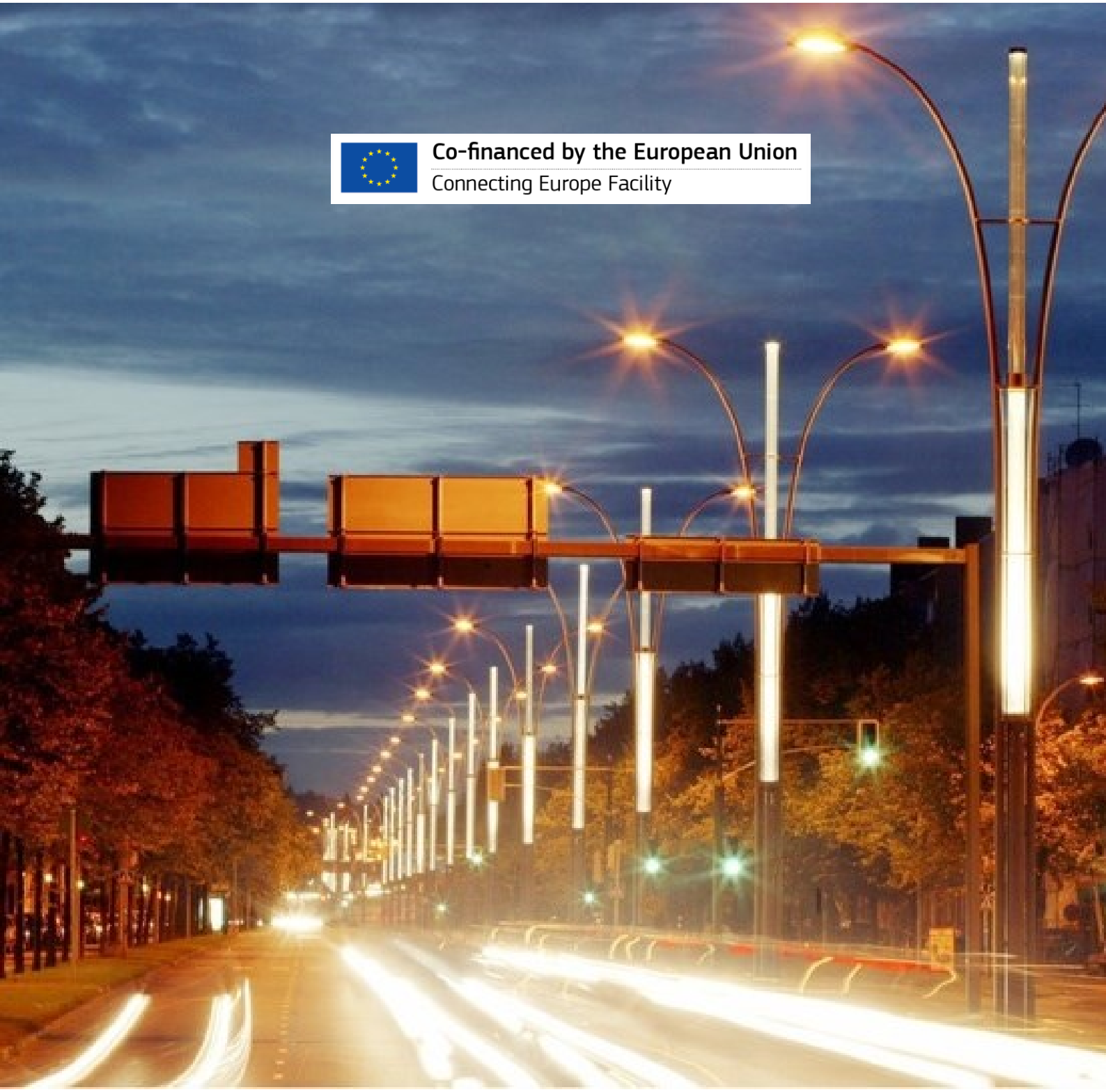

TRAFFIC MANAGEMENT 2.0

Preliminary plan for the interactive and cooperative traffic management in the Helsinki Region

Report summary 2022

PREFACE

The background of interactive and collaborative traffic management is based on observations that siloed government activities and the development of commercial traffic information services lead to a suboptimal outcome for the parties involved, particularly for travelers, where not all collected data is fully utilized, the information is partly contradictory, and investment needs are growing and somewhat overlapping. To fundamentally reform this development, the European intelligent transport community, initiated by Ertico, TomTom, and Swarco, has established a new collaboration concept "Traffic Management 2.0" which is based on joint situational awareness and data sharing, coordinated service delivery (including C-ITS), jointly agreed operational models and wide ecosystemic collaboration.

The aim of the preliminary plan was to establish regional and organisation-specific targets for the development of cooperative and interactive traffic management in the public sector and to draw up a step-by-step development path for implementing the measures within a wider ecosystem.

The steering group of the plan consisted of Sakari Lindholm, Juuso Tuomola and Jani Laiho from Fintraffic Road Ltd, Riikka Aaltonen from the Helsinki Regional Transport Authority (HSL), Eini Hirvenoja and Timo Karhumäki from the Centre for Economic Development, Transport and the Environment, Mikko Lehtonen, Marko Mäenpää and Joonas Kurtto from the City of Helsinki, Antti Savolainen from the City of Espoo and Heikki Alkila from the City of Vantaa. The consultants responsible for the project were Tomi Laine and Atte Riihelä from Ramboll Finland Ltd, Risto Kulmala, Ville Kilpiö and Matti Huju from Traficon Ltd, Magnus Simons from VTT and Ari Vainio from Ari Vainio Ltd.

The work was part of the Nordicway 3 project. Fintraffic Road Ltd and the Cities of Helsinki and Vantaa received funding support from the Connecting Europe Facility (CEF).

This report is a summary report of the studies and specifications implemented within the project during 2021-2022.

Helsinki, 4th of February 2022

Fintraffic Road Ltd

SUMMARY

Traffic management 2.0 concept

The aim of interactive and cooperative traffic management is to combine public and commercial traffic information services. The current situation is not optimal, because when the services are produced in separate silos, the information that is collected is not fully utilised, the information provided to end-users is partly contradictory and investment needs are growing and partly overlapping. In order to fundamentally reform this model, Ertico – ITS Europe has set up the Traffic Management 2.0 (TM 2.0) cooperation group, which includes transport authorities, research centres, service providers, vehicle technology manufacturers and equipment suppliers from different countries. The aim of the Traffic Management 2.0 cooperation group is to apply ecosystem thinking to develop digital traffic management services where the public traffic management operating models and measures are combined with the journey information produced by road users and commercial traffic information services used by consumers on mobile phones and vehicle integrated devices. The TM 2.0 concept focuses on the shared ecosystem of the public and commercial sectors, a high-quality common data platform, commonly agreed principles and new operating models. Thanks to the concept, the standardised digital traffic management tools can also be used in the development of cooperative systems (C-ITS) and the traffic management of automated vehicles in the future.

The TM 2.0 concept has been developed in Europe for many years with support from the European Commission. The Socrates 2.0 project piloted the services and the functionality of the cooperation models in four urban areas. In these projects, the concept was extended and the emphasis shifted from road transport to multimodality.

Goals and services in the Helsinki Metropolitan Area

The aim of the pre-study was to establish regional and organisation-specific targets for the development of cooperative and interactive traffic management in the public sector and to draw up a step-by-step development path for implementing the measures.

The regional targets were specified in workshops, and they were based on the national and MAL level targets set for the development of the transport system. The targets are related to developing traffic flow, safety, the environment and the economy. The following targets were selected as the key targets that would guide the planning: reducing traffic congestion by controlling demand at different times and in different networks, supporting multimodality, promoting traffic safety and the health and safety of end-users, supporting the availability and attractiveness of sustainable modes of transport through travel chain thinking and increased knowledge, enhancing the efficiency of transport infrastructure maintenance and increasing the utilisation rate of the infrastructure and services.

After discussing the targets and reviewing international examples, the participants selected three service areas for further planning:

A. Information services during the journey
B. Traffic control
C. Journey planning and route guidance services

The services in Category A are used during the journey, and their aim is to provide important information about hazards and other situations that affect the end-users. The aim is to maximise the availability of these services for end-users by providing them on multiple channels and offering advanced functionalities.

The applications in Category B are advanced traffic control applications that utilise new types of vehicle terminal equipment or a broad knowledge base to optimise traffic control. In the Helsinki Metropolitan Area, traffic lights are the most commonly used traffic management application that can be developed under the concept to provide extensive impact.

Applications in Category C, on the other hand, are related to the development of navigation and route guidance services, covering both the public and private sectors, through improving the initial information and agreeing on common rules for the management of different traffic situations. Route guidance services are used before and during the journey, for selecting the mode of transport or a combination of different modes of transport, the time of departure and the route, depending on the case.

Each service category consists of two levels. The first level focuses on developing the existing services on the basis of an improved and more comprehensive data platform, and the second level focuses on implementing services with new technical solutions that also require new types of organisation, for example, in terms of cooperation between public and commercial actors. The following figure illustrates the service levels.

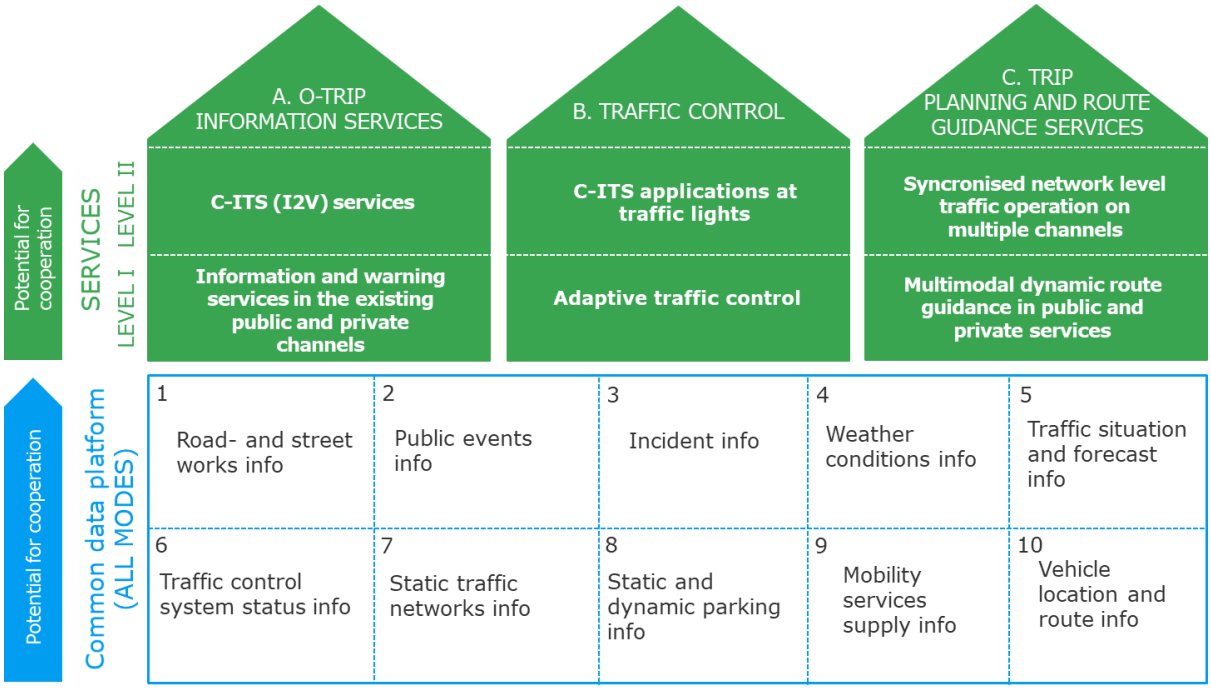

Figure 1. Common data platform as the basis for the development of selected end-user services.

Data platform produced in cooperation as the basis for service development

The data platform that is shared between the ecosystem operators is at the core of the Traffic Management 2.0 concept. It is the prerequisite for the implementation of more advanced end-user services. The pre-study identified ten areas of the common data platform (see Figure 1) that are necessary for the development of the services that meet the target. The data platform required by the selected services consists of both the currently existing datasets as well as the new datasetsthat supplement them. In addition, there are some data existing sources, but the data they produce requires development, for example, digitising. It should be noted that, although the aim of the cooperative and interactive traffic management is to improve cooperation, the elements identified as necessary in the data platform are ordinary elements of traffic information and control, the production of which still needs to be improved. Some of this data falls under the direct production obligation of state and municipal operators, as specified in the forthcoming amendment to the ITS Directive of the European Commission (including static and dynamic traffic network restriction data, traffic network status data such as road works data, etc.).

A common data platform means that all the providers of end-user services have the same basic information on the current state of the transport system, which enables providing information and guidance in a harmonious manner. The common data platform is built by improving the quality and coverage of the relevant datasets, promoting cooperation between the public actors and the public and commercial ecosystem partners. This is what the cooperative development of the data platform means. However, the common data platform does not prevent commercial operators from having incentives to invest in and develop their own data collection and data platform data on market terms as they compete for customers.

Because the intended data platform includes a wide range of different data groups and their data sources, the shared data platform is not implemented by compiling the data into a single processing and distribution system, but the aim is to build a de-centralised data platform system based on contractual interfaces and mutually agreed standards for data models and interface solutions. Each service developer can extract the information they need for their service from the data platform.

There are 10 elements of the data platform that are developed in cooperation, each containing 1–3 types of data. A service production path has been proposed for the elements of the data platform, including the roles and responsibilities of different actors in the production of situational awareness data. The public actors are responsible for developing the data platform.

In the planning, the aim was to find solutions that improve effectiveness and bring synergies, which is why existing structures and services, such as HSL's and Fintraffic systems, are used in the distribution of the situation data.

The development of the data platform is based on cooperation between public actors in many different ways, for example:

- agreeing on uniform data production obligations for the whole region for operators causing planned traffic disruptions (for example, contractors, event organisers)
- procuring a common service provider for road and street maintenance operators for the production, digitalisation and refining of various types of data.
- utilising existing road network services in the production of municipal situational data (for example, the notification service of contractors)
- using existing ecosystems where Fintraffic is already a partner (Waze ecosystem, SRTI ecosystem) to refine the regional data platform
- using extensively Fintraffic's Digitraffic service to distribute data to end-user service providers.

During the work, discussions were held with several international and domestic ITS companies. Typically, commercial operators either sell data as a product or use it in their own operations. It is possible to purchase such data as a service as part of the common data platform, but this model is so expensive that it is only recommended in a limited scope. In general, purchased data should be limited to refining the common data platform, it should not be distributed as such.

Commercial operators may also share data with third parties, if they consider this to promote their business in other ways. In the discussions, at least the status data of parking facilities and the commercial mobility services supply data were

identified as these kinds of data sets, through which the company gains wider visibility and demand for its services by opening up the data.

We also identified some companies that use a business model that is based on data exchange on the market. In the model, the commercial operator hands over the data it collects and receives from the other party data that benefits its own business. The company that follows this model is Waze, which is owned by Google. The newly established SRTI ecosystem, which focuses on the exchange of traffic safety information, is also based on a similar data exchange model. The ability of public actors to make extensive use of business model based on data exchange is limited by the open data policy and the legislation governing it – most of the data collected by public actors is already available to anyone free of charge, so there is no significant exchange value for the data as such.

In conclusion, the data of commercial operators can be integrated into the common data platform when the company derives direct or indirect business benefits in exchange. Despite this limitation, the common data platform, which is mainly financed by public actors, can be complemented with commercial datasets. The potential for cooperation between the public and commercial sectors is also linked to the further processing and digitising of data. It is often more cost-effective to use the services and tools already available on the market, rather than to develop similar functionalities as tailored solutions. The study identified several opportunities of this kind, involving financial compensation for the purchase service provided.

Roles of the operators in the ecosystem

The public actors establish and coordinate the ecosystem, develop the data platform and, to a certain extent, provide basic services to end-users. The public actors collect information through their own systems or are responsible for processes in which information is produced by different actors (for example, street works). The operators are responsible for investing in the production and quality assurance of data and the resourcing related to these. The benefits include improved information for end-users, improved road and street management processes and planning, and ultimately improved traffic flow and safety and reduced emissions. The public actors will see that by developing the data platform and services in cooperation with other public actors in the region, they can achieve more resources and efficiency for the development, which reduces the lead time of development and improves cost-effectiveness. Fintraffic Ltd can support municipalities in developing the data platform, for example, by providing centralised services and its existing tools for the municipalities against a service fee. In the ecosystem, the Digitraffic service has been identified as a key tool for distributing situation data to the market within the whole region, because the centralised model is not only cost-effective, but also easy to use. In addition to the above, Helsinki is developing its own traffic situation platform.

HSL produces the information needed for public transport, its planning and passenger services. The ecosystem allows complementing the information currently provided by HSL with a view to promoting multimodal travel chains.

Synergies and win-win situations between public actors emerge from cities assuming similar roles and responsibilities. This creates synergies in, for example, the planning, definition and implementation of measures, and the cities can also procure services together. Clear responsibilities and harmonised practices lead to resource and cost savings by reducing duplicate tasks. Cooperation within the Helsinki Metropolitan Area Traffic Control Centre PLH enables synergies in operational tasks.

Providing end-user services is the main business of many commercial operators. The main role of commercial operators in the ecosystem is to develop and provide end-user services on market terms. This is also what the public actors want, although certain basic services should be produced publicly also in the future. The principle is that the public sector does not develop new services in an attempt to compete with commercial operators. Instead, they invest in the coverage and quality of the data platform elements, in particular, the elements that relate to the processes of the public actors, and promote the use of these investments on the market through ecosystem cooperation. A high-quality data platform that is developed mainly through public investments can break down silos in the provision of services, when both public and commercial service providers have access to mostly the same situational awareness data.

The objective that is at the heart of the Traffic Management 2.0 concept – the ability of public actors to influence the content and coherence of end-user services – will be developed in the ecosystem in phases by the strategy group, with the aim of obtaining market acceptance and support for the public guidance, as well as ensuring that the guidance does not weaken the incentive of companies to develop their services continuously that is motivated by competition.

End-user services are typically targeted at a specific group of users among whom the company has a market share. From the regional point of view, this means that only the end-users in the commercial operator's market share can be reached by purchasing services from the operator in question. Broad coverage requires cooperation with multiple commercial operators.

Combining data with the common data platform also brings added value for the commercial operators through refining. Consumers receive added value when open data is linked to other services and functionalities. There is a market demand for refined data, which can be based on open data and the company's own ability to add value to it, for example, through analytics. Consumer information produced by public actors (for example, public transport services) can also be commercially exploited through refining. Harmonising the quality of open data and continuous guaranteed maintenance enable high-quality, impactful end-user services that result in more satisfied customers for commercial operators. Centralising data distribution interfaces in one place makes data integration easier, while the importance of a high service level increases (several types of data behind the same service).

Increased interaction between public and commercial actors will improve understanding the needs of the different parties. A clearer view of the needs of public actors and the market for purchased services will help companies to make data analytics investments. Commercial operators need predictability on the market. The public sector also benefits from long-term cooperation.

Companies offering their services on the European or global level have limited opportunities to integrate regional databases. Their participation will significantly increase the effectiveness of the common data platform, but it requires prioritising common data models and API standards. The missing standards must be identified and resolved in cooperation.

The implementation and development of the Traffic Management 2.0 concept is a continuous process that requires effective organisation both at the strategic and the operational level. The following figure illustrates the organisation of the Traffic Management 2.0 concept on the basis of international models, as was outlined in the pre-study. However, the roles of the operators were also examined in the light of regional needs, and the organisation was specified on the basis of the examination. Deepening the ecosystem cooperation in stages also through the introduction of operator roles is discussed later under *Development Path.*

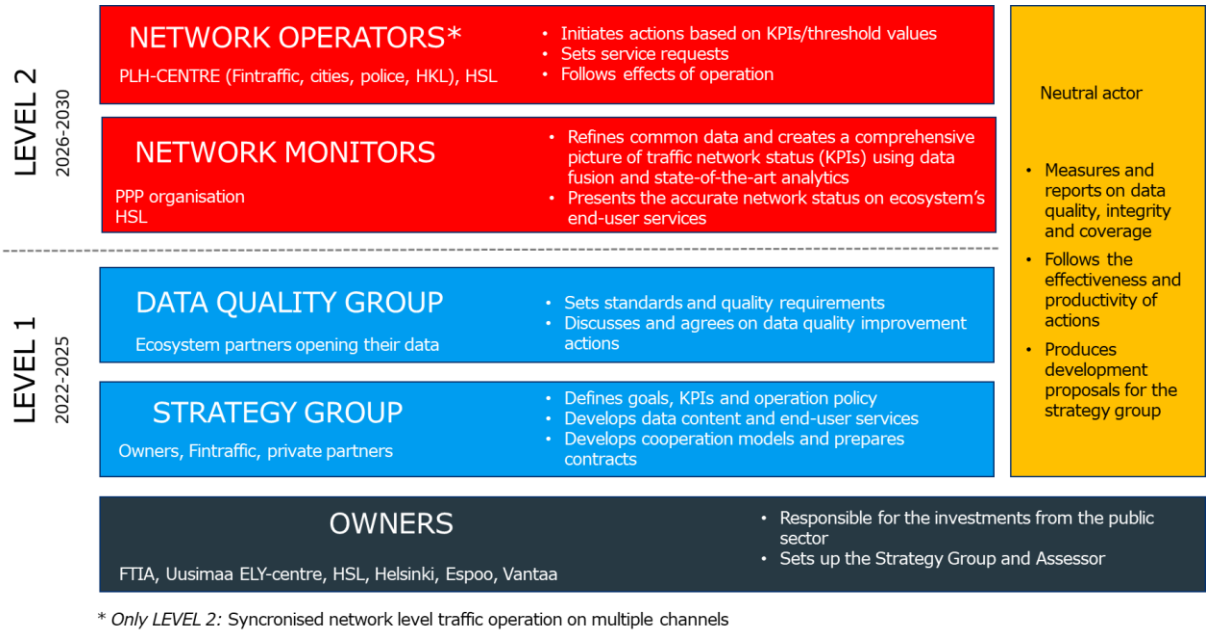

Figure 2. Ecosystem roles at different development phases.

Development path

The Traffic Management 2.0 concept is a large-scale digitalisation project for traffic management and services, where, in addition to technical solutions, the focus is on a transition from separate publicly and commercially provided services to

coordinated and synchronised cooperation. Due to the scale and complexity of the concept, the development path has been divided into three phases, as illustrated below.

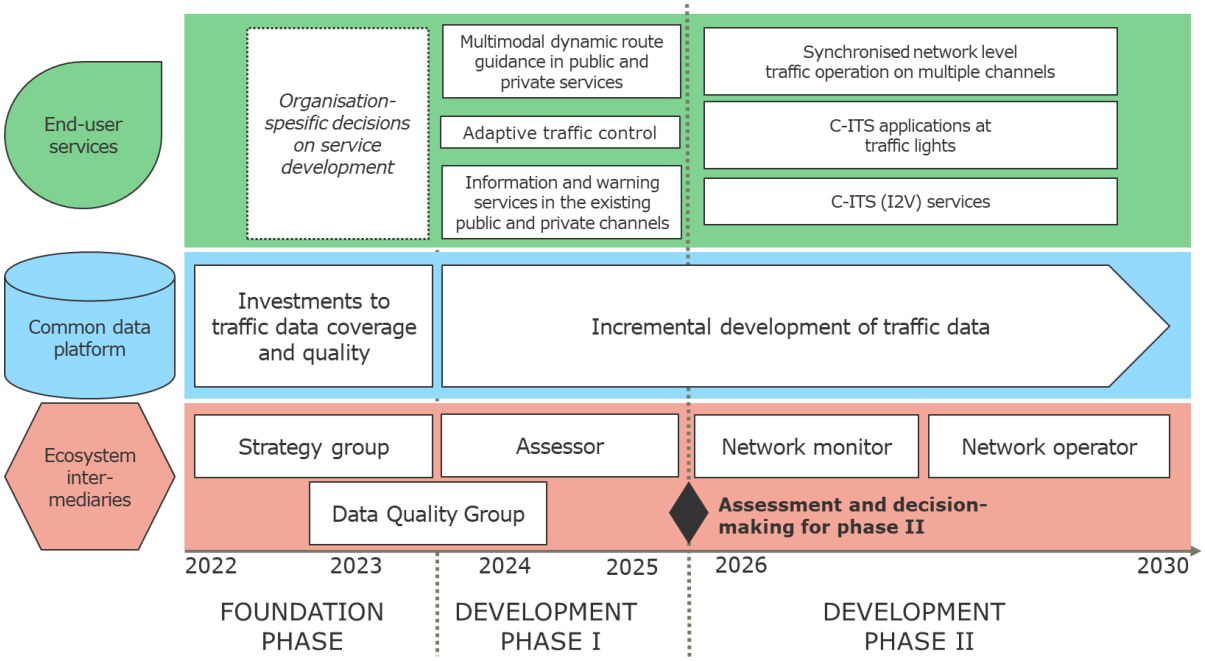

Figure 3. Target implementation and deployment schedule for the elements of the regional development path.

The main content of the phases in a nutshell is as follows:

- **Foundation phase 2022–23**
  - establishing a strategy group to coordinate the development of the data platform and the cooperation between public and commercial actors within the ecosystem
  - launching and implementing investments in the coverage and quality of the common data platform
  - starting the operations of the data quality group
  - starting preparations to integrate new data from the data platform into end-user services
- **Development phase I 2024–25**
  - establishing the role of assessor to monitor and evaluate the effectiveness of the development work
  - implementing the end-user services of Level 1
  - continuing to develop the elements of the data platform
  - assessing the cooperation (by the strategy group) and making decisions on the preparation for closer ecosystem cooperation and on the related organisations and investments, if these are considered necessary on the basis of the assessment
- **Development phase II 2026–2030**
  - Based on the assessment of the previous phase, implementing appropriate network monitoring and operation roles, taking into account the needs and views of commercial operators
  - Implementing the end-user services of Level 2

It is critical to establish a functional strategy group in the foundation phase, comprising of regional public actors and a sufficiently large number of commercial actors. The strategy group's key task, in addition to coordinating significant public investments linked to the data platform, is to serve as a forum for discussion between the public and commercial sectors. The strategy group must ensure that the investments made by public actors in the data platform are also used for the development of market-based end-user services, and find solutions to obstacles related to the use of data. In addition, the strategy group should discuss the principles based on which the public actors can achieve their traffic control targets harmoniously across services on different channels. In development phase I, transport information and route guidance are developed according to a fully voluntary and market-based model, and the role of public actors is to enable the development. The assumption is that the uniformity of information provided to end-users can be achieved by investing in open common

data platform and its quality. This will give commercial operators a fully market-based incentive to invest in their own data analytics to integrate new data types and export them to advanced end-user services.

It should be noted that the measures of development phase I will bring significant socio-economic benefits also after 2025, even if development phase II is never completed.

In development phase II, the cooperation can be deepened if the assessment of phase I supports this, for example, through a PPP organisation, which will develop a more accurate and high-quality data platform between the public and commercial actors who are committed to the PPP model. This model utilises the data and analytics tools owned by different providers to create a common data platform that serves all parties. In this context, the participants will assess whether the public sector needs more sophisticated analytics and how this could be achieved by exploiting the abilities available on the market. It remains to be seen whether commercial operators see this development as beneficial for their own business, and what kinds of incentives, licensing conditions and earning models this model might require. It is also essential at this stage to monitor European trends and the potential future regulatory environment.

The total investment and other non-recurring costs for the foundation phase and development phase I, including the maintenance costs for 2024–25, are estimated to be EUR 3.5 million. Based on the impact assessment, the estimated socio-economic benefits obtained through changes in traffic flow, safety and CO2 emissions are approximately EUR 2 million/year for level I services (full range EUR 0.7–3.6 million/year.) The benefit range depends on how extensively the services cover the users and the informed situations. If the coverage were to remain at the most pessimistic level of the assumptions used in the impact assessment, the benefits achieved (EUR 0.7 million/year) would only slightly exceed the maintenance and service fees for the services (EUR 0.5 million/year). This demonstrates how important it is to invest in the quality of the data platform, the coverage of the network/situational awareness and the interaction within the ecosystem at the beginning. This ensures the widest possible use of the situational awareness available through existing services that have the highest number of users and most extensive reach. If the benefits increase to the level of the probable scenario due to good coverage, the investments will pay themselves back relatively quickly and turn out to be very profitable.

The cost of developing Level II end-user services is estimated at EUR 2.5 million, and the costs of supporting the roles of network monitoring and operation are estimated at around EUR 5–7 million. In addition, the annual costs related to the maintenance and operation of the services are estimated at approximately EUR 2 million per year in the Helsinki Metropolitan Area. The costs are several times higher than the development costs of Level I services. Based on the impact assessment, the benefits of Level II end-user services, – C-ITS services and synchronised online control services – are estimated at around EUR 2.5 million in 2030 in the likely scenario, with a range of EUR 1.1–4.7 million. A profitable implementation of these services therefore requires adequate coverage of both road and street networks and controllable situations, as well as an extensive user reach. The assumptions on coverage used in the calculations are rather conservative. In practice, the effectiveness of C-ITS services requires adequate penetration of compatible terminal equipment and applications, which is one of the factors that must be monitored when deciding on investment in Level II services. In addition, it should be borne in mind that service procurement related to the production of C-ITS services is likely to be well scalable in the wider capital region and possibly at the national level, and the cost estimates may be adjusted as the market develops.

When assessing investments in development phase II, it should be borne in mind that the impact assessment does not take into account the impact on automated vehicles. From the point of view of automated driving, C-ITS services are considered necessary because they enable vehicles to obtain information on the expected situations on their route in order to prepare for manoeuvres or make route choices. Similarly, cooperative services enable exchanging information between the infrastructure and its sensors and vehicles and their sensors. In this way, interoperability promotes the maintenance and support of the operating environments of automatic driving applications and, consequently, the safety benefits of automatic driving. There is also a link between the synchronised network control of Level II services and the management role of for road and street maintenance providers, which is closely linked to the automation of traffic. It is likely that, as automated vehicles become more common, the road maintenance provider will need to influence the route choices of automated vehicles, and development steps related to this have been programmed into the operator roles and systems required for synchronised network control. It is also possible that in the future, regulation will steer development in this direction.

The pre-study was prepared from the perspective of public actors in the Helsinki Metropolitan Area, but the concept is scalable, in many respects, elsewhere in the capital region, in other urban areas and, in some cases, also nationally. Scaling

can bring clear cost savings, and this aspect should be taken into account, in particular, when deciding on investments in development phase II.