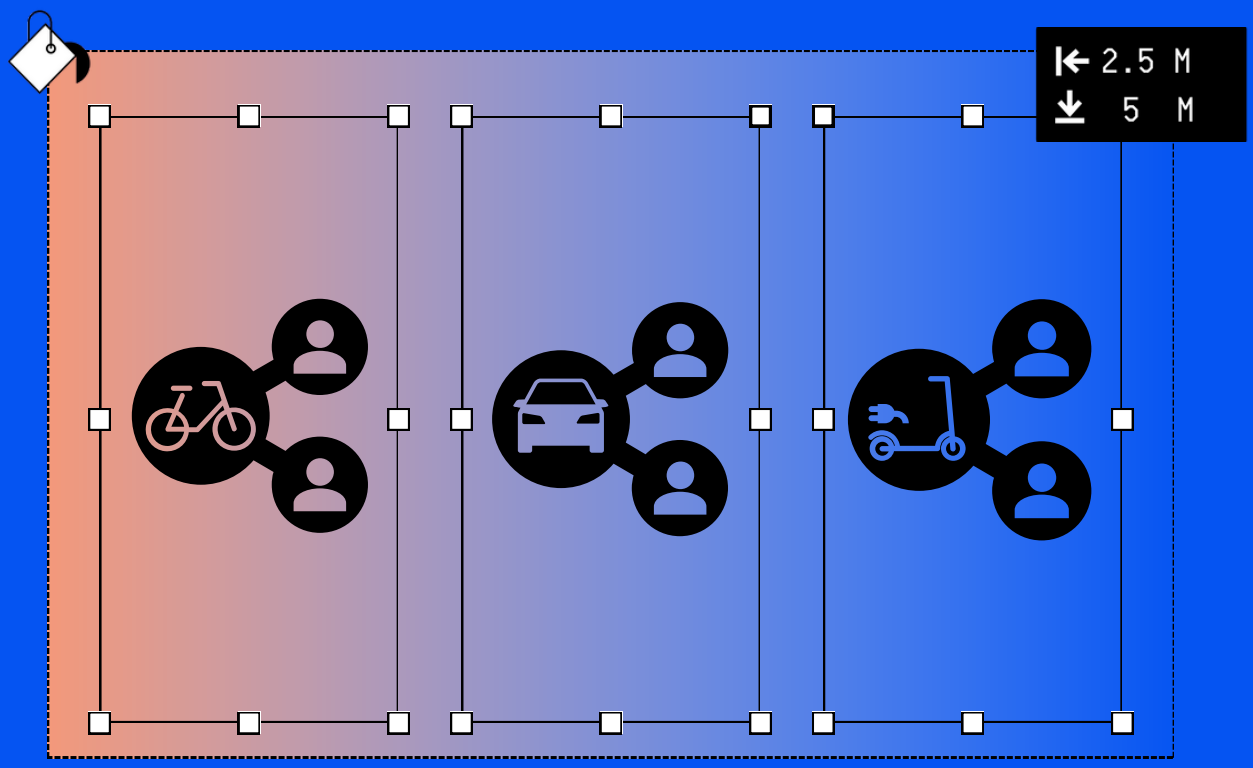
DATA AND DASHBOARDS

Do’s and Don’ts



Interreg North Sea

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mpact

ShareDiMobiHub

Shared and Digital Mobility Hubs (ShareDiMobiHub)

Title: Data and Dashboards: Do's and Don'ts

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Summary

A GREEN TRANSITION

Introduction

This report based on Deliverable 2.8 focuses on **the 'Di' in 'ShareDiMobiHub'**: Shared and Digital Mobility Hubs. After all, digitalisation is essential in developing and monitoring of shared mobility and mobility hubs.

Firstly, digitalisation refers to data-standardisation and -communication that is necessary for developing **Mobility-as-a-Service (MaaS)** solutions and for informing the end-user about his or her journey. This topic is more elaborately in Deliverable 2.9, which discusses some of the ShareDiMobiHub partners' actions to integrate shared mobility and public transport into MaaS platforms.

Secondly, digitalisation touches upon the kind of data that mobility providers produce, the data that governments require to monitor shared mobility, how to visualise data in dashboards in order to keep the overview, and to develop policy based on the data to which public authorities have access.

The first section starts with a **brief introduction into data and data-exchange**. Next, elaborating on the case of the Capital Region of Copenhagen, we focus on the difference between 'data-dreams' and reality. We also introduce the TOMP-API as a standard for data-communication between transport operators and MaaS providers and highlight how project partner Mpact managed the communication initiatives to promote the use of this API.

The second section explores **what data public authorities need and collect.** The University of Applied Sciences Utrecht presents insights regarding public authorities' data and dashboard needs. This is supplemented by recommendations that Way To Go developed for the Flemish Agency for Home Affairs regarding data-monitoring. Also, the City of Leuven shares insights from their digitalisation plan, focussing on what data they collect, why and how.

Section 3 introduces two **dashboard developments in ShareDiMobiHub,** namely the Belgian 'shared mobility dashboard' developed for Way To Go, and the 'automatic reporting tool'-prototype developed by the University of Applied Sciences Utrecht for the Netherlands. We also show how Vestfold County and the City of Leuven use existing software packages to visualise their mobility data, and dive into some dashboards that inspire the Capital Region of Copenhagen in their quest for a dashboard.

The last section showcases **how data can be put to work**. We present the Impact Analysis Tool, developed by the University of Applied Sciences Utrecht, to estimate the positive impacts of shared mobility on the mobility ecosystem. We illustrate how the City of Amsterdam takes data-driven decisions together with the providers. Finally, we present how the Transport Authority for the Amsterdam Region uses data to select potential hub locations in the Amsterdam region.

At the end of this report, you will find an overview of our **main take-aways**, summarised in the shape of do's-and-don'ts.

In a hurry?

There is of course no need to read this entire deliverable. If you are interested in a specific topic, the table below will show you where you can find which information, including best practices from our project partner.

Interested in...	... then go to:
Introduction into data (exchange), a reality-check, and the TOMP-API	Section 1
What data do authorities need, and what makes a good dashboard?	Section 2
ShareDiMobiHub Dashboards team and inspiring examples	Section 3
Putting data to work: from data-collection to decision-making	Section 4

If you can only spend 5 minutes on this report, then we recommend **you proceed directly to section 5**, in which we give you an overview of our main lessons learned in the shape of do's-and-don'ts, including some best practices from ShareDiMobiHub.

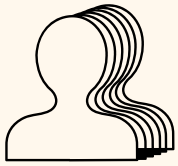
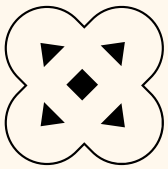
Please note that some partners are still finalising deliverables and dashboards referred to in this document. As soon as these are available, by September 2025 latest, we will incorporate them or hyperlinked to a new report.

1. Data and data-standardisation

In this section, we focus on some of the basics regarding data, emphasising the importance of standardised and exchangeable data for the mobility ecosystem. We provide a non-technical introduction with a more elaborate focus on the TOMP-API, a data standard that is pivotal in integrating mobility data from different sources into MaaS and other platforms. The ShareDiMobiHub project contributed to the further dissemination of this application programming interface (API), which allows building the digital counterpart of 'physical' hubs.

Data, the cornerstone of today's mobility ecosystem

It is hard to imagine our world without data[1]. The mobility sector is no exception to this. Increasingly, policy makers, transport operators and MaaS providers rely on data and the exchange of data for policy, operational, or commercial reasons. This evolution was made possible due to the introduction of smartphones and the **'appification'** of the mobility industry.

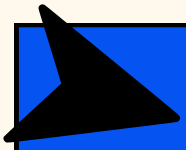
	**Policy makers** use data to understand movement patterns; to monitor the usage of certain transport modes; to decide on whether to increase fleet capacity (by tendering, for instance); to select locations for mobility hubs or to increase the size of hubs based on usage data[2], or to predict the resilience of the (public) transport ecosystem in case of disruptions[3].
	**Transport operators** collect data to get insights into the use of public transport lines or shared modes; to provide real time information in case of traffic disruptions[4]; to inform users on where shared modes are located; and for commercial reasons.
	**MaaS providers** are heavily reliant on the exchange of data: after all, the core of the MaaS promise is to bundle scattered public and/or shared transport services into a single platform. Depending on the level of integration, MaaS platforms can provide real time information, allow for purchasing multiple travel options, or bring the user in touch with customer support[5].

The above is impossible without collecting and exchanging data. In a certain way, this can be compared to traffic: to organise the flows of cars, trucks, bikes or pedestrians in an efficient way, sets of rules were developed to avoid traffic chaos.

Translating this to data-exchange language, 'standards' and 'specifications' a help organising data-exchange in an orderly fashion:

- **Standards** are recognised by an official body such as the CEN: Comité Européen de Normalisation - European Committee for Standardisation.
- **Specifications**, by contrast, are (not) yet recognised by an official standardisation body. Yet, this does not mean that specifications are inferior in quality or that it is not widely used.

In parallel with the growing need for data and data-exchange, numerous standards and specifications have seen the light. Examples of standards are **NeTEx** and **Transmodel**. Examples of specifications are the **TOMP-API** (for integration into MaaS-platforms, see further) and **GTFS** (General Transit Feed Specification) – the latter was developed by Google and is used in Google Maps.



For readers wishing to learn more about data-standardisation, we refer to **the study written by Mpact in the context of the Interreg eHUBS-project**.

Data-exchange between dream and reality

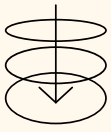
In practice, communicating data between different parties is not always easy, for instance due to a lack of standardised API's or due to the legal framework. This is for instance the case for the Capital Region of Denmark. As in all European countries, Danish mobility data is available via the National Access Point, hosted by the National Road Directorate via the **Dataudveksleren portal**. The available datasets can be consulted and downloaded via their website. Yet, due to Danish legislation, it is forbidden for public transport operators to propose shared mobility options or to tender for them. Consequently, there is at present no integration of data between public transport and shared mobility providers.

Ideally, mobility providers would be able to share data in standardised formats, hence allowing for interoperability, openness, and efficient use in digital mobility services. The Capital Region of Denmark, the responsible authority for public transport in the wider Copenhagen area, would in an ideal world like to receive the following data via the EU-mandated National Mobility Data Space:

REAL-TIME DATA (RTD)	**Data Format**: GBFS (General Bikeshare Feed Specification) or MDS (Mobility Data Specification), both industry standards for shared mobility services.
	Content: Availability of vehicles (bikes, scooters, cars), real-time locations, battery status (for electric vehicles), and operational status.
	Contribution to Public Transport: Integrating real-time data into the national journey planning platform 'Rejseplanen', allowing passengers to easily find, reserve, and combine shared mobility with public transport.

STATION AND ZONE INFORMATION	**Data Format**: GBFS or NeTEx (Network Timetable Exchange).
	Content: Locations of parking zones, charging stations, geofenced areas, and restricted or permitted zones.
	Contribution to Public Transport: Enables seamless transfers between modes of transport by indicating optimal pick-up and drop-off points near hubs like stations and terminals.
BOOKING AND PAYMENT DATA	**Data Format**: TOMP-API (Transport Operator to MaaS Provider API).
	Content: Information on pricing, payment methods, and booking processes.
	Contribution to Public Transport: Supports integrated ticketing and payment across transport modes via MaaS platforms, making multimodal trips more attractive and user-friendly.
HISTORICAL AND STATISTICAL DATA	**Data Format**: CSV or JSON, adhering to GDPR and anonymisation requirements.
	Content: Data on vehicle usage, travel patterns, and demand at different times and locations.
	Contribution to Public Transport: Helps optimising transport planning and resource allocation based on demand, leading to improved services and reduced congestion.
ACCESSIBILITY DATA	**Data Format**: GTFS-flex (General Transit Feed Specification) or equivalent.
	Content: Information about accessibility for people with disabilities (e.g. vehicles with wheelchair ramps).
	Contribution to Public Transport: Promotes inclusivity by ensuring all users can benefit from integrated mobility services.

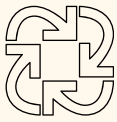
For the **Capital Region of Denmark**, collecting this data would have the following advantages:



Better integration of transport modes: Data allows integrating shared mobility with public transport in journey planning, ticketing, and payments, creating a seamless travel experience.

Increased flexibility and accessibility: Real-time data on vehicles and stations provides access to flexible options when public transport is unavailable or to cover the last mile.

Data-driven planning: Historical data enable transport authorities to identify mobility gaps and to develop strategies to improve public transport accessibility.



Sustainability: Connecting public transport with shared mobility can reduce private car use and emissions, thus contributing to sustainability goals.

Enhanced customer experience: Transparency in data allows users to choose the fastest, cheapest, and most convenient transport options, making public transport and shared mobility attractive alternatives for privately owned cars.

Public transport and shared mobility: shared worlds?

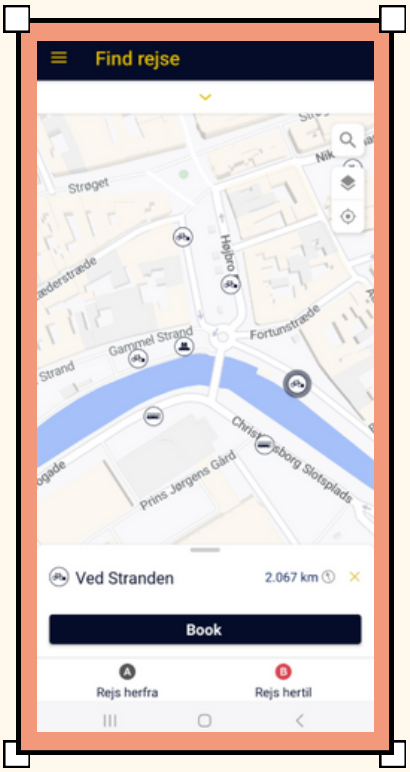
As mentioned earlier, due to Danish legislation, it is not possible for public transport operators to propose shared mobility options, or to tender for them.

Denmark is historically a frontrunner when it comes to integrating planning and paying for public transport usage. All of the country's public transport providers are integrated into the Danish national travel planner app, **Rejseplanen**, as well as into **Rejsekort**, which allows you to pay for your travels via a rechargeable payment card (comparable to the Dutch OV-chipkaart) or with the new Rejsekort App (introduced in 2024). The Rejsekort & Rejseplanen company is owned by the public collective transport companies in Denmark. Its vision is that the new national traffic information and mobility service will contribute to making public transport more attractive, accessible, and easy to use.

The Danish Parliament decided that Rejsekort and Rejseplanen should promote the development of digital mobility services and provide the public with a MaaS platform. At the moment, the Rejsekort & Rejseplan company is in **consultation with the market** for shared mobility providers to materialise this ambition. However, it has not yet been decided how the new public mobility platform will in practice integrate with the private providers. Today, some providers can already be chosen from the Rejseplanen travel planner. Integrated payment trough the digital Rejsekort travel card is, however, not possible yet.

Given its location, the Capital Region of Denmark finds that a MaaS-solution may not be limited to a single operator or country. Bordering Sweden, there is potential to attract foreign customers by developing a digital platform that includes journey planning, booking, and payment **across public and private transport providers**, as well as **across national borders and currencies**. In this context, relying on open and standardised data that can operate across borders is essential. In other words, in an ideal world, it should be mandatory for the data exchange platform "dataudveksleren" to collect data from both public and private transport providers and align their data, making it easier to develop new mobility services.

An inspiring example in this respect is the ITS-Nordic+ project, which develops seamless multimodal cross-border travel by integrating planning, booking and payment processes.



The Rejseplanen-app showing the location of shared bikes (source: Rejseplanen App).

Standardising data-exchange through the TOMP-API

Although data-exchange certainly has many advantages for the public authorities, it should first and foremost make commutes or leisure journeys hassle-free for the most important stakeholder in the mobility ecosystem: **the traveller**. Digital platforms are crucial in this respect, such as:

- Digital kiosks or landing pages showing information regarding the offer at the mobility hub,
- and MaaS-apps to facilitate booking and paying the different mobility services available there.

Platforms as the ones mentioned above are the digital counterpart of physical hubs. After all, what is the use of physically bundling services while keeping the service information, timetables, booking and payment procedures scattered over multiple platforms?

A concrete example of bundling information are the **Hoppin digital pillars** in Flanders: they bundle information regarding the mobility services available at a particular hub, including real-time information of public transport, information on the shared mobility services, a map showing where the different services are located, and so forth. In this fashion, digital kiosks communicate basic but yet essential information about the service offer at a hub, without forcing the potential user to download multiple apps or to look for the information on multiple websites.

The Hoppin digital information kiosk, prototyped using the TOMP-API (copyright: Mpact).

Crucially, integrating information can only be done in a cost-efficient fashion when making use of **standardised protocols for data-exchange.** An example of this is the TOMP-API: the Transport Operator to MaaS Provider - Application Programming Interface. The API was developed by the TOMP Working Group as an open source, standardised protocol for technical communication between MaaS providers and transport operators. It covers all stages of a trip, including planning, booking, execution, support, general information and payments of multimodal trips.

Specifications like the TOMP-API **benefit to all parties involved**. A position paper by the MaaS Alliance highlights that standardising data-exchange:

- Allows authorities to evaluate and analyse the use of the public transport and shared mobility.
- Allows to compare offers from the different providers and understand travel patterns.
- Reduces the overhead of developing and managing data requirements, thus creating an equal level playing field for new players that want to enter the market[6].

This contrasts with many of the present-day situations in which data-exchange is not organised through standardised protocols. Consequently, MaaS providers have to negotiate with each transport provider separately about data-exchange, making integrations into MaaS-platforms more time-consuming and expensive[7]. Yet, the potential of standardised data-exchange is shown by the increased usage of protocols like the TOMP-API, which is currently implemented by over 50 organisations, including highly regarded organisations like Entur (the national mobility planning app for Norway) and Deutsche Bahn Connect (a platform combining DB train services with car- and bike-sharing).

For ShareDiMobiHub, Mpact conducted a series of interviews TOMP-implementors to better understand their motivations for relying on this API.

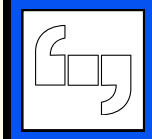
BOX 1

Communicating about data standards

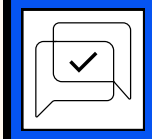
Developing a data specification or standard is one thing, communicating about it is something completely different. Engaging with an audience about data-exchange protocols is rather challenging because things quickly tend to become rather technical, and the audience is quite 'niche'. Nonetheless, communicating about the added value of standards and specifications is important to keep this (not so visible, yet important) data-infrastructure top-of-mind among policymakers and mobility providers.

Mpact, which co-developed this specification, was responsible for making the TOMP-API more visible because it has enormous potential for digitally integrating information at mobility hubs and for enhancing the multimodal user experience through MaaS platforms.

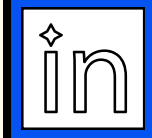
To this end, Mpact started coordinating the Working Team responsible for networking and communication. With other partners, Mpact coordinated a dissemination strategy that consists of four pillars:



Conferences and workshops – Talking with different stakeholders allows to understand the market's needs, to collect feedback, and to inform interested parties about the TOMP-API. To this end, the Working Group presents regularly at high-end conferences in Europe and North America and takes part in workshops, plenaries, and panel discussions.



Blogs and interviews – The TOMP Working Group regularly publishes blogs to focus on some technical issues, and interviews that put our implementors in the spotlight. The focus during the interviews is on the advantages of using the TOMP-API, challenges faced in the implementation process, and suggestion for future development. The interviews are available through the TOMP's community platform.



Visibility on LinkedIn – Only publishing blogs and interviews on your website will not significantly increase your visibility. This is where LinkedIn comes in. The Working Group now makes more active use of LinkedIn. New content on our webpage and upcoming presentations by TOMP members at conferences are actively communicated via LinkedIn – with success: between November 2023 and April 2025, the number of followers increased from 464 to 606 (+ 31%).

Website – The first place where stakeholders look for information about the TOMP-API, is the website. As the TOMP Working Group has to inform a diverse audience (policy makers, PT and shared mobility operators, journalists, community members), this website was redeveloped into a landing page that contains basic information. From here, one is directed to specific channels based on the information he or she is looking for: the Mobility4Users channel for the TOMP-community, GitHub for technical information, LinkedIn aiming at a more general audience, and Slack for chatting directly with the TOMP community. All channels are updated regularly to show that the protocol is 'alive'.

2. In search for data-driven policies

This section explores what data public authorities need and collect. We dive deeper into research by the University of Applied Sciences Utrecht regarding the data-monitoring needs of municipalities, and how different data can be integrated into an accessible dashboard. This is supplemented by insights from Way To Go (formerly Autodelen.net), which has provided recommendations regarding data-monitoring to the Flemish Agency for Home Affairs. To conclude, we focus on the digitalisation plan of the City of Leuven, which discusses their data-needs, what data they collect, why, and how.

What makes a good dashboard for municipalities?

ShareDiMobiHub wants to better understand the **data monitoring needs** of municipalities. Insights on this topic were gathered by the University of Applied Sciences Utrecht through three resources: literature, annual reports on shared-mobility monitoring, and workshops with municipalities. In the following paragraph, findings from these three resources are discussed. A more detailed analysis is available through a report written by the University of Applied Sciences Utrecht.

One of the main recommendations done in literature, is to develop a **shared mobility dashboard**. As there currently are a lot of relevant data and datasets, analysing this information has become labour intensive and requires certain skills. However, using a dashboard lowers the threshold for gaining insights from the available data.

A good dashboard should include some specific features, among which (1) a function to compare data between municipalities; (2) insights into contextual factors like public transport, urbanisation levels of the neighbourhood, and the greenspace in the area; and (3) data-monitoring over time on a neighbourhood level. The data should only be available to people working in the municipality, and sharing this data should be in their control. A dashboard should be designed to be **consulted infrequently** and does not contain too much real-time data that requires the user to regularly visit the dashboard to gain meaningful insights.

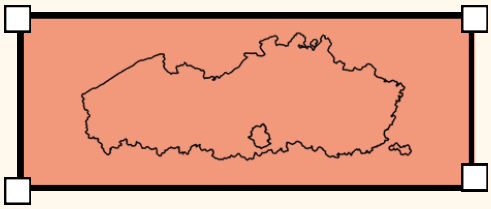
Previous reports on shared mobility from the municipalities of Amsterdam and Rotterdam provide a good insight into **key metrics** that can be included in a dashboard, such as the number of vehicles, distance travelled, rentals, and rental durations, often broken down by vehicle type, including shared cars, bicycles, and mopeds. Both municipalities use maps, but with different focus: while Amsterdam emphasises shared mobility inventory and service areas, Rotterdam highlights

origin-destination patterns. Additionally, both cities report on the offer, use, and total distance travelled, typically using a half-year timescale to represent the data from the winter- and the summer-months separately.

As a part of ShareDiMobiHub, the University of Applied Sciences Utrecht organised workshops to identify **additional data needs** that are useful for policymakers. The following dashboard needs were identified:

- visualisations for hub occupation rates by time of day
- visualisations for rental data by vehicle type and provider
- time-based comparisons (e.g., seasonal or yearly trends) and parking insights through maps
- custom filters, hub comparisons, and complaint tracking to address operational needs
- public transport and environmental data where relevant
- frequent reporting functionality to assist municipalities in planning and monitoring efforts.

Combining the 'wants' listed here with the key metrics as the ones highlighted for **Amsterdam and Rotterdam** allows to develop an insightful dashboard that equips municipalities and transport authorities to take decisions based on objective, complete and comparable data.



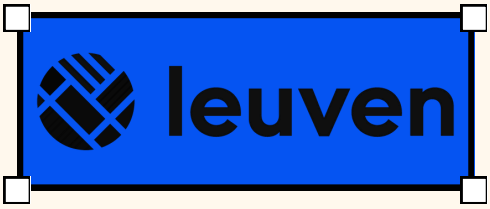
Recommendations on data-collection in Flanders

The use of shared mobility services in Flanders, Belgium, has increased significantly over the past decade. This growth **increased the need for improved data-sharing** between municipalities and mobility operators. In the framework of the ShareDiMobiHub project, Way To Go developed a report that maps the challenges that municipalities and operators are facing, and the potential solutions to these challenges.

FLEMISH MUNICIPALITIES REQUIRE	**Better coordination among government entities**: Multiple agencies collect data on car-sharing, but there is a lack of centralised access and coordination.
	Standardised data portals: Municipalities struggle to track car-sharing usage and its effectiveness due to fragmented data sources.
	Detailed usage data: Municipalities want to receive more granular insights, such as trip details, user demographics, and the impact of car-sharing on private car ownership.
	Integration into mobility planning: Cities need data to evaluate shared mobility's role in broader transport strategies, including first- and last-mile solutions.

CHALLENGES FACED BY FLEMISH SHARED MOBILITY PROVIDERS	**Burden of custom data reporting**: Each municipality requires different datasets, creating inefficiencies and unnecessary overhead for operator
	Concerns about commercially sensitive data: Some operators hesitate to share detailed data publicly due to competitive concerns.
	Need for data standardisation incentives: Many smaller operators lack the technical capacity to implement standardised reporting systems.

WAY TO GO RECOMMENDS DEVELOPING AND PROVIDING
A phased roadmap for data standardisation: The report suggests moving from minimal data exchange (Phase 0) to real-time bidirectional data-sharing (Phase 3).
A centralised dashboard & map: A unified platform would offer municipalities real-time visibility into shared vehicle locations and usage patterns.
Financial & technical support for operators: Assistance in the shape of technical and financial support is needed to help operators adopt standardised data formats (e.g., GBFS, MDS, TOMP-API).



Developing a digitalisation plan in the City of Leuven

To put your data to work, it is essential to develop a digitalisation plan: this allows you to list which data you need, from whom, and what you will do with it. As a part of ShareDiMobiHub, the City of Leuven, Belgium, has prepared **a digitalisation plan to monitor shared mobility and the Hoppin hubs** ('Hoppin' is the brand for mobility hubs in Flanders). The objective of this plan is to obtain better shared mobility usage data. Moreover, Leuven has some specific digital objectives that are also integrated in the digitalisation plan, namely working towards a data-driven policy and higher service level for digital info.

In summary, Leuven wants to move away from the current situation of **fragmented data collection**. Currently, there are differences regarding metrics, level of detail (e.g. location), timing, or shape in which the data is provided to the city (dashboard vs. Excel) by the shared mobility providers. The City of Leuven is therefore working towards high-performance data management that allows them to develop a long-term policy vision and to monitor and evaluate policy decisions.

To achieve this objective, the City of Leuven will cooperate **with internal and external stakeholders** to determine which data is crucial, and which is 'nice-to-have'. Internal stakeholders include the Digi-team, the sustainability department, the communications department and, of course, the mayor and aldermen. External stakeholders include the car-sharing operators, the bike-sharing operator, the Transport Region (Vervoerregio) Leuven, and the Flemish Department for Mobility and Public Works. The competences of each partner and the way in which data is exchanged, is discussed more elaborately in the Digitalisation Plan developed by the City of Leuven within this project.

Moreover, Leuven has the ambition to work towards **automatic data-exchange** and transparency of data so that the most important parameters are visible at any time via a dashboard for internal use (see paragraph 3.2 as well).

Must-have Dashboard Data according to Leuven

Parameter	Level	Car	Cargo bike	E-bike	Bike
Number of members or accounts	Provider	✓	✓	✓	✓
Number of active users	Provider	✓	✓	✓	✓
Number of unique active users per vehicle	Vehicle	✓	✓		
Number of unique active users per location	Location			✓	✓
Start and end time of every trip	Vehicle	✓	✓	✓	✓
Mileage at start and end of every trip	Vehicle	✓	✓		
Address of location	Vehicle	✓	✓	✓	✓
Availability	Vehicle	✓	✓	✓	✓

Developing Dashboards

3.

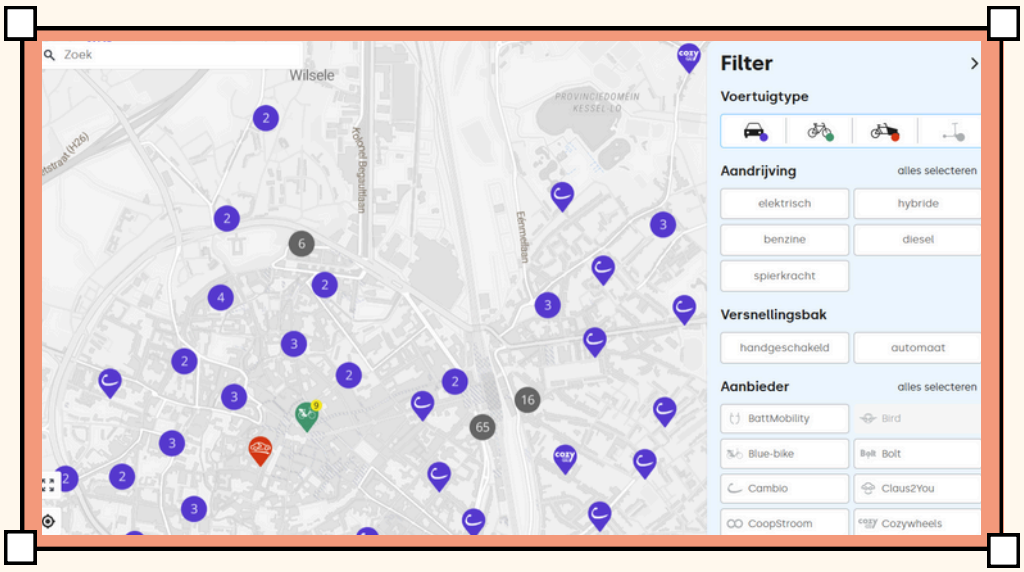
To facilitate the data-driven decision-making as well as to inform the end-user, it makes sense to visualise data in the shape of a dashboard. In this section, we present several dashboards that were developed during this project. Starting from scratch, Way To Go launched a dynamic shared mobility map for Belgium, targeting the end-user. As an add-on to the CROW-dashboard, the University of Applied Sciences Utrecht developed a prototype for an automatic reporting tool for the Netherlands. Other project partners, like Vestfold County and the City of Leuven, relied on existing software programs to visualise their data. The Capital Region of Denmark finds inspiration in dashboards that are being developed in the context of other EU-funded projects.

Developing new dashboards for the grand public and policymakers

Drafting a wish list of the metrics, filters and visualisations for the ideal dashboard is a crucial, but only first step (see section 2.1). As a part of ShareDiMobiHub, some project partners went a step further and developed tools to visualise or monitor the shared mobility offer.

To visualise the shared mobility offer in Belgium, Way to Go tendered for the development of a **dynamic map**. The tool they developed includes two main components, namely:

1. A shared mobility map showing the (real-time) shared mobility offer in Belgium. It features several filters such as propulsion type, gearbox and operator.
2. A basic monitoring tool showing the number of available and total vehicles (and other indicators) per municipality.



Way To Go's map giving an overview of the shared mobility offer in Leuven.

For developing this map, Way To Go collaborated with Nazka Mapps. The development of the database (and subsequently also the basic monitoring tool and map) posed **several challenges**:

- Way To Go has no leverage towards operators to share data and collaborated with them on a voluntary basis. Only one operator refused to share their API due to bad experiences elsewhere.
- Several operators have no API and can only provide static information. This information could not be integrated into the database as it cannot be updated automatically. Nevertheless, Way To Go managed to integrate 23 APIs from different operators.
- The API-quality differs a lot. Only one of the listed car-sharing companies was GBFS compatible. For the other car-sharing companies, the API had to be translated into a GBFS-compatible format. Also, the amount of information in the API differs per car-sharing operator. Some operators provide only information on the station level with no individual vehicle information available, while others provide no or the wrong information on the fuel type.
- Most shared micromobility operators have good quality GBFS-data available. However, only a few of them provide information regarding the total number of vehicles in the fleet and only show their availability. Therefore, based on the database, it is impossible to track the exact number of shared vehicles.

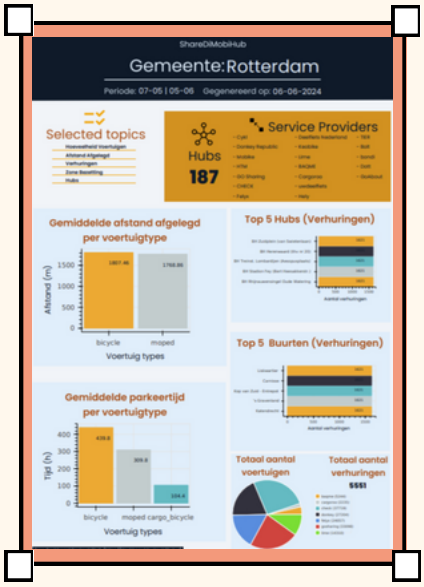
Despite these challenges, Way To Go managed to develop the **first nationwide dashboard** that integrates information on the bulk of the shared mobility providers in Belgium. The map can be accessed **through this link**.

The University of Applied Sciences Utrecht prototyped an **automatic reporting tool**. A reporting tool was one of the features that municipalities expect from a dashboard. Rather than building something completely new, the reporting tool was developed as an additional feature to the CROW '**Dashboard Deelmobiliteit**', a Dutch nationwide dashboard for monitoring shared mobility.

Based on data needs identified through the workshops led by the Utrecht University of Applied Sciences, the team made a list of data-figures and requirements that can be achieved with the data available through the API of the 'Dashboard Deelmobiliteit'. Students from the Bachelor Program in Computer Science have been working on implementing this tool. They started by developing a prototype with dummy data, which can be substituted with real data. The prototype's **output consists of a report** that assembles data on, the average distance travelled per vehicle, the average parking time, and metrics on the hubs (designated by the municipality). Moreover, the user of the dashboard can select a timeframe and an area of interest. The strength of the prototype is that it compiles a multi-page report that summarises key metrics. The report can also be downloaded as a PDF for further distribution, for instance to politicians.

Unfortunately, the prototype has not been developed further due to time and capacity constraints, as well as complexities regarding its implementation. Moreover, another tool was prioritised for further development as it gained significantly more

traction and attention among policymakers and service-providers: the Location Selection Tool. This tool allows policy makers to identify potential hub locations. A web version of the **Location Selection Tool** is available for the Province of Utrecht. A manual is available as a dedicated deliverable.



Summary sheet generated with the prototyped automatic reporting tool.

Mobility dashboard in Vestfold County

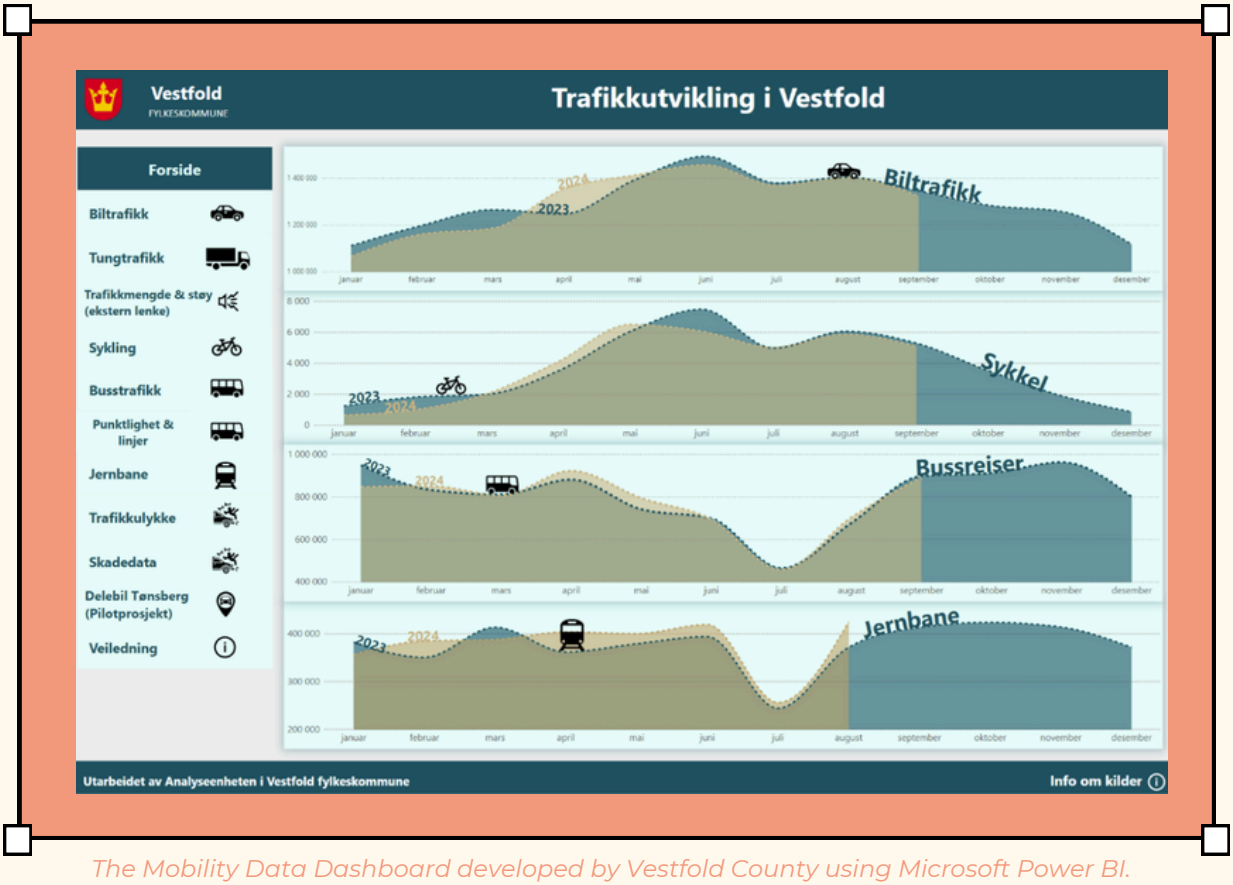
Vestfold County is one of the ShareDiMobiHub partners that wanted to get a better understanding of mobility patterns in their region. Situated in southern Norway along the Oslo fjord, Vestfold is home to around 250.000 inhabitants living in small cities such as Tønsberg, Sandefjord or Larvik. As a part of the project, the county developed three mobility hubs in Tønsberg and started using a mobility dashboard. Vestfold County did not want to re-invent the wheel: rather than building a dashboard from scratch, they opted for using **Microsoft Power BI** to develop a dashboard. This was a logical choice as they already had in-house expertise regarding Power BI for reporting mobility data in the area of Grenland.

Power BI is a **business analytics tool** developed by Microsoft. It enables users to visualise data, share insights, and create interactive reports and dashboards. It integrates data from various sources, transforming it into insights through visual representations like charts and graphs. The arguments of the Vestfold team for using Power BI are that it is user-friendly, supports real-time data updates, and is commonly used for data-driven decision-making in businesses.

Using Power BI, Vestfold County developed a Mobility Dashboard that contains data on motorised traffic, cycling, shared cars and bikes, traffic accidents, and noise pollution due to traffic. To get this overview, the dashboard integrates data from **different data sources**, namely the Norwegian Public Roads Administration, the Norwegian Railway Directorate, the County administration itself, and the hospital (for traffic accidents). The data is updated on a monthly basis.

With simple steps, users can define areas and get insight into traffic volumes, noise measurement results, public transport passenger numbers and punctuality.

The tool can retrieve and sort information about different vehicle groups, such as bicycles, cars, and heavy vehicles. It is also possible to find information about traffic accidents, which can be sorted by municipality, vehicle type, and within selected timeframes from 2020 onwards.



The Mobility Data Dashboard developed by Vestfold County using Microsoft Power BI.

Vestfold County decided to make the Mobility Dashboard publicly available **via the County's website**.

The County can provide up-to-date and relevant data to the local administrations and politicians, the media, real estate developers, mobility providers, and other interested parties. Drawing on the dashboard, the stakeholders can take informed decisions on the development of shared mobility and public transport services, as well as spatial planning and urban development in the region. In general, the response to this mobility dashboard has been very positive: the County's municipalities, policy makers, and local newspapers show interest in the dashboard and make use it for decision-making or communication towards a broader audience.

Vestfold County is exploring how they can **capture shared mobility data** from the shared mobility providers, which has proven to be challenging in the past. The data from the car-sharing pilot in Tønsberg is already integrated into the dashboard, and the County has the intention to develop the Mobility Dashboard further, adding new modes and features.

Mobility dashboards in Leuven

A similar development is taking place in the City of Leuven, which will develop two tools to make more data-driven decisions regarding the expansion of the Hoppin mobility hubs or shared mobility services: a geographic tool using ArcGIS and a PowerBI dashboard. Both tools will be fed with the desired data thanks to a more efficient data-management, both internally and in coordination with the providers of shared mobility services (see paragraph 2.3).

Leuven's first tool will be **ArcGIS for area-specific policy goals and decisions** (under development with the project). Regarding the Hoppin mobility hubs and shared mobility, there are a number of place-related policies that need to be defined and monitored on a spatial level. The ArcGIS tool is being developed for internal use to monitor, visualise, and provide insights into the use of shared vehicles and Hoppin hubs on a spatial level. Four main categories are defined within this tool, namely Hoppin hubs, shared cars, shared cargo bikes and shared bikes. The tool will bring relevant map layers are brought together, and information will be linked in fields to geographic points, clusters or areas to provide the clearest and most insightful answers to policy questions.

Secondly, the City of Leuven develops a **Power BI dashboard** for quantitative policy goals and decisions. Again, this will be a dashboard for internal use to monitor, visualise, and provide insight into the supply and use of shared mobility services and Hoppin hubs. In the future, the Mobility Department of the City of Leuven would like to establish a global dashboard that also integrates the other mobility data and that can also be used as a tool for external communication.

The Power BI dashboard will make it easier for the City of Leuven to develop, monitor, and adjust **quantitative policy goals and decisions** regarding shared mobility on its territory. The ambition is to track:

Leuven's Dashboard goals

- **The annual evolution of supply of different shared vehicles at 3 levels:**
  - **Level 1: for bike or car**
  - **Level 2: for bike, cargo bike or car**
  - **Level 3: by provider**
- **The annual evolution of use of different shared vehicles at 3 levels:**
  - **Level 1: for bike or car**
  - **Level 2: for bike, cargo bike or car**
  - **Level 3: by provider**
- **The annual evolution of impact on private vehicle ownership (car and cargo bikes)**
- **The biennial evolution of impact on modal split**
- **The origin of the users**

BOX 2

ShareDiMobiHub, inspired by...

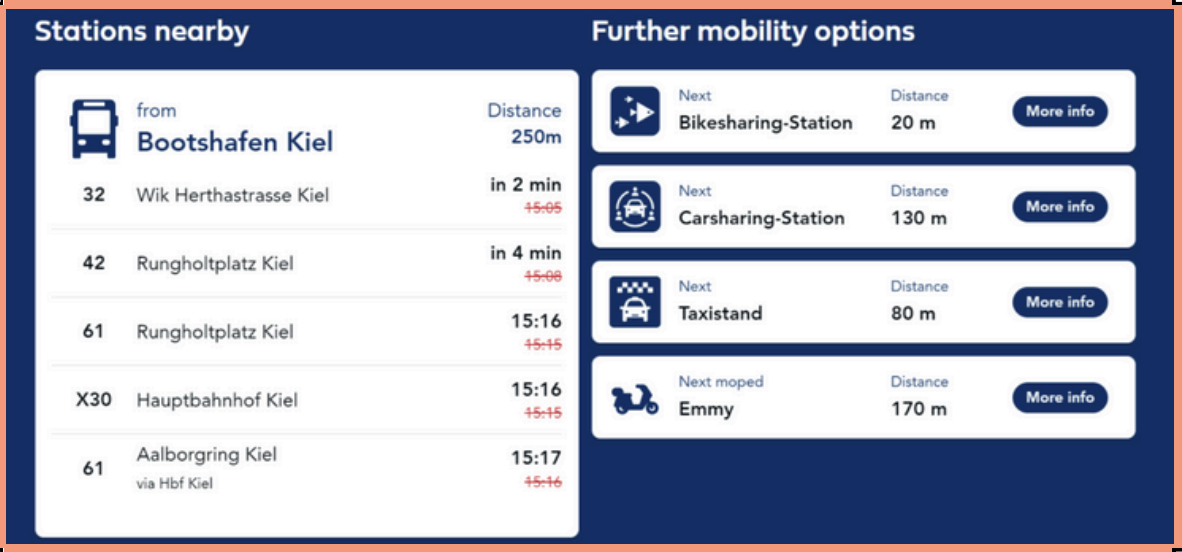
The ShareDiMobiHub consortium loves to get inspired by other projects. One concrete example of this is the Capital Region of Denmark, which is looking for a dashboard that could fulfil their local policy needs and help them in communicating data towards politicians and other stakeholders. They see considerable potential in a dashboard that is being developed by the Danish Technical University as a part of the Horizon Europe GEMINI-project[8].

GEMINI

The mobility data dashboard is tested with shared mobility usage data from Rudersdal, north of Copenhagen. The dashboard communicates the number of trips, active users, rented vehicles, average distance and customer satisfaction, both weekly and monthly, for three shared mobility providers. The dashboard also shows usage data per hub over time (trips, active users and rented vehicles), and enables you to download the data from the platform.

A mobility dashboard developed in the Gemini-project and tested by the Capital Region of Denmark.

Another inspiring example for the Capital Region of Denmark is the 'mobil.live' platform from the Kiel Region in Northern Germany. This platform targets users of public transport and shared mobility, showing the next bus departures and nearby shared mobility options. The main advantage of this platform is that it bundles information of public transport and shared mobility into a single platform, thus enhancing the user experience and optimising communication towards the end-user.



The mobility dashboard from Kiel also inspires the Capital Region of Denmark.

As a part of the Capital Region of Denmark's strategy for shared mobility and mobility hubs, the region will investigate and work towards a dashboard that shows the effects and travel patterns for shared vehicles, as well as its connectivity to the public transport network and the city centres.

4. Measuring impact and data-driven decisions

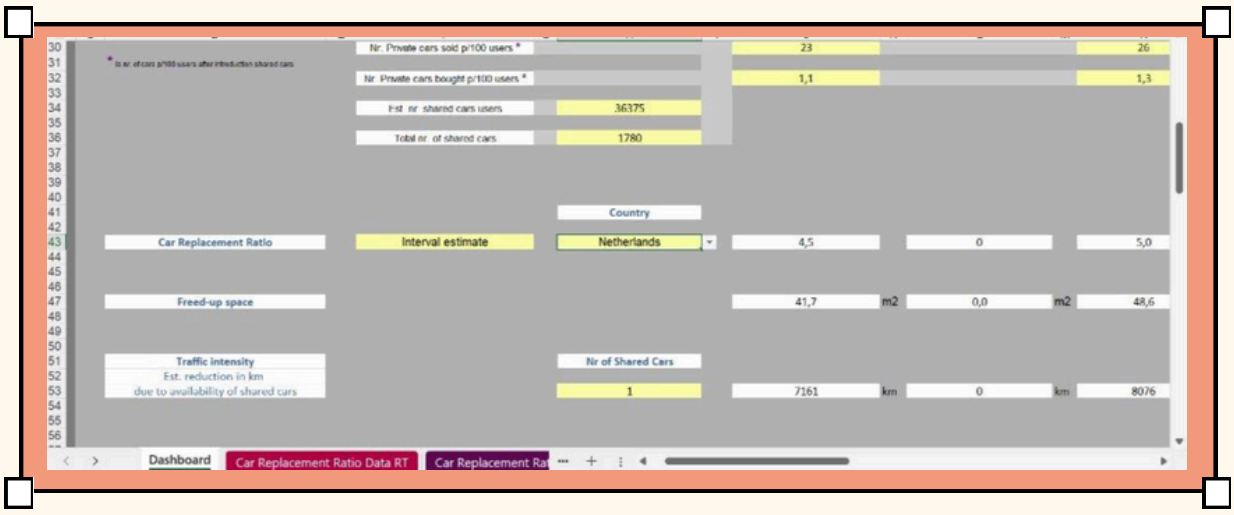
One final question remains: how can all our data be put to work? We try to answer this question by presenting some of the initiatives from ShareDiMobiHub partners. We start with the Impact Analysis Tool developed by the University of Applied Sciences Utrecht, which allows estimating the positive impacts of adding shared mobility options to the mobility ecosystem. We also highlight how the City of Amsterdam takes data-driven decisions together with the providers. Finally, we illustrate how the Transport Authority for the Amsterdam Region combined different datasets and steams to select the optimal hub locations in the Amsterdam and the surrounding municipalities.

Estimating the positive effects of shared mobility

The last years have seen a surge in the number of academic articles and other reports on the impact of shared mobility services, especially bike and car-sharing. To bring all these insights together, the University of Applied Sciences Utrecht is compiling a literature review that focuses on useful **indicators for policy makers**, such as the replacement ratio of private cars, the change in traffic intensity and space use, and the impact on emissions.

Based on this literature review, the University of Applied Sciences is developing an **Impact Analysis Tool** that allows policymakers to quantify the effects of adding shared mobility to the mobility ecosystem or estimating the impact of increasing the existing offer. The potential effects are related to emission reductions, traffic intensity, and space usage. Although still under development, a tool will be available at the end of the project.

In this tool, a user could select a country (e.g. 'the Netherlands') and a scenario (e.g. 'adding 10 roundtrip electric shared cars'). Next, the tool estimates the expected impact of this scenario, such as saving X m2 of space or reducing CO2, NOx and PM10-emissions by 100 kg. The tool thus supports policymakers in search for more (background) information on the positive impacts of shared mobility. Also, it provides them with more insights into the variables that may determine the merits of investing in bike- and car-sharing solutions.



Prototype of the Impact Analysis Tool, which translates academic insights into impact estimations for policymakers.

Collaboration and coordination are key

Many mobility specialists and data wizards have a lot of knowledge of a lot of things. Yet this knowledge is only truly useful when it is shared with partners working on similar topics and facing similar challenges.

fietsberaad CROW

An interesting initiative to foster knowledge exchange stems from the CROW, known for the **Dashboard Deelmobiliteit** in the Netherlands: the CROW-team organises bi-monthly meetings to better understand what the Dutch cities need to make good use of this mobility dashboard.

The City of Amsterdam participates in this initiative: their data specialist contributes by **sharing expertise with CROW**, as well as by developing and testing new features based on experiences using the dashboard. This has for instance lead to creating a feature that allows drawing hubs in the dashboard. Through this functionality, it has become possible to measure the use of the hub per modality. In developing these new features, Amsterdam is working closely together with the other big Dutch cities, namely The Hague, Rotterdam, Eindhoven and Utrecht.

Consequently, using the data received through the CROW-platform, Amsterdam can measure the concrete impact of shared mobility and hubs. Concretely, the data is used to analyse whether the selected hub locations are adequate. The City of Amsterdam also discusses this data with the providers (combined with their data). Based on these **data-fuelled discussions,** the city and the providers can determine whether they need to take action for a specific location.

The CROW-platform is now also used to **communicate new hub locations** with providers. The other way around, shared mobility providers can communicate with the City of Amsterdam via the platform about the proposed locations. Again, this feature was developed due to Amsterdam's collaboration with the CROW-team.

Selecting hub locations with the Transport Authority for the Amsterdam Region

What is the most suitable location for a mobility hub in your city or region? This is a question that many mobility professionals are struggling with. Within this project, the Transport Authority for the Amsterdam Region and the Dutch research institute TNO used a data-driven approach to map **potential hub locations** for Amsterdam and the surrounding municipalities.

Concretely, the Transport Authority for the Amsterdam Region pre-selected **466 potential hub locations**. For each hub, a minimum and maximum number of vehicles was set[9]. The algorithm then determined which of these hubs can actually be realised in different scenarios. For doing so, TNO used a model developed before to assist the City of Amsterdam in the selection of its neighbourhood hubs networks during the Interreg e-HUBS project,[10] hereby using local travel patterns as input. To select the optimal hub locations in the wider Amsterdam transport region, the Transport Authority used its regional traffic model VENOM as input. In this traffic model, **predictions** are made about how many people make a trip on an average workday and which mode of transport they use: car, bicycle, or public transport. For the analysis in context of the project, a fourth option was added: a shared mobility to travel between two hubs.

The algorithm then ran five different scenarios, which are discussed in more detail in the TNO-report.

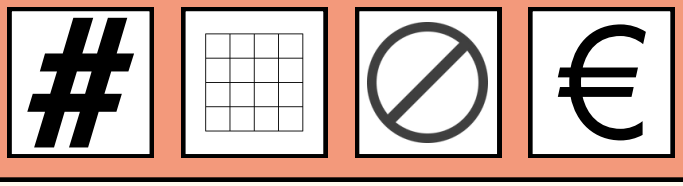
Required data for hub location scenarios

Number of hubs needed - This was estimated through expert judgement and differed for the five scenarios. Some places have been pre-selected as non-car hubs, as their geography does not allow offering shared cars. An example is the medieval heart of Amsterdam, which is already largely carless.

Vehicle capacity per hub - This was estimated through expert judgement and differed for the five scenarios.

Constraints on allowed trip lengths and allowed walking distances to hubs - This was estimated through expert judgement and was based on existing theories as well as the 'STOMP-principle'[11]. For instance, the Transport Authority wants to discourage using (shared) cars for short trips. Therefore, a minimum length for car-sharing trips in kilometres was set in the model. Trips with a shorter distance are then being converted to other modes. Similarly, maximum trip durations in minutes were set for bikes and mopeds.

Customer price - This was estimated through expert judgement and was based on pre-existing TNO-modulations.



For each scenario, **the algorithm defined the optimal locations** for the shared mobility hubs in the Amsterdam Transport Region. The data outputs include:

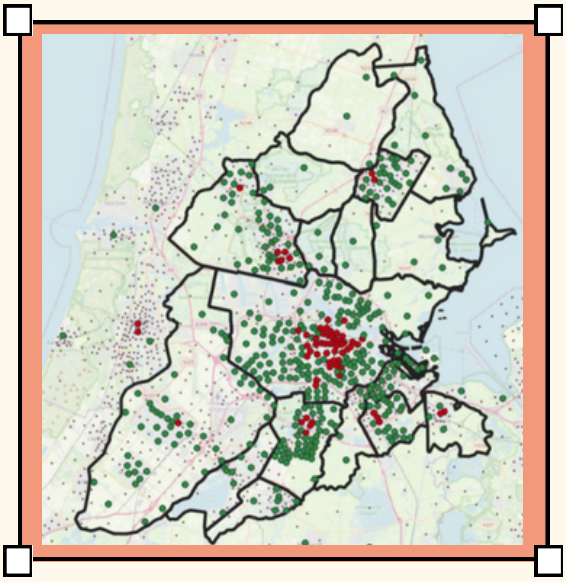
- **Activated hubs** – This shows the theoretical optimal distribution of the hubs in the Transport Region (i.e. fixed hubs, or just the presence of shared vehicles[12]) given certain constraints, based on predicted demand and use. Depending on the scenario, there are 150 or 250 hubs. In one scenario, the theoretical maximum of 466 regional hubs were activated.
- **Budget requirements** – This is the required budget for annual exploitation and the (one-time) building budget.
- **Modal split** - These are the possible changes in travel behaviour. Data is available on shared mobility as such, as well as in combination with public transport.

How can all this modelling be used in the decision-making process? The Transport Authority for the Amsterdam Region is current assessing how they can **translate these theoretical insights** into materialised hubs in the field. For every hub, this will be done in cooperation with local municipalities based on expert judgment and local terrain knowledge.

Adding to that, the modelling exercise also looked at how the hubs, when implemented, would be used and how it would influence the modal shift. This exercise revealed that there are clearly **different user patterns** for car-sharing and shared micromobility. This strengthened the Transport Authority in their vision that shared cars and micromobility should be treated differently:

- Micromobility will, according to the modelling, be combined much more with public transport. Therefore, the Transport Region decided to propose a similar governance structure for micromobility as for public transport, namely a tendering model.
- For shared cars, given their different user patterns, the Transport Authority sees less of a role for itself as their core business is to organise public transport.

In 2025 TNO and the Transport Authority for the Amsterdam Region will **deepen the research** towards shared mobility and explore the relationship between shared mobility services and individual public transport connections.



Potential hub locations in one of the models. Green dots are locations to which shared cars can be added. Red dots represent hubs where shared cars are not allowed.

Data and Dashboards: Do's and Don'ts

5.

In this report we gave an overview of the different actions regarding data and dashboards in ShareDiMobiHub. Combining the insights from academics, transport regions, mobility providers, non-profits and policymakers allowed us to come up with some learnings of which we believe that they can be **relevant for policymakers** and politicians involved in the development of shared and digital mobility hubs.

Our learnings are listed here below in the shape of 5 do's and don'ts, including what we believe are some best practices from the our project.

1

Do not ask data just because you can. Do make use of them for planning and decision-making

Shared mobility providers collect different data from their users. For public authorities, it is tempting to ask all the data that a provider has, even data that are not per se relevant for your organisation. Therefore, think upfront about the use cases for your data and define requirements accordingly. Communicate clearly towards the (shared) mobility providers why you need certain data and how the data will be integrated in your mobility strategy. As some of the provider's data is commercially sensitive, you will need clear agreements on what data can be publicly shared, and what not.

Best practices

- Capital Region of Copenhagen has a clear understanding of the data and formats they want.
- Transport Authority for the Amsterdam Region uses data to select future hub locations.
- City of Amsterdam takes specific actions based on the data from mobility providers and CROW.

2 Do not underestimate the importance of data and data-exchange. Do stress how they benefit to all stakeholders in the mobility ecosystem

Data is not high on the priority list of policy makers and politicians: projects that materialise in something visible, like a mobility hub, usually attract more interest from the media, the public, and politicians. Yet highly qualitative data and well-organised data exchange serve the end-user equally well: it allows for optimised and integrated booking and payment procedures, or political decisions-making based on facts rather than feelings. To achieve this, it is essential to keep the importance of qualitative data and standardised data-exchange top of mind.

Best practices

- Mpact supports the TOMP Working Group in communicating about this protocol for data-exchange.
- Policy-officers, newspapers and politicians express interest in Vestfold County's mobility dashboard.
- University of Applied Sciences Utrecht listed relevant dashboard data for policymaking.

3 Do not hide your stash of data. Do share them when useful for communication purposes and awareness-raising

An increasing number of data is generated and collected. Often, this data remains hidden within the offices of the mobility provider or public authorities. Yet, (non-commercial) data can be a powerful communication tool, for instance to inform users about the shared mobility offer in their neighbourhood or to assist politicians in the decision making process.

Best practices

- Vestfold County provides a publicly available dashboard containing diverse mobility data.
- Way to Go offers a real time position map of all the major shared mobility services in Belgium.
- University of Applied Sciences Utrecht develops a tool that measures the impact of shared mobility.

4 Do not reinvent the wheel. Do make use of existing software packages or platforms

When developing a dashboard, it is tempting to create a dashboard from scratch and to tailor it entirely to your organisation's needs. This is time-consuming and costly. Therefore, it is better to make use of existing software packages that you can customise to your use case, to develop a dashboard in partnership with other cities and regions, or to draw upon inspiration from abroad. To make optimal use of the dashboard once it has been established, the civil servants should get training to understand how to use the dashboard. Adding to this, using the dashboard should be embedded in the organisation's internal processes to avoid that all knowledge is situated in the hands of one person.

Best practices

- Vestfold County and the City of Leuven make use of existing software to visualise data.
- Capital Region of Denmark finds inspiration in existing dashboards before developing one itself.
- The big Dutch cities make use of the nationwide CROW dashboard for data communication.

5 Do not just push a standard or a dashboard. Do take the interests and insights of all stakeholders into account and provide support

Using a standardised protocol for data-exchange or a centralised dashboard results in time and cost-savings for both public authorities and mobility providers. Yet, standardising and centralising usually implies a transition towards a new API or dashboard. Not all providers of authorities have sufficient institutional capacity to manage this transition. Moreover, mobility providers might be reluctant to share commercially sensitive data. It is therefore crucial that all stakeholders are involved in choosing and implementing a data-protocol or centralised dashboard and in selecting the data that can be communicated. Crucially, shared mobility operators should get support (financially and/or logistically) in order to facilitate this transition.

Best practices

- Way To Go recommends providing a roadmap and support when adopting a data protocol.
- Leuven collaborates with internal and external partners for collecting mobility data.
- The big Dutch cities play a role in shaping the national CROW shared mobility dashboard.

References

6.

Footnotes

1. For a more elaborate introduction into data, data-exchange and the reasons for exchanging data, we refer to a study written in context of the Interreg NWE eHUBS project: Groen, T., Van Molle, J., & Baguet, J. (2023). Data Standardisation for Shared Mobility, a study. Deliverable D2.1 from the eHUBS project. 4-12. Available from: https://www.mpact.be/wp-content/uploads/2023/08/data-standardisation-for-shared-mobility-a-study-1.pdf.

2. See the case of the Transport Authority for the Amsterdam Region, discussed in paragraph 4.3.

3. Consider for instance the approach developed in the 'SmartHubs' project: Malandri, C., Patuelli, R., Rabasco, M., Reggiani, A. & Rossetti, R. (2024). Resilience and Vulnerability Assessment. Deliverable 5.4 from the SmartHubs project. 61p. Available from: https://www.smartmobilityhubs.eu/_files/ugd/c54b12_ef8004368f544daa8bb8dc5054dae4e1.pdf.

For traffic congestion prediction, see among others Mystakidis, A., Koukaras, P., & Tjortjis, C. (2025). Advances in Traffic Congestion Prediction: An Overview of Emerging Techniques and Methods. Smart Cities 8:25. 37p. Available from: https://doi.org/10.3390/smartcities8010025.

4. Consider for instance the case of predicting train delays based on data: Tiong, K.Y, Ma, Z., & Palmqvist, C.-W. (2023). A review of data-driven approaches to predict train delays. Transportation Research Part C (148). 20p. Available from: https://doi.org/10.1016/j.trc.2023.104027.

5. The four different levels of MaaS are discussed in Sochor, J., Arby, H., Karlsson, I. M., & Sarasini, S. (2018). A topological approach to Mobility as a Service: A proposed tool for understanding requirements and effects, and for aiding the integration of societal goals. Research in Transportation Business & Management 27, 3-14. Available from: https://www.sciencedirect.com/science/article/abs/pii/S2210539518300476?via%3Dihub.

6. Abella, A., et al. (2021). Interoperability for Mobility, Data Models, and API. Building a common, connected, and interoperable ground for the future of mobility. MaaS Alliance. Available from: https://maas-alliance.eu/wp-content/uploads/2021/11/20211120-Def-Version-Interoperaability-for-Mobility.-Data-Models-and-API-_-FINAL.pdf.

7. Ecorys (2022). Maatschappelijke meerwaarde van een uniforme datastandaard voor MaaS MKBA en business cases TOMP API. Study commissioned by the Dutch Ministry of Infrastructure and Water Management. 51 p.

8. The GEMINI project develops and tests sustainable business models for new mobility services in eight European cities.

9. Note that this is a modeled number. The actual demand can be higher at certain locations.

10. Xanthopoulos, S. (2022). Optimization of the Location and Capacity of Shared Multimodal Mobility Hubs to Maximize Social Welfare. MA Thesis TU Delft, Faculty of Civil Engineering & Geosciences. 108p. Available from: https://repository.tudelft.nl/file/File_b503712f-b68b-4698-b817-0db7a1c7307a?preview=1.

11. The STOMP-principle refers to a policy vision that encourages a shift towards active modes, with car use becoming the last-choice. STOMP stands for 'Stappen' (walking), 'Trappen' (cycling), 'Openbaar Vervoer' (public transport), 'Mobility as a Service' and finally 'Privéauto' (private car).

12. No actual decision has been made whether we fully 'lock' regional shared mobility within dedicated hubs, or that in some areas a form of floating is accepted. For this model however, hubs are a prerequisite.

Source Documents

Abella, A., et al. (2021). Interoperability for Mobility, Data Models, and API. Building a common, connected, and interoperable ground for the future of mobility. MaaS Alliance. Available from: https://maas-alliance.eu/wp-content/uploads/2021/11/20211120-Def-Version-Interoperaability-for-Mobility.-Data-Models-and-API-_-FINAL.pdf.

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ShareDiMobiHub Consortium

The consortium of ShareDiMobiHub consists of 13 partners and 4 subpartners with multidisciplinary and complementary competencies. This includes European cities and regions, universities, network partners and transport operators.

PARTERNSHIP

Regional authorities and cities

PROVINCIE UTRECHT

leuven

The Capital Region of Denmark

Gemeente Amsterdam

Vestfold FYLKESKOMMUNE

Gemeente Rotterdam

TØNSBERG KOMMUNE · PORSGRUNN KOMMUNE · SKIEN KOMMUNE

Transport Authorities

Statens vegvesen
Norwegian Public Roads Administration

Vervoerregio Amsterdam

Universities

HAW HAMBURG

University of Antwerp
TPR | Department of Transport and Regional Economics

UNIVERSITY OF APPLIED SCIENCES UTRECHT

Network organisations

WAY to GO

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