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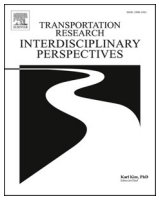

Towards sustainable mobility – Transformative scenarios for 2034

Katariina Kiviluoto [a,*], Petri Tapio [a], Anu Tuominen [b], Jari Lyytimäki [d], Ira Ahokas [a], Jonne Silonsaari [c], Tim Schwanen [e]

[a] Finland Futures Research Centre, University of Turku, Rehtorinpellonkatu 3, 20500 Turku, Finland
[b] VTT Technical Research Centre of Finland Ltd., Tekniikantie 21, 02150 Espoo, Finland
[c] Research Centre for Health Promotion, University of Jyväskylä, Keskussairaalankatu 4, 40600 Jyväskylä, Finland
[d] Finnish Environment Institute, Latokartanonkaari 11, 00790 Helsinki, Finland
[e] Transport Studies Unit, University of Oxford, South Parks Road, Oxford OX1 3QY, United Kingdom

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ABSTRACT

Increasing the share of walking and cycling is one of the building blocks of sustainable mobility transformation. Fundamental changes are needed in society and urban structure to support the integration of walking and cycling into everyday routines. We conducted an online Delphi study with 30 walking and cycling experts during the first wave of the COVID-19 pandemic in Finland in the spring of 2020. The aim was to explore transport experts' views on the future and derive scenarios of walking and cycling with the broader context of the urban mobility system. The scenarios were created using a combination of cluster analysis and qualitative content analysis. In addition, a methodological elaboration of the Disaggregative Delphi analysis was introduced, systematising the analysis of qualitative data. The analysis resulted in five scenarios depicting walking and cycling in 2034: 1. Business as Usual Plus, 2. The Demise of Bus-Transport, 3. The Era of Soft Modes, 4. Public Transport Serving All, and 5. Car-dependent Lifestyles Persist. The scenario set can be used as a basis for strategic transport planning and policy as well as a more practical tool for identifying measures for walking and cycling promotion in urban areas.

Towards sustainable mobility

Increasing the share of sustainable transport modes, such as walking and cycling, is one of the building blocks of sustainable mobility transformation. Fundamental changes are needed in the society and urban structure to support the integration of walking and cycling into everyday routines (Pooley et al., 2011). Transforming mobility systems is essentially a question of combining various interventions ranging from transport planning to technological innovations and engineering to behaviour change (see e.g. Banister 2008, Geels 2012, Tuominen et al. 2014, Wangel et al. 2013, Stephenson et al. 2018, Harms et al 2016). This requires a new way of thinking and a strong vision (Loo & Banister 2016; Levels 2020). The concept of transition pathway is particularly useful in understanding the complexities of sustainability transformations, as described by Geels and Schot (2007) and further developed by, for example, Marletto (2014) for transport scenarios, Foxon (2013) for energy, Turnheim et al. (2015) for sustainability transitions and Rosenbloom (2017) for low-carbon transitions. The elaboration provided by Rosenbloom (2017) uses the concept of pathways as a bridging element between biophysical, techno-economic and socio-technical pathways to underline the complex and multifaceted nature of transformation. Rosenbloom (2017) emphasizes the need to appreciate plurality instead of a "fusion of perspectives". The need to embrace plural pathways resonates with the concept of alternative future scenarios (Amara 1981; Owens 1995; Banister & Hickman 2013; Vähäkari et al. 2020). As human decisions - both conscious and unconscious – influence which of the scenarios eventually become reality, multiple scenarios and their prerequisites should be outlined.

Our study contributes to outlining a relevant set of scenarios from expert and stakeholder views on sustainable mobility, focusing on the shares of cycling and walking in the context of other modes in Finland. We use the Disaggregative Delphi approach to gather and analyse the various scenarios (see Tapio 2003, Varho & Tapio 2013). According to Melander (2018), earlier Delphi- based transport scenarios have focused on logistics, sustainable mobility, future technologies and environmental issues such as CO_2 emissions. Although frequently used in

* Corresponding author.
E-mail addresses: katariina.kiviluoto@utu.fi, katariina.kiviluoto@turkuamk.fi (K. Kiviluoto).

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transport research (see e.g., Kluge et al. 2020, Jittrapirom et al. 2020), Delphi approaches have not been used often in research on walking and cycling (but see Tolley et al. 2001; Pikora et al. 2003; Spickermann et al. 2014; Young et al. 2014; Huertas-Delgado et al. 2019; Adam et al. 2020). Delphi-based scenarios depicting sustainable mobility have addressed visions for urban mobility in Norway (Julsrud & Priya Uteng 2015) and expert opinions on what deep policy-based interventions for sustainable mobility could entail (Stephenson et al. 2018). This research responds to calls by Stephenson et al. (2018) that integrated efforts are needed to transform the entire mobility system and Julsrud & Priya Uteng (2015) calling for an understanding of the way scenarios may be connected to worldviews of the future.

We put forward the following research questions: RQ1: What kind of scenarios of walking and cycling can be derived from transport experts' views of the future in the context of the overall urban mobility system in Finland for the period 2016–2034? RQ2: What barriers and drivers do experts see in current efforts to encourage sustainable mobility transitions? The empirical material was gathered during the early stages of the COVID-19 pandemic, which is reflected in the results. In the light of declined public transport volumes during the COVID-19 pandemic, more research is needed especially on behavioural responses related to public transport to increase the overall preparedness of transport officials and planners for future extraordinary circumstances (see e.g. Gkiotsalitis & Cats 2021; Abdullah et al., 2021). However, understanding behaviour or lay-persons' intentions need to be complemented with awareness and expert views of alternative futures.

The future timeline was selected based on governmental policy of attaining carbon neutrality by mid-2030′s, adjusted a little to provide a linear timescale in relation to the background data interval of the Finnish National Travel Survey (NTS) of six years.

Walking and cycling in the case country Finland

Saidla (2018) describes the capital of Finland, Helsinki, as an international forerunner in active transport. The first National Strategy for Walking and Cycling (2011) and related Action Plan (2012) were launched in Finland around a decade ago, followed by the Walking and Cycling Promotion Programme (MinTC 2018). The current programme aims to improve the conditions for walking and cycling in Finnish municipalities, to support the reduction of greenhouse gas emissions from transport and promote public health by presenting ten key action areas. The ambitious target of the programme is a 30 % increase in the number of walking and cycling trips by 2030 (compared to 2018 levels). The target is in line with the National Energy and Climate Strategy (2016). The 30 % increase would mean a 35–38 % modal share for walking and cycling.

According to a survey into Finnish municipalities, a quarter of them had a cycling promotion programme or strategy in 2018 (Turunen 2019). Cycling promotion programmes have advanced cycling-related policy decisions, human resources, and cycling investments in municipalities. A working group on cycling had been established in 22 % of Finnish municipalities. User surveys on cycling conditions were conducted by a quarter, and cycling volumes and modal share were monitored by one-fifth of the municipalities. 52 % of the respondents considered that cycling volumes had remained the same or increased compared to the situation in 2010. The highest increase could be identified in the six largest cities with more than 150 000 inhabitants. Municipalities considered high-quality, well-connected, and well-maintained cycling networks along with cycling safety as key issues in developing cycling conditions (Turunen 2019).

Municipalities and regional authorities have been the actors primarily responsible for funding and implementing walking and cycling measures. In addition, the national government has funded around 110 local walking and cycling projects through a national mobility management programme, a walking and cycling programme with government grants during the years 2010–2019 (FTA, 2018b). The government also increased funding for cycling by a factor of ten in 2020 (FG, 2019). The local projects have been important initiators for local walking and especially cycling promotion and actor collaboration. Many shared city bikes have received financial support and, around the time when our research material was gathered, operated in 19 cities in Finland (Kerkelä 2019). The programme highlights that promoting walking and cycling requires not only creating new pedestrian and cycling routes but also influencing public opinion and raising the quality level of existing route networks, urban form, and service networks.

According to the national consumer survey on cycling performed in 2018, 13 % of Finns (all age groups) used the bicycle around the year, 64 % during the snow-free period, and only 23 % did not cycle at all. The main reasons for using bicycles were the ease of travel, positive health impacts as well as recreation and sports. Shorter distances to the workplace, shops and services, better cycling infrastructure and parking facilities, owning a better bicycle and possibility to transport large items and groceries with bicycle docks were mentioned as factors that could increase respondents' cycling. Recent literature states that cycling infrastructure has a considerable impact on the cycling volumes in municipalities (Vaismaa 2014, Nielsen & Skov-Petersen 2018, Hong et al., 2019, Félix et al. 2020). High-quality main routes from residential areas to centres and working place areas seem of special importance. Of the Finnish cities, Oulu, in the northern part of the country, Joensuu in the east, and the capital city of Helsinki in the south have been the most active in improving cycling conditions. Although knowledge of cycling has increased significantly in Finland, walking is less investigated and monitored. Studies on the stakeholder views on the future of both 'soft modes', cycling and walking, are almost non-existing.

Table 1 compares Helsinki with some major cities in Europe in terms of modal split. The shares of walking (11 %) and cycling (32 %) are relatively high, but forerunner cities such as Amsterdam or Copenhagen are still ahead.

Research approach

The Delphi method

Expert opinions were gathered with the Delphi method. Linstone and Turoff (1975) describe the Delphi method as a structured means for gathering expert opinions on complex issues in a collective process. Traditionally, Delphi has been seen as a relevant method for seeking consensus on the probable future (Helmer 1967, Hsu and Sandford, 2007), but it is less often used for scenario building. In non-consensus-oriented Policy Delphi (see Turoff 2002) variants, such as Disaggregative Delphi (Author 2003) and the Dissensus Delphi (Steinert 2009), expert views are grouped into alternative future scenarios instead of aiming at a unified view of the future. Scenarios are depictions of plausible alternative futures (Bishop et al. 2007) and while they do not predict the future, they indicate what might happen, if we follow a certain path of actions (see Tuominen et al. 2014).

Anonymity, iterative expert rounds and feedback are key characteristics of the Delphi method (Kuusi et al., 2006). Anonymity is seen to counteract shortcomings of conventional group interactions by minimising group pressure and the influence of dominant individuals, thus giving more room for plurality. Also, confidentiality and anonymity may reduce tendency to conform to professional norms, and encourage experts to convey opinions more freely (Hsu and Sandford 2007; Kuusi et al. 2006; Tapio 2003).

Special attention should be devoted to the composition of the expert panel (Tapio 2003; Hsu and Sandford 2007; Varho & Tapio 2013). An appropriate panel should include diverse expertise to ensure the potential for multiple viewpoints (Linstone and Turoff 1975; Kuusi 1999). Kuusi (1999:181-182) argues that the expertise of a Delphi panellist should be seen as multi-dimensional: a person may be an expert even without formal expertise in a given field if they represent a relevant stakeholder group. Varho and Tapio (2013) call for an expanded view on

Table 1
Modal share of trips and passenger kilometres in some Northern European capital cities.

Country	Capital	Population	Year	Cycling		Walking		Public transport		Car	
				Modal share of trips %	Passenger km/day	Modal share of trips %	Passenger km/day	Modal share of trips %	Passenger km/day	Modal share of trips %	Passenger km/ day
Denmark*		5 806 000	2019	14.5	1.3	18.7	0.8	7.4	3.5	59.3	32.4
	Copenhagen	1 334 000	2019	2.2	2.6	23.7	1.1	14.9	5.3	36.2	20.5
Finland**		5 487 000	2016	8	2	22	2	8	8	59	59
	Helsinki	648 000	2018	10	1.2	34	1.2	31	7.9	25	11.7
Germany***		82 790 000	2018	12.6	1	21.3	1	11.1	8	54.4	28
	Berlin	3 613 000	2018	18	++	30	++	27	++	26	++
Sweden****		10 230 000	2019	12.8	0.67	14.6	0.38	18.6	8.8	51.6	24.2
	Stockholm'	2 334 000	2019	10	0.64	28	1.3	35	12.2	25	19.6
The UK *****		67 000 000	2019	2.0	0.24	26.0	0.9	10.0	5.04	61.0	22.1
	London	9 177 000	2019	2	++	25.0	++	36.0	++	35.0	++

*) Center for Transport Analytics, 2021a & Center for Transport Analytics, 2021b); **) FTA (2018a), HSL (2019); ***) Karlsruher Institut für Technologie (2020); Technische Universität Dresden (2020); ****) Trafik analys (2020), Region Stockholm (2020); ')Stockholm metropolitan region. *****); Department for Transport (2020); Transport for London (2020), ++) N/A.

expertise: understanding and solving complex issues requires a wide range of expertise in areas not traditionally linked with a certain education. Following Varho and Tapio (2013), we considered experts as knowledge-sharing informants with unique sets of worldviews governed by their personal views and those acquired in a professional setting. By guaranteeing anonymity via an online platform, we aimed to support the free expression of opinions on the future of transport modes.

According to Hsu and Sandford (2007) and Jones et al. (2020), little formal guidance exists on how to select the experts. Bias is seen as one of the major pitfalls in selecting the panellists (Tapio 2003). The expertise matrix, first developed by Kuusi et al. (2006), utilises a simple grid where the Delphi panellists are listed according to a set of competencies and interests, as well as socio-demographic factors (such as gender, age, educational background, occupation). The matrix ensures that adequate coverage is achieved. Furthermore, the matrix quickly reveals if there are any gaps in relevant expertise or socio-demographic factors (Varho and Tapio 2013).

In this study, the Delphi panel was selected with the aim to gather expert opinions from a wide range of perspectives related to passenger transport, especially walking and cycling, as well as health and climate

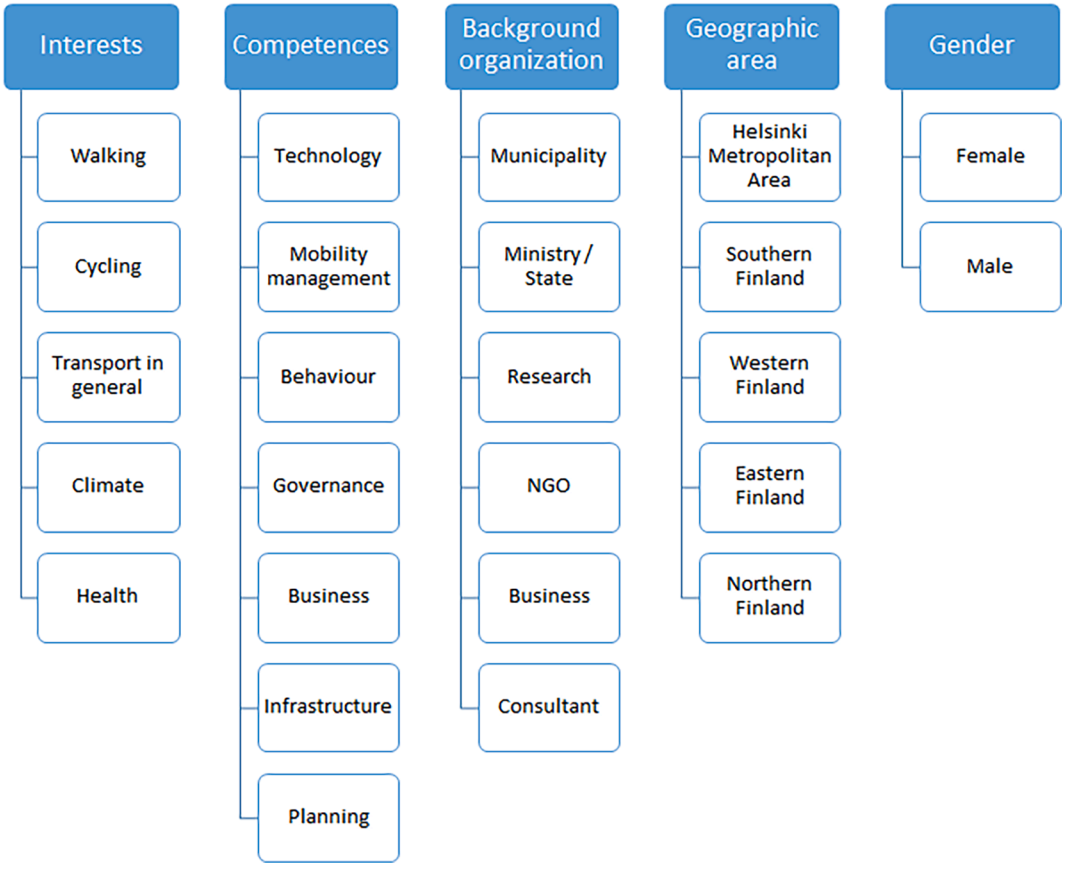

Fig. 1. Interests, competences and other factors covered in the expertise matrix.

issues. Invited experts included city and government officials, and representatives of NGOs, research organisations and businesses (see Appendices 1 & 2). A peer group consisting of transport, health and environmental professionals was consulted to ensure that relevant experts were identified and, we also utilised the co-nomination method (Varho and Tapio, 2013). The experts were positioned into an expertise matrix according to their interests, competencies and socio-demographic factors (Fig. 1). Use of the expertise matrix made it easy to identify and address any gaps. The original expertise matrix included 69 experts and 30 of them eventually participated.

Objectives, Delphi questionnaire and the eDelphi platform

We used the Delphi method to gather expert opinions of the desirable and probable futures to form scenarios of the future of urban transport in Finland. The experts were asked to identify what probable changes they foresee and what preferable (albeit possible) changes they envision in urban transport by 2034. The quasi-exact year 2034 was derived from the Finnish National Travel Survey (NTS) rhythm which is replicated every 6 years and is the main source of transport data in Finland. Three intervals from the latest NTS onwards were used which is compatible with national strategies for walking and cycling.

Questionnaire design is a key aspect of a successful Delphi study. Vague and too abstract questions are some of the pitfalls of Delphi studies (Tapio 2003). This risk was tackled by having a few colleagues evaluate and comment on the questionnaire before the launch. Special attention was given to the formulation of the questions to make them as unambiguous as possible. A comment box was included for each question to gain qualitative arguments supporting numeric responses, and to offer a platform for the iterative process. For the questionnaire, please see Appendix 3.

Part 1 of the questionnaire included trend questions mapping the desirable and probable development of the volumes (km/person/week) of the main transport modes (walking, cycling, bus, rail and private cars). For the probable development, the respondents were asked to estimate the most likely outcome from their personal view, and for the desirable development, the respondents were asked to envision the desirable future in a realistic manner. The panellists were asked to continue a graphic trendline 1998–2016 (based on the Finnish NTS data) until 2034. The use of probability estimations alone may result in disregarding abrupt non-linear changes (see e.g., De Smedt et al. 2013). We also assumed that visualising the desirable and probable future of a particular transport mode would produce rich material for scenario building.

In **part 2**, the panellists were presented a set of Likert scale questions mapping the potential of means and tools available in key sectors to increase walking and cycling. The panellists were also asked to assess the potential of various target groups to increase walking and cycling.

Part 3 included two questions on walking- and cycling-related business activities. The panellists were asked to assess the potential of various business activities, services, and products to increase the share of walking and cycling. In addition, the panellists' views on how to promote walking and cycling related business activities were mapped in an open question.

Part 4 mapped the panellists' views on weak signals, wild cards of drivers related to walking and cycling with open questions to encourage creative reflection. **Part 5** included background questions mapping expertise and standard socio-demographics.

The panel was accessible for 14 days in April 2020 in the eDelphi system (eDelphi.org), an online platform developed specifically for Delphi studies and their management. The platform has addressed key shortcomings of Delphi in several ways. It guarantees true anonymity of the participant by providing a random pseudonym for each panellist and allows innovative ways to ask questions (see Aengenheyster et al. 2017). The platform also permits the use of real-time Delphi (cf. Gordon, 2009), where panellists can access and modify their answers freely the entire time the panel is open. Open commenting enables interaction, feedback, and serves as a platform for the iterative process (Linstone and Turoff 1975; Tapio 2003). According to Gnatzy et al. (2011), the benefits of real-time Delphi include efficiency and speed achieved mainly by reducing the number of rounds from several to one. This may in turn decrease the dropout rate, a shortcoming of conventional Delphi studies (Tapio 2003). Also, a real-time Delphi gives respondents the opportunity to return to the survey, think through other panellists' views in an open-minded way and reconsider their own original answers.

Data analysis

Cluster analysis

There are multiple ways in which data are analysed and results presented in Delphi studies. In this study, we describe the results as alternative scenarios. To create scenarios, responses related to traffic volumes of walking, cycling, buses, rail and passenger cars were analysed with hierarchical cluster analysis available in the SPSS26 software in the following manner.

Units of analysis: Answers related to probable and desirable futures were analysed as separate cases. This emphasises plurality of the scenarios. Even though desirable and probable futures are philosophically different in nature (see Amara 1981), they can be operationalised with the help of the same indicators and subsequently compared. This approach was adopted for the current study.

Variables and data: Only values for the years of 2028 and 2034 were used since many respondents seemed not to have noticed the first data point of 2022 in the questionnaire. Three respondents had apparently forgotten to drag and drop the value for 2028. These values were interpolated as the arithmetic mean of 2022 and 2034 values. One participant had apparently forgotten to estimate a value for 2034 regarding car traffic, but as the values of 2022 and 2028 were identical, we assumed the value to be identical also for 2034. In all, there were 32 valid cases including answers to all transport modes.

Standardisation: To emphasise relative changes in each transport mode with equal weight the data were standardised to a scale from 0 to 100. The highest answer for each mode for the year 2034 in the whole dataset was given the value of 100 and values for the other responses were calculated linearly relative to the maximum. We considered the variation between the standard deviations of various modes so small that further standardisations were not performed.

Method and distance measure: The grouping of the answers was performed with the furthest neighbour algorithm and using simple Euclidean distance of the standardised values as the dissimilarity measure. The simple Euclidean distance (as opposed to squared distance) seems to work well for time series data, where values for a few variables are systemically related to each other.

The number of clusters: Hierarchical cluster analysis is an agglomerative technique and, when used in an exploratory analysis, does not suggest a number of clusters. It only shows mathematically how the grouping proceeds from individual cases to a smaller number of bigger groups. The choice of the number of clusters has also a practical side related to the research question – how many different transport scenarios can be interpreted based on the material? In order to make an educated choice, we considered the outcomes for the two- to ten-cluster solutions. Based on these and the dendrogram in Fig. 2, we identified the five-cluster solution as providing distinct and relatively homogenous clusters with clear policy relevance.

Explorative qualitative content analysis

The clusters were enriched and expanded with qualitative data, derived from the comments and answers to open-ended questions. The qualitative data was divided according to the five clusters and analysed using qualitative content analysis (QCA), which Schreier (2014) defines as a systematic, yet a flexible method for analysing textual data. Based on subjective coding, QCA reduces the amount of data by categorising the research material into relevant categories, the themes (Hsieh &

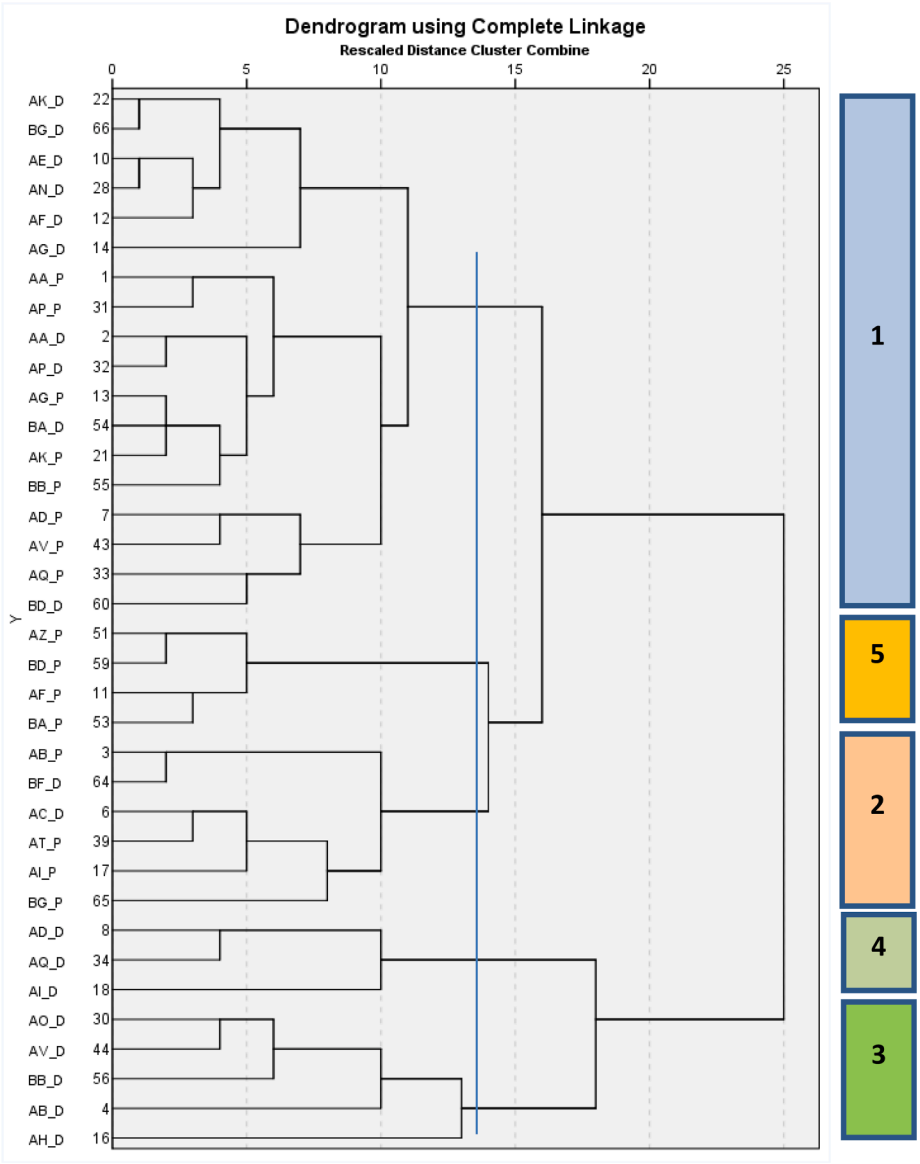

Fig. 2. Dendrogram for cluster analysis. Notes: The final five clusters are included on the right-hand side. Cases are identified by initials, followed by either "-D" for desirable future or "-P" for probable future.

Shannon 2005). This approach is compatible with the exploratory nature of hierarchical cluster analysis. The focus of the analysis was on the way people described their views on the future of Finnish passenger transport, the future use of different transport modes and the barriers and drivers related to the increased use of sustainable transport modes, especially walking and cycling.

The main categories affecting the future of walking and cycling were formed inductively based on reading and re-reading of the data. Seven main categories emerged: urban structure, infrastructure, governance and decision-making, service provision, external factors, and individual factors and transport mode. The main categories were used as a base for the formations of the scenarios (Table 2).

Constructing the scenarios

The scenarios were constructed by combining quantitative data on cluster centres with the qualitative information for each of the five clusters. Each scenario was regarded as representing an analytically separate, collective view on the future with its underlying logic embodied in the cluster-specific comments. The analysis included the preparation of a written memo for each cluster that summarised the cluster-specific view of the future and a visualisation of the qualitative material into five transition pathways. Each transition pathway contained main categories per each cluster as well as a set of factors arising from the material that either support, hinder, or have a conflicting effect on the realisation of the specific scenario. As a result, a systematic understanding of five distinctive scenarios was developed (See Fig. 3 for the formation process).

There were some limitations which affected the systematic qualitative content analysis. The qualitative data of cluster 4 was rather scarce to form a transition pathway. The data consisted of the comments given by four respondents and included only desirable future images. In this case, the qualitative comments of probable future development of the same respondents were used to derive the pathway. The comments regarding probable futures were interpreted to include some ideas of desirability.

Walking and cycling in five mobility scenarios for the period 2019–2034

The five scenarios are depictions of five distinctive futures, each with

Table 2
Illustrative example of the composition of a main category developed during the qualitative contents analysis.

Quotes	Attributes	Sub-category	Main category
"The urban structure should support sustainable traffic"	Sustainable urban structure	Dense structure	Urban structure
"New jobs are being created in areas with poor PT connections, yet working hours require flexibility from workers making car-use a necessity"	The development of urban structure does not support PT use		
"I think bigger cities will develop and build along major train routes"	Development along with transport hubs		
"Cycling has desirably increased due to better cycling conditions, denser urban structure, but also due to regulation of car traffic, pricing and by creating more space for other travel modes."	Dense urban structure has a positive effect on cycling		
I believe that the amount of walking remains the same in denser areas, but decreases in other areas due to e-commerce, home deliveries and bigger shops. Nearby services may even shrink in urban areas."	Dense structure supports walking		
"There are many areas in Finland, where the car is the only mode of transport alongside walking and cycling – walking and cycling are not valid options when the length of trips increases."	Many areas with long distances	Sparse structure	
"Shrinking school networks prevent or hamper cycling or walking to school."	Services become more scattered		
"I would like to maintain the freedom of choice so that living in urban centres or dense urban structures is not required from all, even if this would mean the preservation of private car use."	The combination of dense and sparse urban structures should be tolerated	Dense and sparse structure	
Supermarkets (reachable by cars only) narrow down walking and cycling.	Scattered services near urban areas	Urban sprawl	
I believe that the amount of walking remains the same in denser areas, but decreases in other areas due to e-commerce, home deliveries and bigger shops. Nearby services may even shrink in urban areas."			
Controlling urban sprawl is a factor affecting walking and cycling.	Urban sprawl affects walking and cycling		
"It is important to recognise that service planning (schools, day-care, commercial services and free time activities) affects mode choices and, of course, structure as such.	Urban structure and service planning affect mode choices	Urban structure key actor	
"A more relaxed lifestyle, a decline in"hurrying" and taking part in supervised hobbies, favouring nearby services (by both decision-makers and consumers), an increase of an urbanised structure and knowledgeable planning in urban centres are key factors"	Urban structure affects mode choices together with other factors		

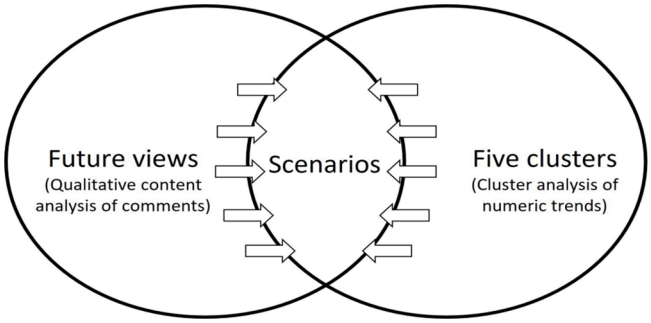

Fig. 3. The formation of the scenarios from qualitative future views and the five numeric clusters.

its own logic. Fig. 4 shows a numeric comparison of the scenarios with historical data derived from the Finnish NTS (1998 & 2016). From the historical data, we can see that the share of private cars increased while the share of other transport modes decreased between 1998 and 2016. The future scenarios of Business as Usual Plus and Car-dependent Lifestyles Persist are conservative scenarios with only a slight decrease in the share of private cars. The Demise of Bus Transport scenario shows a drop in bus transport, whereas Public Transport Serving All indicates a clear increase in both bus and rail transport. The Era of Soft Modes is the most radical scenario, which shows a significant increase in the share of walking and cycling and a clear drop in the share of private car use. A detailed description of each scenario is presented in the following section (Figs. 5-9).

Business as Usual plus scenario

> "*It is not really likely that we would see fast changes. Infrastructure changes, which are instrumental in increasing the popularity of cycling, take time. It is crucial that current infrastructure projects genuinely promote cycling (and not only seem to do so) because we will be using these cycling lanes for decades to come. Unfortunately, we continuously see planning solutions which are marketed as being cycling-friendly, but are facilitating car use."* Comment by respondent BB-P

The Business as Usual Plus scenario suggests marginal growth in the share of walking and cycling between 2016 and 2034, hence the name of the scenario. The share of cycling has increased slightly, especially in commuting. Private car use has almost levelled off. The share of public transport (bus and rail) has grown steadily, but private cars dominate the urban mobility system.

In this scenario, **urban structure** is based on a combination of dense urban centres and urban sprawl elsewhere: planning decisions made in the past decades continue to lock in car-dependent urban structures that make transforming the current urban structure beyond central areas extremely challenging. Therefore, **infrastructure** tends to be car-centred, and decision-makers prioritise investments that support car use. Although service provision highlights the flexibility and accessibility, dwindling municipal budgets ensure that the underlying focus remains on mechanisms enabling private car use.

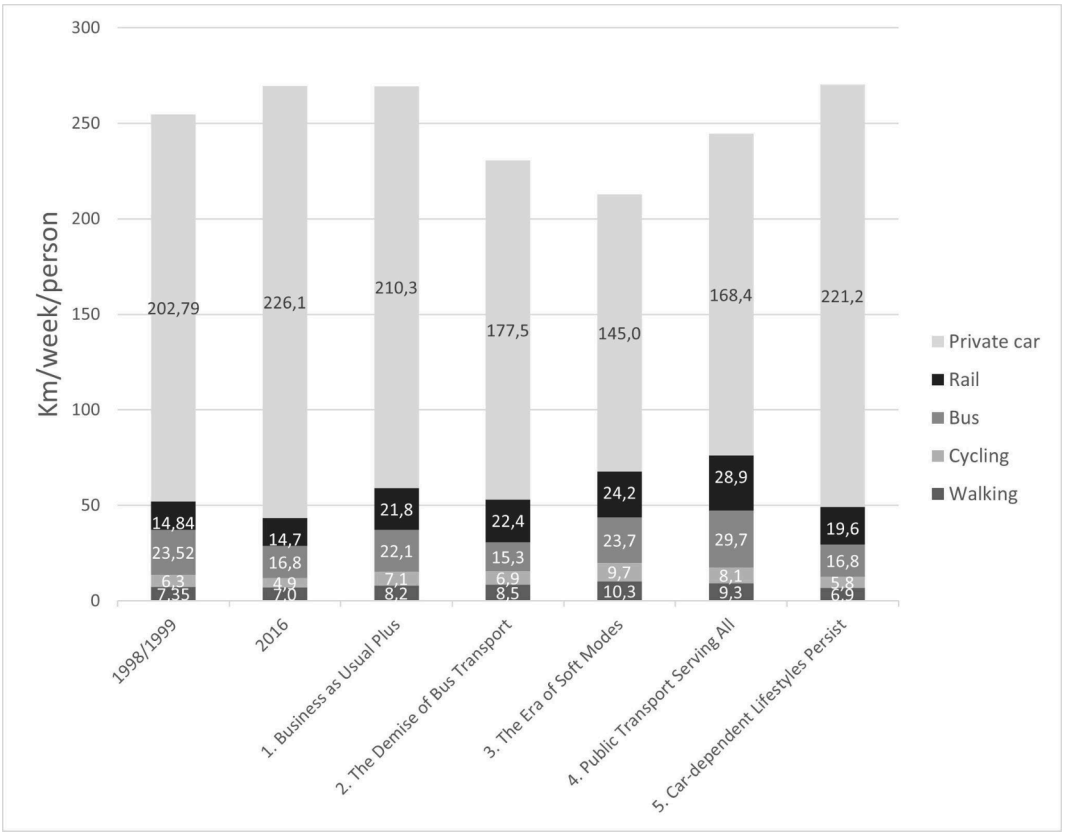

Fig. 4. Traffic volumes of five mobility scenarios compared to historical travel data derived from the Finnish National Travel Survey (NTS).

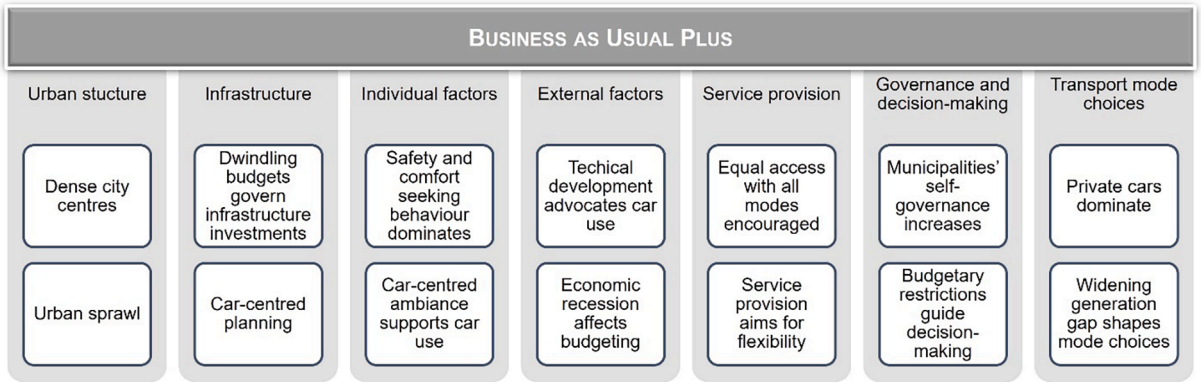

Fig. 5. Overview of the elements forming the transition pathway of the Business as Usual Plus scenario.

Governance and decision-making are clouded by demands for austerity and municipalities are forced to act within the budgetary delimitations. Larger and better-off cities have both money and the will to develop walking and cycling while other parts of the country continue to rely heavily on private car use and wavering public transport services. **Individual attitudes and beliefs** support car use which is seen to be flexible, safe and comfortable in comparison to other modes of transport. Private cars dominate the choice of transport modes. **External factors**, such as new stricter climate policies have seen the introduction of more technically advanced and affordable electric vehicles to minimise the environmental consequences of private cars.

The Demise of bus transport scenario

> *"Challenges related to the environment and pandemics support domestic travel. New residential areas will be built along train lines…Trams will start operating in the city of Tampere and based on the positive experiences other cities may also choose to switch to trams. The city of Helsinki will increase its rail network".* Comment by respondent BF-D

In the Demise of Bus Transport scenario, the share of walking and cycling increases and is higher in 2034 than in Business as Usual Plus. Also, rail travel is on a trajectory of significant increase, but bus travel has dwindled. Private car use has decreased a little in comparison to 2016, but it is still by far the dominating travel mode.

The decline in bus use in the Demise of Bus Transport scenario is the result of three main factors. Due to an increasingly diverse mobility system, there is an abundance of alternative **transport modes** available.

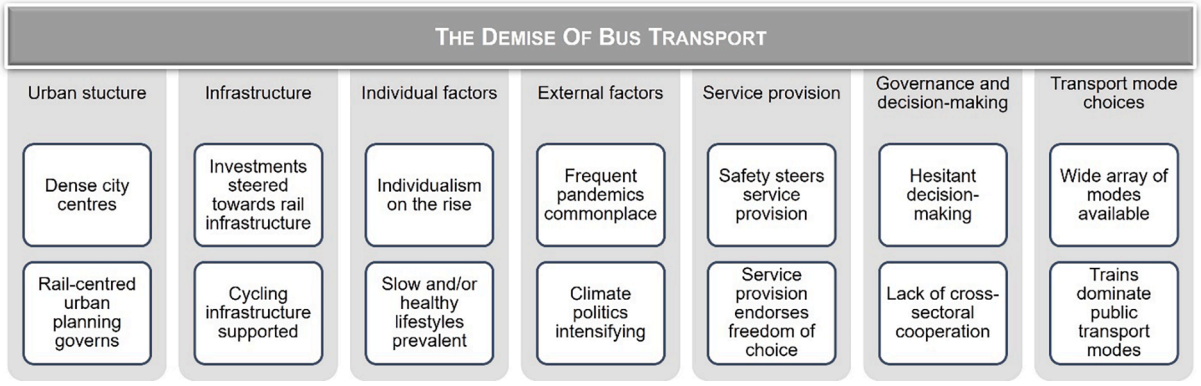

Fig. 6. Overview of the elements forming the transition pathway of the Demise of Bus Transport scenario.

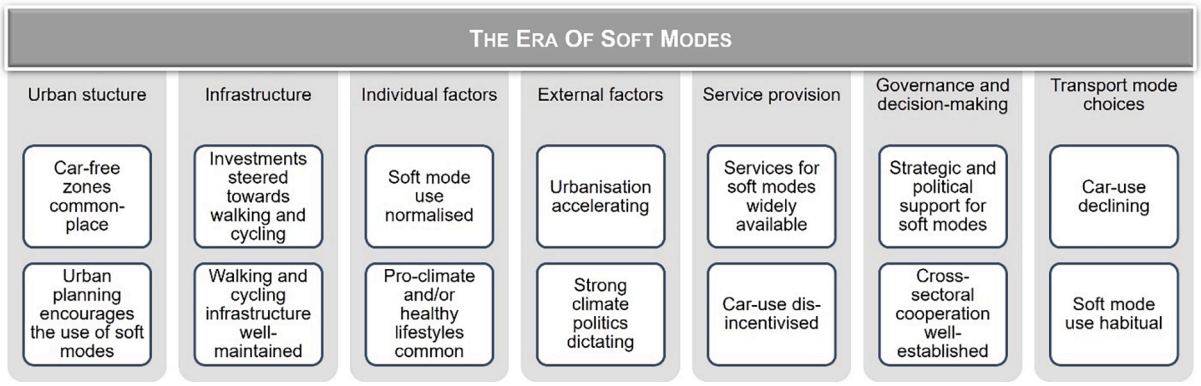

Fig. 7. Overview of the elements forming the transition pathway of the Era of Soft Modes scenario.

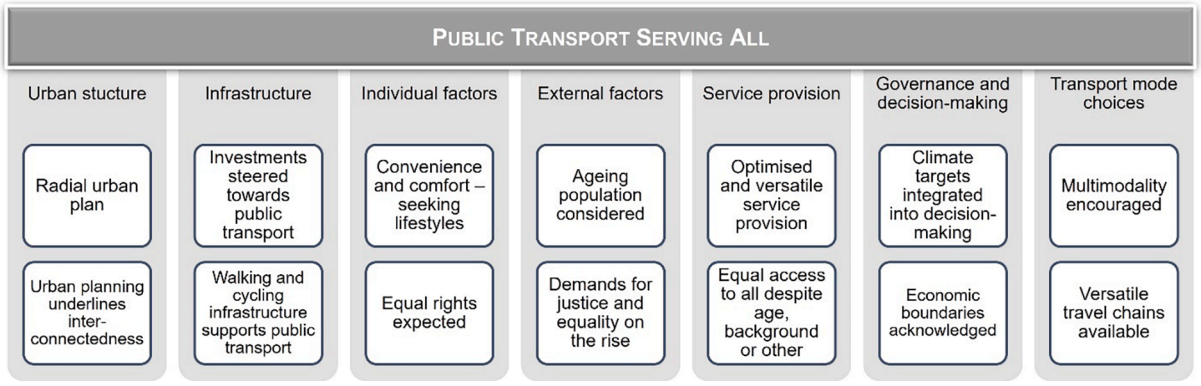

Fig. 8. Overview of the elements forming the transition pathway of the Public Transport Serving All scenario.

Despite increased volumes in sustainable transport modes, bus travel suffers, as many are disfavouring buses in their daily trips due to the poor public image of buses, especially among car-drivers. **Individual lifestyle choices** stress health and comfort in everyday lives. The third factor is linked with **external factors** such as frequent pandemics and strict climate policies, which together with continuous global economic uncertainties affect the scope of long-term planning. With diminished budgets, transport-related **decision-making** and planning is becoming increasingly hesitant, as difficult decisions require well-thought prioritisation. Governments are more reluctant to support large-scale bus projects and favour rail (or tram) **infrastructure** investments. Consequently, many municipalities' investment plans facilitate urban rail travel instead of the development of more extensive bus services. The **urban structure** has slowly begun to shift towards denser communities developed along railways.

The Era of Soft modes scenario

> *"Making needless car-travel more difficult (with costs, parking fees and further-situated (parking) facilities) and investing in active modes (infrastructure, e-bike support schemes, taxation, commuting support schemes) may decrease car use by 20–30 %. Also, the new more climate-conscious generation may not stress car ownership as much. Urbanisation and dense urban structure may also have a positive effect."* Comment by respondent AV-D

The share of walking and cycling is significantly higher in this scenario in comparison to the previous two scenarios. We can also see a rise in both bus use and rail transport. The modal share of the private car has

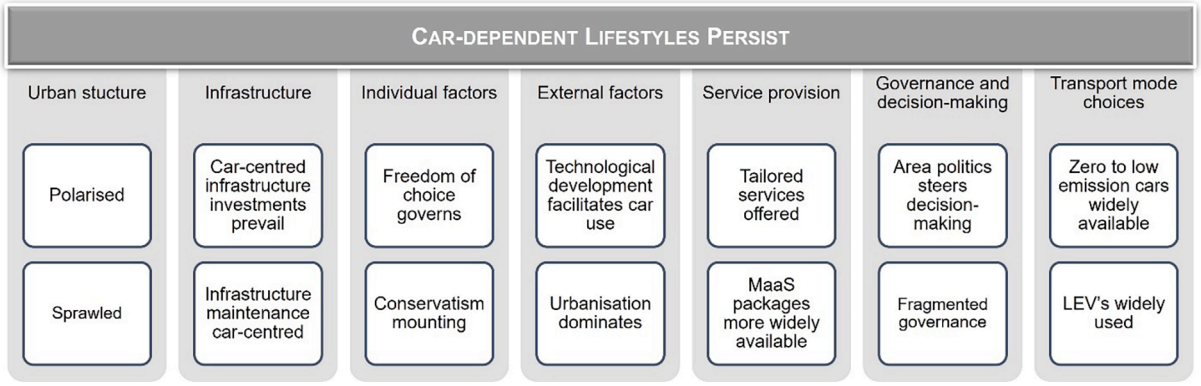

Fig. 9. Overview of the elements forming the transition pathway of the Car-dependent Lifestyles Persist scenario.

decreased significantly, although it is still the dominating transport mode.

In the Era of Soft Modes scenario, the increase in walking and cycling is above all the result of the adoption of a clear, overarching strategy to support active transport modes across sectors, **governance** levels and in **decision-making**. A more general change in the political climate is partly the result of **external trends** such as EU-wide climate policies and urbanisation. The willingness to regulate private car use has gained political momentum. Investing in high-quality walking and cycling **infrastructure** is seen as a long-term investment for the benefit of both people and the environment. **Urban structure** encourages the use of active modes. Car parking in new housing developments is regularly placed farther away and urban space has been allocated for new car-free zones and pedestrian streets.

The benefits of walking and cycling are widely recognised, and **individuals** have become drawn to pro-climate and healthy lifestyles. This switch in lifestyles is reflected also in the media with the increase in positive and diverse stories normalising frequent walking and cycling. Walking and cycling related **service provision** has diversified and, for example, the variety of Mobility as a Service (MaaS) packages has grown. This has subsided the need for families to own a second car, and more and more people have even decided to live entirely car-free lives.

Public transport Serving all scenario

> *"Climate targets require a rise in the use of public transport. We should aim to improve the functionality of the public transport network and car traffic should be limited in places where public transport is a valid option. I think that we are heading in this direction."* Comment by respondent AD-P

Public transport (especially bus transport) is the clear winner in the Public Transport Serving All scenario. The share of walking and cycling is higher than in the Business as Usual Plus and the Demise of Bus-transport scenarios, but lower than in the Era of Soft Modes scenario. Private car use has decreased considerably and we can see almost as clear a drop in private car use as in the Era of Soft Modes.

In Public Transport Serving All, the growing **external pressure** to meet emission targets by limiting private car use has become more pressing. Solving the dilemma between sparse urban structure and climate policies has led **politicians and officials** to examine public transport more closely. By developing public transport into a perfectly functioning service network in most parts of the country equal access to transport services can be provided despite age, economic situation or geographic location. Public transport is generally seen as a combination of main and complementing **transport modes**, which together form a multimodal system enabling sustainable door-to-door travel catering for **individual demands** of convenience, comfort, healthiness and equality. The process to integrate **urban structure** and public transport is ongoing and building a well-functioning public transport service network together with good **infrastructure** for non-motorised modes are the key aims of transport planners. The introduction of road pricing and progressive carbon taxation has not been met without resistance, but under the recently imposed, very strict EU-wide climate legislation, these measures are commonly seen as necessary.

Car-dependent Lifestyles Persist scenario

> *"The declining trend is surely going to break, but the probability of major growth* [*in cycling*] *seems low. E-bikes may increase kilometres a lot for some, but still, the majority of Finns do not cycle, which affects the average and its stable development in the future. To sum it up, many people will cycle more in the future, but the majority will not. There will be many alternative transport modes besides cycling in urban environments."* Comment by respondent BD-P

The Car-dependent Lifestyles Persist scenario shows a slight rise in the share of rail travel and cycling in comparison to 2016 values, but positive development of sustainable modes is very modest compared to the other scenarios. Private car use has remained stable. The shares of bus transport and walking have decreased slightly and cycling shows a small increase. Only rail transport increases due to recent urban tram investments.

In the Car-dependent Lifestyles Persist scenario, car-centred lifestyles show no faltering and the positive development of soft modes has stagnated. **External factors** driving the development are linked with urbanisation and technology. The persistence of car use is the result of political will, urban sprawl, the introduction of new low-emission cars and geographic polarisation. In terms of **individual factors**, owning a private car is widely considered a civil right because distances are so long. Positive examples of walking and cycling as everyday choices are limited to dense urban settings with high-quality cycle lane **infrastructure** and short distances to services. Lack of practical cycling skills is becoming more common among children.

With **urban structure** becoming more sprawled and polarised, proposals to limit car use are met with strong resistance. Politicians and the public regularly use arguments underlining the urban–rural divide in decision-making. This topped with fragmented **governance** has cemented the notion that private cars will remain as the main **transport mode** for quite some time. The introduction of new financial instruments supporting the decarbonisation of private car fleets has led to a new record high in the sales of low emission cars. **Service provision** is built on the concept of tailored services. MaaS services offering alternatives to car ownership has increased only a little in larger cities.

Conclusions and discussion

To answer the first research question about scenarios for walking and

cycling in Finland, we have developed five scenarios that place probable and desirable developments in the context of wider urban mobility system changes between 2016 and 2034. These scenarios are summarised in Table 3 describing the scenarios in terms of modal split, key elements of the scenarios, as well as explicit and implicit background assumptions.

The background assumptions and tacit elements presented in Table 3 are based on interpretations of the qualitative data. The background elements are more explicit interpretations, whereas tacit elements are implicit insights derived and interpreted from the data. For example, for the Era of Soft Modes scenario, the qualitative analysis revealed that the experts seemed to link interest in health or climate issues with the growth of walking and cycling, whereas equality and healthiness were linked with public transport in Public Transport Serving All. In comparison, for Car-Dependent Lifestyles Persist the data indicated a generally pessimistic attitude about the willingness of people to lead car-free lives, whereas in Business as Usual Plus the justification for private car use was implicitly linked with electric vehicles providing the guilt-free option. The qualitative data implied potentially underused potential to enact mode change which could possibly be addressed in future policies or other sustainable mode related activities in Finland.

The experts were asked to consider and assess not only the future of walking and cycling but also the future of other modes. Therefore, the scenarios portray-five distinct views of future urban mobility systems, where walking and cycling may or may not dominate the scene. Only one of the scenarios, the Era of Soft Modes, depicts a mobility system based strongly on sustainable modes with walking and cycling doubling compared to 2016 values. This scenario is facilitated by a combination of three drivers: 1) Coordinated cross-sectoral cooperation, 2) strong political will supporting walking and cycling investments and 3) vocal public support of soft modes and restricted car use, in line with the findings of, for instance, Stephenson et al. (2018), Harms et al. (2016) and Adam et al. (2018). The Demise of Bus Transport and Public Transport Serving All scenarios are public transport based but walking and cycling contribute as important parts of the mobility system. Car-dependency dominates two of the scenarios, Business as Usual Plus and Car-dependent Lifestyles Persist, but the situation is not entirely hopeless for sustainable modes in Business as Usual Plus, where walking and cycling represent a valid option especially in urban areas. The Car-dependent Lifestyles Persist scenario describes a world where the

Table 3
Comparison of the five scenarios.

Elements of the pathway	Business as Usual Plus	The Demise of Bus Transport	The Era of Soft Modes	Public Transport Serving All	Car-dependent Lifestyles Persist
Number of responses					
Probable future	8	4		3	
Desirable future	9	2	5		4
Modal split (km/week/person)					
Walking	8.2	8.5	10.3	9.3	6.9
Cycling	7.1	6.9	9.7	8.1	5.8
Bus	22.1	15.3	23.7	29.7	16.8
Rail	21.8	22.4	24.2	28.9	19.6
Private car	210.3	177.5	145.0	168.4	221.2
Key elements in the transition pathway					
Urban structure	Dense centres, sprawl	Rail-centred, dense cities	Green, car-free zones	Public transport centred, well-connected	Sprawled, polarised, car-centred
Infrastructure	Car-centred	Emphasis on rail and cycling infrastructure	Emphasis on walking and cycling infrastructure	Public transport-related infrastructure	Car-centred
Governance and decision-making	Independent municipalities, economic boundaries govern	Lack of cooperation, hesitant decision-making	Strategic coordination, political will supports walking and cycling	Economic boundaries govern, political support for climate targets	Fragmented governance
Service provision	To ensure accessibility with all modes	Safety guaranteed in services	Walking and cycling related services widely available	Equal access to all, versatile services	Tailored solutions to support car-dependent lifestyles
External factors	Digitalisation, technical development, economic recession	Climate politics, frequent pandemics, technological development	Urbanisation, climate politics, digitalisation	Ageing population, climate politics, justice and equality	Technological development, urbanisation
Individual factors	Flexibility, freedom of choice, belief in technology, car-centred culture	Freedom of choice, social distancing, individualism	Health, pro-climate, positive attitudes towards walking and cycling	Comfort, convenience and safety	Freedom of choice, comfort, conservatism
Interpretations of background assumptions					
Main drivers	Economic incentives, efficiency, speed	Willingness to invest in rail and cycling, infrastructure, corona pandemic	Willingness to invest in soft infrastructure, the polluter pays principle	Ensuring equal access, versatile services	Supporting car-dependent lifestyles
Lifestyles	Car-centred, carbon-conscious	Slow and healthy	Healthy and pro-climate	Healthy and equal	Car-centred
Aims	Accessibility with all modes	Fighting climate change	Ensuring urban space supports soft modes	Develop and support PT	Support the current status quo
Key questions or challenges requiring answers	How to prioritise?	How to re-organise urban space?	How to limit car use?	How to provide service for all?	How to form a common vision?
Tacit elements					
Unused potentials	Workplaces, media	Domestic tourism	Positive awareness	Walking to access public transport	Practical skills, young people
Weak signals	Young people not affording cars	Tram investments spreading to other cities	Immigration changing mode choices	Bonus schemes for non-drivers	Narrow images of maleness

mobility system has not really changed and the increase in walking and cycling is very modest.

The second research question focused on the barriers to and drivers of current efforts to encourage sustainable mobility transitions that the participants identified. Mobility systems, and more specifically systems supporting walking and cycling, are formed in an interplay of various variables all fulfilling an important role in the whole. Key elements of the transition pathways according to the experts revolve around.

- urban structure (whether functions are concentrated in dense core areas or sprawled)
- infrastructure (whether walking and cycling-friendly infrastructure and the willingness to invest are available)
- governance (whether this is based on cooperation or siloed)
- decision-making (whether political will exists)
- service provision (whether this is available)
- mind-sets, lifestyles and culture (whether the general mind-set is for or against sustainable modes)
- individual factors (what is acceptable and valued).

These findings are in line with the conclusions of, for example, Adam et al. (2018) who listed infrastructure, urban form, car-centred culture, governance, and political and public support as critical factors in increasing the share of cycling; and Harms et al. (2016) who underline the need for strategic leadership, good infrastructure and (dis)incentives as success factors. The experts were especially concerned about the prioritisation of limited financial resources in an uncertain future about providing equal opportunities despite the geographic location or socioeconomic standing of different parts of urban areas. Also, the reorganisation of urban space was recognised as a pivotal question.

One result of our research deals with the role of private cars in future mobility systems. Although the use of private cars decreases a little or considerably in all five scenarios, in terms of traffic volume it remains unchallenged by other modes (see Fig. 4). This result can be interpreted in several ways. It could represent a signal that a growth in sustainable mobility based on walking, cycling, micro-mobility and public transport may eventually emerge, at least in larger cities. Restricting car use may be possible with the right mix of carrot and stick measures, including infrastructure investments, although challenging due to the view of the private car as an everyman's right. Yet, it seems rather clear that private cars will continue to dominate urban mobility systems for some time: the experts foresee that the continuation of car-based mobility in the era of strict emission targets is enabled by technological breakthroughs and public support. Even in the most radical scenario, the Era of Soft Modes, private cars are still the dominating transport mode, although their use would drop by more than a third from 2016 values measured in passenger kilometres (Fig. 4). Therefore, we need to plan for a sustainable transport system encompassing both low-emission private cars alongside (other) sustainable transport modes and a reduction of the overall demand for transport. Embracing a systemic view and more in-depth understanding of households' everyday practices will be beneficial to capture the complexities and various feedback loops related to such planning efforts.

Providing a glimpse of alternative mobility futures in the form of scenario pathways not only helps to underline the need to focus on the long term of mobility system change, but also provides ways to expose conflicting interests and priorities as argued by Rosenbloom (2017). It thus challenges the tendency to follow a seemingly predetermined path. Scenarios can also be used when discussing the prioritisation of finite resources. The scenarios presented in this article offer glimpses of five crystallised views of the future, where the role of walking and cycling in urban mobility systems fluctuates, depending on the emphasis given to the various key drivers. All of the scenarios depict pathways to alternative futures, and they can be used as thought experiments that inform strategic or practical planning. They offer suggestions to frame policies for better support of sustainable mobility or strengthen walking and cycling strategies. Because the Delphi study was organised just after the start of the Covid-19 lockdown in Finland, the views also contain some indication of how the current (and future) pandemics may affect mobility systems. The experts had some concern on how public transport (especially bus travel) will recover after the lockdown. Echoes of this concern can, for example, be seen in Helsinki where public transport was still struggling with a clear drop in passengers three months after the lockdown restrictions were lifted (Salomaa & Härding 2020).

This research has shown that a scenario can be seen as an agglomerate of a set of experts' views on the future. A systematic way of analysing qualitative material opens up the cognitive structure of thinking behind purely numeric Delphi responses. When transport scenarios are only based on mathematical modelling, they contain a mere subset of the dynamics in the system under consideration. The Disaggregative Delphi approach allows for a greater plurality of insights into how system dynamics (might) work in the future. In further studies, it would be worthwhile to analyse some of the deeper assumptions and tacit elements, which seemed to lurk behind the panellists' stated arguments. Analysing the cognitive structures that shape thought and discourse about changes in urban mobility could potentially shed light on the factors and processes responsible for the limited progress in transitioning towards more sustainable urban transport systems. Uncovering various underlying factors could also assist in finding ways to break current stagnation and open new alternative paths to more sustainable transport futures.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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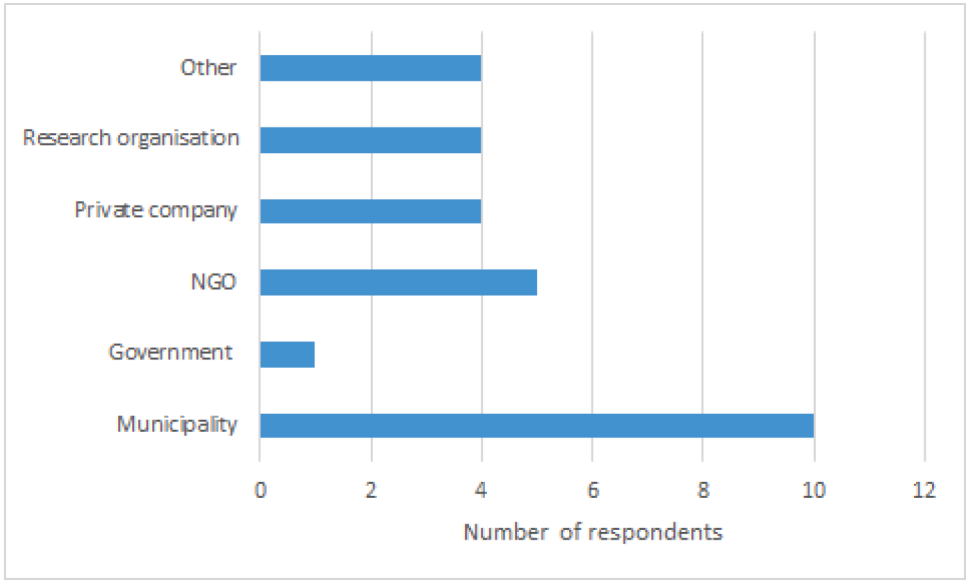
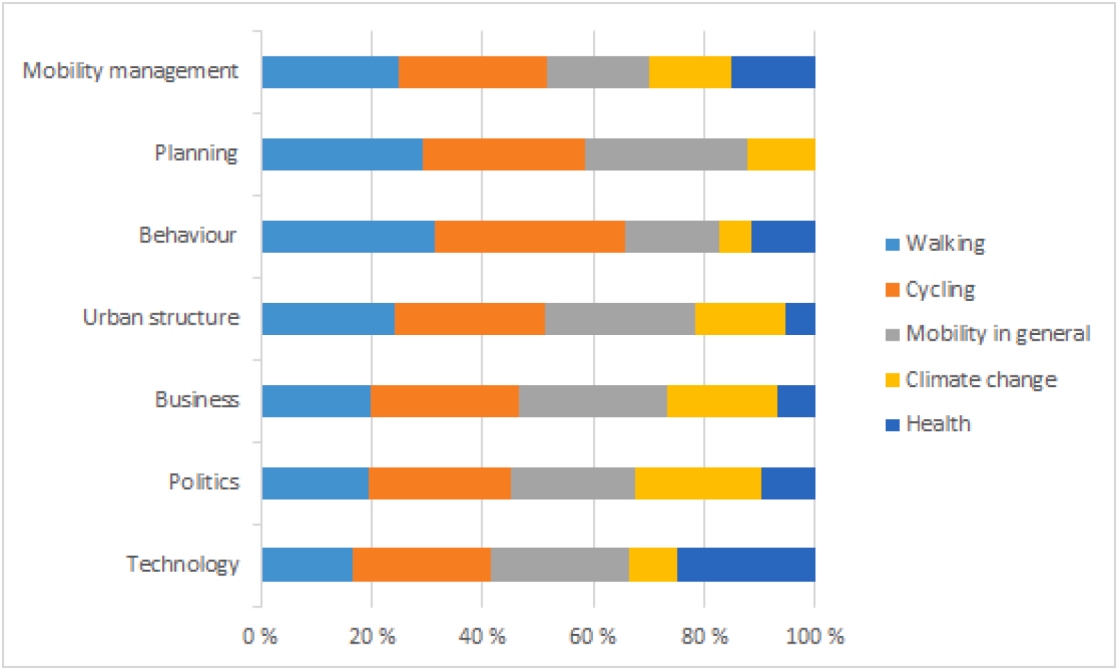
Appendix 1 The number of respondents per organisation type



Appendix 2 Self-assessed expertise of the respondents regarding the expertise matrix



Appendix 3 The questionnaire: The future of walking and cycling

NB. The images have been taken from the original questionnaire and are thus in Finnish. The questionnaire also lacks the comment boxes, which were in the original questionnaire below each question.

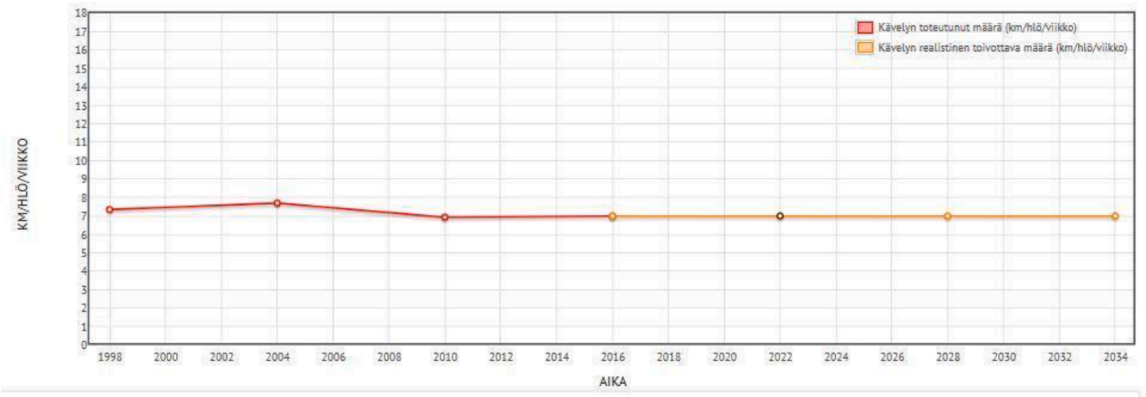
1. The probable development of walking by 2034.

In the following questions (1–11) we will ask you to estimate the development of different transport modes by 2034.
What is your estimation of the probable amount of walking (km/person/week) in 2034? You can move the trendline to your chosen position. The

previous numbers have been taken from the National travel survey (1998–2016).

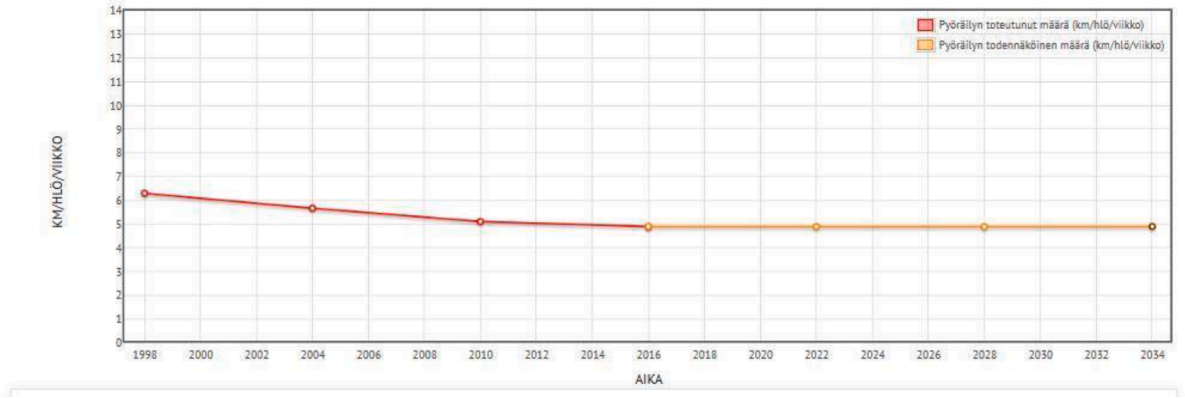
2. The realistic, preferable development of walking by 2034.

What is your estimation of the preferred amount of walking (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



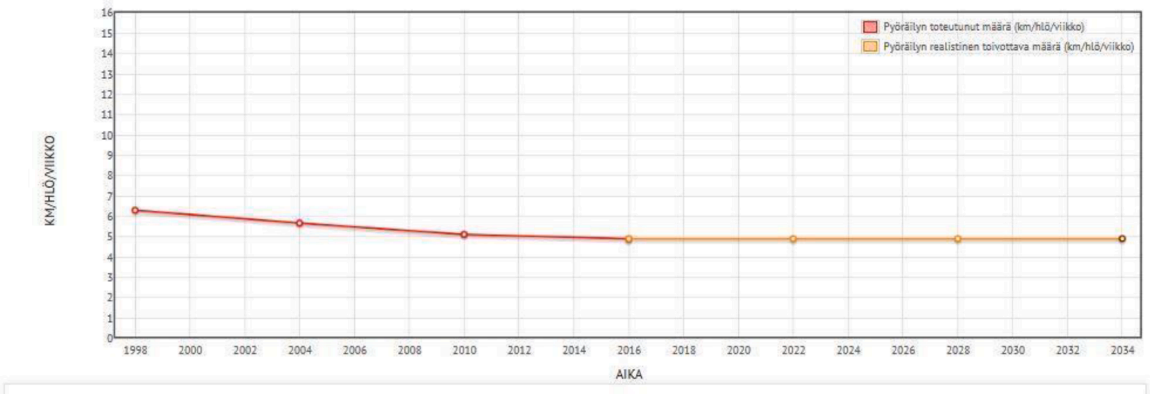
3. The probable development of cycling by 2034.

What is your estimation of the probable amount of walking (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



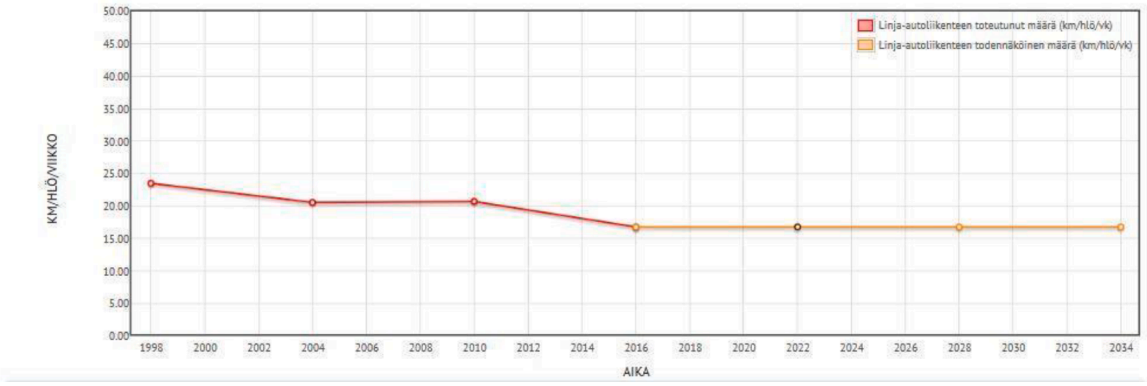
4. The realistic, preferable development of cycling by 2034.

What is your estimation of the preferred amount of cycling (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



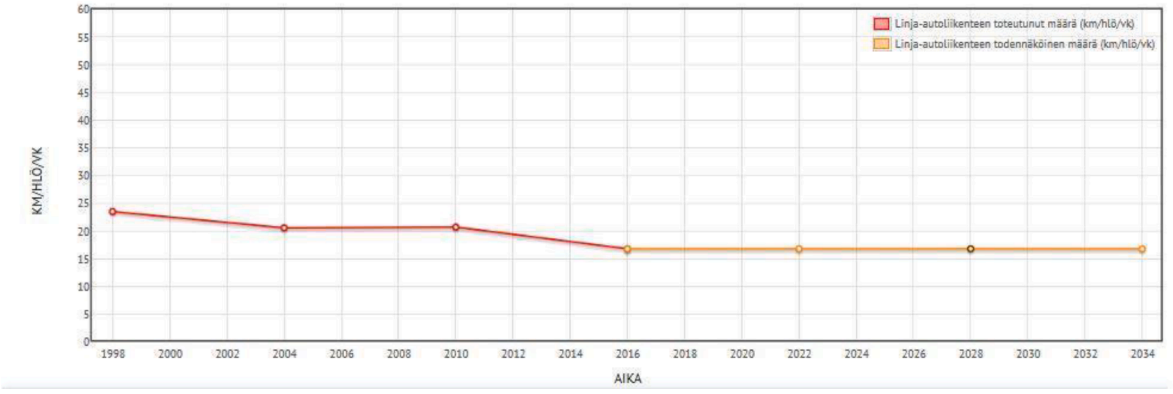
5. The probable development of bus transport by 2034.

What is your estimation on people probably choosing bus as a transport mode (km/person/week) in 2034? You can move the graph to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



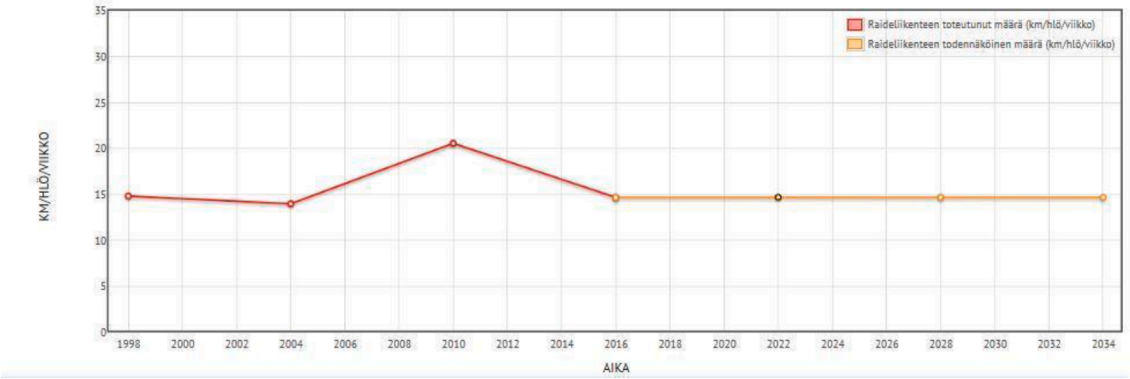
6. The realistic, preferable development of bus transport by 2034.

What is your estimation on people preferably choosing bus as a transport mode (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



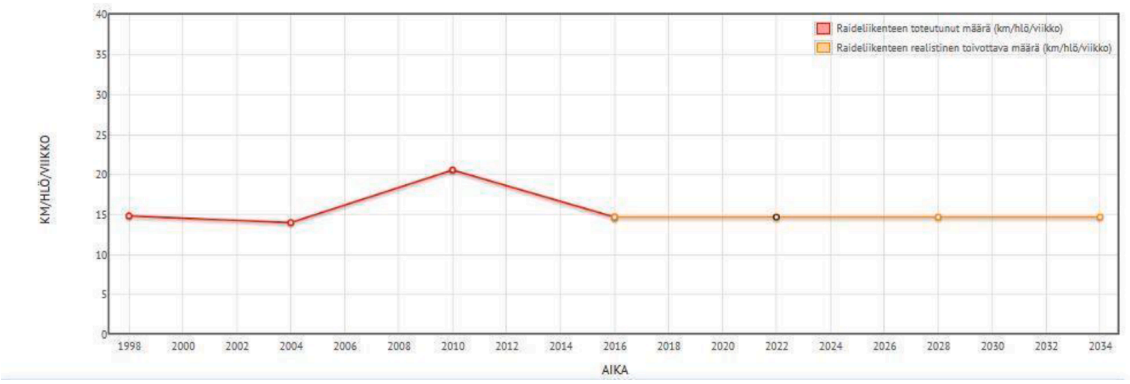
7. The probable development of rail transport by 2034.

What is your estimation on people probably choosing rail transport (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



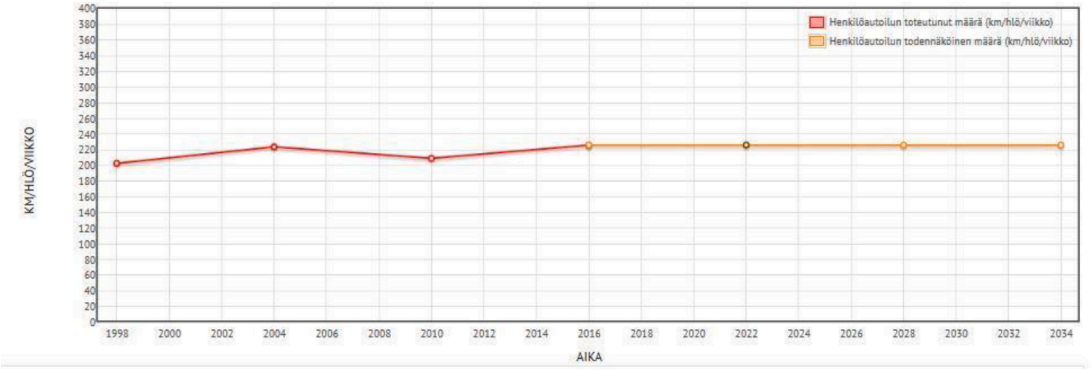
8. The realistic, preferable development of rail transport by 2034.

What is your estimation on people preferably choosing rail transport (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



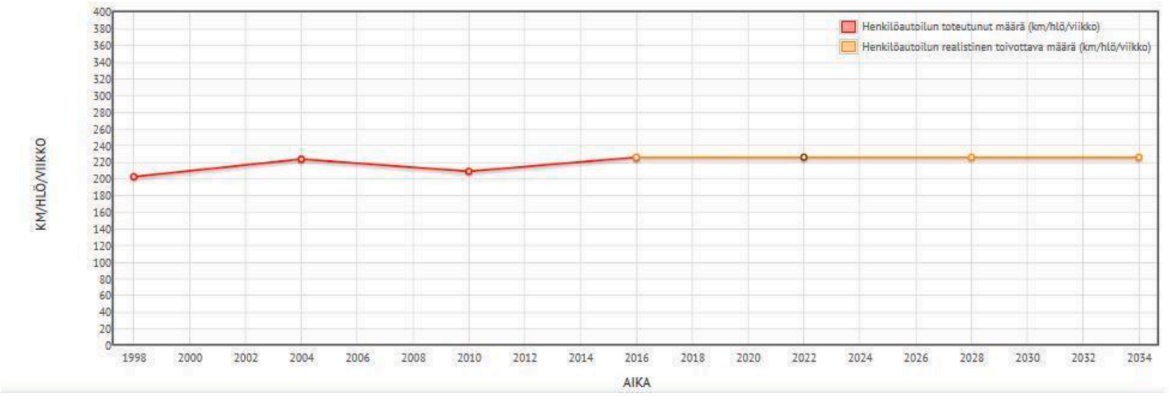
9. The probable development of private car transport by 2034.

What is your estimation on people probably choosing private cars as a transport mode (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



10. The realistic, preferable development of private car transport by 2034.

What is your estimation on people preferably choosing private cars as a transport mode (km/person/week) in 2034? You can move the trendline to your chosen position. The previous numbers have been taken from the National travel survey (1998–2016).



11. New modes of transport in the future.

What is your estimation on the future development of new light vehicles (e.g. e-scooters, e-mopeds, hoverboards etc.). Please use the comment box for your answer.

12. The potential of various governmental actions to increase walking and cycling.

In the following questions (12–17) we will ask you to estimate the potential various actions have in increasing walking and cycling.

Estimate the potential of the following governmental actions in increasing the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Taxation and regulatory measures (e.g. fuel taxation, acquisition support)	o	o	o	o	o	o
Legislative actions (e.g. climate / noise / MaaS legislation)	o	o	o	o	o	o
Economic measures (e.g. additional governmental funding schemes, funding schemes	o	o	o	o	o	o
Development and enhancement of cross-sectoral cooperation	o	o	o	o	o	o
Clarification of roles and responsibilities in governmental organisations	o	o	o	o	o	o
Development of information control (e.g. national recommendations)	o	o	o	o	o	o

13. The potential of various municipal actions or measures to increase walking and cycling.

Estimate the potential of the following municipal actions or measures in increasing the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Development of the urban structure (e.g. densifying the urban structure)	o	o	o	o	o	o
Prioritising walking and cycling in road & traffic development (e.g. car-free zones)	o	o	o	o	o	o
Improving walking and cycling infrastructure in municipalities (e.g. building cycling or walking lanes)	o	o	o	o	o	o
Economic incentives in the municipal level (e.g. the pricing of public transport, parking)	o	o	o	o	o	o
Increasing communication and marketing efforts for walking and cycling	o	o	o	o	o	o
Increasing knowledge (e.g. wayfinding, guidelines)	o	o	o	o	o	o
Digital services supporting walking and cycling (e.g. route guides, calculators, MaaS-interfaces)	o	o	o	o	o	o
Providing citizens opportunities to participate in decision-making	o	o	o	o	o	o
Promoting piloting and experiments (e.g. bicycle libraries)	o	o	o	o	o	o

14. The potential of actions/ measures taken in workplaces to increase walking and cycling.

Estimate the potential of the following workplace-related actions in increasing the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Providing economic incentives in workplaces and companies (e.g. public transport commuting support, support for company bicycles)	o	o	o	o	o	o
Providing spaces which support walking and cycling (e.g. cloakrooms, bicycle parking)	o	o	o	o	o	o
Supporting walking and cycling related practices (e.g. bicycles for work-related travel, walking meetings)	o	o	o	o	o	o
Creating a walking and cycling friendly atmosphere in workplaces	o	o	o	o	o	o

15. The potential of actions / measures taken in educational institutions, schools and primary care to increase walking and cycling.

Estimate the potential of the following actions in educational institutions, schools and primary care to increase the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Ensuring skills and knowledge (e.g. integrating walking and cycling into education and teaching)	o	o	o	o	o	o
Creating a walking and cycling friendly atmosphere in workplaces (using walking and cycling - positive narratives)	o	o	o	o	o	o
Supporting walking and cycling related practices (e.g. theme days, recommendations for walking and cycling)	o	o	o	o	o	o
Increasing cooperation between different actors (e.g. parents, PTA's)	o	o	o	o	o	o
Providing spaces which support walking and cycling in schools and primary care (e.g. locked cabinets, bicycle parking)	o	o	o	o	o	o

16. The potential of actions or measures in research organization to increase walking and cycling.

Estimate the potential of the following actions related to research organizations in increasing the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Increasing walking and cycling related basic research	o	o	o	o	o	o
Increasing walking and cycling promoting applied research	o	o	o	o	o	o
Increasing walking and cycling related RD activities	o	o	o	o	o	o
Increasing transdisciplinary cooperation and research	o	o	o	o	o	o
Popularisation of walking and cycling related research (e.g. article and podcasts highlighting the benefits of walking and cycling)	o	o	o	o	o	o

17. The potential of actions or measures in the media sector to increase walking and cycling.

Estimate the potential of the following actions related to the media sector in increasing the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6do not know
Increasing the media coverage of walking and cycling (e.g. articles, programs, lobbying of journalists)	o	o	o	o	o	o
Creating a positive image of walking and cycling (e.g. discourse, publishing criteria)	o	o	o	o	o	o
Adapting media and marketing principles related to car industry (e.g. forbidding car ads)	o	o	o	o	o	o

18. The potential of actions or measures of NGO's to increase walking and cycling.

Estimate the potential of the following actions related to the media sector in increasing the modal share of walking and cycling by 2034 using a Likert scale (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential). You can also choose the option "do not know". You can comment or specify your answer in the comment box. You can also add other actions you find impactful.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Increasing walking and cycling related communication and marketing (e.g. campaigns	o	o	o	o	o	o
Producing information to promote walking and cycling (e.g. recommendations)	o	o	o	o	o	o
Increasing walking and cycling related project development	o	o	o	o	o	o
Increasing cooperation with different actors (e.g. other NGO's, the municipal sector)						

19. Walking and cycling as a form of everyday physical activity.

Increasing the amount of walking and cycling is a way to increase everyday physical activity (PA). How likely do you see that the following statements will become a reality in 2034 using a scale from 1 to 5 (1 = very improbable, 2 = somewhat improbable, 3 = neutral probability, 4 = somewhat probable, 5 = highly probable)? You can also choose the option "do not know". You can comment, justify or clarify your answers in the comment box below.

	1 =very improbable	2 =somewhat improbable	3 =neutral probability	4=somewhat probable	5 =highly probable	6=do not know
The relevance of walking and cycling as a form of everyday PA is emphasized more in the public.	o	o	o	o	o	o
Walking and cycling –based everyday PA is promoted via cross-sectoral cooperation more than today.	o	o	o	o	o	o
The urban structure encourages walking and cycling –based everyday PA more than today.	o	o	o	o	o	o
Guidance, which supports walking and cycling –based everyday PA, is better available than today.	o	o	o	o	o	o
Political decision-making acknowledges the benefits of walking and cycling –based everyday PA better than today.	o	o	o	o	o	o
Job culture encourages walking and cycling –based everyday PA more than today.	o	o	o	o	o	o
Media produces more positive images on walking and cycling –based everyday PA than today.	o	o	o	o	o	o
Kindergartens, schools and educational institutions encourage walking and cycling –based everyday PA more than today.	o	o	o	o	o	o
Sports clubs and the leisure sector support walking and cycling –based everyday PA more than today.	o	o	o	o	o	o
There are more products and services available, which support walking and cycling –based everyday PA.	o	o	o	o	o	o

20. The potential of different groups to increase walking and cycling.

Please, evaluate the potential of following groups to increase walking and cycling in their everyday activities by 2034 using a scale 1–5 (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential).)? You can also choose the option "do not know". You can comment, justify or clarify your answers in the comment box below.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Families with children	o	o	o	o	o	o
Children and adolescents	o	o	o	o	o	o
Young adults	o	o	o	o	o	o
Middle-aged people	o	o	o	o	o	o
Younger seniors	o	o	o	o	o	o
Older seniors	o	o	o	o	o	o
Families with two or more private cars	o	o	o	o	o	o
Habitants in bigger cities	o	o	o	o	o	o
Habitants in middle-sized cities	o	o	o	o	o	o
Habitants in rural centres or smaller cities	o	o	o	o	o	o
Habitants in sparsely populated cities	o	o	o	o	o	o

21. Business activities linked with walking and cycling

In the following questions (21–22) we will ask you to estimate various means linked with business activities and their impact on the amount of walking and cycling.

Please estimate the potential of the following services or solutions to create walking and cycling related business activities on a scale 1–5 (1 = no potential, 2 = little potential, 3 = moderate potential, 4 = considerable potential, 5 = great potential).)? You can also choose the option "do not know". You can comment, justify or clarify your answers in the comment box below.

	1 =no potential	2 =little potential	3 = moderate potential	4=considerable potential	5 =great potential	6=do not know
Social media platforms	o	o	o	o	o	o
Communication or information sharing services	o	o	o	o	o	o
Educational services	o	o	o	o	o	o
Tailored products or services (e.g. apps, real-time measuring)	o	o	o	o	o	o
Products and services for streamlining travel chains	o	o	o	o	o	o
Maintenance and repair services for bicycles	o	o	o	o	o	o
Development services related to active modes of transport	o	o	o	o	o	o
Development and sales of media or entertainment contents related to or supporting walking and cycling (e.g. games, programs, internet sites)	o	o	o	o	o	o
Products and services which aim to enhance experiences or a sense of adventure (e.g. livening up the environment, wellbeing)	o	o	o	o	o	o
Service design supporting walking and cycling	o	o	o	o	o	o
Products and services tailored for work environments	o	o	o	o	o	o

22. Walking and cycling related business opportunities and preconditions.

How can we in your opinion best support walking and cycling related business activities? Which new business sectors could be linked to walking and cycling promotion in the future?

Please, provide your answer to the comment box below.

23. Weak signals linked with walking and cycling.

In the following questions (23–25) we will map your views on wider development perspectives.

We can perceive the future via weak signals. Weak signals are existing signs or phenomena which may be regarded as a sign of a bigger change.

Which weak signals have you perceived related to the increase of walking and cycling?

Please, provide your answer to the comment box below.

24. Wild cards linked with walking and cycling.

We can perceive the future also via wild cards. Wild cards are surprising factors, which have a low probability, but if realised they can have a major impact on the current state of things.

Which wild cards could there be related to the promotion of walking and cycling?

Please, provide your answer to the comment box below.

25. Wider developmental pathways linked with walking and cycling.

In your opinion, what are the most important drivers related to lifestyles, urban structure or technologies, which could significantly increase walking and cycling by 2034?

Please, provide your answer to the comment box below.

26. Your expertise.

In the following questions (26–27) we will map your background information.

Delphi-questionnaires are based on expertise. In this question, we ask you to align your expertise on two axels. You can choose more than one option.

For example, if you consider yourself an expert on cycling, mobility management or behaviour, you will choose these options from row two. If you are an expert on walking, health, technology and business, you will choose these options from rows one and five.

	TEKNOLOGIA	POLITIIKKA	LIIKETOIMINTA	YHDYSKUNTARAKENNE	KÄYTTÄYTYMINEN	SUUNNITTELU	LIIKKUMISEN OHJAUS
KÄVELY							
PYÖRÄILY							
LIIKENNE YLEENSÄ							
ILMASTONMUUTOS							
TERVEYS							

27. Background information.

Sex.

- Man.
- Women.
- Other.
- Do not want say.

Age group.

- Below 20 years.
- 20–24.
- 25–34.
- 34–55.
- 55–64.
- +65.

Educational background.

- Basic education.
- Secondary education.
- Bachelor level degree.
- Master level degree.
- PhD or similar.
- Other.

Geographical location.

- Uusimaa.
- Varsinais-Suomi.
- Satakunta.
- Häme Proper.
- Pirkanmaa.
- Kymi Valley.
- South-Karelia.
- South-Savonia.
- North-Savonia.
- North-Karelia.
- Middle Finland.
- South-Bothnia.

- Middle Bothnia.
- Ostro-Bothnia.
- Kainuu.
- Lapland.
- Åland.

Occupational group.

- Leading position within an employer organisation.
- Junior officer.
- Senior officer.
- Functionary.
- Entrepreneur.
- Student.
- Retired.
- Unemployed.
- Other.

Employer organisation.

- Municipality.
- Government.
- Research organisation.
- NGO.
- Private company.
- Retired.
- Other.

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