canteen so that the healthier options are presented first).

“System 2” – *transparent nudges* are clear regarding the objective and means, where the latter typically is informing people (e.g. nutritional labelling of food products). “System 2” – *non-transparent nudges* address people’s reflective system but are not fully clear about the means that are being employed to influence the decision-making (e.g. most people will not know about psychological effects of a default opt-in).

Evaluation of nudging methods employed in SimpliCITY

The nudging methods which have been used in SimpliCITY to increase the use of sustainable city services belong to the “System 2” (reflective) and transparent methods. These methods encourage people to take a well-informed decision and change behaviours, for example, through an educational campaign, labelling (e.g. nutritional information labels), or information about what others do or don’t (social norms and comparison).

“System 2” and transparent methods can facilitate deliberate, reflective and reasoned decision-making by citizens. Therefore these methods are the least debated forms of nudging and generally seen as ethically appropriate ways of trying to persuade citizens to take a particular decision and change behaviours (Hansen & Jespersen 2013; Hausman & Welch 2010; Ivanković & Engelen 2019; Lin et al. 2017). Also surveys on citizen’s opinion about different nudges show that the public supports these methods with much higher approval rates than other proposed forms of nudging (Reisch & Sunstein 2016; Sunstein et al. 2018a/b).

The methods employed by SimpliCITY are online challenges, competitions and other game-like methods which promote “System 2” processes in a transparent way regarding the aims (e.g. increase cycling of citizens instead of using the car) and means (e.g. a competition to promote that behaviour). These methods can be subsumed under the social influence methods, particularly social comparison where participants can compare their results to those of others.

Social comparison has often been used in programmes aimed to reduce home energy and water consumption (e.g. Allcott & Rogers 2014; Ashby et al. 2012; Ayres et al. 2009; Datta et al. 2017; Ferraro & Price 2011; Nolan et al. 2008; Schultz et al. 2007). In such programmes people receive consumption reports, including comparison to others in the town or neighbourhood, and tips how to consume less. The approach can yield significant reductions especially if repeated reporting leads people to gradually adapt their behaviour, e.g. develop different energy use habits, use energy-efficient lightbulbs or appliances, etc., for example in the OPOWER energy efficiency programme (Allcott & Rogers 2014; Frey & Rogers 2014).

Important differences of the SimpliCITY approach to these programmes are that the methods employed aim to *increase* citizen’s use of city services for sustainable mobility, local consumption and social inclusion, and the platform that provides the functionalities for these methods allows *dynamic presentation* of citizen’s participation online and on mobile devices.

6 References

- Abrahamse W. & Steg L. (2013): Social influence approaches to encourage resource conservation: A meta-analysis. In: *Global Environmental Change*, 23(6): 1773-85; <https://pure.rug.nl/ws/portalfiles/portal/131929578/> (2021-06-15)
- Allcott H. & Rogers T. (2014): The short-run and long-run effects of behavioral interventions: Experimental evidence from energy conservation. National Bureau of Economic Research, Working Paper 18492, January 2014, <https://www.nber.org/papers/w18492.pdf> (2021-06-15)
- Anagnostopoulou E., Bothos E., Magoutas B., Schrammel J. & Mentzas G. (2018): Persuasive technologies for sustainable mobility: state of the art and emerging trends. In: *Sustainability*, 10(7), 2128, <https://doi.org/10.3390/su10072128> (2021-06-15)
- Anagnostopoulou E., Urbančič J., Bothos E., et al. (2020): From mobility patterns to behavioural change: leveraging travel behaviour and personality profiles to nudge for sustainable transportation. In: *Journal of Intelligent Information Systems*, 54, 157-178; <https://www.researchgate.net/publication/328029343> (2021-06-15)
- Andersson A., Winslott-Hiselius L. & Emeli A. (2018): Promoting sustainable travel behaviour through the use of smartphone applications: A review and development of a conceptual model. In: *Travel Behaviour and Society*, Vol. 11, 52-61; <https://www.researchgate.net/publication/324141027> (2021-06-15)
- Ashby K., Forster H., Cenicerros B., et al. (2012): Green with Envy: Neighbor comparisons and social norms in five home energy report programs. ACEEE Summer Study on Energy Efficiency in Buildings 2012, 7-22_7-34, <https://aceee.org/files/proceedings/2012/data/papers/0193-000218.pdf> (2021-06-15)
- Ayres I., Raseman S. & Shih A. (2009): Evidence from two large field experiments that peer comparison feedback can reduce residential energy usage. National Bureau of Economic Research, Working Paper No. 15386, September 2009, <https://www.nber.org/papers/w15386> (2021-06-15)
- Bothos E., Apostolou D. & Mentzas G. (2015): Recommender systems for nudging commuters towards eco-friendly decisions. In: *Intelligent Decision Technologies*, 9(3), 295-306; <https://www.researchgate.net/publication/281788752> (2021-06-15)
- Caraban A., Karapanos E., Gonçalves D. & Campos P. (2019): 23 ways to nudge: A review of technology-mediated nudging in human-computer interaction. In: *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, Glasgow, May 2019, Paper No.: 503, <http://doi.org/10.1145/3290605.3300733> (2021-06-15)
- Cellina F., Bucher D., Mangili F., et al. (2019): A large scale, app-based behaviour change experiment persuading sustainable mobility patterns: Methods, results and lessons Learnt. In: *Sustainability*, 11(9), 2674, <http://doi.org/10.3390/su11092674> (2021-06-15)
- CH4ALLENGE (2016): Participation Manual: Actively engaging citizens and stakeholders in the development of Sustainable Urban Mobility Plans, <http://www.sump-challenges.eu/kits> (2021-06-15)
- CIVITAS ELAN (2012): Citizen Engagement in the field of mobility. Regional Environmental Center Slovenia, Ljubljana, <http://civitas.eu/content/citizen-engagement-field-mobility-civitas-elanen> (2021-06-15)

- CIVITAS SATELLITE Advisory Group Game Changers (2020): Policy Paper, http://www.rupprecht-consult.eu/uploads/tx_rupprecht/SATELLITE_Policy_Paper_Advisory_Group_Game_Changers.pdf (2021-06-15)
- CTC – The UK’s national cyclists’ organisation (2009): Safety in numbers – documents, <https://www.cyclinguk.org/campaign/safety-in-numbers> (2021-06-15)
- Datta S., Miranda J.J., Zoratto L., Calvo-González O., Darling M. & Lorenzana K. (2017): A behavioral approach to water conservation: Evidence from Costa Rica, pp. 13-29, in: Calvo-González O. & Zoratto L. (eds.): Behavioral Insights for Development. Cases from Central America. Washington: World Bank Group, <https://openknowledge.worldbank.org/handle/10986/28335> (2021-06-15)
- De Hartog J.J., Boogaard H., Nijland H. & Hoek G. (2010): Do the health benefits of cycling outweigh the risks? In: Environmental Health Perspectives, 118(8): 1109-16, <http://doi.org/10.1289/ehp.0901747> (2021-06-15)
- Di Dio S., Massa F., Nucara A., Peri G. & Schillaci D. (2020): Pursuing softer urban mobility behaviors through game-based apps. In: Heliyon, 6(5), e03930, <https://doi.org/10.1016/j.heliyon.2020.e03930> (2021-06-15)
- DYN@MO (2014): Participation 2.0 in the Sustainable Urban Mobility Planning Process – Experiences from the CIVITAS DYN@MO Project, https://civitas.eu/sites/default/files/participation_2.0_in_the_sump_process_dynamo_web.pdf (2021-06-15)
- ELTIS (2020): SUMP Online Guidelines, <https://www.eltis.org/mobility-plans/sump-online-guidelines> (2021-06-15)
- ELTIS: City database, <https://www.eltis.org/mobility-plans/city-database> (2021-06-15)
- EPOMM - European Platform on Mobility Management (2018): Mobility Management Strategy Book. Leuven, Belgium, http://www.epomm.eu/docs/EPOMM_strategy_book.pdf (2021-06-15)
- Ettema D., Friman M., Gärling T. & Olsson L.E. (2016): Travel mode use, travel mode shift and subjective well-being: Overview of theories, empirical findings and policy implications, pp. 129-150, in: Wang D. & He S. (eds.): Mobility, Sociability and Well-being of Urban Living. Springer; <https://www.researchgate.net/publication/292980904> (2021-06-15)
- Ferraro P.J. & Price M.K. (2011): Using non-pecuniary strategies to influence behavior: Evidence from a large-scale field experiment. National Bureau of Economic Research Working Paper No. 17189, July 2011, <https://www.nber.org/papers/w17189> (2021-06-15)
- Frey E. & Rogers T. (2014): Persistence: How treatment effects persist after interventions stop. In: Policy Insights from the Behavioral and Brain Sciences, 1(1): 172-179, https://scholar.harvard.edu/files/todd_rogers/files/persistence.pdf (2021-06-15)
- General Data Protection Regulation – Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC, <http://eur-lex.europa.eu/eli/reg/2016/679/oj> (2021-06-15)
- Goenka, S. & Andersen L.B. (2016): Urban Design and Transport to Promote Healthy Lives. In: The Lancet, 388 (10062), 2851-53, [https://doi.org/10.1016/S0140-6736\(16\)31580-X](https://doi.org/10.1016/S0140-6736(16)31580-X) (2021-06-15)
- Hamari J., Koivisto J. & Sarsa H. (2014): Does gamification work? A literature review of empirical studies on gamification, pp. 3025-34, in: 47th Hawaii International Conference on System Sciences (HICSS), Waikoloa, Hawaii, USA, 6-9 January 2014, <https://doi.org/10.1109/HICSS.2014.377> (2021-06-15)

- Hansen G.P. & Jespersen A.M. (2013): Nudge and the Manipulation of Choice: A Framework for the Responsible Use of the Nudge Approach to Behaviour Change in Public Policy. In: European Journal of Risk Regulation, 4(1): 3-28; <https://www.researchgate.net/publication/263087308> (2021-06-15)
- Hausman D. & Welch B. (2010): Debate: To nudge or not to nudge. In: Journal of Political Philosophy, 18(1): 123-36, <https://www.researchgate.net/publication/229562409> (2021-06-15)
- Hummel D. & Maedche A. (2019): How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies. In: Journal of Behavioral and Experimental Economics, Vol. 80, 47-58; <https://www.researchgate.net/publication/331704698> (2021-06-15)
- Ivanković V. & Engelen B. (2019): Nudging, transparency, and watchfulness. In: Social Theory and Practice, 45(1): 43-73; <https://www.researchgate.net/publication/330654355> (2021-06-15)
- Jacobsen P., Ragland D.R. & Komanoff C. (2015): Safety in numbers for walkers and bicyclists: exploring the mechanisms. In: Injury Prevention, 21(4): 217-220; https://www.onestreet.org/images/stories/Safety_in_Numbers_2015.pdf (2021-06-15)
- Jesse M. & Jannach D. (2021): Digital nudging with recommender systems: Survey and future directions. In: Computers in Human Behavior Reports, Vol. 3, 100052, <http://doi.org/10.1016/j.chbr.2020.100052> (2021-06-15)
- JRC - Joint Research Centre / Sousa Lourenco J., et al. (2016): Behavioural Insights Applied to Policy. European Report 2016. Brussels: European Commission, <http://doi.org/10.2760/903938> (2021-06-15)
- Kahneman, Daniel (2003): Maps of bounded rationality: Psychology for behavioral economics. In: American Economic Review, 93(5): 1449-75, https://scholar.princeton.edu/sites/default/files/kahneman/files/maps_bounded_rationality_d_k_2003.pdf (2021-06-15)
- Kahneman, Daniel (2011): Thinking, fast and slow. New York: Farrar, Straus & Giroux
- Karlsen R. & Andersen A. (2019): Recommendations with a nudge. In: Technologies, 7(2), 45, <https://doi.org/10.3390/technologies7020045> (2021-06-15)
- Kiba-Janiak M. & Witkowski J. (2019): Sustainable urban mobility plans: How do they work? In: Sustainability, 11(17), 4605, <https://doi.org/10.3390/su11174605> (2021-06-15)
- Klieber K., Luger-Bazinger C., Hornung-Prähauser, Geser G., et al. (2020): Nudging sustainable behaviour: Data-based nudges for smart city innovations. Paper presented at the ISPIM Innovation Conference, June 2020, Proceedings: LUT Scientific and Expertise Publications; <https://www.researchgate.net/publication/345768043> (2021-06-15)
- Lin Y., Osman M. & Ashcroft R. (2017): Nudge: Concept, effectiveness, and ethics. In: Basic and Applied Social Psychology, 39(6): 293-306; <https://www.researchgate.net/publication/320969370> (2021-06-15)
- Meske C. & Potthoff T. (2017): The DINU model - a process model for the design of nudges, pp. 2587-97, in: Proceedings of the 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, June 2017. Online available from AIS Electronic Library (AISeL), Research-in-Progress Papers, http://aisel.aisnet.org/ecis2017_rip/11 (2021-06-15)
- Meurer J., Lawo D., Pakusch C., Tolmie P. & Wulf V. (2019): Opportunities for sustainable mobility: Re-thinking eco-feedback from a citizen's perspective, pp. 102-113, in: C&T'19: Proceedings of the 9th International Conference on Communities & Technologies, Vienna, June 2019, <https://doi.org/10.1145/3328320.3328391> (2021-06-15)

- Mirsch T., Lehrer C. & Jung R. (2017): Digital nudging: Altering user behavior in digital environments, pp. 634-648, in: Leimeister J.M. & Brenner W. (Hrsg.): Proceedings der 13. Internationalen Tagung Wirtschaftsinformatik, St. Gallen, Switzerland, February 2017; <https://www.researchgate.net/publication/311706679> (2021-06-15)
- Mont O., Lehner M. & Heiskanen E. (2014): Nudging: A tool for sustainable behaviour? Swedish Environmental Protection Agency. Report 6643, December 2014, <https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6643-7.pdf?pid=14232> (2021-06-15)
- Mueller N., Rojas-Rueda D., Cole-Hunter T., De Nazelle A., et al. (2015): Health impact assessment of active transportation: a systematic review. In: Preventive Medicine, Vol. 76, 103-114; <https://www.academia.edu/13411363/> (2021-06-15)
- Netherlands Institute for Transport Policy Analysis (2018): Cycling Facts. Lucas Harms & Maarten Kansen. Ministry of Infrastructure and Water Management, The Hague, April 2018, <https://english.kimnet.nl/publications/publications/2018/04/06/cycling-facts> (2021-06-15)
- Nolan J.P., Schultz P.W., Cialdini R.B., Goldstein N.J. & Griskevicius V. (2008): Normative social influence is underdetected. In: Personality and Social Psychology Bulletin, 34(7): 913-923; <https://www.researchgate.net/publication/5305895> (2021-06-15)
- Nordic Council of Ministers / Elberg-Nielsen A.S., et al. (2016): Nudging and pro-environmental behaviour. TemaNord 2016:553, October 2016, <https://norden.diva-portal.org/smash/get/diva2:1065958/FULLTEXT01.pdf> (2021-06-15)
- OECD (2017): Behavioural Insights and Public Policy: Lessons from around the world. Paris: OECD Publishing, <http://doi.org/10.1787/9789264270480-en> (2021-06-15)
- Pajarito D. & Gould M. (2017): Smart mobility, the role of mobile games, pp. 44-59, in: Proceedings of JCSG 2017 -Joint International Conference on Serious Games, Valencia, Spain, November 2017, Springer (LNCS 10622); http://geo-c.eu/pubs/2017_PajaritoSeriousGames.pdf (2021-06-15)
- PASTA Consortium (2017): Handbook of good practice case studies for promotion of walking and cycling. PASTA Consortium, November 2017, http://www.pastaproject.eu/fileadmin/editor-upload/sitecontent/Publications/documents/20171027-PASTA_Project_-_Brochure_-_V4.pdf (2021-06-15)
- Piatkowski D. & Bopp M. (2021): Increasing Bicycling for Transportation: A Systematic Review of the Literature. In: Journal of Urban Planning and Development, Vol. 147(2); <https://www.researchgate.net/publication/350327595> (2021-06-15)
- PRESTO (2010): Cycling Policy Guide: Promotion of Cycling. Intelligent Energy Europe project, February 2010, https://ec.europa.eu/transport/sites/default/files/cycling-guidance/presto_policy_guide_promotion_of_cycling_en.pdf (2021-06-15)
- Pucher J. & Buehler R. (2007): Making cycling irresistible: Lessons from the Netherlands, Denmark and Germany. In: Transport Reviews, 28(4): 495-528; <https://www.researchgate.net/publication/228351600> (2021-06-15)
- Ranchordás, Sofia (2020): Nudging citizens through technology in smart cities. In: International Review of Law, Computers & Technology, 34(3): 254-276, <https://doi.org/10.1080/13600869.2019.1590928> (2021-06-15)
- Raser E., Gaupp-Berghausen M., Dons E., Anaya-Boig E., et al. (2018): European cyclists: travel behavior: Differences and similarities between seven European (PASTA) cities. In: Journal of Transport & Health, Vol. 9, 244-252, <https://doi.org/10.1016/j.jth.2018.02.006> (2021-06-15)

- Reisch L.A. & Sunstein C.R. (2016): Do Europeans like nudges? In: Judgment and Decision Making, 11(4): 310-325, <http://journal.sjdm.org/16/16202b/jdm16202b.pdf> (2021-06-15)
- Rupprecht Consult (ed., 2019): Guidelines for developing and implementing a Sustainable Urban Mobility Plan, 2nd edition, https://www.eltis.org/sites/default/files/sump_guidelines_2019_interactive_document_1.pdf (2021-06-15)
- Sallis J.F., Cerin E., Conway T.L., Adams M.A., et al. (2016): Physical activity in relation to urban environments in 14 cities worldwide: A cross-sectional study. In: The Lancet, Vol. 387 (10034): P2207-17, [https://doi.org/10.1016/S0140-6736\(15\)01284-2](https://doi.org/10.1016/S0140-6736(15)01284-2) (2021-06-15)
- SaMBA (2018): Behaviour change policies state of the art. SaMBA Project Report, prepared by S. Mauro and A. Musco, November 2018, <https://www.alpine-space.eu/projects/samba/pdfs/state-of-the-art-report-on-behaviour-change-policies.pdf> (2021-06-15)
- Schneider C., Weinmann M. & Vom Brocke J. (2018): Digital nudging: Guiding online user choices through interface design. In: Communications of the ACM, 61(7): 67-73, <https://doi.org/10.1145/3213765> (2021-06-15)
- Schultz W., Nolan J., Cialdini R., Goldstein N. & Griskevicius V. (2007): The constructive, destructive, and reconstructive power of social norms. In: Psychological Science, 18(5): 429-434; <http://assets.csom.umn.edu/assets/118375.pdf> (2021-06-15)
- SHAPE-IT (2014): Guidelines for Policy Makers. Policy Integration, Policy Processes and Participation in Sustainable Urban Mobility Planning. October 2014, <https://www.changing-transport.org/publication/policy-makers-guidelines-sump/> (2021-06-15)
- SimpliCITY (2021): Evaluation – Results from Pilot 1. Project deliverable 7.2, 25 January 2021, <https://www.simplicity-project.eu/research-2/> (2021-06-15)
- Stanak M. & Winkler R. (2015): Nudging – Behavioural sciences applied to the big four public health issues and health inequalities. LBI-HTA Projektbericht Nr. 83/Addendum. Wien: Ludwig Boltzmann Institut für Health Technology Assessment, http://eprints.hta.lbg.ac.at/1078/2/HTA-Projektbericht_Nr.83_Addendum.pdf (2021-06-15)
- Sunstein C.R., Reisch L.A. & Kaiser M. (2018b): Trusting nudges? Lessons from an international survey. In: Journal of European Public Policy, 26(10): 1417-43, <https://doi.org/10.1080/13501763.2018.1531912> (2021-06-15)
- Sunstein C.R., Reisch L.A. & Rauber J. (2018a): A worldwide consensus on nudging? Not quite, but almost. In: Regulation & Governance, 12(1): 3-22, <https://doi.org/10.1111/rego.12161> (2021-06-15)
- Sunstein, C.R. (2015): The ethics of nudging. In: Yale Journal on Regulation, 32(2): 413-450; <https://digitalcommons.law.yale.edu/yjreg/vol32/iss2/6> (2021-06-15)
- Teschke K., Reynolds C.C., Ries F.J, Gouge B. & Winters M. (2012): Bicycling: health risk or benefit? In: UBC Medical Journal, Vol. 3, 6-11, http://med-fom-ubcmj.sites.olt.ubc.ca/files/2015/11/ubcmj_3_2_2012_6-11.pdf (2021-06-15)
- TRACE (2018): The trace toolkit. Guidelines and recommendations on tracking walking & cycling for mobility planning and behaviour change. Project deliverable 8.6, Brussels, http://h2020-trace.eu/fileadmin/user_upload/publications/deliverables/TRACE_toolkit_final_web.pdf (2021-06-15)

- UNECE - United Nations Economic Commission for Europe (2020): A Handbook on Sustainable Urban Mobility and Spatial Planning. Promoting Active Mobility. Geneva: UNECE, <https://thepep.unece.org/sites/default/files/2020-10/Handbook%20on%20Sustainable%20Urban%20Mobility%20and%20Spatial%20Planning.pdf> (2021-06-15)
- Walk21 Foundation (2019): Promoting Mobility Behaviour Change. Practical guidance for inspiring more walking, cycling and public transport and minimising car use. Walk21 Foundation, https://ec.europa.eu/futurium/en/system/files/ged/promoting_behaviour_change.pdf (2021-06-15)
- Weinmann M., Schneider C. & Vom Brocke J. (2016): Digital Nudging. In: Business & Information Systems Engineering, 58(6): 433-436; <https://www.researchgate.net/publication/308880355> (2021-06-15)
- Willis D.P., Manaugh K. & El-Geneidy A. (2013): Uniquely satisfied: Exploring cyclist satisfaction. In: Transportation Research Part F: Traffic Psychology and Behaviour, Vol. 18, 136-147, <https://doi.org/10.1016/j.trf.2012.12.004> (2021-06-15)
- World Bank (2015): Mind, Society and Behaviour, World Development Report 2015. Washington: World Bank Group, <https://www.worldbank.org/en/publication/wdr2015> (2021-06-15)
- World Bank / Calvo-González O. & Zoratto L. (eds.) (2017): Behavioral Insights for Development. Cases from Central America. Washington: World Bank Group, <https://openknowledge.worldbank.org/handle/10986/28335> (2021-06-15)