Development of Diagnostics-Interventions Toolkit for Enabling Year-Round Active Mobility

For the planners who dare to care

Miloš N. Mladenović, PhD
Associate Professor
Spatial Planning and Transportation Engineering
School of Engineering
Aalto University

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Summary

Active mobilities are a central aspect of urgently needed sustainability transitions in urban mobility systems worldwide. Due to the sustained physical exertion which directly contributes to the specific mobility effort, and different exposure to the environmental conditions in comparison to other transport modes, active mobilities have a very important role in positively impacting human and planetary well-being.

Despite the clear and pressing need to increase the share of active mobility throughout the year, there are three major challenges that need to be overcome. First, specific groups of residents have to change their everyday mobility habits, which is influenced by changes in a range of their capabilities, opportunities and motivations. Second, in order to enable those changes, there is a need to prioritize and package effective and implementable interventions in the public space. Third, there is a need to develop planning processes, procedures and cultures that would enable cooperative and communicative decision-making across a range of urban mobility stakeholders.

With those challenges in mind, this report describes the development of Diagnostics-Interventions Toolkit for diagnosing contextualized challenges and responding to those with identifying adequate interventions. The development of this toolkit has been done in close collaboration between planning practitioners and researchers, through a series of questionnaires, interviews, site visits, and workshops, supported by research-based and professional literature scans, all integrated through soft systems methods.

The report outlines the idea of communicative planning as underpinning the toolkit development, presented alongside specific toolkit requirements based on the notions of usefulness and usability in planning support systems. In addition, the report describes the toolkit framework, presently envisioned as nine toolkit modules. Besides the framework, the report describes the role of the toolkit in relation to common planning activities and actors and the iterative approach for the toolkit use process itself. Finally, the report depicts wireframes for each of the currently envisioned modules, spanning from those focused on development of resident personas in order to understand behavioural change challenges, to modules focused on interventions packaging and organizational cultures, which relate more directly to the second and third overarching challenge mentioned above.

With an onward look, the report sets the stage for further research and development activities within this project, which will continue in close collaboration between planning practitioners and researchers, to iteratively test and refine the toolkit through specific piloting cases across the partner municipalities. Besides that, the report is potentially useful for other research and development project across the world, by opening new pathways in both systems and transdisciplinary thinking – which are essential for path breaking away from the present-day absolutely unsustainable urban mobility systems.

Acknowledgements

1. Introduction

1.1 Active mobilities and their impacts

Active mobility encompasses a range of everyday mobility modes, such as walking and cycling, but also many more (Figure 1), all happening in the public space, and in close synergy with collective and shared transport modes (ITF, 2020; ITF, 2023). All everyday mobility usually includes cognitive-affective processes, but what distinguishes active mobility is the **sustained physical exertion** with any intensity which **directly contributes** to the specific mobility effort (Cook et al., 2022). This definition would mean that modes qualifying as active include but not limited to running, skateboarding, travel by manual wheelchair, swimming, skiing, kick-scooting, cycling using a power-assisted bicycle, or roller-skating. In contrast, travelling with other modes, even if there is physical exertion (e.g., pressing a propulsion pedal), but when that exertion does not directly contribute to the mobility effort is out of scope – and here we primarily mean sedentary operation of motorized vehicles, such as private cars.
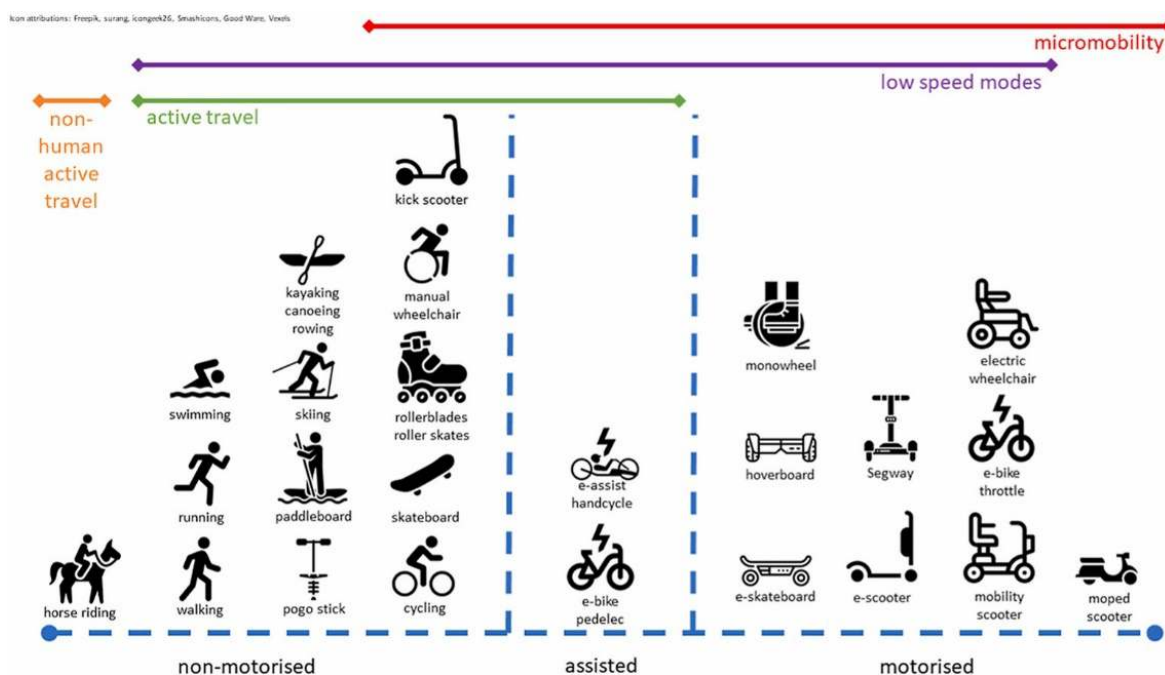
Figure 1: Taxonomy of active travel modes and related categories

This project focuses on year-round active mobilities (**YRAM**), defined here as active mobility throughout the whole year, which include autumn and winter months, during which there is usually a reduction in the modal share of different active mobilities. Taking into account the year-round perspective, and due to the very nature of active mobility that involves sustained physical exertion and associated embodied cognitive-affective processes in more direct exposure to the environment, here it is important to underling that there are direct positive impacts from active mobilities to **human wellbeing** (ITF, 2012; Kong et al.,

2024; Logan et al., 2023; Loo, 2021; Mladenović et al., 2021; OECD, 2013; Ryghaug et al., 2023; Singleton, 2019):

- Physical health impacts, such as improved cardiovascular health and overall fitness, as well as reduced risk of diabetes and joint problems.
- Mental health impacts, such as reduced risk of dementia and depression, and reduction in stress and anxiety.

Besides the direct impacts on human wellbeing, urban mobility systems with a high share of active mobility have a plethora of systemic impacts due to the direct impacts on the environment or short- and long-term change in human behaviour that causes secondary impacts on human or **planetary wellbeing** (e.g., Bagheri et al., 2020a,b; Brand et al., 2021; Buehler & Pucher, 2021; Kemarau et al., 2024; Marshall & Ferenchak, 2019; Malin et al., 2020; Ryghaug et al., 2023; Useche et al., 2019):

- The quality of the natural and built environments in which residents live, which consequently impacts their wellbeing. This includes reduction in traffic injuries and fatalities, as well as reduction in various types of pollution, such as air pollution (e.g., nitrogen oxides, carbon monoxide, particulate matter), noise-vibration pollution, light pollution, as well as water and ground pollution (e.g., oil, particulate matter, heavy metals). Moreover, beyond the immediate physical exertion and associated embodied cognitive-affective processes, there are impacts on social wellbeing, including such aspects as increased social capital, stronger social networks, as well as a higher level of social cohesion and sense of community. In contrast, this aspect includes other negative secondary impacts on human wellbeing, such as reduced urban resilience to extreme weather events, with flooding and heat island effects being key examples.
- Broader impacts on planetary wellbeing, such greenhouse gas emissions, energy use, habitat fragmentation, biodiversity and biomobility loss, ocean acidification, freshwater table disruption, and a range of biogeochemical flows – which in turn impact human wellbeing as well.

1.2 Overarching YRAM challenge 1: Enable change in the habitual urban mobility behaviour of specific resident groups

The central part of the behaviour challenge towards YRAM relates to the environmental conditions (Chapman & Larsson, 2021), which are anticipated to become worse due to the ongoing climate change (Masson et al., 2020), including **three bodily aspects** (Figure 2):

1. Reduced friction and stability in the contact with the streetscape surface, caused by such phenomena as ice formation, high snow amount, surface water accumulation and combination with other materials such as leaves and dirt.
2. Direct bodily discomfort while moving, caused by such phenomena as reduced temperature, precipitation intensity or wind conditions.

3. Reduced visibility as in seeing the environment and other users and being perceived by other users in the mobility system, caused by reduced daylight hours and overall weather conditions that reduce visibility.
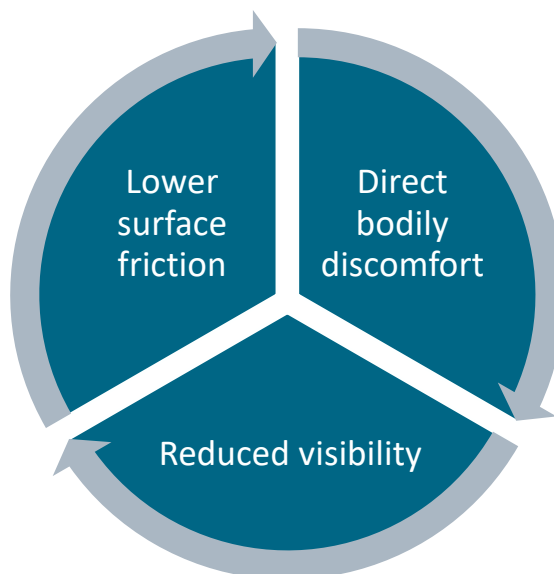
Figure 2: Three key challenges for active mobility-related sustained physical exertion in autumn and winter periods

Besides considering the above micro environmental constraints for YRAM, here it is important to understand that we are dealing with **habitual human behaviour and its change over time** (ITF, 2023; Larsen, 2017; Millonig, 2021; Mladenović et al., 2021; Mladenović et al., 2024; Pearson et al., 2023; Rahman & Savan et al., 2017; Rérat, 2019; Risser & Sucha, 2020; Rovniak & King, 2017; Sciara, 2022; Spotswood et al., 2015; Te Brömmelstroet et al., 2022; Van der Vliet et al., 2018), which is framed by the following three aspects:

- **Habits-Heuristics** > Everyday mobility is a habitual process, where learned sequence of acts have become automatic responses to specific cues, and are somewhat functional in obtaining certain goals. Habit formation is affected by repeated performances and mental associations between cue and actions that tend to minimize the cognitive effort by automatizing the everyday actions, framed by various heuristics and biases that increase our feeling of managing our surrounding, as well as diurnal rhythms in time use affected by daily activity spaces.
- **Perceptions-Experiences** > Everyday mobility habit formation is affected by the fact that humans are beings that perceive and experience their surroundings, through their senses (e.g., seeing, hearing, smell) as well as through a plethora of other embodied cognitive-affective processes, combined as affective (de)activation and (un)pleasantness (e.g., sense of fear on the icy surface, sense of engagement in the green area) or cognitive evaluation (e.g., low standard environment due to noise pollution). Thus, positive or negative mobility experiences reinforce or prevent uptake of new mobility habits.

- **Attitudes-Beliefs-Norms** > Everyday mobility habit formation is also affected by a range of cultural and social factors that affect the formation of "appropriate" habits, due to the social nature of human beings. Thus, habit formation is based on copying what "normal/significant" others are doing "rightly", such as the close ones (e.g., family, friends), the many that are considered part of the in-group, and those with power status (e.g., social media influencers).

With that in mind, the challenge of promoting YRAM spans several levels, from individual to social and environmental (Figure 3), including both aspects directly related to physics of the surroundings during autumn and winter months, but also broader challenges of human behaviour change. Thus, behavioural change requires not just broadly speaking built environment and other interventions, but also a broad change in embodied performances and social interactions within the urban mobility system.
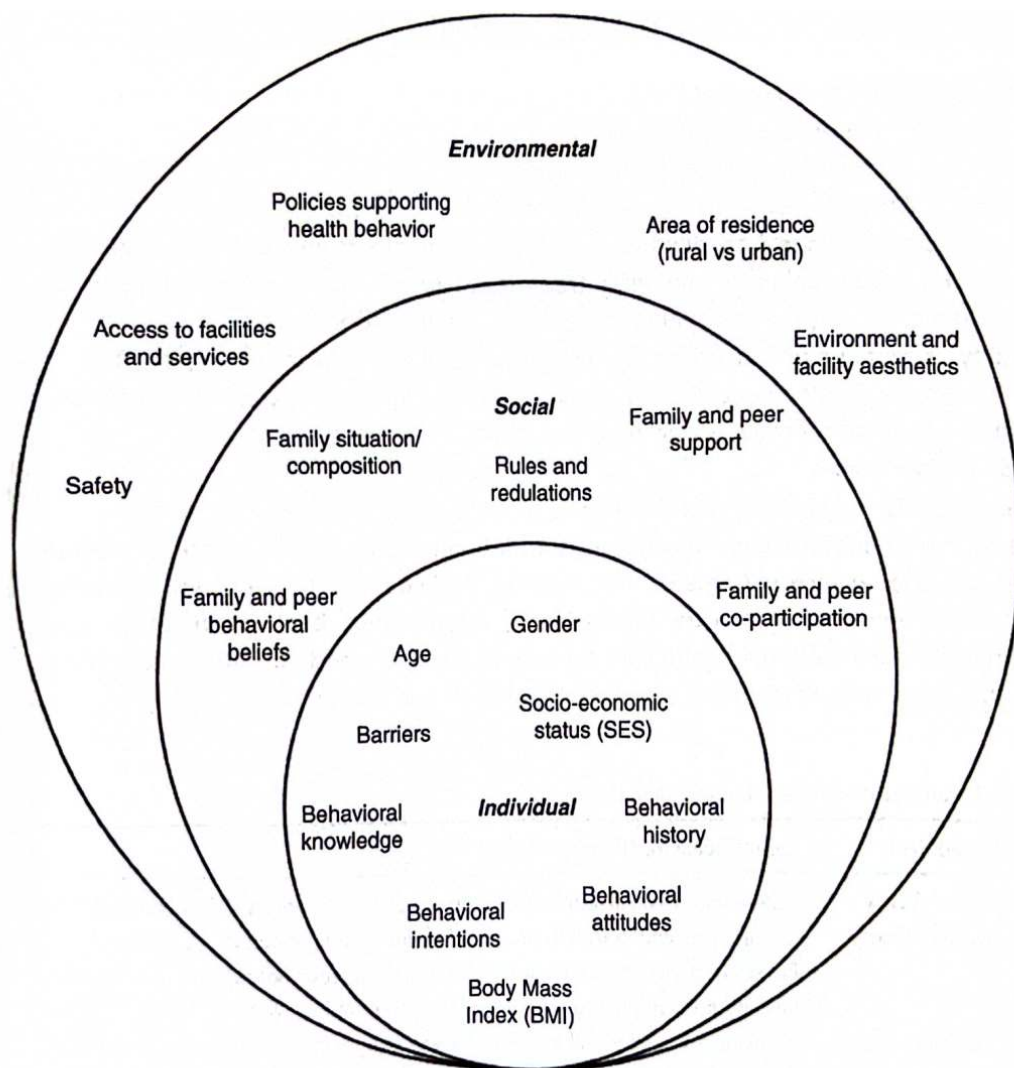
Figure 3: Nested model of human behaviour factors (Salmon et al., 2020)

Besides recognizing that human behaviour and its change spans several levels, there are two additional aspects. First, behaviour is influenced by three following dimensions: a) **capabilities** (physical and psychological), b) **motivations** (automatic and reflective) and c) **opportunities** (physical and social). This perspective on human behaviour change is referred shortly to as COM-B model in the literature (West et al., 2020). The following figure depicts a Behavioural Change Wheel, which in addition to COM-B integrates interventions functions (in red) and policy categories (in grey).
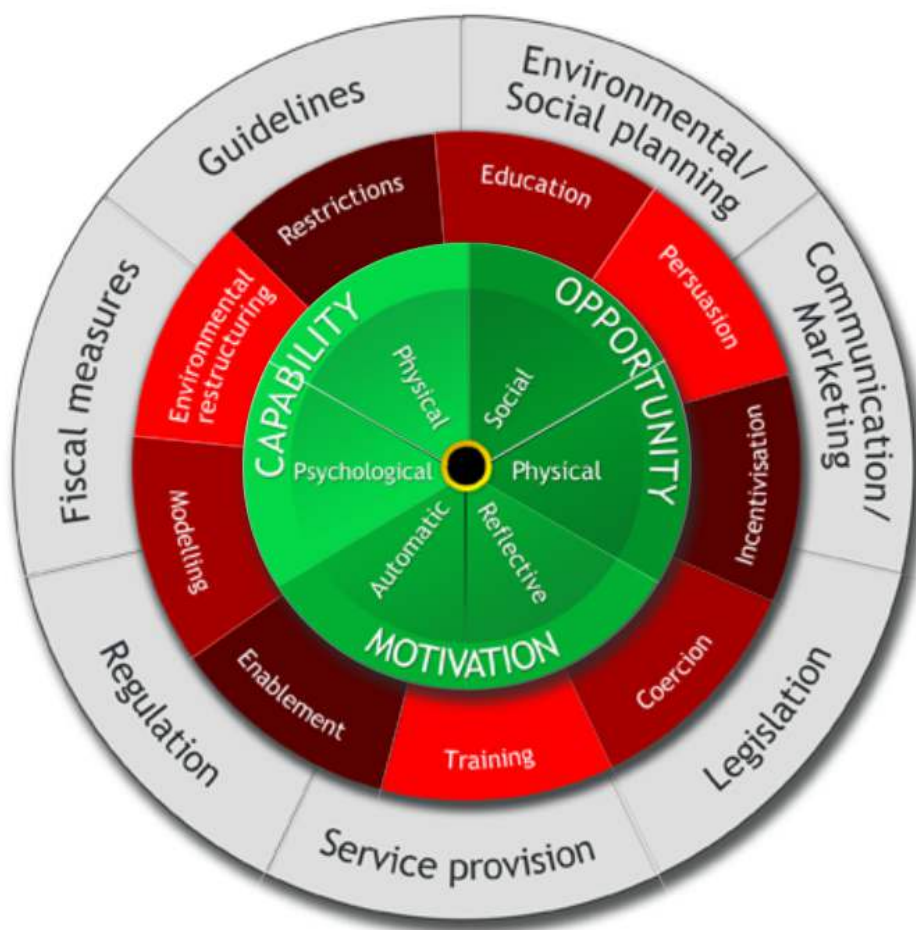
Figure 4: Behaviour change wheel (Michie et al., 2011)

Second, besides recognizing that each individual is a multi-dimensional being, it is also important to recognize differences among groups of people by also identifying those different groups (Dibaj et al., 2021; Dibaj et al., 2025; Pirinen, 2022). Segmentation or clustering of people with similar behaviour or underlying capabilities, opportunities and motivation can be explained by a concept of **persona** – a fictional yet representative character of a specific group of people in the urban mobility system (Vallet et al., 2020; Wybraniec et al., 2024). Relating this concept to communicative rationality explained below, the power of using personas in urban planning is not solely about connection to truth of what human behaviour is but rather for improving empathy and creativity within the planning-design process itself (Miaskiewicz & Kozar, 2011; So & Joo, 2017). A personas example from the UK Department for Transport's study is depicted in the following Figure 5.

Meet the **Personas**
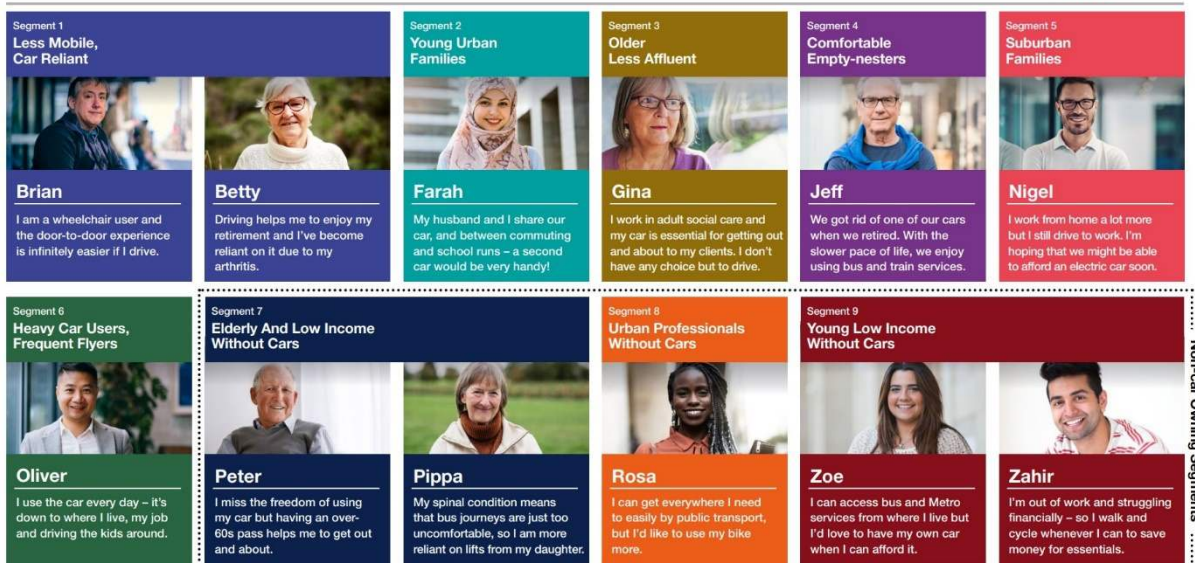
Figure 5: Transport user personas (DfT, 2023)

1.3 Overarching YRAM challenge 2: Packaging interventions to improve their effectiveness and implementability

In contrast to the above anticipated impacts from active mobility, it is important to emphasize that transformation of everyday mobility systems requires prioritization of interventions, set as Avoid-Shift-Improve (ASI) Framework (UN, 2016), in the following order of priority:

1. **Avoid** > reduce the total amount of trips and their kilometres travelled, especially those travelled with motorized transport,
2. **Shift** > switch from private motorized passenger car travel to other more sustainable modes, such as walking, cycling, and public transport, in that order of priority, and
3. **Improve** > improve efficiency of our vehicles, such as their fuel sources and energy consumption, and efficiency of traffic flows, such as operational efficiency.

Thus, active mobility is essential for both Avoid and Shift aspects of the ASI Framework (Banister, 2008). The interplay of Avoid and Shift actions requires a focus on the integrated land use and transport planning, where mixed and dense development with high quality urban design and integration with high quality public transport reduces the need for long-distance travel and promotes local access to amenities. Moreover, high quality active mobility infrastructure and promotion actions provide further support for behavioural change away from motorized travel. In line with ASI Framework, previous research informs us that there is an abundance of available planning interventions (Buehler et al., 2017; Dai & Dadashova, 2021; Glavic et al., 2016; Kelly et al., 2020; Panter et al., 2019; Pearson et al., 2023; Pucher & Buehler, 2008; Pucher et al., 2010, Roaf et al., 2024; Savan et al., 2017; Sallis et al., 2016; Schoner et al., 2015; Wang et al., 2016; Weckström & Mladenović, 2020; Winters et al.,

2017). An example of the range of actions that require integration is depicted in the following Figure 5, although it does not include maintenance activities, while another example of overarching urban planning principles is in the Figure 6.
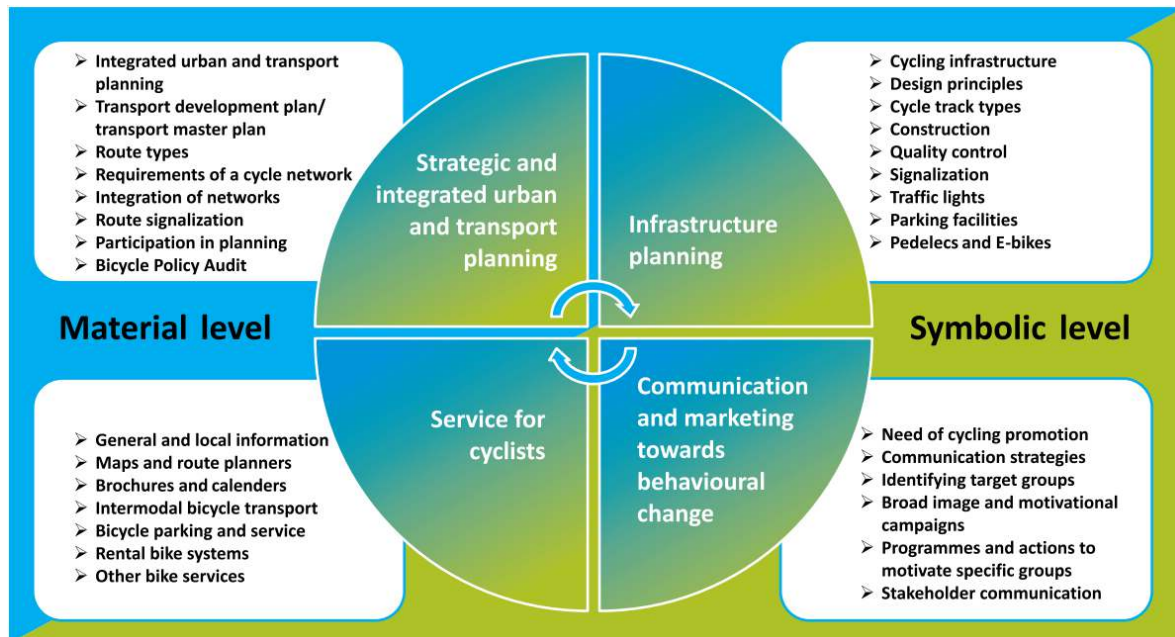
Figure 5: Different strands of cycling promotion (Deffner et al., 2012)

Figure 6: Modern city planning principles for sustainable mobility (EIT Urban Mobility, 2022)

Overall, the approach to interventions in this project follows the classification introduced by the European Cyclists Federation (ECF, 2023), as:

- **Hardware**, as in the built environment and infrastructure
- **Software**, as in regulations (e.g., infrastructure quality standards, bicycle parking in building codes), education, training, awareness-raising, fiscal and financial instruments
- **Orgware**, as in cross-departmental collaboration, allocation of responsibilities, adequate human resources, stakeholder participation, capacity building

However, just adding more and more urban mobility interventions in a non-prioritized manner is not a good approach to urban planning overall. The key question often referred to as policy design is how to achieve **effective** and **implementable** interventions (Mladenović, 2022). Effectiveness means achieving change in specific impacts or human behaviour according to specific planning goals. Implementability means overcoming various barriers for implementing an intervention, such as financial, technical, legal, administrative barriers, but also wider public and political acceptability. In order to achieve both effectiveness and implementability, the state-of-the-art approach in policy design is one of **packaging interventions** (Givoni et al., 2013; Givoni, 2014; Tight, 2016; Tønnesen et al., 2021). The following two figures below depict specific examples of packaging and packages related to cycling.
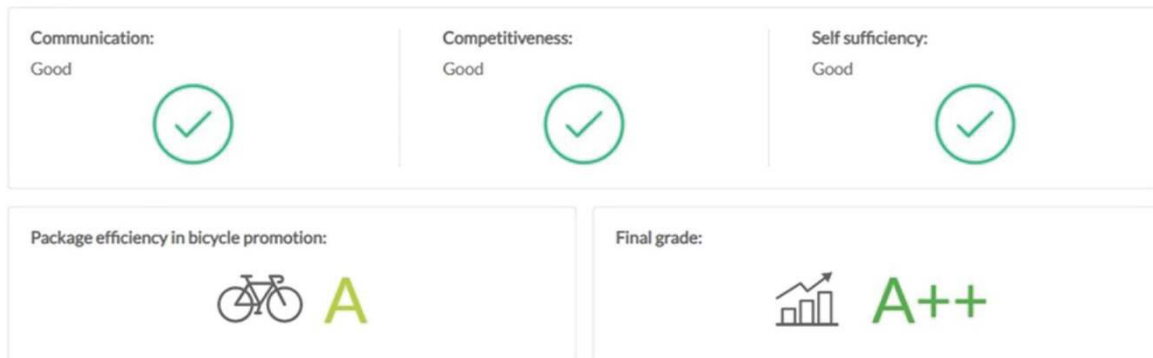
Figure 7: Cycling Measures Selector (CMS) promotors (top), measures (middle), and example of package score (bottom) (Dias et al., 2022)

Mandatory Measures

Cycling network · Safe and efficient intersections · Bicycle parking network · Information · Management, monitoring and maintenance

Complementary Measures

Package A

Connecting people and schools · Integration of bicycle in public transport · Financial incentives for cycling

Package B

Education for mobility by bicycle · Parking Pricing for vehicles · Cyclists' Support Infrastructure

Evaluation

Package A

Self-sufficiency — It must include at least one measure that goes beyond financial barriers.

Communication — It should include Measures of the type 'Attitudes and Behaviors'.

Competitiveness — Must include 'Push' Measures.

Efficiency in bicycle promotion — B

Final Grade — C

Package B

Self-sufficiency — Good

Communication — Good

Competitiveness — Good

Efficiency in bicycle promotion — B

Final Grade — A

Figure 8: Examples of measures' packages (Dias et al., 2022)

1.4 Overarching YRAM challenge 3: Development of planning processes, procedures and cultures

Appendix I contains a non-exhaustive list of documents specifically focused on active mobilities – including primarily professional documents that are readily available online. This systematic scan of the professional literature indicates that we already have a high number of guidelines and handbooks that should inform practitioners about good practices in planning, design and maintenance interventions to promote active mobilities. In contrast to the above planning and engineering activities, previous research has highlighted a plethora of broader institutional challenges in planning practice related to active mobility (Aldred et al., 2019; Alm & Koglin, 2022; Babb & Curtis, 2015; Babb et al., 2022; Bhatnagar et al., 2023; Bicalho et al., 2019; Bozovic et al., 2021; Brezina et al., 2020; Chapman et al., 2019; Chen, 2024; Cole et al., 2010; Curtis & Low, 2016; Deffner & Hefter, 2015; Dill et al., 2017; Gaffron, 2003; Glavić et al., 2019; Hudde, 2023; Koglin, 2015; Koglin & Rye, 2014; Knapskog & Rynning, 2021; McLeod et al., 2020; Mladenović et al., 2021; Patton, 2007; Pineo & Moore,

2022; Rietveld & Stough, 2005; Robartes et al., 2021; Rohrer et al., 2023; Scherer, 2023; Tuominen et al., 2022; Vigar, 2000; Wang, 2018; Wilson & Mitra, 2020). A summarized visualization of different interdependent structural factors is depicted in the Figure 9. Some of those issues key issues, also identified across the Nordic-Baltic region are:

- No explicit goals or objectives to foster YRAM within the municipal or regional strategy, or then the implementation is not monitored and enforced;
- Obsolete design guidelines and no available design practices, such as those for street design;
- Planning processes and procedures are not developed with YRAM in the focus, rather for motorized transport in the focus;
- No clear responsibility to one actor for implementation, requires coordination of many actors across organizational siloes;
- Lacking commitment to implementing a certain intervention in an adequate manner with high quality, even if such solutions are well designed;
- Limited quantitative and qualitative data collection procedures and datasets available;
- Limited evidence available within the organization of new and untested solutions, without developed organizational culture to experiment and learn;
- Not enough budgetary resource in general and dedicated to active mobility, incl. also dedicated staff responsible for active mobility;
- Single planner has limited cognitive capacity and memory so cannot keep always all the possible aspects in mind;
- Limited public involvement in understanding problems and developing solutions;
- Legal and contracting challenges for maintenance implementation and quality monitoring;
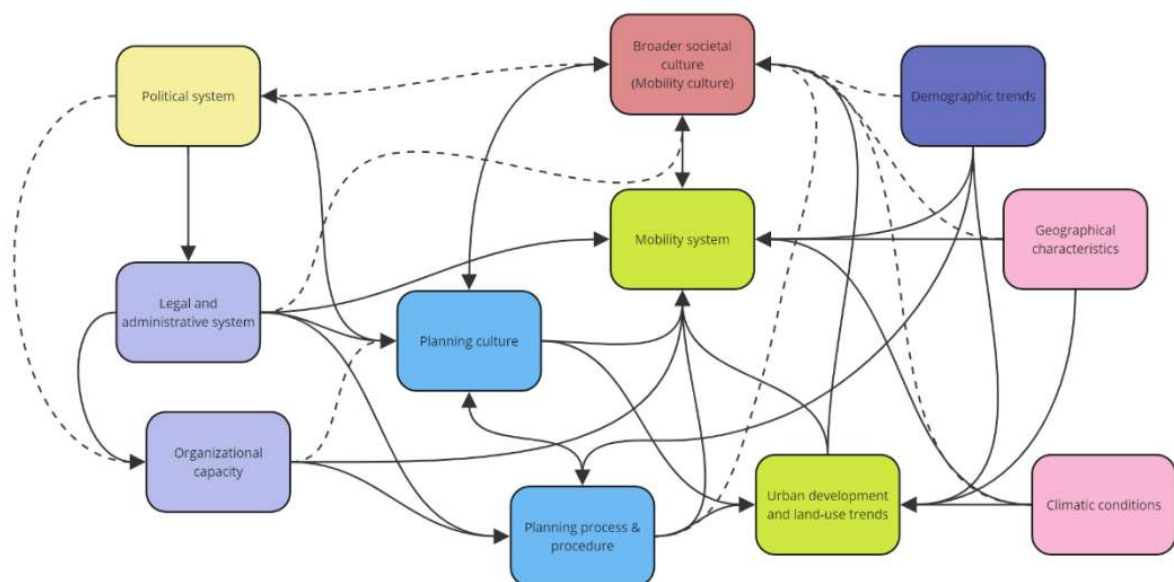

Figure 9: Structural factors affecting YRAM-related interventions (Duong, 2024)

Thus, in addition to the challenge of promoting YRAM being a problem of physics and human behaviour change, or having effective and implementable interventions, the last major component of the challenge is the fact that diagnosing problems and developing interventions is a so-called **many hands coordination problem** (Mladenović, 2024; Verma et al., 2023). This means that in practice, there is a broad range of actors needed in a planning process, not just different kinds of civil servants from different department in a municipality, but also actors from other organizations, as well as residents and political decision-makes (Eräranta & Mladenović, 2021). This governance challenge can be seen in the first two factors of the Safe Systems framework, from the following figure.

Key component	Description
1. Establish robust institutional governance	Permanent institutions are required to organise government intervention covering research, funding, legislation, regulation and licencing and to maintain a focus on delivering improved road safety as a matter of national priority.
2. Share responsibility	Those who design, build, manage and use roads and vehicles and provide post-crash care have a shared responsibility to prevent crashes resulting in serious injury or death.
3. Strengthen all pillars	When all road-safety pillars are stronger, their effects are multiplied; if one part of the system fails, road users are still protected.
4. Prevent exposure to large forces	The human body has a limited physical ability to tolerate crash forces before harm occurs; the system should prevent those limits from being exceeded.
5. Support safe road-user behaviour	While road-user errors can lead to serious harm, the Safe System focuses on roads and vehicles designed for safe interaction with road users. It supports humans *not* to make mistakes and tune their tasks as much as possible to their competencies.

Figure 10: The five key components of the Safe Systems framework (ITF, 2022)

Going beyond the process and procedure aspects, here it is important to deeper the understanding of this challenge through the concept of organizational (Schein & Schein, 2017) and governance **culture** (Olin & Mladenović, 2024). The notion of culture here is useful primarily to point towards shared underlying assumptions (Figure 11), such as how important active mobility is in the urban mobility system but also other assumptions, such as what kind of interventions a planner can imagine or talk about. As such, understanding culture helps with not just looking for the right solutions, but ultimately in reframing the problem at hand (Wedell-Wedellsborg, 2020).

Figure 11: Visualization of three-level model of organizational culture (Van Schaik, 2023)

1.4 The toolkit aims and development methodology

The following Figure 12 depicts the broad view on the full impact chain, and the position of the toolkit within that chain. As such, the toolkit has two broad aims:

- To support decisions related to the **diagnosing of behavioural change and associated planning challenges** preventing a higher level of YRAM in a specific context,
- To support decisions related to the **development of intervention packages** to address specific challenges preventing a higher level of YRAM in a specific context.
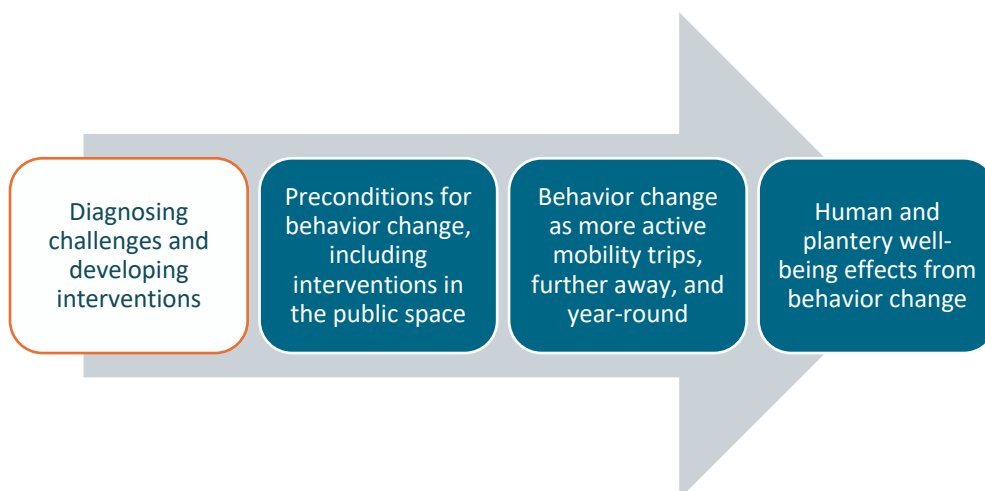
Figure 12: The toolkit impact chain

This decision-support is primarily directed towards various types of **civil servants responsible for YRAM** (e.g., urban planners, transport planners, mobility managers, transport engineers, maintenance engineers, etc.) and other associated experts in the field of everyday mobility. In addition to this diagnostics-intervention toolkit, the development in this project relates also to two other toolkits, namely **monitoring toolkit** that focuses on different types of data and analytics (e.g., quantitative or qualitative) that can be used to understand changes related to YRAM over time, and **citizen activation toolkit** that focuses on developing specific resident activation activities, such as campaigns.

The development of the toolkit so far has been based on combining several methods, all integrated using rich picture diagramming (Lewis, 1992; Bell et al., 2019), as a visual communication technique used to capture and represent complex situations, issues, or systems in a holistic and inclusive manner. Typically employed in systems thinking and problem-solving processes, a rich picture diagram provides a visual snapshot that incorporates diverse perspectives, stakeholders, and relevant elements within a given context. It goes beyond traditional linear representations by fostering a deeper understanding of the underlying dynamics. The rich picture diagramming is complemented with a set of methods, including desktop research of the academic and professional literature, site visits, questionnaires, as well as individual and group stakeholder interviews and workshops (Flick, 2022), all conducted during the first year of InterReg Baltic Sea Region BATS project. As such, this analytical-development approach encourages knowledge exchange with stakeholders, helping to uncover hidden insights, to develop a more comprehensive understanding of the complexities involved, and identify potentially innovative solutions. Overall, these interactions are based on a fundamental assumption that collaboration and co-creation between practice and academia needs continuous empathy and trust-building (Mladenović & Eräranta, 2020).

2. Toolkit Requirements

2.1 Communicative planning as a foundation

The toolkit is supposed to build upon and complement a wide array of already available guidelines and toolkits, while minimizing the amount of repeated materials, in order to add value aligned with abovementioned aims. As such, the toolkit is not supposed to replace traditional tools for surveying, analysis, or design, but rather to complement and improve them (Figure 13).
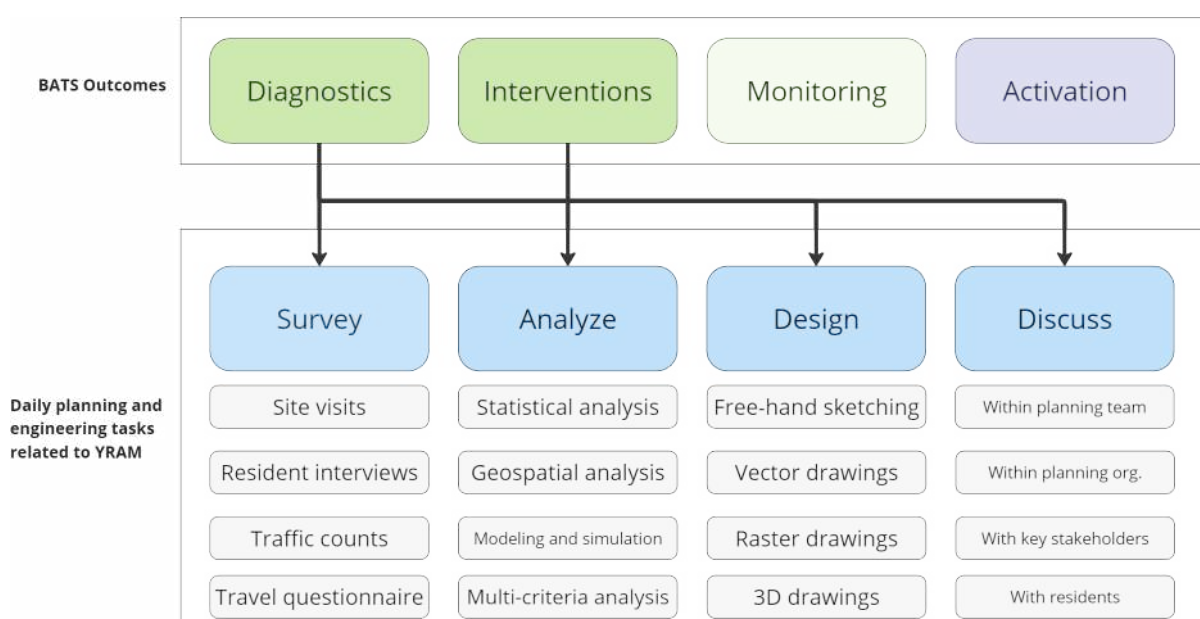
Figure 13: The relation of BATS Diagnostics-Interventions outcomes to planning and engineering tasks related to YRAM

In addition, the toolkit development is based on the well-proven quality approach to urban planning, referred to as communicative planning. Within the **communicative rationality**, in contrast to traditional instrumental rationality (Lindelöw et al., 2016), the role of the planner is to be communicative expert with technical knowledge (Vigar, 2017; Willson, 2001). Such expert plays multiple roles beyond narrowly-defined technical roles, including process design, mediation, development and dissemination of knowledge within the planning organization. The purpose of planning is not finding the best solution to a fixed and known set of ends but rather reaching an understanding that facilitates action while increasing capacity for reasoned deliberation and democratic decision-making. The process of planning is recursive and not linear, where facts, values and discovery are interlined, while the emphasis is on organizational learning and consensus building (Eräranta & Mladenović, 2021). Communicative processes are a substantial part of the planning process, where planners seek to improve the validity with which the claims are made, e.g., truthfulness, legitimacy, trust. With all that in mind, the diagnostics and interventions aspects of the

toolkit must enable various levels of communicative actions, such as those ranging from a meeting within a planning team to develop technical guidelines for a specific city, to those as public participation meeting including diverse residents. A comparison of instrumental and communicative rationality is depicted in Table 1.

Table 1: Comparison of instrumental and communicative rationality (Willson, 2001)

Issue	Instrumental Rationality	Communicative Rationality
1. Role of the planner	Expert/analyst. Often a specialist (e.g., modeling, community affairs, finance, etc.) Official role is objective, but usually plays a political role.	Communicative expert with technical knowledge and skill. Plays multiple roles--process design, activist mediation, education and technical roles. Self discloses roles.
2. Purpose of planning	Problem solving and optimization, with a rational decision-maker as the client. Finding the best solution for a fixed and known set of ends.	Reaching an understanding that facilitates action. Increasing capacity for reasoned deliberation and democratic decision-making.
3. Planning process	A sequence of linear steps (with feedback). Assumes that facts and values can be addressed separately. Action follows knowledge.	Recursive process: fact, value and discovery are interlinked. Emphasizes learning and consensus building. Is invented/modified as part of the planning activity. Action and knowledge are simultaneous.
4. Communication	Planners' communication is assumed to provide accurate representations of facts and values; has standard meaning outside of action.	Communicative processes produce meaning and linguistic "action". Planners seek to improve the validity with which claims are made, e.g., truthfulness, legitimacy and sincerity.
5. Problem framing	Problems can be defined and bounded in a single frame; problems can be broken into pieces and recombined; problems can be defined in the absence of solutions; problems can be "solved".	Multiple problem definitions and frames are acknowledged; problems are broadly bounded. Planning actively engages multiple problem frames, seeks creative redefinition.
6. Analysis/ Modeling	Reductionism, reliance on data and models as forms of inquiry. Knowledge is empirically established.	Quick-response models used along with other forms of knowing. Modeling claims are part of discourse.

2.2 Usefulness and usability in decision-support and toolkit requirements

Recognizing those structural challenges in practice listed above, and the current gaps in toolkits and guidelines, BATS toolkit development will have to follow the principles of **usefulness** and **usability** in developing decision-support tools for planning practice (Jiang et al., 2021). Here, usefulness is defined as added value, either at the individual, group, or outcome level, as depicted in the following Figure 12. Usability on the other hand focuses on more direct details of a toolkit, including such aspects as visual appeal, simple interface, easiness of access and use, etc.

Added value	Definition
Individual Learning about the object	Gaining insight into the nature of the planning object
Learning about other stakeholders	Gaining insight into the perspective of other stakeholders in planning
Group Collaboration	Interaction and cooperation among the stakeholders involved
Communication	Sharing information and knowledge among the stakeholders involved
Consensus	Agreement on problems, solutions, knowledge claims and indicators
Efficiency	The same or more tasks can be conducted with lower investments
Outcome Better informed plans or decisions	A decision or outcome is based on better information and/or a better consideration of the information

Figure 14: Usefulness in planning decision-support (Pelzer et al., 2014)

The following Table 2 visualizes the match between three key needs in planning and engineering practice identified so far (i.e., Enable behaviour change of specific user groups, Develop a package of interventions, and Develop planning processes) and the requirements for decision-support that should be developed in the toolkit.

Table 2: The match between needs and requirements for decision-support

Need in planning and engineering practice	Requirement for decision-support
Enable behaviour change of specific user groups	R1: Elaborate a specific persona for the case at hand
Enable behaviour change of specific user groups	R2: Keep track of different types of users in the mobility system
Enable behaviour change of specific user groups	R3: Understand different aspects shaping the broader mobility system
Develop a package of interventions	R4: Design the details of the intervention
Develop a package of interventions	R5: Keep track of different types of interventions
Develop a package of interventions	R6: Evaluate the intervention effectiveness and implementability
Develop a package of interventions	R7: Package interventions to improve their effectiveness and implementability
Develop planning processes, procedures, and cultures	R8: Define needed steps, actions, and actors
Develop planning processes, procedures, and cultures	R9: Elaborate underlying organizational culture aspects

3. Toolkit Framework and Process

The toolkit draft has been developed keeping in mind the above listed requirements, and in a modular form. The following Table 3 describes the match between specific requirements and the toolkit modules. In addition, the following Figure 13 depicts the current toolkit framework, with specific modules.

Table 3: Matching between requirements and toolkit modules

Requirements	Modules
R1: Elaborate a specific persona for the case at hand	1. Persona Design
R2: Keep track of different types of users in the mobility system	2. Personas Shelf
R3: Understand different aspects shaping the broader mobility system	3. Mobility System
R4: Design the details of the intervention	4. Intervention Design
R5: Keep track of different types of interventions	5. Interventions Shelf
R6: Evaluate the intervention effectiveness and implementability	6. Intervention Evaluation
R7: Package interventions to improve their effectiveness and implementability	7. Interventions Packaging
R8: Define needed steps, actions, and actors	8. Planning Process-Actors
R9: Elaborate underlying organizational culture aspects	9. Organizational Culture

The following Figure depicts the toolkit framework as a whole, with all the individual modules developed so far, including their numbering and title.

1. Personas Design	2. Personas Overview	3. System Structure
4. Intervention Design	5. Interventions Shelf	6. Interventions Evaluation
7. Interventions Packaging	8. Process Components and Actors	9. Organizational Culture

Figure 15: The toolkit framework

Figure 16 depicts an overview of a planning process with actors and activities, and the relation between the toolkit and those activities. The intention is that toolkit should be useful in various parts of the planning process, and that primary user group are key responsible planners leading specific urban and transport planning processes.
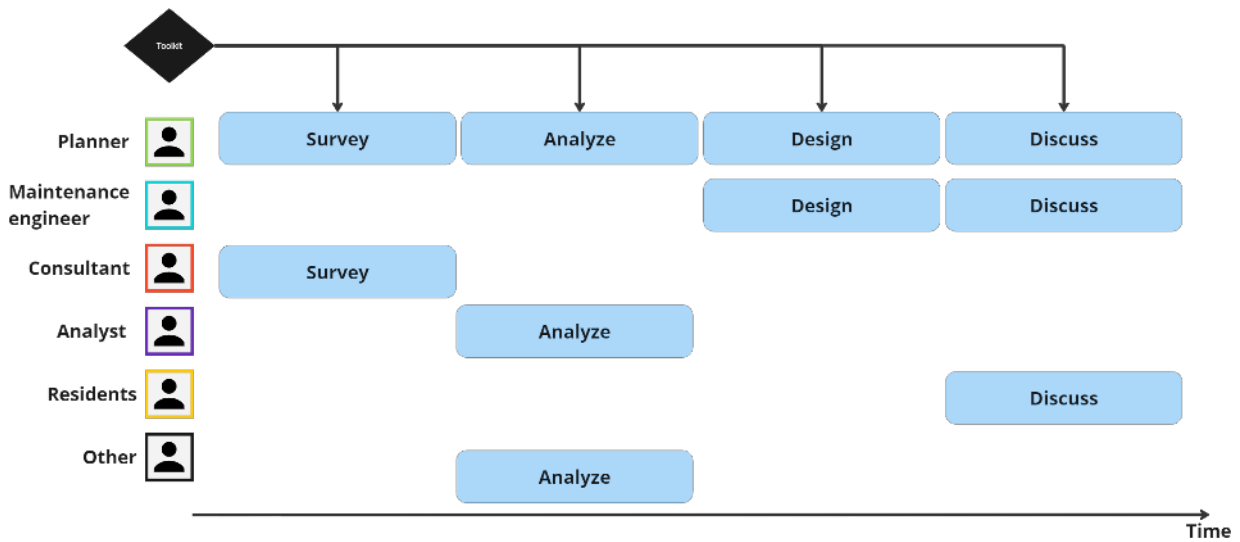
Figure 16: The use of toolkit in a planning process

Besides the relation to the overall planning processes, the following Figure 17 depicts two distinct examples of the toolkit use process, emphasizing the iterative and non-linear nature of different planning activities. On the lefthand side, the toolkit use process has started with a discussion about different types of users in the mobility system (i.e., Personas Overview), for example, triggered by media discussion about certain people feeling unsafe while walking in the winter. In that case, the toolkit use process has continued to modules one, four, five, six, seven, and eight. On the righthand side, the toolkit use process has started with a discussion about the planning process, for example, triggered by a political request to rethink the planning process by including specific missing actors. In this case, the toolkit use process has continued to modules five, four, three and nine. In addition,
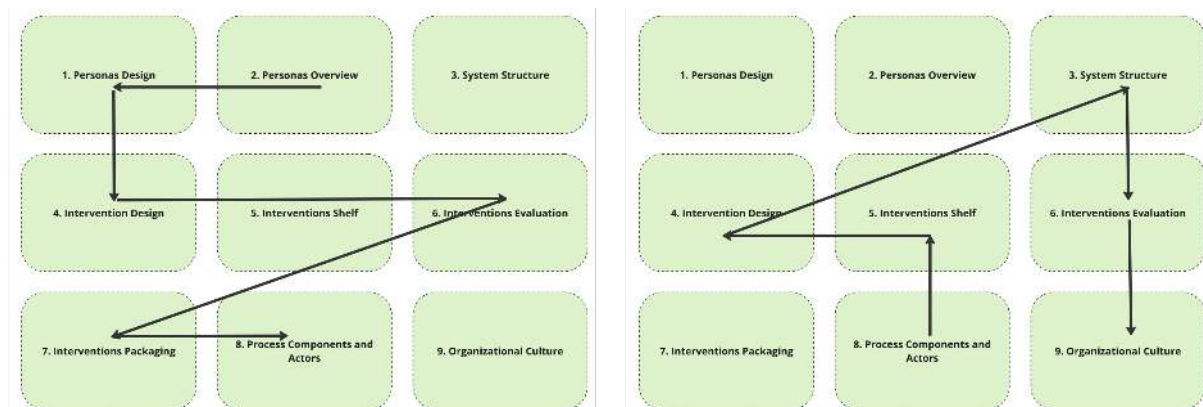
Figure 17: Two distinct examples of the toolkit use process

4. Toolkit Modules

The following part depicts the current draft of the toolkit modules with some relevant mock-up content. They are depicted as wireframes (Garrett, 2011), a straightforward visual representation of a toolkit which illustrates the layout and structure of the user interface, without focusing on design elements such as colours, images or typography. Wireframes are used in the early stages of the design process, to plan and communicate the overall structure and functionality, before more detailed work begins. Currently, the toolkit is envisioned to be in adjustable for both digital or physical format and use.

Module 1: Persona Design

Challenge addressed: Enable behaviour change of specific user groups.

Requirement: Elaborate a specific persona for the case at hand.

When to use it: In the survey or analysis phase of an urban or mobility planning project.

How to use:

1. Identify the main persona that needs a) support in maintaining the existing active mobility habits or b) support in modifying the existing mobility habits towards active ones.
2. Analysis can start with assumptions and be supplemented with real data collected through interviews or questionnaires, using digital technologies or in-person participatory techniques.
3. Identify and describe the basic background information.
4. Identify and describe existing mobility habits and experiences.
5. In relation to potential intervention, identify capabilities, opportunities, and motivations.
   - An individual must have the **capability** to change:
     - They have the physical ability to perform the desired behavior.
     - They have the psychological and technical skills required to perform the desired behavior.
   - An individual must have the **opportunity** to change:
     - A person's physical environment means that there are the services and infrastructure available to allow them to change.
     - A person's social environment means that relevant social and cultural norms support the behavior, and it is viewed as socially acceptable or desirable.
   - An individual needs to be **motivated** to change or more motivated to perform the desired behavior over their current behavior or over an alternative behavior. This is made up of:
     - an individual's perception of themselves as having the ability to carry out a particular behavior ('self-efficacy'). This is influenced by having the capability and opportunity to change.
     - an individual's attitudes towards certain behaviors (i.e., what is 'good' and 'bad') and the impact on conscious and unconscious decision making. This means people need to understand why change is relevant to them.

Image:	Name:	Gender and Age group	Family status, Income, Education, Occupation
Usual destinations and distances	**Existing everyday travel modes**	**Positive aspects of current travel experiences**	**Negative aspects of current travel experiences**
Desired intervention	**Capabilities**	**Opportunities**	**Motivations**

Module 2: Personas Overview

Challenge addressed: Enable behaviour change of specific user groups.

Requirement: Keep track of different types of users in the mobility system.

When to use it: In the survey or analysis phase of an urban or mobility planning project.

How to use:

1. Identify the main personas that are recognized in the mobility system under your purview.
2. Analysis can start with assumptions and be supplemented with real data collected through interviews or questionnaires, using digital technologies or in-person participatory techniques. It is suggested to use numerical segmentation or clustering techniques in combination with iterative qualitative relative differentiation between different personas.
3. Focus on the frequency of mode choice as part of broader mobility habits, including all the different travel modes that one persona can be already habituated to.
4. Identify differences in mode choice over the course of the year, especially focusing on darker and winter months and changes related to active mobility modes.
5. Identify specific YRAM challenges for that persona that are affecting change in mode choice between different times of the year.
6. Brainstorm about potential interventions that might be relevant for this persona, either to maintain its existing mobility habits from other parts of the year, or to introduce new mobility habits.
7. Identify a priority list of personas based on those who are most promising for targeted interventions, such as those who already have some frequency of YRAM active mobility.
8. Use the list as a continuously updating one, allowing for new personas to enter the list from other projects, and for some personas to be phased out due to validation reasons.

Persona 1	Persona 2	Persona 3	Persona 4	Persona 5	Persona 6	Persona 7
Frequency of winter cycling: None	Frequency of winter cycling: None	Frequency of winter cycling: None	Frequency of winter cycling: Low	Frequency of winter cycling: Medium	Frequency of winter cycling: Medium	Frequency of winter cycling: High
Frequency of winter walking: Low	Frequency of winter walking: Medium	Frequency of winter walking: High	Frequency of winter walking: Low	Frequency of winter walking: Low	Frequency of winter walking: Medium	Frequency of winter walking: Low
Frequency of public transport use:	Frequency of public transport use:	Frequency of public transport use:	Frequency of public transport use:	Frequency of public transport use:	Frequency of public transport use:	Frequency of public transport use:
Frequency of private car use:	Frequency of private car use:	Frequency of private car use:	Frequency of private car use:	Frequency of private car use:	Frequency of private car use:	Frequency of private car use:
Other travel modes:	Other travel modes:	Other travel modes:	Other travel modes:	Other travel modes:	Other travel modes:	Other travel modes:
YRAM Challenges:	YRAM Challenges:	YRAM Challenges:	YRAM Challenges:	YRAM Challenges:	YRAM Challenges:	YRAM Challenges:
Relevant interventions:	Relevant interventions:	Relevant interventions:	Relevant interventions:	Relevant interventions:	Relevant interventions:	Relevant interventions:

Module 3: System Structure

Challenge addressed: Enable behaviour change of specific user groups.

Requirement: Understand different aspects shaping the broader mobility system.

When to use it: In the survey or analysis phase of an urban or mobility planning project.

How to use:

1. Identify and make explicit the main aspects that affect the broader mobility system under your purview.
2. Map out the main characteristics in the following order: Geography, Climate, Urban form, Legal system, Demographics, Culture, and Politics.
3. Start with assumptions and complement with real data if available.
4. Discuss what aspects of each characteristic are a fact that is rather unchangeable.
5. Discuss what aspects of each characteristic are potentially something that can change over time.
6. Prioritize aspects that are estimated to shape the YRAM mobility habits the most for the mobility system under your purview.
7. Identify needs for further studies on some of the characteristics that are hard to assume or data is not already available about.

Aspect	Fact	Change
Geography		
Climate		
Urban Form		
Legal System		
Demographics		
Culture		
Politics		

Module 4: Intervention Design (Winter Maintenance)

Challenge addressed: Develop a package of interventions.

Requirement: Design the details of the intervention.

When to use it: In the analysis or design-planning phase of an urban or mobility planning project.

How to use:

1. Identify the main components of the intervention type you are considering as potentially relevant for the main persona in your case at hand.
2. For Winter Maintenance interventions, those components are shown in the following table, with details.
3. Break down further the intervention type into components, checking if the provided list is comprehensive enough.
4. Add further intervention details for mobility system under your purview based on expert interviews or in-house data analysis.
5. Develop new intervention detail, keeping in mind the scale for a specific intervention and the impact chain, by cross-referencing to the following end-user criteria:
   - **Cohesion:** A network that enables movement from a wide range of origin and destination points in the municipality, integrated with public transport, with consistent wayfinding, and lack of barriers.
   - **Directness:** A network that minimizes detours, but instead focuses on as direct travel lines as possible, in order to compensate for a relatively lower speed of active modes.
   - **Safety:** A network that does not cause crashes, but rather prevents them or ensure that if there are crashes that severe injuries and fatalities are avoided.
   - **Comfort:** A network that is free from bottlenecks and nuisances that might force the users to exert additional physical effort, such as slopes, uneven riding surfaces or excessive stopping.
   - **Attractiveness:** A network that is enjoyable through quality design and integration into the environment, as well as other perceived aspects, such as perceived safety.

Aspect	Details
Weather Information System	Local Regional
Road surface Information System	Visual Sensor-based
Communication systems	Paper-based Web-based
Infrastructure design	Cross-section Snow storage locations
Quality standards and monitoring	Quality classes Devices Procedures
Maintenance crew training	Routing Machine operation
Materials for maintenance	Salt Grit Abrasives
Methods for maintenance	Anti-icing De-icing Sweeping Ploughing
Planning Operations	Sector/route design and priority Fleet sizing Crew assignment and scheduling Snow logistics

Contracting	Procedures and constraints, incl. exceptions
Long-term data analytics	Expert-based analytics User feedback
Roles and responsibilities	Legal Contracting

Module 5: Interventions Shelf

Challenge addressed: Develop a package of interventions.

Requirement: Keep track of different types of interventions.

When to use it: In the analysis or design-planning phase of an urban or mobility planning project.

How to use:

1. Identify and record different potential interventions that exist or could be implemented in the mobility system under your purview.
2. Search for interventions by reading professional or academic literature, attending training or professional events, through continuous education opportunities, peer or social media networks, and other sources.
3. Categorize the intervention into one of the following types: Environmental restructuring, Education and training, Persuasion and behavioural modelling, Incentivisation, or Coercion and restriction. When categorizing the intervention, re-evaluate the definition of the category.
4. Describe as much as possible the details of the intervention that have been found.
5. Describe the assumptions for effectiveness of the intervention.
6. If possible, describe the evidence for effectiveness and implementability of the intervention.
7. Update the list of interventions on a continuous basis, using this as a repository for intervention design and evaluation.

Type	Definition	Shelf
Environmental restructuring	Constraining or promoting behaviour by shaping the physical or social environment.	• Integrated land use and transport planning • Street design • Service provision, including winter maintenance
Education and training	Increasing knowledge and understanding by informing, explaining, showing and providing feedback; Increasing the skills needed for a behaviour by repeated practice and feedback;	
Persuasion and behavioural modelling	Using words and images to change the way people feel about a behaviour to make it more or less attractive, showing examples of the behaviour for people to imitate;	
Incentivisation (incl. financial)	Changing the attractiveness of a behaviour by creating the expectation of a desired outcome or avoidance of an undesired one;	
Coercion and restriction	Changing the attractiveness of a behaviour by creating the expectation of an undesired outcome or denial of a desired one; Constraining performance of a behaviour by setting rules;	

Module 6: Intervention Evaluation

Challenge addressed: Develop a package of interventions.

Requirement: Evaluate the intervention effectiveness and implementability.

When to use it: In the analysis or design-planning phase of an urban or mobility planning project.

How to use:

1. Assume a targeted intervention that might be suitable for the key persona.
2. In a group of experts and-or residents, evaluate the effectiveness of the intervention, using the following leading questions, in a written format and assigning a numeric value.
   - **Direct effects:** How effective is the intervention in achieving the policy objective(s)? To what extent will it reach the target persona and how large an effect will it have on those who are reached?
   - **Side effects:** What are the chances that it will lead to unintended adverse or beneficial outcomes, and what could those be?
   - **Equity/fairness:** How far will the intervention increase or decrease differences between advantaged and disadvantaged segments of society?
3. In a group of experts and-or residents, evaluate the implementability of the intervention, using the following leading questions, in a written format and assigning a numeric value.
   - **Acceptability:** How much is this intervention acceptable by key stakeholders? What would need to be done to ensure public and political acceptance?
   - **Practicability:** How can the intervention be implemented within the administrative and technical context? What would need to be done to ensure that the resources and personnel were in place?
   - **Affordability:** How can the necessary budget be found for the intervention? How will it provide a good return on investment?
4. Sum the total points, to be able to later on rank different evaluations.

|	Effectiveness			Implementability		
	Direct effects (1–10 points)	Side effects (–5 – +5 points)	Equity (–5 – +5 points)	Acceptability (1–10 points)	Practicability (1–10 points)	Affordability (1–10 points)
Target Intervention:						
Effectiveness Points: Implementability Points: **Total Points:**	Points:	Points:	Points:	Points:	Points:	Points:

Module 7: Interventions Packaging

Challenge addressed: Develop a package of interventions.

Requirement: Package interventions to improve their effectiveness and implementability.

When to use it: In the design-planning phase of an urban or mobility planning project.

How to use:

1. Based on the intervention evaluation, place each intervention in the following diagram, following the relative values for effectiveness and implementability.
2. In a group of experts and-or residents, identify the most important **primary** intervention for behavioural change.
3. In a group of experts and-or residents, identify possible interventions that should be **pre-conditional**, as interventions, without the inclusion of which, one or more other interventions will not function, thus being on the critical path for action.
4. In a group of experts and-or residents, identify possible interventions that should be **synergetic**, as interventions which support or facilitate the functional ability of one or more other interventions, although these other interventions can still be implemented independently.
5. In a group of experts and-or residents, identify possible interventions that are **contradictory**, as interventions that produce conflicting outcomes or incentives, which means that they are 'at odds' with the purpose of other (primary or additional) interventions, and they need to be phased-out.
6. Define a package of interventions to be potentially implemented.

Very High

Implementability

Very Low

Effectiveness

Very High
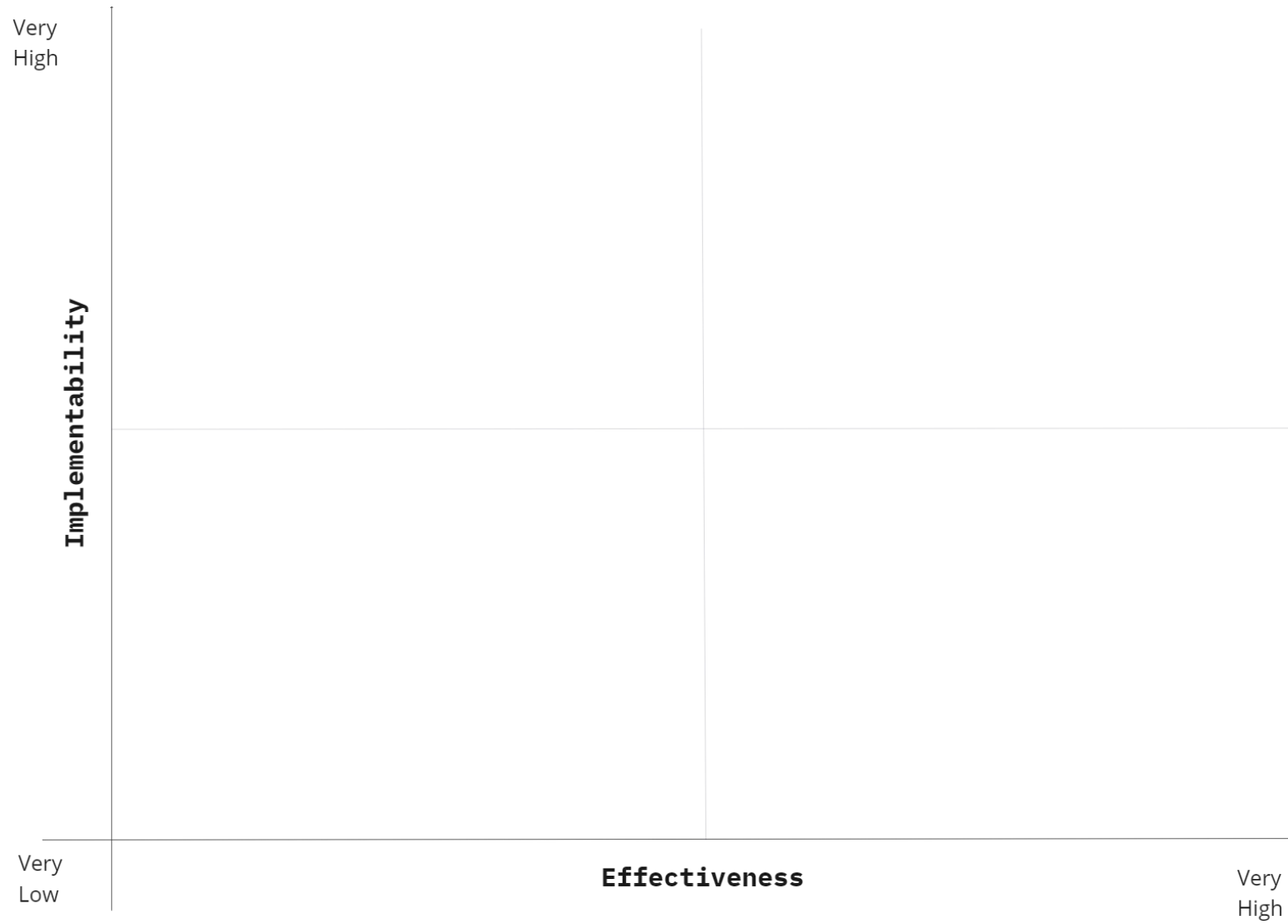
Module 8: Process Components and Actors

Challenge addressed: Develop planning processes, procedures, and cultures.

Requirement: Define needed steps, actions, and actors.

When to use it: At the beginning of an urban or mobility planning project, and at crucial change milestones.

How to use:

1. In an expert group or in discussion with residents, identify the main planning process components that are key for performing the plan making and implementation. These components should be identified at the same time when defining the key actors that are crucial for intervention implementability and effectiveness.

2. In an expert group or in discussion with residents, identify the planning process components that are important for exchanging information between different actors and stakeholders. These components should be identified at the same time when defining the important actors that are crucial for implementing the intervention.

3. In an expert group or in discussion with residents, identify the planning process components that are important for one-way informing of different actors. These components should be identified at the same time when defining the important actors that should be kept informed about the ongoing process.

4. These components and actors should be done at least ex ante and ex post the planning process, to compare and learn the lessons for future processes on what components or actors are needed at a specific point in time.

	Process Components	Actors
Performing		
Exchanging		
Informing		

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Module 9: Organizational Culture

Challenge addressed: Develop planning processes, procedures, and cultures.

Requirement: Elaborate underlying organizational culture aspects.

When to use it: At the beginning of an urban or mobility planning project, and at crucial change milestones.

How to use:

1. Conduct individual interviews within the key organizations responsible for the urban mobility system. Follow up the individual interviews with a focus group and workshop.
2. Structure the discussion about the underlying organizational culture aspects by focusing on: Attitudes, Assumptions, Beliefs, Invisible structures, Communication styles, and Soft power.
3. Keep an eye on other factors that do not easily fall into any of these categories, and revisit the categorization of the underlying organizational culture aspects.
4. Identify which factors are possible to change in the short-term for the interventions at hand, and which factors will require more strategic and long-term approach to changing.

Attitudes	Assumptions	Beliefs	Invisible structures	Communication styles	Soft power	Other

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Appendix I – A list of planning, design, and maintenance guidelines

- Getting to Smart Growth: 100 Policies for Implementation (https://www.epa.gov/smartgrowth/getting-smart-growth-100-policies-implementation#1)
- Getting to Smart Growth II: 100 More Policies for Implementation (https://www.epa.gov/smartgrowth/getting-smart-growth-100-policies-implementation#2)
- Global Street Design Guide (https://globaldesigningcities.org/publication/global-street-design-guide/)
- Designing for All Ages & Abilities (https://nacto.org/publication/urban-bikeway-design-guide/designing-ages-abilities-new/)
- How to Implement Street Transformations (https://globaldesigningcities.org/publication/how-to-implement-street-transformations/)
- Urban Street Design Guide (https://nacto.org/publication/urban-street-design-guide/)
- Streetscape Guidance (https://content.tfl.gov.uk/streetscape-guidance-2022-revision-2.pdf)
- Better Streets for Better Cities: A handbook for active street planning, design and management (https://drive.google.com/file/d/18ZN5rhQKSWhG-QK5Tdi2-63H_B5QV09J/view)
- Manual for Streets (https://assets.publishing.service.gov.uk/media/5a7e0035ed915d74e6223743/pdfmanforstreets.pdf)
- Urban Corridor Road Design: Guides, Objectives and Performance Indicators (https://www.roadspace.eu/wp-content/uploads/2019/11/MORE_D1_2_FINAL.pdf)
- Streets that Fit: Re-allocating Space for Better Cities (https://www.oecd-ilibrary.org/transport/streets-that-fit_5593d3e2-en)
- Road space re-allocation (https://morewebsite.wpenginepowered.com/wp-content/uploads/2022/04/D2.3-final.pdf)
- Slow your street (https://streetexperiments.com/wp-content/uploads/2023/03/SlowYourStreets_HowToGuide_Final-v.2.pdf)
- Cities safer by design (https://publications.wri.org/citiessafer/)
- Active Design (https://www.sportengland.org/guidance-and-support/facilities-and-planning/design-and-cost-guidance/active-design)
- Streets for Diversity (https://www.rca.ac.uk/research-innovation/research-centres/helen-hamlyn-centre/streets-for-diversity/)
- London Complete Streets Design Manual (https://london.ca/sites/default/files/2020-09/Complete%20Streets%20Design%20Manual.pdf)

- Winter Design Guidelines (https://www.edmonton.ca/public-files/assets/document?path=PDF/WinterCityDesignGuidelines_draft.pdf)
- Street design manual for Oslo (https://bicycleinfrastructuremanuals.com/manuals7/Street-Design-Manual-for-Oslo-City-of-Oslo-Agency-for-Urban-Environment_2020.pdf)
- Design Manual for Urban Roads and Streets (https://assets.gov.ie/227051/cbe57ca9-b4c8-4aae-842f-79c805cfc639.pdf)
- Designing Streets: A Policy Statement for Scotland (https://www.gov.scot/binaries/content/documents/govscot/publications/corporate-report/2010/03/designing-streets-policy-statement-scotland/documents/0096540-pdf/0096540-pdf/govscot%3Adocument/0096540.pdf)
- Tactical Urbanist's Guide to Materials and Design (https://tacticalurbanismguide.com/guides/tactical-urbanists-guide-to-materials-and-design/)
- A Tactical Urbanism Guidebook (https://sutp.org/publications/a-tactical-urbanism-guidebook/)
- Developing Strategies for Change During Street Experiments (https://ex-tra-project.eu/developing-strategies-for-change-during-street-experiments/)
- Street experiments Guidelines Kit (https://streetexperiments.com/wp-content/uploads/2022/12/SET-Guidelines-Kit_2022.pdf)
- Best European practices in promoting cycling and walking (https://research.tuni.fi/uploads/2020/11/0b5f7c8f-best_european_practices.pdf)
- Handbook of good practice case studies for promotion of walking and cycling (https://www.pastaproject.eu/fileadmin/editor-upload/sitecontent/Publications/documents/2017-PASTA-Project_Handbook_WEB_02.pdf)
- How to plan and develop a pedestrian and cycling network (https://transformative-mobility.org/multimedia/how-to-plan-and-develop-a-pedestrian-and-cycling-network/)
- Streets for walking and cycling (https://transformative-mobility.org/multimedia/streets-for-walking-and-cycling/)
- Pedestrian and Bicycle Planning: A Guide to Best Practices (http://www.vtpi.org/nmtguide.doc)
- International cycling infrastructure best practice study (https://content.tfl.gov.uk/international-cycling-infrastructure-best-practice-study.pdf)
- Cycle Infrastructure Design (https://assets.publishing.service.gov.uk/media/5ffa1f96d3bf7f65d9e35825/cycle-infrastructure-design-ltn-1-20.pdf)
- Urban Bikeway Design Guide (https://nacto.org/publication/urban-bikeway-design-guide/)
- Cycling Design Standards (https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit#on-this-page-2)
- Design manual for bicycle traffic (https://crowplatform.com/product/design-manual-for-bicycle-traffic/)

- Bicycle transport planning guide (https://pyoraliikenne.hel.fi/)
- Designing for Small Things With Wheels (https://nacto.org/publication/designing-for-small-things-with-wheels/)
- Focus on Cycling (https://kk.sites.itera.dk/apps/kk_pub2/index.asp?mode=detalje&id=1133)
- Integrated Cycling Planning Guide (https://projects2014-2020.interregeurope.eu/eucycle/library/#folder=3115)
- Geometric design parameters for cycling infrastructure (https://projects2014-2020.interregeurope.eu/eucycle/library/#folder=3485)
- Quality parameters for cycle infrastructure: At-grade uncontrolled crossings (https://www.ecf.com/system/files/Quality_parameters_crossings_0.pdf)
- Quality parameters for cycle infrastructure: Interruptions and delays (https://www.ecf.com/system/files/Quality_parameters_interruptions_delays.pdf)
- Don't give up at the intersection (https://nacto.org/publication/dont-give-up-at-the-intersection/)
- Quality parameters for cycle infrastructure: Longitudinal gradients (https://www.ecf.com/system/files/Quality_parameters_longitudinal_gradients.pdf)
- Supporting and encouraging cycling in Sustainable Urban Mobility Planning (https://urban-mobility-observatory.transport.ec.europa.eu/document/download/ea316d2f-7155-4297-b673-11a514726d53_en?filename=supporting_and_encouraging_cycling_in_sumps.pdf)
- Bicycle Library Cookbook (https://sumba.eu/sites/default/files/2022-04/SUMBA%20Bicycle%20Library%20Cookbook.pdf)
- Planning for cyclists (https://ava.vaylapilvi.fi/ava/Julkaisut/Vaylavirasto/vo_2020-18_pyoraliikenteen_suunnittelu_web.pdf)
- Guidelines for pedestrian and cycling infrastructure in Vilnius (https://vilnius.lt/wp-content/uploads/2019/08/30-3844.pdf)
- Development of strategic instruments for planning the cycling networks (https://www.b-mobil.info/fileadmin/user_upload/RAD_Masterplan_BGLD_2018.pdf)
- Making Buildings Fit for Sustainable Mobility (https://www.ecf.com/system/files/Making_Buildings_Fit_For_Sustainable_Mobility.pdf)
- Planning for Walking Toolkit (https://content.tfl.gov.uk/the-planning-for-walking-toolkit.pdf)
- Planning for pedestrians (https://ava.vaylapilvi.fi/ava/Julkaisut/Vaylavirasto/vo_2022-34_jalankulun_suunnittelu.pdf)
- Supporting and encouraging walking in Sustainable Urban Mobility Planning (https://urban-mobility-observatory.transport.ec.europa.eu/document/download/6c00c382-42a9-4cd8-9327-

33c0cfbbc345_en?filename=supporting_and_encouraging_walking_in_sumps.pdf)

- Winter Maintenance Handbook (https://www.theihe.org/wp-content/uploads/2019/03/Winter-maintenance-IHE-handbook-FINAL.pdf)
- Best Practice in Winter Maintenance (https://www.cnfpt.fr/sites/default/files/best_practices_in_winter_maintenance_ifme_final_v21.pdf)
- Maintenance Fit (https://navico.fi/wp-content/uploads/2024/01/KunnossapitoKuntoon_loppuraportti_01_2024.pdf)