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Perspectives into topical issues in society and ways to support political decision-making.

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Policies to guide the automation and servitisation of transport

Esko Lehtonen, Ville Helminen, Johannes Mesimäki, Anu Tuominen, and Eetu Wallius

The automation, digitalisation and servitisation of transport can improve the ease and convenience of travel for many. While this can lead to both social and economic benefits, it also presents challenges. The total amount of traffic may grow, urban structure may become increasingly dispersed and travel may even become more difficult for certain groups. This can potentially negatively affect the sustainability of transport and land use. However, sustainability challenges can be addressed with appropriate policy measures.

Transport and land use systems are in transition

The transportation sector is currently undergoing three simultaneous transformations: automation, servitisation and electrification. Automation and servitisation are especially driven by digitalisation and the development of artificial intelligence. These three transformations have the potential to significantly alter the types of available travel modes, as well as the factors affecting the ease of mobility, such as the cost, effort and time required to travel.

Changes in the available options for mobility will affect people's ability to make different types of trips, such as commutes, errands and leisure trips. Furthermore, they will affect accessibility to different activities and locations. As a result, the attractiveness of different areas as places to live and work may change. In the long term, changes in mobility patterns and the attractiveness of different locations and activities will be reflected in changes to urban fabric and new transport infrastructure. These changes will interact with other trends, such as urbanisation.

This study identified the main impact mechanisms through which transport automation and servitisation can affect passenger transport and regional and urban forms. This was done by analysing the impact mechanisms of five different technology and service concepts: 1) automated cars, 2) robotaxis, 3) automated public transport, 4) shared mobility and peer-to-peer rental services and 5) mobility as a service (MaaS). The role of intelligent transport and mobility management was also considered in relation to the above.

The results of this study will help to anticipate future impacts and promote the use of new transport technologies and services to achieve the strategic objectives set for the transport system.

New technologies and services offer new means for transport and land use planning

New transport technologies and services can provide new mobility opportunities (accessibility) and improve efficiency and road safety. They can also provide solutions to sustainability challenges related to mobility and land use. As such, they are in line with objectives set out in the National Transport System Plan (Transport 12 plan).

However, some interactions between transport and land use can lead to effects that are in conflict with the objectives. A key challenge is the increase in vehicle traffic that is likely to result from the automation of passenger cars, as well as increased urban dispersal, which are at odds with sustainability objectives. A second challenge is the polarisation of mobility options: urban areas may offer a wide range of mobility services based upon automated public transport, while more rural areas remain dependent on (automated) private cars.

The automation and servitisation of transport relate broadly to a variety of issues such as social policy, attitudes and preferences, technological potential, transport infrastructure, urban structure and costs. The socio-technical and complex nature of the transport system and its characteristics, such as the longevity of investments and the substantial role of regulation, increase the difficulty of promoting new technologies and services and related decision-making. Therefore, the challenges and opportunities presented by these technological transformations should be addressed in societal strategies and planning at local, regional and national levels. Technologies and services offer a means to achieve transport policy objectives, but only if their development is steered in the desired direction.

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Using a transport and land use interaction model to identify impact mechanisms

A literature review was carried out on the impact of new technologies and services, as well as on theories concerning the interactions between transport and land use. The development of most new transport technologies and services is in the early and experimental stages. Therefore, impacts identified from the literature are mainly based on local pilots, modelling results and expert opinions. Contextual factors such as the existing state of land use and policy objectives impose constraints on the development of technologies, making it challenging to anticipate their impacts.

Based on the literature review, a systemic transport and land use interaction model (Figure 1) was created to identify the impact mechanisms of the technology and service concepts. These mechanisms were further elaborated by answering seven questions which relate to different components of the model (Table 1).

The impacts of the technology and service concepts arise primarily from their effect on travel resistance and the new modes of transport they provide. Travel resistance essentially describes the generalised costs of travel, such as the time, effort and financial costs involved. Most technologies and services aim to reduce travel resistance or optimise the ratio of its components.

Changes in mobility opportunities lead to changes in mobility. This may lead to changes in the demand for transport infrastructure and mobility services as people's commuting, shopping and leisure travel patterns shift. In the longer term, these changes will also reflect on the attractiveness of different areas. The changes in attractiveness will affect the location decisions of households, businesses and other actors. Attractiveness significantly affects how land use is developed in different areas.

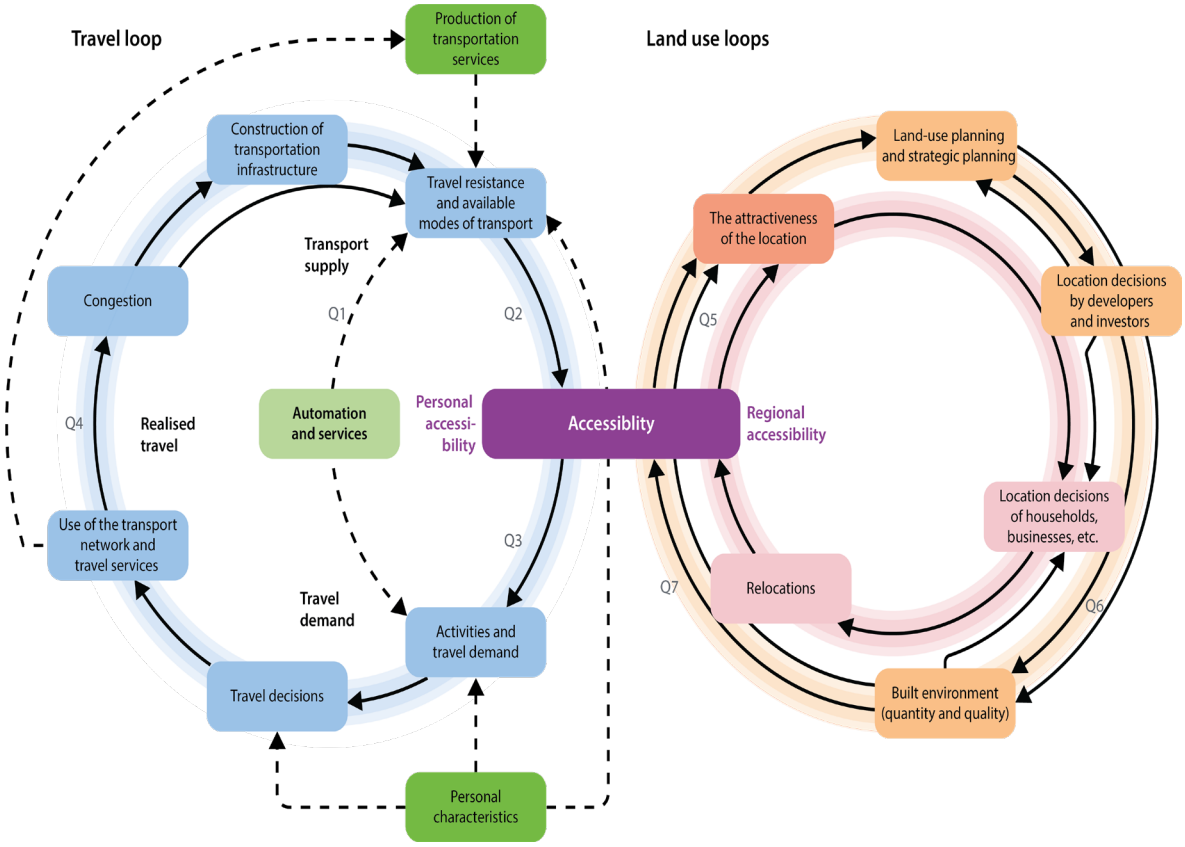

Figure 1. Transport and land use interaction model. The questions used to describe the impact mechanisms (Table 1) relate to the different parts of the model (Q1-Q7).

Table 1. Questions used to describe the impact mechanisms.

Q1: How does the technology or service change travel resistance or the availability of transport modes?
Q2: How will these changes to travel resistance and availability of travel modes affect accessibility?
Q3: How do changes in accessibility and the travel experience affect activities and the travel to reach them?
Q4: How do services/networks respond to changes in travel? Will this affect travel resistance?
Q5: How do changes in accessibility and travel affect the attractiveness of different areas and urban structures as well as land use development?

Q6: What other changes in the built environment will occur due to the introduction of the technology or service?

Q7: How do changes in the built environment and land use affect accessibility in and the attractiveness of different areas and urban structures?

The market potential and best use cases for mobility technologies and services were also identified through interviews. Based on the impact mechanisms and the interviews, two simultaneously occurring pathways with implications for both the transport and land use systems were identified. Additionally, feedback on the transport and land use interaction model and the identified impact mechanisms were collected in two expert workshops.

The interaction model describes the impact mechanisms through which new transport technologies and services can change the transport system and land use.

Impact mechanisms shape the pathways

New transport technologies and services will not be adopted in isolation but will interact with each other. Therefore, the combined impact of technologies and services on transport and land use was considered through two parallel future pathways.

In the first pathway, automated private cars will improve accessibility by car and reinforce car-oriented transport and land use development. Automated driving will make car use more attractive and convenient, thus increasing its use. Over time, this will lead to road congestion. It will also exacerbate urban sprawl, making alternative modes of transport less competitive as typical travel distances increase.

In the second pathway, a combination of automated public transport and new mobility services offers competitive alternatives to the private car, especially in urban areas. Robotaxis, automated public transport, shared mobility, peer-to-peer renting, MaaS services and intelligent mobility management all play a role in the future of service-based mobility. Service-based mobility can make the transport system more efficient and improve conditions for a dense urban fabric. On the other hand, a dense urban fabric is often a prerequisite for the introduction and profitability of mobility services, underlining the need to coordinate transport and land use planning. Outside urban areas, market-based mobility services are unlikely to be launched. This could lead to a polarisation between urban areas, where transport services are available, and rural areas, where people rely on private cars. Access to mobility services may also not be possible for all groups, as they may require digital skills and able-bodiedness.

New transport technologies and services will interact with each other, not operating independently of each other.

Policy recommendations to steer the pathways

Based on the identified impact mechanisms, this study identified policy recommendations to influence the pathways. These are:

1. **Transport and land use planning:** Transport and land use planning influence the transport system and urban structure. New transport technologies can solve problems concerning urban transport but also pose challenges. Automated passenger cars may improve traffic flow and safety, but encourage the development of car-centric urban fabric. Service-based mobility relying mainly on automated public transport can enable more efficient use of space and a more sustainable modal split. In transport and land use planning, it is necessary to identify opportunities or threats posed by changes in traffic. By anticipating these changes, sustainable mobility can be promoted in both urban and rural areas.
2. **Improving public transport:** Automated public transport can improve its service level and attractiveness, thus promoting its use as well as the new mobility services which rely on it. Dense urban fabric and public transportation support and facilitate each other.
3. **Taxation, economic incentives and restrictions.** Taxation and economic incentives should be directed to facilitate public transport and shared mobility. Cities can introduce a range of measures, such as road pricing or temporal or geographic restrictions on certain modes of travel if new modes of travel cause issues. Financial incentives are needed to support the integration of sustainable transport modes.
4. **Parking policy:** Parking policies can be used to steer the use of automated private vehicles and shared mobility services. Parking policies designed cooperatively by cities and service providers can contribute to a liveable urban landscape and economically support mobility service providers.
5. **Co-regulation:** Co-regulation supports public-private cooperation in the development of transport technologies and services. It is based on rules established by a public authority, according to which various private and public parties can form voluntary agreements. This approach supports the usability of new technologies, improves their sustainability and maintains their continuity.
6. **Education and digital services:** The digital skills of citizens can be improved through education. Especially older people's skills regarding the use of automated driving systems and mobility services need to be addressed.

7. **Facilitating the conditions for automated driving:** Appropriate conditions facilitating automated driving must be ensured so that automated cars, robotaxis and automated public transport can be introduced. This requires active monitoring of the development of automated driving technology and appropriate investments by the public sector.

More on the topic

The final report of the project (in Finnish): Lehtonen, Helminen, Mesimäki, Tuominen, Wallius (2024). Liikenteen uusien teknologioiden ja palveluiden vaikutusmekanismit. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 2024:36. Valtioneuvoston kanslia, Helsinki. Available in Finnish: https://urn.fi/URN:ISBN:978-952-383-494-1.

The impacts of road transport automation on travel demand, modal split, traffic flow, environment, road safety and the interaction between road users in Finland have also been examined in the report (in Finnish): Aittoniemi et al. (2024). Tieliikenteen automaation vaikutuksia. Traficomin tutkimuksia ja selvityksiä 10/2024. https://www.traficom.fi/sites/default/files/media/file/Tieliikenteen_automaation_vaikutuksia_10_2024.pdf

More information on the coregulation, e.g.: European Economic and Social Committee: https://www.eesc.europa.eu/sites/default/files/resources/docs/auto_coregulation_en--2.pdf

More information

Senior Scientist Esko Lehtonen VTT Technological Research Centre of Finland Ltd., Phone. +358 40 158 9548, esko.lehtonen@vtt.fi, https://www.vttresearch.com/

Senior Scientist Ville Helminen, Finnish Environment Institute Syke**,** Phone. 029 525 1166, ville.helminen@syke.fi, https://www.syke.fi

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Chair of the steering group:
Senior Specialist Atte Riihelä
Ministry of transport and communications
atte.riihela@gov.fi

Government's analysis, assessment and research activities

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