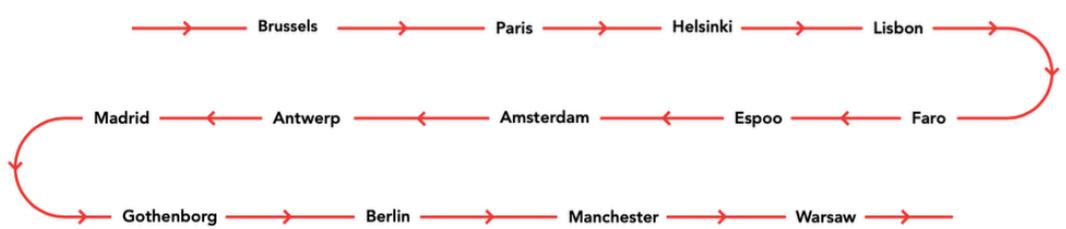




The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

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Abstract

In recent years, shared mobility has been exponentially growing in Amsterdam. The annual growth rate is expected to exceed 20% by 2030. The Municipality of Amsterdam recognizes shared mobility as an important player in the transition towards a Mobility as a Service (MaaS) ecosystem: a sustainable mobility network with shared electric vehicles, a smart public transport network and little private car ownership. In order to reach this point, the Municipality has to adapt the infrastructure according to these new developments. To acquire insight into mobility flows, data of shared mobility is required. A data standard moulded in an Artificial Programming Interface (API) could be the solution.

An API enables the standardized transmission of data between shared mobility operators and cities. Due to years of delay in the digitization of policy execution, knowledge among municipalities about the criteria for the design and implementation of data standards is low. The aim of this study commissioned by the Municipality of Amsterdam is to provide European cities with further knowledge about the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators.

In this study interviews were conducted with major European cities, organizations in the field of Smart Mobility and experts in data, governance, privacy and urban planning. Literature and document surveys were also conducted, and observations of biweekly meetings with the five largest Dutch cities and the Dutch Ministry of Infrastructure and Water Management were taken into account. The results were analysed with the Grounded Theory, an interpretive and inductive method for analysing qualitative data.

The results show that the main opportunities are clear use-case mapping, a strong legal framework, and joint trust between cities and shared mobility operators. The main bottlenecks are the different interpretations of the General Data Protection Regulation (GDPR) among stakeholders and cities' lack of data governance capabilities. The most common practical possibilities are the use of the Mobility Data Specification (MDS) and a Trusted Third Partner for data processing and storing.

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1 List of Abbreviations

API	Artificial Programming Interface
B&W	board of Mayor and Aldermen
CDS-M	City Data Standard – Mobility
GBFS	General Bikeshare Feed Specification
GDPR	General Data Protection Regulation
I&W	Ministry of Infrastructure and Water Management
MaaS	Mobility as a Service
MDS	Mobility Data Specification

2 Introduction to the Research Project

2.1.1 Position in the technological innovation chain

During my research internship at the Municipality of Amsterdam I took part in an innovation project conducted by the Smart Mobility Team. The Municipality of Amsterdam is a large and mature organization with a divisional and mechanical structure.¹ Every department has its own goals, agenda and project managers. The City of Amsterdam is continuously searching for improvement of its policies and urban livability.² These aspects are often seen in mature organizations that lie at the end of the technological innovation chain. Hence the Municipality is positioned at the continuous development phase, as visualized in Figure 1. Development is sought in many areas, including mobility. Innovations are emerging rapidly in the field of Smart and Shared Mobility. This thesis fits in well with these developments.

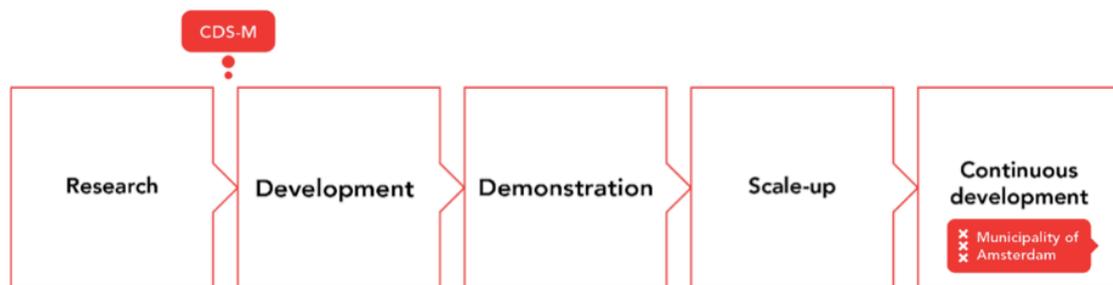


Figure 1. Positioning of CDS-M and the Municipality of Amsterdam in the Technological Innovation Chain.³

2.1.2 Description of the research project

The innovation project I was involved in is called 'City Data Standard - Mobility' (CDS-M). The aim of this project is to gather insight into the requirements of a European data standard for shared mobility operators. A data standard is termed as a documented agreement on definition, scope, technical representation and format of supplied data.⁴ In this case it concerns the latter, namely data transmission from shared mobility operators towards cities. The goal of the CDS-M project is to arrive at a data standard that meets the requirements for adoption, to subsequently include the data standard in the permits of the shared mobility operators. The data retrieved by CDS-M could support policies such as Amsterdam Car free,⁵ Amsterdam Circular,⁶ Amsterdam Clean Air⁷ and Amsterdam Inclusiveness,⁸ as well as other policies related to the enhancement of quality of life.

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CDS-M is a joint project of Amsterdam with the four other largest cities in the Netherlands, the G5 (Amsterdam, Rotterdam, The Hague, Utrecht, Eindhoven). The objective is to first arrive at a national standard and thereafter a European one. The Smart Mobility Team recognizes the advantage of a European data standard: stronger cooperation among European cities, a higher quality of designs and increased pace of innovation. According to the Smart mobility team, these developments generate higher adoption rates, leading to greater legitimacy and a chance to receive European subsidies.⁹ Therefore, this research has a European focus.

This research is a market study into the opportunities, bottlenecks and practical possibilities of a European data standard. Practical possibilities refer to the various data standards and implementation methods that can be used. This research supports the Smart Mobility Team in determining whether the current design of the CDS-M could serve as a European standard, or whether another course should be taken.

The CDS-M project can be perceived as a process innovation, because data collection is an ongoing process and is enhanced by the use of CDS-M.¹⁰ The CDS-M project is positioned at the research and development phase in the technological innovation chain, as visualized in Figure 1. A first functional design is currently being developed. However, the smart Mobility Team indicated that further research is needed to arrive at a solid design, which can be communicated with market parties and European cities. Moreover, the CDS-M project fits in with Bossink's definition of the concepts research and development: namely, knowledge is transformed into the development of a data standard.

*'Research is a basic scientific activity to generate new knowledge and insight. Development is the application of knowledge and insight to create new products or services.'*³ (Bossink, 2011)

In the research and development phase, ideation and creation processes occur. Ideation processes consist of the generation of new ideas, concepts and plans. Creation processes convert these into improved viable products that are scalable and successful.¹⁰ This research can be seen as input for the ideation processes of the Smart Mobility Team. With this research I aspire to contribute to shifting the CDS-M steps to the right in the innovation chain.

The central research question of this thesis is: ***What are the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators?***

To answer this research question, interviews were held with employees from mobility teams of other major European cities and with experts in the field of data, governance, privacy and urban planning. Literature and document surveys were conducted. By mapping the opportunities, bottlenecks and practical possibilities, CDS-M can be positioned in the European market field, and criteria for design and implementation become tangible. This information is of value to the Smart Mobility team, as it offers the team footing in determining the course of the CDS-M project.

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The central research question is designed to comply with the SMART principle: Specific, Measurable, Attainable, Relevant and Time-bound.³ The central research question is specific, because it is centralized to data standards for shared mobility operators, and is measurable and attainable by conducting interviews and a document survey. The research is relevant because it supports the Smart Mobility Team in defining a strategy to arrive at a uniform data standard. The research is time-bound due to the scope and timeframe of this thesis.

The first sub-question is: *What exactly is a data standard and how does it provide value to municipalities?* To answer this question, the scientific aspect of a data standard is explained, as are the regulations concerning data protection and privacy.¹¹ In addition, the social and business aspects of a data standard are discussed. The social aspect concerns the definition of privacy and its importance for society. The business aspect incorporates a market investigation of existing data standards and value adding use cases.

The second sub-question is: *What are the basic principles of CDS-M and what is the rationale for its development?* The motives for development and the current design are discussed. Because CDS-M is still in its infancy, there is no scientific literature about the standard yet. Therefore, CDS-M is solely substantiated in the empirical part of this thesis. The sub-questions substantiate the central research question and serve as preparation for the interview series.

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3 Company description

In this section the generic organizational model of the Municipality of Amsterdam is described, and the primary and secondary processes of the organization are discussed.³ To explain the processes of the Smart Mobility Team, the operation of the Municipality as a whole must be clear. The governance structures are dissected from macro to micro level, to describe the primary processes of the Smart Mobility Team. In this respect, the Municipality of Amsterdam is perceived as the macro level and the Smart Mobility Team as the micro level.

3.1 Generic organization model

The Smart Mobility Team is located at the very end of the hierarchical organization model. It is part of the overarching services department ('Dienstverlening'), which is delineated in Figure 2. The Smart Mobility Team is not even depicted in the figure, revealing what a tiny switch it is in the larger process of policy execution.¹²

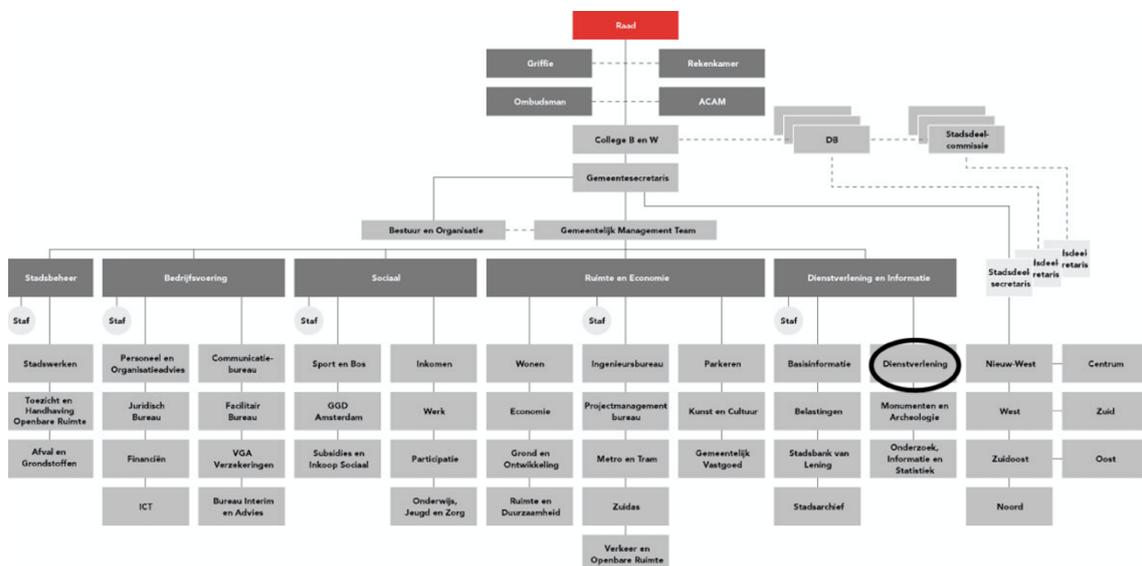


Figure 2. Generic organization model of the Municipality of Amsterdam. The dark grey blocks represent the pillars 'Urban management', 'Business operations', 'Social domain', 'Space and Economy', and 'Services and information' (from left to right). These pillars form the basis of the Municipality of Amsterdam. The Smart Mobility Team falls under the services department ('Dienstverlening'), which is situated under the pillar 'Services and information'.¹²

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The macro level consists of the municipal council ('gemeenteraad') and the board of Mayor and Aldermen ('college van Burgemeester en Wethouders', B&W). The red box in Figure 2 represents the municipal council, which consists of councillors elected in quadrennial municipal elections. The councillors belong to a political party and function as representatives of society.¹³ The municipal council draws up a policy plan each year, which is executed by B&W.¹⁴ B&W is appointed every four years by the coalition in the municipal council.¹⁵

B&W is supported by an advisory and consultative body, the Municipal Management Team ('Gemeentelijk Management Team', GMT).¹⁶ The city manager ('gemeentesecretaris') is GMT chairman.¹⁷ GMT is connected to the five pillars of the Municipality of Amsterdam,¹² as such guaranteeing the functioning of the entire municipal apparatus.¹⁶

3.2 Processes of the Municipality of Amsterdam

3.2.1 Primary process of the Municipality of Amsterdam

The inputs of the Municipality's primary process of policy execution are capital and knowledge.¹⁸ Policy execution relies on the transformation of knowledge and capital into bureaucratic systems that improve quality of life.¹⁹ This primary process of the Municipality of Amsterdam is visualized in Figure 3.

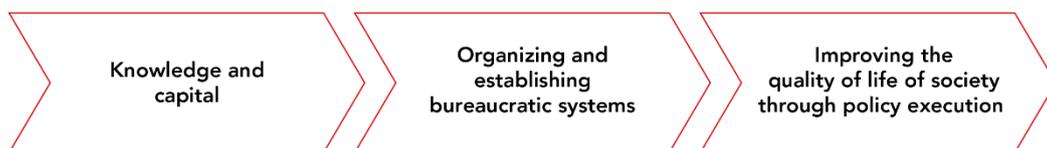


Figure 3. Primary process of the Municipality of Amsterdam.

The knowledge input is provided by residents, civil servants, support organizations and surrounding municipalities.¹⁸ The visions of these actors are represented by the elected councillors in the municipal council and are initiated by B&W. The Smart Mobility Team is subjacent to the alderman of Traffic, Transport, Water and Air Quality.²⁰ The collaboration between the aldermen and the Smart Mobility team is visualized in Figure 6. The origins of the input of capital are shown in Figure 4.

Approximately 45% of the capital input comes from the central government. The capital is provided by the Municipal Fund and 'specific payments'.¹ Subsidies are an additional and variable income source.²¹ The remaining capital is retrieved by levies and taxes of the City of Amsterdam itself.

The input of knowledge and capital are required for policy execution and improving quality of life, as knowledge and capital are needed to facilitate the bureaucratic systems that enforce these final products of the primary process. The bureaucratic systems are controlled and altered by the legal authority of the municipal council and sustained by B&W.¹⁹

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3.2.2 Secondary process of the Municipality of Amsterdam

The secondary process of the Municipality of Amsterdam is the establishment of the annual budget. The annual budget determines how much each domain is allowed to spend per year.²² The input of this process is the vision of the municipal council and the capabilities of B&W, and the output is the annual budget plan. The process of establishing the annual budget is visualized as a yearly cycle in Figure 5.

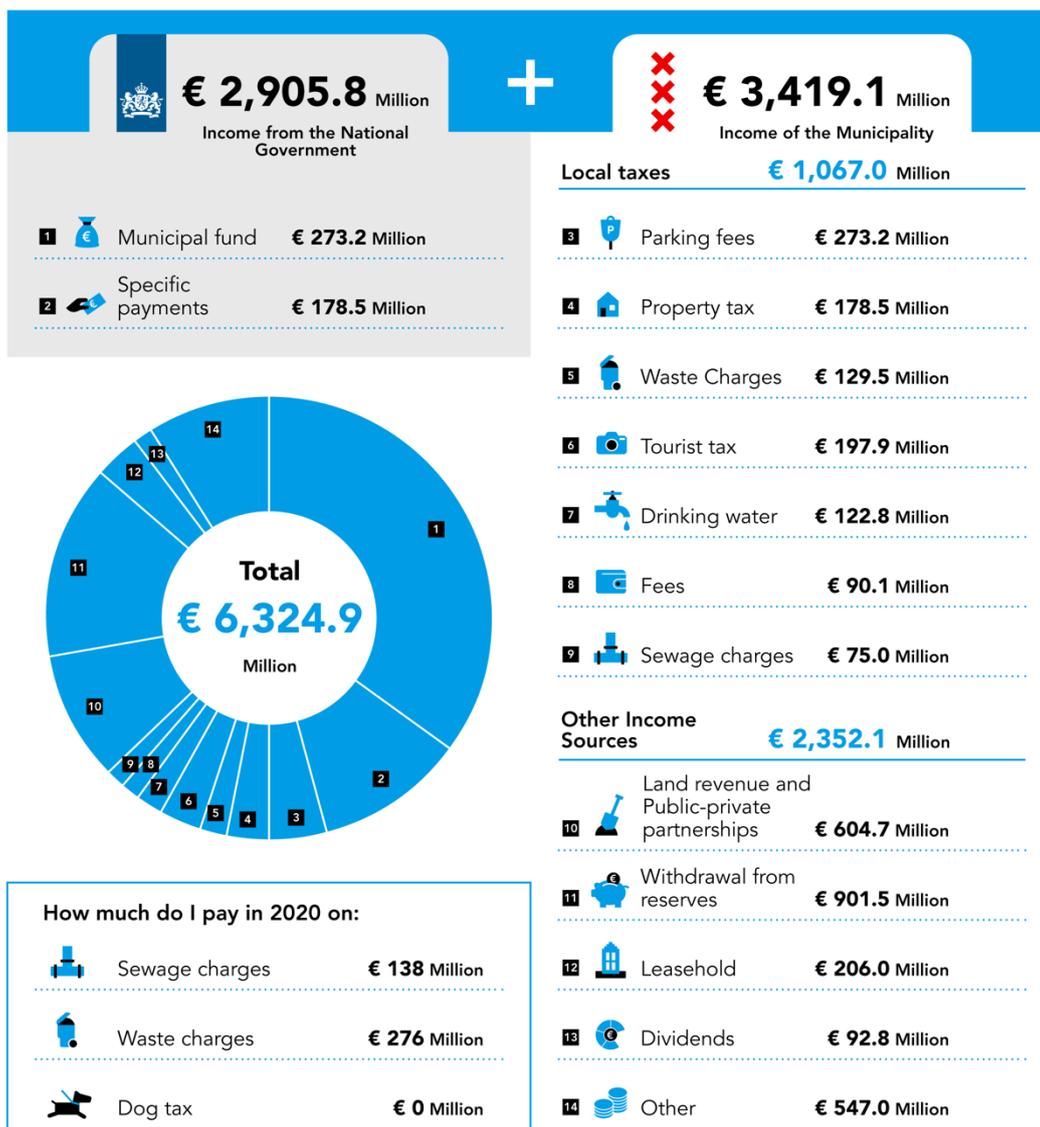


Figure 4. Distribution of capital of the Municipality of Amsterdam.²³

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The first phase starts in March. In this phase the municipal council announces its vision by means of a policy framework. Subsequently, B&W elaborates this vision into a proposal in June. This proposal is adapted on behalf of the municipal council, whereafter the annual budget for the upcoming year is determined in November. Throughout the year the current and upcoming budget plan can be altered through motions issued by the municipal council. The accepted motions are part of the memorandums in March and October. At the end of the year, annual accounts are made and a report is written for audit.²²

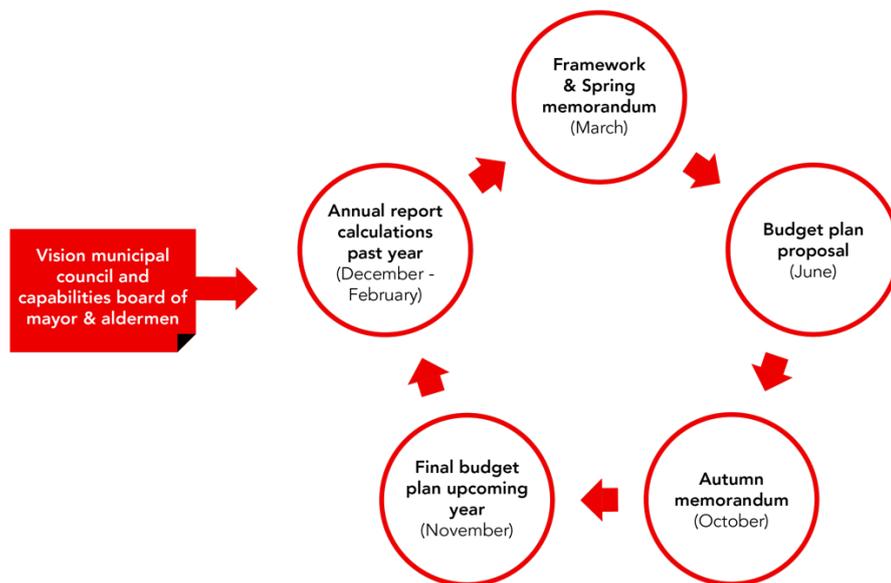


Figure 5. Secondary process of the Municipality of Amsterdam: establishment of the annual budget.

3.3 Processes of the Smart Mobility Team

3.3.1 Primary process of the Smart Mobility Team

The Smart Mobility Team can start developing its annual policy plan after the annual budget is determined. This plan includes all upcoming projects, such as the CDS-M project. The steps of developing an annual policy plan are visualized in Figure 6. In some cases, existing regulations have to be changed before the policy plan can take effect. The policy plan is approved internally, whereafter it can be coordinated with B&W and the municipal council. If the proposal of the annual policy plan of the Smart Mobility Team is accepted, the requested budget may be spent.¹⁹

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Knowledge and capital are also part of the input of the primary process of the Smart Mobility Team. The staff of the Smart Mobility Team deliver knowledge, and capital is needed to pay the salaries. Once the proposal is approved, additional input of capital is added for implementation. The Smart Mobility Team often outsources implementation to a third party. Hence the primary process is also known as the 'purchasing process'. The third party then supplies the Smart Mobility Team with data, which is used for internal analysis.^{19,24}

Purchase process

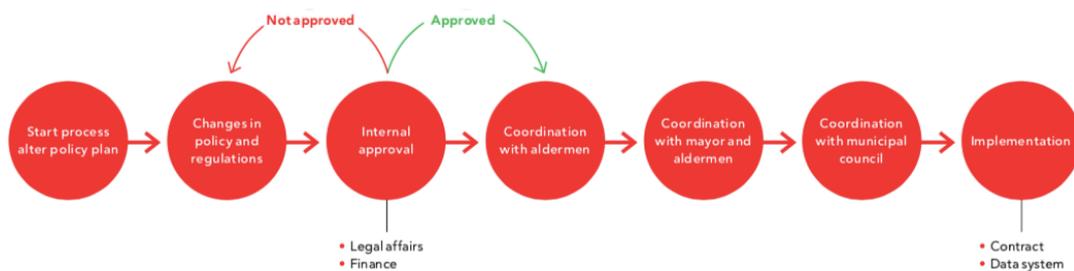


Figure 6. Purchasing process of the Smart Mobility Team

3.3.2 Secondary Process of the Smart Mobility Team

For every upcoming project a detailed plan of approach must be drawn up after the annual plan has been accepted. These plans of approach have to be approved by both the municipal council and B&W. Developing a plan of approach is the secondary process of the Smart Mobility Team. The steps of this process are visualized in Figure 7. Once the proposal has passed the legal check, the plan of approach is finalized with an argumentation document and sent to the municipal council and B&W. After approval the project can be implemented.¹⁹

Smart mobility

CDS-M

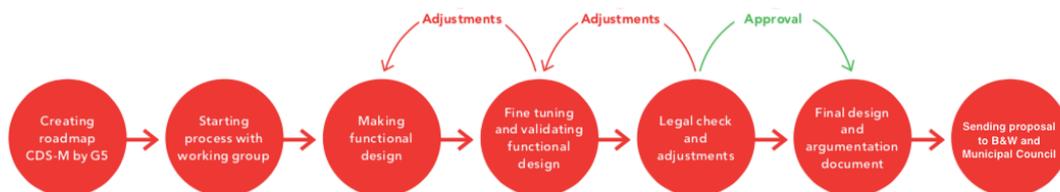


Figure 7. Design process of the CDS-M plan of approach.

4 Literature survey

The theoretical framework offers an overview of current literature related to the design and implementation of a European data standard for shared mobility operators. The literature survey, together with the research questions and problem definition, frame the conceptual model, research planning and interview questions. For clarity's sake, the research questions are briefly repeated below.

Central research question: ***What are the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators?***

1st sub-question: *What exactly is a data standard and how does it provide value to municipalities?*

2nd sub-question: *What are the basic principles of CDS-M and what is the rationale for its development?*

4.1 Problem definition

The problem definition is described as follows: Currently there is little knowledge about the opportunities, bottlenecks and practical possibilities of designing and implementing a European data standard for shared mobility operators. According to the G5, this knowledge is not merely lacking in the literature, it is not fully present within city governments either. The G5 recognize shared mobility as a critical component in transitioning to a Mobility as a Service (MaaS) ecosystem, a sustainable mobility system consisting of services, with little private car ownership. To support and steer shared mobility in the right direction, insight into the mobility flows is needed. The G5 see a data standard as an efficient solution. However, there are many technical, legal, social and governance criteria attached to the design and implementation process of a European data standard for shared mobility operators. The Smart Mobility Team and the G5 would like to be better informed about these criteria in order to determine follow-up steps within the CDS-M project.²⁵

The goal of this research is therefore to provide the Smart Mobility Team and the G5 with further knowledge about these criteria by investigating the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators. The criteria for design and implementation differ, therefore a twofold approach is used in this thesis.

Not all topics of the research questions are discussed in the theoretical framework, as only a selection of the subjects is present in scientific literature. Consequently, in this section data standards are explained in general terms. The subjects that are not fully discussed in the theoretical framework are explained in detail later on in the empirical section.

4.2 Theoretical framework

4.2.1 Design of a data standard

This section explains the technical design of a data standard, as well as the association between value creation, use cases and design choices. The influence of legislation on the design is briefly explained and the applicability of the data standards that are present in the literature is discussed.

Previous studies show that data standards are often moulded into Artificial Programming Interfaces (APIs).^{26,27,28,29,30,31} According to a recent study of Wulf and Blohm (2020), APIs have become a common instrument of the digital strategy.³⁰ They explain that APIs enable standardized communication between distinct databases. Hence the CDS-M is an API that enables standardized flows of data from the operators' database towards the database of the City of Amsterdam. Any database can apply an API because APIs are made of an interface definition language (IDL), which is a general language every software can understand. IDL consists of a simple syntax that activates language-independent calling.³²

The language-independent calling consists of three steps: (1) API provider sends request to endpoints of the server, (2) third-party platform answers request, (3) API provider receives output from server and stores raw data in a database.²⁸ According to Bachmann (2020), APIs create interoperability, because the standardized formats can be processed and analysed on a large scale without pre-processing.³³ In this sense, APIs facilitate the data as a service economy, thanks to their upscaling ability.³⁰

From this literature it can be derived that APIs serve as the technical design of a data standard and play an important role in the digital strategy and data as a service economy. Whether APIs are the most suitable format for data standards centralized to shared mobility specifically, is not mentioned in the literature.

And yet, one study by Baltra *et al.* (2020) mentioned the two most mature data standards on the market, namely the General Bikeshare Feed Specification (GBFS) and the Mobility Data Specification (MDS). According to Baltra and colleagues, GBFS queries GPS parking data and MDS retrieves both real-time trip and parking data. Both standards have a regulatory effect, as they provide insight into parking and traffic violations. No statement is made about whether the standards could support Urban Planning possibilities in addition to their regulatory function.³⁴

Remarkably, Urban Planning literature emphasizes the demand for mobility data. It also highlights the need for standardized formats for the purpose of policy execution.^{35,36,37,38} Zheng *et al.* (2014) substantiate this need by the Urban Computing Theory, and define Urban Computing as a tool for systems thinking within Urban Planning. With Urban Computing, Big Data is used for pursuing Smart City strategies.³⁵ Bandyopadhyay and Sen (2011) and Sourbati and Behrendt (2020) describe Smart City strategies as focused on achieving a connected, clean, safe and inclusive city by using Big Data and advanced technologies such as the Internet of Things (IoT).^{36,37}

The Urban Planning literature shows that mobility data could support use cases such as stimulation of shared mobility, enhancement of parking possibilities, regulation of the public space, minimization of traffic jams, minimization of rush-hour peak pressure, road safety enhancements, and health through decreased air pollution.³⁸ This literature also indicates that the use of historic data sets is sufficient for Urban Planning practices and policy objectives. The value of real-time data is not discussed. Based on the literature, it cannot be determined whether GBFS and MDS are applicable for Urban Planning besides their regulatory functions.³⁵ From the literature findings it can be concluded that the motivation to develop a data standard, regulatory or Urban Planning, has a major influence on the design, especially at the level of detail of requested data and regardless of whether it is real-time or historical.

Legal requirements influence the design of a data standard as well. Caitlin (2020) shows that mobility data is characterized as personal data under the General Data Protection Regulation (GDPR), because vehicle IDs and GPS data are traceable to an individual.³⁹ GPS data is requested by both GBFS, MDS and Urban Computing. Hence the GDPR considers all these data collection methods to fall under the processing of personal data. However, with GBFS and MDS real-time GPS data is requested, whereas historic data is requested with Urban Computing. The GDPR states that personal data processing is only allowed if strictly necessary and is done in the least intrusive manner.³⁹ On the basis of literature it is debatable whether the use of GBFS and MDS for Urban Planning is GDPR-compliant, because the Urban Planning literature does not indicate the need to use real-time data for achieving conventional Urban Planning policy goals. However, this could also be an indication of outdated literature that does not include the latest developments in data use for Urban Planning.

In addition to the requirement of necessity and proportionality, the GDPR requires the use of Privacy Enhancing Techniques (PETs) and Privacy by Design (PbD) to ensure as little privacy infringement as possible.^{40,41} PbD is based on the principle that privacy is guaranteed from the beginning of the design to the processing and storing of personal data.⁴² PbD can be facilitated by PETs. The most commonly used PET for location privacy is k-anonymity, an anonymization theory.⁴³ With k-anonymity a data standard requests such a large pre-aggregated sample size of vehicles per area that identification of users is not possible.⁴⁴ Yao *et al.* (2010) explain that k-anonymity ensures locational privacy, but at the same time restricts the design of a data standard to pre-aggregated data querying. Yao *et al.* (2010) recognize that k-anonymity can thereby limit the usefulness of a data standard, because policy objectives for which raw data is needed are no longer achievable.⁴⁵ In the case of a data standard for shared mobility operators, k-anonymity can limit the regulatory function.

Another widely used PET for purposes of location privacy is 'differential privacy'. This PET is recommended by Callegati *et al.* (2015), who describe that differential privacy is specifically valuable if there is a chance of combining data sets with auxiliary information. Auxiliary information is often present if municipalities act as data controllers, given that different data sources of residents are maintained by the same municipality. Auxiliary information decreases the level of k-anonymity, because the possibility of re-identification increases. Callegati and colleagues state that differential privacy can solve this problem, because the technique operates with a random algorithm that adds

noise to the location data and enforces anonymity.⁴¹ It is a complex technology that requires a high degree of technological infrastructure and expertise to run properly.⁴¹

There is an exceptional possibility in which differential privacy does not guarantee privacy completely. This could happen if historical data sets are juxtaposed to real-time data sets. Differential privacy is designed solely for real-time data processing. If municipalities aspire to store data, further aggregation is required beforehand.^{46,47} Hence if municipalities want to use historic data for planning purposes, together with real-time data for regulatory purposes, further data management methods are needed.^{48,49,50} Which measures should be taken in this case, is not discussed in the literature. I would like to contribute to this research gap in the empirical portion of this thesis.

4.2.2 Implementation of a data standard

In this section possible opportunities and bottlenecks of the implementation of a European data standard for shared mobility operators are addressed on the basis of literature findings. These topics are part of the central research question. The concepts are thus briefly explained before they are applied to the literature.

The term 'bottleneck' was coined by Eliyahu Goldratt and is part of his 'Theory of constraints'. Goldratt (1998), defines a bottleneck as a point of critique which stops or slows down the process. He states that by solving bottlenecks, the process improves.⁵¹ One bottleneck of the implementation of a European data standard for shared mobility operators may be privacy concerns. Such privacy concerns arise from criticism, which aligns with Goldratt's definition. Privacy concerns can slow down implementation, as they could result in insufficient social adoption by European cities and shared mobility operators' refusal to participate.⁴⁰

Two reasons for these privacy concerns mentioned in the literature, are the lack of digital infrastructure and expertise in data governance of cities, and the ethical perspective of data sharing.⁵²

The ethical perspective is emphasized by Roessler (2005), as she rates the importance of complete data protection and privacy above that of technological progress. She states that data protection and privacy are both fundamental aspects of our quality of life and pillars of democracy. Roessler stresses that Big Data processing poses a threat to an individual's informational privacy. In this literature, informational privacy is defined as the ability to control access over what other people know about oneself.

According to Roessler and Lever (2015), informational privacy enables autonomy.⁵³ They state that autonomy is the main prerequisite of democracy, explaining that democracy relies upon citizens who value their autonomy and therefore threats to privacy are always threats to democracy.⁵² Their study further highlights that informational privacy is threatened by the digital age and data processing. They point out that data is made up of bits, which enables it to be replicable, scalable and searchable – therefore it can be easily used in different contexts, leading to identification and

loss of informational privacy.^{52,54} With their research, Roessler and Lever aspire to stimulate the ethical debate on municipalities' use of personal data for policymaking purposes. This debate could cause delays and difficulties in the social adoption of a data standard by European cities.⁵²

Not only the autonomy of citizens is limited by the use of data standards, but the autonomy of shared mobility operators is also limited too. In the digital age, data is the 'new gold'. The business models of service companies, such as shared mobility operators, consist of data trading to a large extent.⁵² Through municipalities' use and publication of data from shared mobility operators, part of the operators' market position is lost. The data of shared mobility operators is commercially sensitive. In this respect, the principle of data governance which states that all public data should be 'open source' is in conflict with the interests of market parties.^{26,55} This conflict of interest could cause resistance,^{56,57} which could grow because of the current backlog of digitization in cities' data governance. For privacy insurance of the shared mobility operators' data, complex PETs must be in place. Resistance could also grow if market parties mistrust the capabilities of city governments to properly safeguard privacy.⁵⁸

And yet, the backlog in digitization could also serve as an opportunity for the successful implementation of a European data standard for shared mobility operators. The term 'opportunity' could be explained by the definition used in 'Management, an Introduction' by David Boddy.¹ Boddy describes an opportunity as an element in the environment that could be exploited to a project's advantage.¹ The backlog of digital infrastructure creates a shortage of qualitative data and data standards for the realization of a fair Mobility as a Service (MaaS) ecosystem.^{27,59,60,61} An objective of the MaaS ecosystem is to support shared mobility and thereby enable a paradigm shift towards more sustainable urban mobility.^{40,62} The large need for data standards throughout Europe, in combination with the willingness to support shared mobility, could be exploited towards co-creation among European cities and market parties to arrive at a successful implementation.

MaaS is a recently developed system-level concept about the mobility service economy.⁶¹ The MaaS alliance defines MaaS as: *'...the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi or car rental/lease, or a combination thereof. For the user, MaaS can offer added value through use of a single application to provide access to mobility, with a single payment channel instead of a multiple ticketing and payment operation.'* According to Sochor *et al.* (2015)⁶⁰ and Yanying and Voegelé (2017),⁶³ to successfully deploy a MaaS ecosystem – for which achieving a level playing field is a prerequisite – cooperation, pilots and partnerships are essential.

According to Polydoropoulou *et al.* (2020), cooperation on the design of data standards is particularly crucial for successful implementation. They emphasize that policymakers should establish standards for data collection, management and sharing, because there is a lack of compatible standards for transport operators. The study indicates that this shared demand creates room for cooperation to arrive at qualitative designs that increase interoperability and effectiveness. It is also highlighted that subsidies and pilots could enable this process.^{27,61}

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A study from Stockholm by Fenton *et al.* (2020) confirms this viewpoint, stressing that municipalities should take an active role in maintaining the collaborations between city and market parties, specifically for upscaling data governance and the MaaS ecosystem.⁶³ Another objective for investing in collaborations is raised by Yanying and Voegelé (2017), who state that if collaborations are not made by municipalities soon, shared mobility operators may join large tech companies such as Google, due to their luring, easy-to-use open data standards. This could result in a market monopoly that hinders the entire MaaS ecosystem and thereby implementation of data standards.⁶² All in all, the degree of implementation mainly depends on the degree of cooperation, which in turn is dependent on the amount of trust the shared mobility operators have in the municipalities with respect to privacy assurance and the ethical handling of the collected data.

I further expect to find opportunities and bottlenecks in the implementation of a data standard at the European governance level, especially with regard to the European Commission's inclusion of data standards in European regulations. However, I could not find extensive scientific literature on this subject, so I plan to fill this research gap during the empirical research.

5 Methods

5.1 Conceptual Model

The conceptual model consists of the core concepts from the literature and the interrelationships between those concepts and the research subject.⁶⁴ The core concepts are the design and implementation of a European data standard. Aspects that influence the design and implementation are the regulations, privacy concerns and policy objectives with accompanying use cases. These factors influence the requested data subjects, details of data, whether data is real-time or historic, and the processing and storing activities.

Empirical research is needed to test and expand the literature findings. In this study interviews were conducted with stakeholders, a document survey was conducted and observations from meetings were taken into account. The stakeholders of a European data standard for shared mobility operators are employees and mobility teams of major European cities, organizations in the field of Smart and Shared Mobility, and experts in data, governance, privacy and urban planning. In the interview series CDS-M acts as a discussion starter. CDS-M triggers attitudes towards data, governance, privacy and use cases. By telling the story of CDS-M, stakeholders' vision are activated. During the interviews the visions of both Amsterdam and stakeholders were exchanged on the basis of a semi-structured interview questionnaire. A data standard, CDS-M, thereby has a direct effect on stakeholders' visions. The visions are in turn communicated and included in the course of the CDS-M project. In this respect, the stakeholders' visions have a direct effect on the design and implementation of a data standard too.

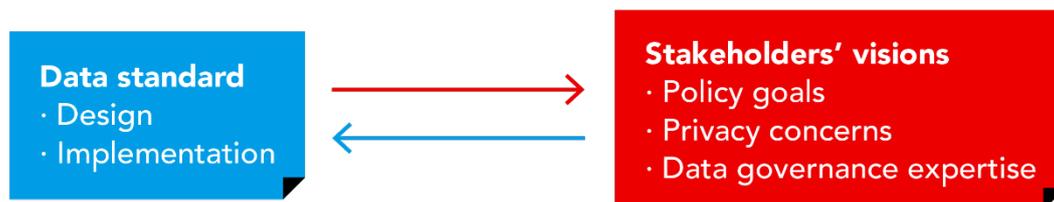


Figure 8. The conceptual model with feedback effect.

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In other words, the CDS-M opens up the discussion around the criteria and demands for a European data standard for shared mobility operators. This discussion is an ongoing process that acts as a feedback effect between the data standard and the stakeholders' vision. The *feedback effect* is explained as follows: changes in design or implementation of a specific data standard result in different attitudes of stakeholders towards that data standard. Conversely, changes in stakeholders' visions could result in alteration of the design or implementation choices of that same data standard. This feedback effect remains in motion, because a municipality always searches for a balance between stakeholders' satisfaction, cooperation and adoption on the one hand and achievement of policy objectives on the other.^{19,25} The *feedback effect* is visualized in the conceptual model of Figure 8.

5.2 Research plan

The objective of the empirical research is to test and complete the literature findings, to subsequently answer all research questions. The visions of stakeholders derived from semi-structured interviews contribute to mapping the opportunities, bottlenecks and possibilities of a European data standard for shared mobility operators. This is visualized in Figure 9.

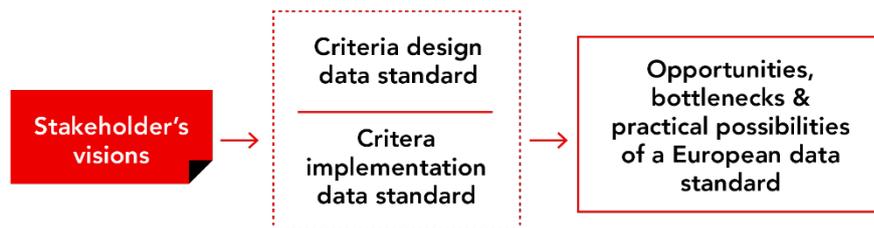


Figure 9. How stakeholders' visions contribute to the central research question.

In addition to answering the central research question, 'What are the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators?', the interview series, document survey and observations contribute to the two sub-questions: (1) 'What exactly is a data standard and how does it provide value to municipalities?' and (2) 'What are the basic principles of the CDS-M and what is the rationale for its development?'.

The interviews, document survey and observations are sources of qualitative data. The data is analysed through the interpretive lens of the researcher. An interpretive lens is an inductive approach that filters large amounts of data to derive connections.⁶⁵ Figure 10 shows how the qualitative data is collected.

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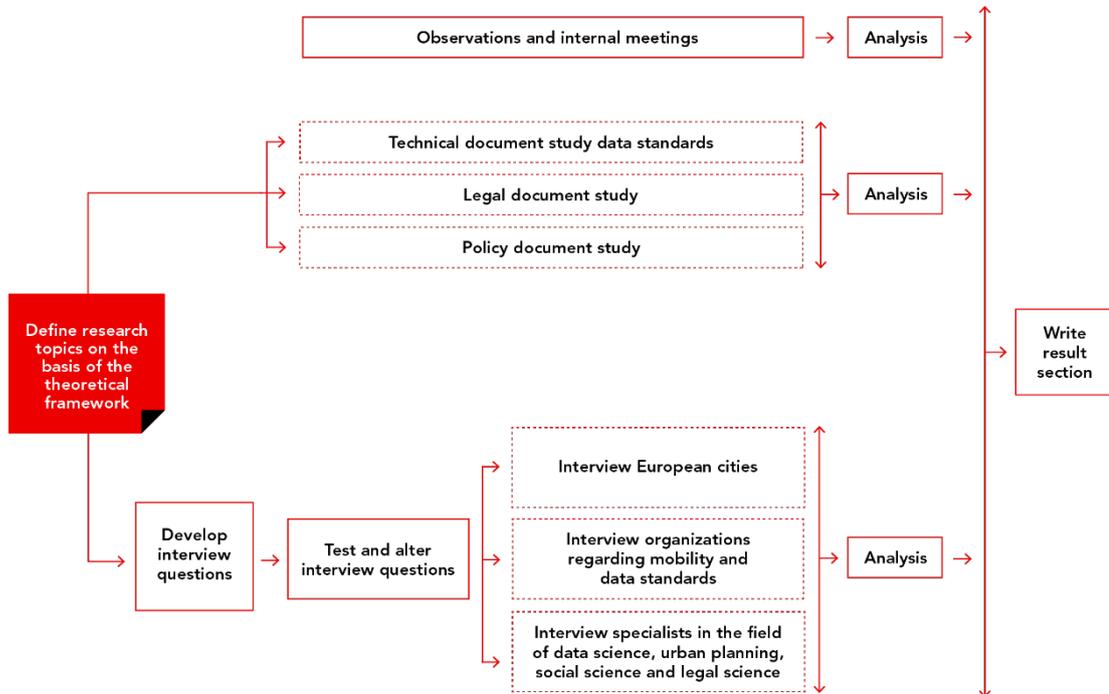


Figure 10. Empirical Research Planning.

As can be seen in the Empirical Research Planning (Figure 10), the document survey is divided into three types of documents: technical, legal and policy. The technical document survey consisted of researching the codes of the data standards currently available. The following codes were reviewed: CDS-M; TOMP-API, created by the Dutch Ministry of I&W;⁶⁶ Network Time Exchange (NeTEx), created by the European Committee of Standardization (CEN);⁶⁷ GBFS, created by the North American Bikeshare Association (NABSA);⁶⁸ and the Metrics API⁶⁹ and regular version of MDS, maintained by the Open Mobility Foundation (OMF).⁷⁰ The CEN data standards SIRI and Opra are still under development and therefore not yet available.⁷¹ The same goes for Shared Streets from OMF and the Oslo standard from Belgium. These data standards could not be studied by means of a document survey, but are mentioned in the empirical results (Appendix 1.4). Studying the codes provides knowledge of the requested data subjects, the level of detail, and whether real-time or historic data is being requested. Studying the codes is an essential preparation for the interview series.

The legal document survey consists of reviewing reports on data protection and privacy. Reviewed documents are the General Data Protection Regulation, the Charter of Fundamental Rights, and reports by the European Data Protection Supervisor. A summary of these documents is provided in Appendix 3. These documents were studied as a preparation for the interviews as well as to further identify possible legal limitations of the design and implementation of a data standard.

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The reviewed policy documents are documents of the Dutch Ministry of Infrastructure and Water Management (I&W), documents of the Smart Mobility Team, mobility reports of other European cities, reports of the European Commission and use cases of the Open Mobility Foundation (OMF).⁷² These documents were reviewed as preparation for the interviews and to map value-adding aspects of a data standard.

The interview series starts later on in the research than the document survey. An interview questionnaire was drawn up prior to the interviews. This questionnaire is based on the literature and document survey findings. This first draft of the questionnaire is adapted to the needs and preferences of the Smart Mobility Team, whereafter the interview series can take place. This adaption was required because not all desired topics were present in the literature and document surveys, given that data standards for shared mobility are still in their infancy.

The interviewees are presented in Table 1. Many interviewees work for a municipality or organization in the field of Smart Mobility and have a background in data, governance, privacy or urban planning.

Table 1

Interviews held
<ul style="list-style-type: none"> • Sarah Eskens: PhD Information law, University of Amsterdam, legal expert • Ross Curzon-Butler: Chief Technology Officer at Cargoroo & CDS-M Co-developer at Smart Mobility Team Amsterdam, data expert • Jascha Franklin-Hodge: Executive Director at the Open Mobility Foundation, data expert • Michael Schnuerle, Director of Open-Source Operations at Open Mobility Foundation, data expert • Tijs de Kler: CDS-M Developer at Smart Mobility Team Amsterdam, data expert • Sami Sahala: Manager at ITS in Helsinki • Jorge Coelho: Chief Information and Innovation officer of Faro, data expert • Karen van Cluysen: Secretary General at Polis, governance expert • Geert Pater: Manager at RDW, data and governance expert • Peter de Jager: Senior adviser at RDW, data and governance expert • Larisa Wentholt: Applied Innovation & Exemptions Manager at RDW • Valeria Caiati: Researcher at TU Eindhoven, urban planner • Yuki Tol: Project manager for City of Amsterdam, philosopher and social scientist • Sam Li: Senior Innovation Officer for greater Manchester, data expert • Michael Dod: Digital Service Manager for greater Manchester, data expert • Ian Inglis: Senior Project Manager for greater Manchester • Mélanie Gidel: Manager at Smart Mobility Department, Paris • Mikael Ivari: Senior adviser at Urban Transport Administration, Gothenburg • Julie Alexis: Manager at Mobility Team, Dreux • Martin le Francq: Project manager at Smart Mobility Department, Brussels • Tijs de Kler: CDS-M Developer at Smart Mobility Team Amsterdam, data expert • Gemma Schepers: Manager at Smart Mobility Team Amsterdam • Daan van der Tas: Project lead, MaaS Smart Mobility Team Amsterdam • Sami Sahala: Project Manager at ITS Helsinki • Juho Kostianen: Project Manager at City of Helsinki, data expert

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- Janne Rinne: Project manager at Forum Virium **Helsinki**, data expert
- Mariona Conill de Azpiazu: Mobility engineer at Sustainable Mobility Department, **Barcelona** (AMB)
- Jordi Ribe: Manager at Mobility & Urban Innovation Department, **Barcelona**
- Marta Trzaskowska: Production Engineer & Technologist, City of **Warsaw**
- Benjamin Rabenstein: Project Manager at Senate Department for Environment, Transportation and Climate Protection of **Berlin**, urban planner
- Frederik Mehler: Project Coordinator at the Senate for Environment, Traffic & Climate Protection of **Berlin**, urban planner
- Sergio Fernández Balaguer: Manager at Municipal Transport Company, **Madrid**
- Philippe Crist: Advisor, Innovation and Foresight at ITF - International Transport Forum
- Beryl Dreijer: Data Protection Officer **Amsterdam**, legal expert
- Ruud Mollema: Project director of ICTU, Ministry of Infrastructure and Water Management of **the Netherlands**, data expert
- De Roos Advocaten: legal experts
- Fabrizio Areodo: Code developer at Aurige and Co-developer of the NeTeX 5 version, data expert
- Christophe Duquesne: Code developer at Aurige and Co-developer of the NeTeX 5 version, data expert

Staff at mobility teams of major European cities were interviewed to gain insight into several aspects. Questions were posed on the current shared mobility strategy, digital infrastructure, privacy concerns, whether standards have already been deployed, and what possible use cases could be fulfilled with data standards. In the semi-structured interviews the opportunities, bottlenecks and practical possibilities in design and implementation of a European data standard for shared mobility operators were identified.

Governance organizations such as I&W, CEN and the Dutch Vehicle Authority (RDW) were interviewed to identify the possible opportunities, bottlenecks and implementation options of a European data standard at the European governance level, through inclusion in regulations by the European Commission.

Data scientists were interviewed to research the possibilities in technical design as well as in data processing and storing. Urban planners were interviewed to map the relevant policy objective and use cases. Use cases guide design choices of the data standard, as they determine which data subjects have to be retrieved at which level of detail. Likewise, use cases determine the legal requirements for data processing and storing activities based on target reasoning. Data scientists can provide information on PETs that can be used while processing and storing the data.

Legal experts can provide further interpretation of the requirements of necessity and proportionality, plus additional data protection and privacy regulations. The legal experts together with social scientists provide views on which position city governments should choose in the grey area of the GDPR when it comes to data processing and storing. All experts contributed to identifying the opportunities and bottlenecks of design and implementation.

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During the empirical research, additional knowledge was added to the literature findings. The validity of the overall results was tested in the discussion by triangulation. Triangulation is enabled by the substantial number of results provided by the multi-method approach of using interviews, documents and observations. Triangulation is the combination of methodologies and sources in the study of the same phenomenon, and ensures a higher internal validity.^{65,73}

The results were analysed by using the Grounded Theory, an interpretive and inductive method for analysing qualitative data. It consists of classifying and categorizing data into sets of codes, led by the concepts from the literature survey. The software 'Atlas' was used for analysis.⁷⁴ The Grounded Theory consists of three coding phases. The first phase is 'open coding', in which the overarching concepts from the interviews are determined. The concepts are subsequently divided into subcategories in the 'axial coding' phase. The final phase is 'selective coding', which involves identifying the answers to the research questions.^{65,73}

6 Results

6.1 Introduction

As described in the theoretical framework, a data standard has two overarching aspects: design and implementation. Both are influenced by the visions of the stakeholders and vice versa (as shown in Figure 8). During the interview series, the visions of stakeholders and experts towards a European data standard for shared mobility operators were collected. The visions further identified the value that a data standard can deliver to municipalities; the opportunities, bottlenecks and practical possibilities in design; and the opportunities, bottlenecks and practical possibilities in implementation. The literature survey and observations substantiated the results of the interviews. The literature survey and internal meetings provided information on the basic principles of CDS-M and the rationale for development.

The empirical results of the interview series are the input for the first phase of the Grounded Theory, 'Open Coding'. In this phase the overarching concepts were established: 'Value of data standard', 'Opportunities in design', 'Bottlenecks in design', 'Practical possibilities in design', 'Opportunities in implementation', 'Bottlenecks in implementation' and 'Practical possibilities in implementation'.

In the second phase, 'Axial Coding', these overarching concepts were divided into sub-concepts. The sub-concepts are presented in the further elaboration of the empirical research results. The quotes within a specific sub-concept are labelled with sub-topics, if there are still differences in attitude. From the least to the most detailed, the codes are arranged as follows: Concept > sub-concept > sub-topic. Hence a sub-topic is the most specific code a quote can contain. The concepts and sub-concepts are elaborated in Appendix 1, with sub-topics bolded. The sub-topics are discussed in Appendix 5.

In the third phase of the Grounded Theory, 'Selective Coding', the theoretical framework was also coded, and compared to the coded results of the empirical study (Appendix 4). Interrelationships become visible in this phase. These interrelationships are tested by triangulation in the Discussion section (7.1), whereafter the research questions are answered in the Discussion and Conclusion sections.

The empirical results are arranged according to the research questions: **(1)** 'What exactly is a data standard and how does it provide value to municipalities?', **(2)** 'What are the basic principles of CDS-M and what is the rationale for its development?', **(3)** 'What are the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators?'.

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Only the two most frequently quoted sub-concepts per overarching concept of the central research question are highlighted in this Results section, otherwise it would become too lengthy. Further information about the sub-concepts and sub-topics can be found in Appendixes 1 and 5. Throughout the Results section, references are made to the prescribed tables in the Appendixes and consulted documents.

6.2 Value of a data standard

The Open Mobility Foundation maintains the MDS standard, which has been adopted by several American and European cities. MDS is the most established standard for shared mobility operators today. The OMF has created an overview of the possible use cases of MDS. Some of these use cases are centralized to value creation for municipalities. These use cases are presented in Table 2 below.⁷²

Table 2

Regulate shared mobility	Use cases Open Mobility Foundation
Regulate with vehicle caps	Determine total number of devices per operator.
Regulate with daily permit fees	Calculate fees per scooter deployed per day.
Regulate restricted area rides	Find locations where devices are operating or passing through restricted areas.
Regulate with top-speed calculations	Determine the average speed of a trip and ensure it meets requirements.
Regulate public space with sidewalk management	Ensure devices are not ending or riding on sidewalks and use data to validate.
Regulate hours of operation	Ensure operating hours are being followed, e.g. no riding late at night for safety in some cities.
Regulate no-ride zones	Ensure that riders do not drive in a no-ride zone.
Regulate slow-speed zones	Ensure that riders do not drive faster than the maximum speed in specific zones.
Regulate no-parking zones	Ensure that riders do not park in no-parking zones.
Regulate preferred parking zones	Encourage riders to park in preferred zones, such as hotspots.
Monitor shared mobility	Use cases Open Mobility Foundation
Insight into fleet Increase/reduction	Count trips per vehicle per day, for fleet increase/reduction.
Insight into parking area performance	Information about location and performance of all designated parking areas.
Insight into trip duration	Stats on trip duration.
Insight into trip distance	Stats on trip distance travelled, provided in data and validated with trip lines.
Insight into hourly fleet utilization	Hourly fleet utilization with origin/destination locations.
Insight into vehicles of specified status	Number of vehicles status that are within a specified geography at a specific moment in time.

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Support policy analysis and execution	Use cases Open Mobility Foundation
Car reduction analysis	Determine if multi-modal travel leads to decreased private car usage.
Impact on transit analysis	Provide visibility into the association between micro-mobility and other modes, such as public transit.
Pollution mitigation	Using trips along a corridor in conjunction with other vehicle data to reduce emissions over time.
Improve mobility policy with city council reports	Use data to communicate the value, successes and issues of mobility policy, and allow guidance on safe operations and approval.
Improve user satisfaction + reduce resident nuisance complaints	Complaints from residents about operations, parking, riding and speed.
Increase personalized travel options	Increase personalized travel by origin/destination demand, learn where people are riding to and from.
Increase equity and public space by distribution requirements	Ensure devices are distributed according to equity requirements.
Information about crash reports	Investigate injuries and collisions with other objects and cars to determine causes of roadway accidents.
Increase safety by injury investigation	Investigate crashes of vehicles reported by riders, the public or operators.
Information about vandalism and incidents	Investigate vandalism of vehicles reported to city by the public or operator.
Publish open data (for research)	Publish a subset of raw data to open data websites for research, analysis and accountability by anyone, and fulfil open records requests.
Enable two-way communication in machine-readable format	Use cases Open Mobility Foundation
Publish fleet caps	Publish fleet caps.
Publish no-parking zones	Publish preferred or no parking zones to encourage provider use.
Publish preferred parking zones	Publish preferred parking zones to encourage provider use.
Publish slow-speed zones	Publish slow-speed zones, reducing speeds in specific areas.
Publish no-ride zones	Publish no-ride zones.
Publish emergency guidance	Publish emergency guidance for unplanned events beforehand or in real-time, such as road closures.
Publish event areas	Publish event areas beforehand or in real-time with rules for providers to implement temporarily at specific event areas.
Public availability of devices	Allow the public to see where vehicles are available for use.

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Improve urban planning	Use cases Open Mobility Foundation
Improve Infrastructural planning based on Route Usage/Demand	Determine where to place new bike/scooter lanes and drop-off zones based on usage and demand, start and end points, and trips taken.
Improve public space by Right of way Management	Determine which routes are the most popular for riders and reveal hotspots, to improve physical space.
Remove conflicts with Curb Management	Alerts to remove devices from public right of way where known issues occur or create plans to fix these issues.
Analyse Road Improvement Effects	Determine road usage by riders before and after implementing road changes, improvements and signal retimings.

The use cases are divided into five areas: 'Regulate Shared mobility', 'Monitor shared mobility', 'Support policy analysis and execution', 'Enable two-way communication in machine-readable format' and 'Improve urban planning'. A data standard can provide value within all these five areas, depending on which functions and data subjects are activated. The five areas have been used as sub-concepts in the 'Axial coding' phase of the overarching concept 'Value of data standards'. The frequency with which the sub-concepts are quoted in the interviews is shown in Figure 11.

Value adding aspects of a data standard

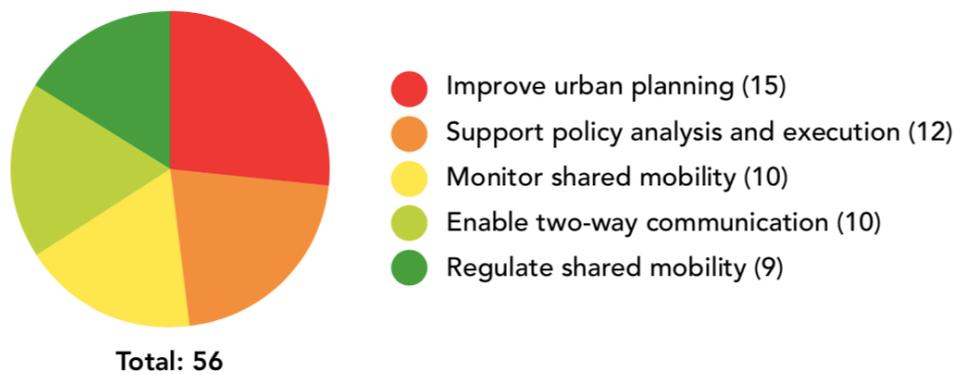


Figure 11. Quoted sub-concepts of the concept 'Value of a data standard for shared mobility'.

The most frequently mentioned value-adding aspect of a data standard is the ability to improve urban planning. This sub-concept was quoted in the interviews from Vienna, Faro, Paris, Greater Manchester, Helsinki, Lisbon and Espoo. The urban planning purposes of a data standard were also emphasized several times by Valeria Caiati, researcher at TU Eindhoven.

From the interviews it can be drawn that the demand for a data standard focused on urban planning practices is the highest. The 'Improve urban planning' sub-topics mentioned in the interviews are: 'Improve public space by Right of way Management', 'Improve Infrastructural planning based on Route Usage/Demand' and 'Remove conflicts with Curb Management' (Appendix 1.1.2).

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'Support policy analysis and execution' is the second most frequently mentioned sub-concept. It was mentioned in the interviews from Amsterdam, Faro, Paris, Greater Manchester and Helsinki. The 'Support policy analysis and execution' sub-topics are: 'Blind people use case', 'Sidewalk management', 'Increase equity and public space by distribution requirements', 'Impact on transit analysis', 'Increase personalized travel options', 'Publish open data as incentive' and 'Car reduction analysis' (Appendix 1.1.5).

The sub-concepts 'Enable two-way communication in machine-readable format' and 'Monitor shared mobility' are quoted ten times each. 'Enable two-way communication in machine-readable format' is quoted in the interviews from Faro, Espoo and Lisbon. This sub-concept is also valued by Philippe Crist, who quoted it twice. 'Monitor shared mobility' is quoted in the interviews from Helsinki, Paris, Greater Manchester, Brussels and Lisbon. The sub-concept is mentioned by Valeria Caiati and social scientist Yuki Tol.

The 'Enable two-way communication in machine-readable format' sub-topics are: 'Most efficient way of policy communication', 'Publish emergency guidance', 'Publish no-park and no-ride zones', 'Publish preferred parking zones' and 'Publish slow-speed zones' (Appendix 1.1.1).

The 'Monitor shared mobility' sub-topics are: 'Travel patterns', 'Insight into trip duration', 'Insight into trip distance', 'Insight into hourly fleet utilization', 'Availability data', 'Status assets' and 'Parking area performance' (Appendix 1.1.3).

At nine times, 'Regulate shared Mobility' was quoted the least. It was quoted in interviews from Faro, Espoo, Brussels and Paris. The sub-topics are: 'Regulate parking zones', 'Regulate vehicle caps', 'Regulate driving zones' and 'Regulate slow-speed zones' (Appendix 1.1.4).

From the empirical results of the concept 'Value of a data standard' it can be drawn that not all OMF use cases are mentioned by interviewees. Whether this is due to unawareness or a lack of demand cannot be deduced from the interviews (Appendix 1.1).

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6.3 CDS-M

The City Data Standard Mobility is a response to the growing supply of shared mobility in cities, the digitization of governance and the upcoming MDS. CDS-M is part of the MaaS model designed by I&W. The CDS-M is a joint project of the G5 and I&W. The MaaS model is called the 'Golden triangle' and represents the backend infrastructure required for the deployment of the MaaS ecosystem in cities. The 'Golden triangle' is visualized in Figure 12.

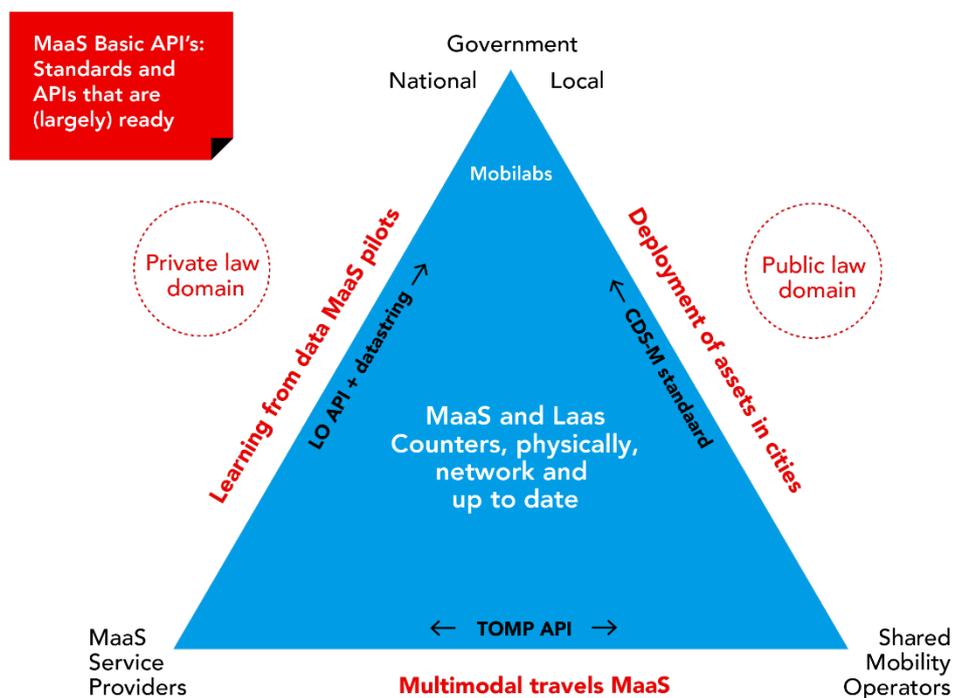


Figure 12. Golden triangle.

CDS-M is designed to enable the communication between shared mobility operators and municipalities. Two-way communication is not yet included in the first design plan, although it is the goal to include that feature in the final design. The designers of CDS-M are Ross Curzon-Butler and Tijs de Kler, both part of the Smart Mobility Team of the Municipality of Amsterdam. Together they are creating the first functional design of CDS-M, due January 2021. Their starting point is to design a data standard that is simple, easy to use and applicable for all modalities. CDS-M requests the following data hourly: number of unique users, number of trips, average distance of trips, average duration, and pre-aggregated and obfuscated data of trip startpoints and endpoints. CDS-M therefore contains trip and fleet data (see Figure 13).

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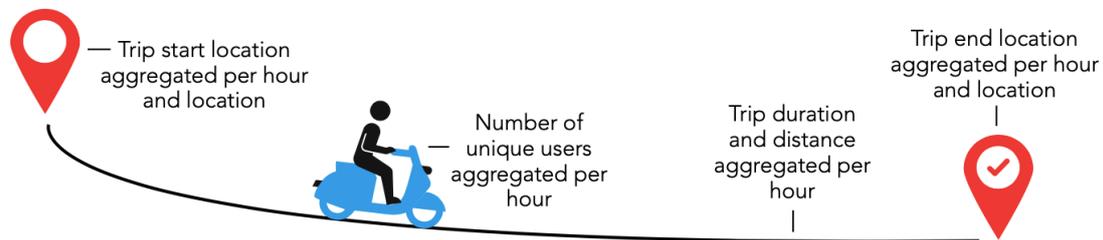


Figure 13. Requested data by CDS-M.

CDS-M is less intrusive than MDS, as it does not request real-time GPS data of trips or parking. CDS-M also shifts the responsibility for aggregation to the operators, thereby limiting data storage and processing activities (Appendix 1.4.1). Parking and availability data are not included in CDS-M, but this type of data can be polled from the TOMP-API, which is also part of the Golden triangle in Figure 12.^{24,19} Maintenance and incidents data are not yet included in the standards of the Golden triangle (Appendix 1.4.1).

The upcoming of MDS has been a motive to start the CDS-M project, as market parties were convinced that MDS violates European privacy legislation. These concerns are due to the high level of detail and large amount of data supplied by MDS. Real-time data processing is a big leap compared to the Excel files with which the municipality used to communicate. This gap causes resistance from market parties.¹⁹ From this conviction the CDS-M project was started, to design a European data standard for shared mobility operators. However, in the course of the CDS-M project it became clear that MDS might comply with European legislation after all. Whether the concerns of the market parties are justified is investigated in this study.

According to the GDPR and the interviews with De Roos Advocaten and Beryl Dreijer, Data Protection Officer of the Municipality of Amsterdam, the processing of personal data with MDS is not automatically in violation of the European data protection and privacy legislation (Appendix 2.2.2, 2.25, 3). From the document survey and the interviews it emerged that personal data may be processed and stored when a legitimate processing ground in the public task is used, and the data processing and storing complies with the requirements of necessity and proportionality, as well as with the principles of purpose limitation, data minimization, storage limitation, and integrity and confidentiality (Appendix 3). Still, requesting detailed raw data for a purpose that does not require that amount of data or level of detail places an unnecessarily large responsibility and burden of processing activities on municipalities, which is not desirable from the perspective of the G5. The G5 initially want to use data from shared mobility solely for urban planning, and CDS-M is currently being developed with this purpose in mind (Appendix 2.2.1).²⁵

One prerequisite for the successful implementation of CDS-M is trusting the market parties' abilities to provide qualitative pre-aggregated data. Not all interviewees have this trust in market parties. However, the aim of Ross-Curzon Butler and Tijs de Kler is to collaboratively finalize CDS-M with the market parties after the first functional design is finished. It is expected that the joint design of CDS-M will provide the required trust.

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The collaboration could also lead to higher-quality designs and could ensure that the market parties deliver high-quality data earlier on in the implementation process (Appendix 2.2.1).²⁵

6.4 Opportunities in design



Figure 14. Sub-concepts of the concept 'Opportunities in design'.

By far the largest opportunity in the design process of a data standard is doing clear use-case mapping. Being mentioned twenty times, this sub-concept rises far above the others. It was quoted in interviews from Amsterdam, Helsinki, Brussels, Antwerp and Lisbon. The sub-concept was also quoted by Geert Pater and Peter Jager, data specialists at RDW, Karen Cluysen from Polis, and six times by Philippe Crist from ITF. The sub-topics are: 'Target reasoning for clear vision' and 'GDPR Processing grounds' (Appendix 1.2.1).

The second-largest sub-concept, 'Willingness to align European data standards', is quoted sixteen times in interviews from Amsterdam, Faro, Madrid and Lisbon. Moreover, the organization of NeTEx mentioned its willingness to align their standards (Appendix 1.2.8). Appendix 1.2.1 to 1.2.8 shows specific quotes and the associated sub-topics related to all sub-concepts of 'Opportunities in design'.

6.5 Bottlenecks in design

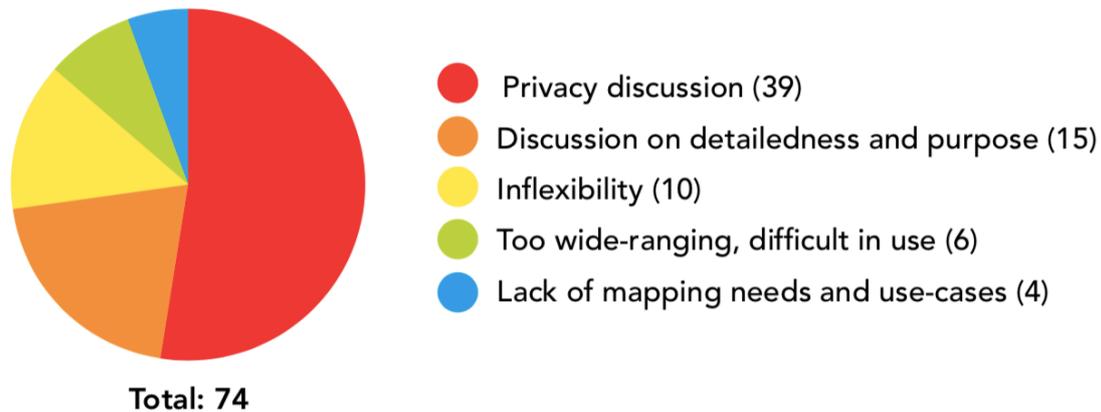


Figure 15. Sub-concepts of the concept 'Bottlenecks in design'.

By far the biggest bottleneck is the 'Privacy discussion', which was mentioned 39 times in the interviews. The sub-concept is quoted by interviewees from Greater Manchester, Amsterdam, Antwerp, Vienna, Faro, Brussels, Espoo, Helsinki, Paris, Gothenburg and Lisbon. Furthermore, privacy statements were made by TU Eindhoven researcher Valeria Caiati, De Roos Advocaten, Karen van Cluysen from Polis, Geert Pater and Peter Jager from RDW, and Philippe Crist from ITF.

The sub-topics of the 'Privacy discussion' are: 'MDS is GDPR-compliant when clear target reasoning is executed and the principles of GDPR are adhered to', 'The conviction that data brokers working with MDS are GDPR-compliant', 'Concerns about whether the full version of MDS is GDPR-compliant', 'GDPR is an open-standards framework', 'Subjective interpretation of the "reasonable means criterion"', 'Objective interpretation of the "reasonable means criterion"', 'Using a Trusted Third Party enhances GDPR compliance', 'Not much difference legally in using a third party in terms of privacy', 'A cloud-based system is not necessary and therefore the use of data brokers is privacy-intrusive', 'Anonymised datasets qualify as personal data if the raw data is not deleted', 'Not enough expertise in municipalities to properly manage open-data policies', 'Target reasoning is needed for GDPR compliance'. From these sub-topics it emerges that there are different opinions about the privacy sensitivity of MDS and the outsourcing of data processing. This obscurity is a bottleneck for arriving at a uniform data standard (Appendix 1.3.4).

'Discussion on level of detail and purpose of the data standard' is quoted fifteen times and is thereby the second most-frequently mentioned bottleneck in design. It is quoted in interviews from Helsinki, Vienna, Berlin, Amsterdam, Paris and Lisbon. The sub-concept is likewise quoted by the Open Mobility Foundation and Ruud Mollema from I&W. The sub-topics are: 'Aggregated trip data for urban planning', 'Detailed trip data for regulating', 'Detailed availability data for regulating', 'Detailed raw data offers flexibility' and 'Detailed trip data for urban planning'. The results substantiate that use cases shape the design choices of a data standard. Distinct demands for use cases can cause difficulties in arriving at a uniform data standard (Appendix 1.3.1). Appendix 1.3.1 to 1.3.5 shows the specific quotes and the associated sub-topics relating to all sub-concepts of 'Bottlenecks in design'.

6.6 Practical possibilities in design

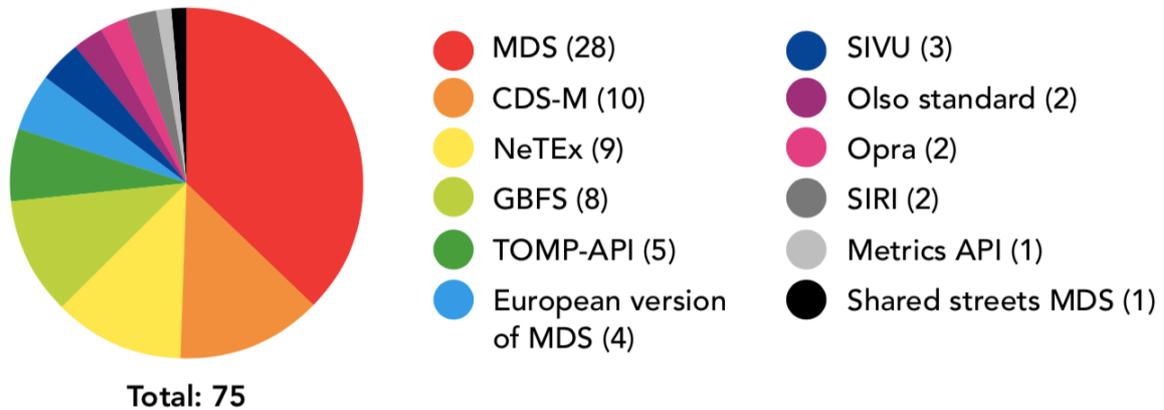


Figure 16. Sub-concepts of the concept 'Practical Possibilities in design'.

All data standards mentioned as practical possibilities in design are visualized in Figure 14. Each data standard requests different data subjects and levels of detail. From the interviews it emerged that the data standard can be used individually as well as in combination. As such, distinct data standards can be used for different use cases.

MDS was quoted the most, at 28 times, in interviews from Helsinki, Brussels, Lisbon, Paris, Faro, Amsterdam, Antwerp and Vienna. Moreover, the developers of NeTEx, Philippe Crist from ITF, OMF and Karen van Cluysen from Polis quoted the sub-concept.

MDS is developed by the Los Angeles Department of Transportation (LADOT) and the Open Mobility Foundation keeps it running. It is flexible in its settings; function can be switched on and off depending on the desired use case. MDS ranges from real-time to historic fleet, trip and availability data.

CDS-M is quoted ten times, although all of the quotes were by the municipality of Amsterdam. CDS-M requires pre-aggregated fleet and trip data. Appendix 1.4.1 to 1.4.12 shows the specific quotes and the associated sub-topics relating to all sub-concepts of 'Practical possibilities in design'.

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6.7 Opportunities in implementation



Figure 17. Sub-concepts of the concept 'Opportunities in implementation'.

The most frequently mentioned sub-concepts of 'Opportunities in implementation' are 'Demand from cities for a data standard for shared mobility operators' and 'Strong legal framework'. Each is quoted fifteen times.

'Demand from cities for a data standard for shared mobility operators' is quoted in interviews from Antwerp, Helsinki, Paris, Greater Manchester, Lisbon and Berlin. Furthermore, Karen van Cluysen from Polis mentioned cities' need for digital standardization. The sub-topics are: 'Need for data standards for MaaS' and 'Increase effectiveness policy execution' (Appendix 1.5.1).

The sub-concept 'Strong legal framework' is quoted in interviews from Lisbon, Faro, Brussels, Vienna, Madrid, Antwerp and Paris. Karen van Cluysen also mentioned this sub-concept. All actors agree on the fact that a strong legal framework increases the enforcement power of municipalities, thereby facilitating easier implementation of data standards (Appendix 1.5.4). Appendix 1.5.1 to 1.5.6 shows the specific quotes and the associated sub-topics relating to all sub-concepts of 'Opportunities in implementation'.

Bottlenecks in implementation

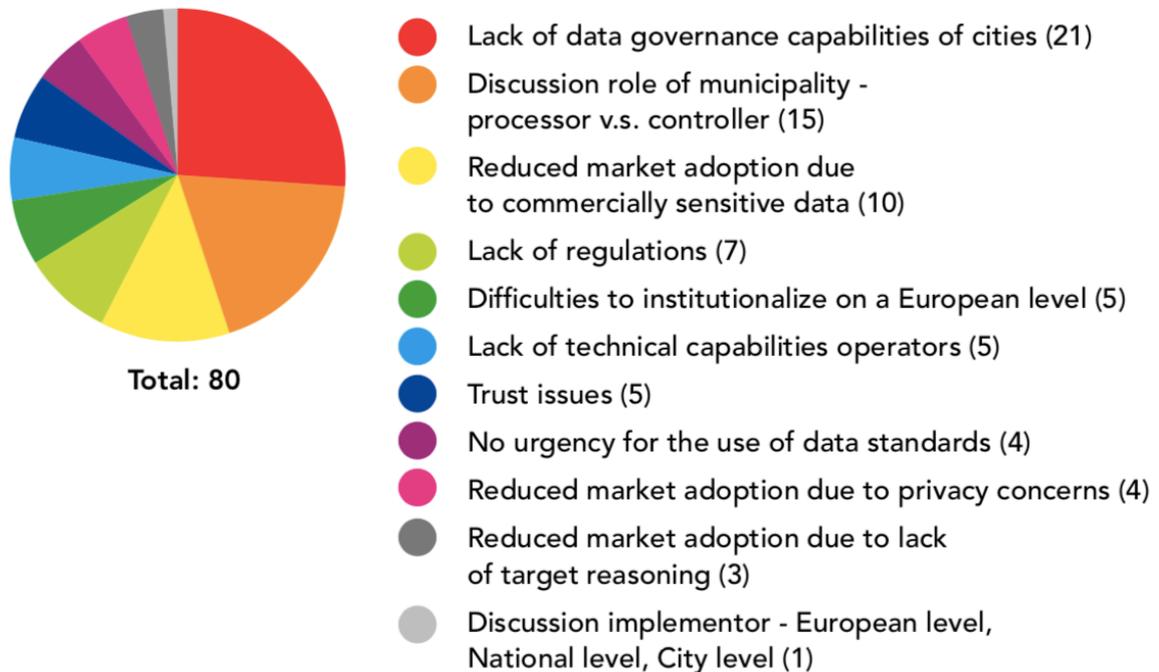


Figure 18. Sub-concepts of the concept 'Bottlenecks in implementation'.

The concept 'Bottlenecks in implementation' has by far the most sub-concepts of all. The sub-concept 'Lack of data governance capabilities' is mentioned the most in the interviews, at 21 times, and is quoted in interviews from Amsterdam, Paris, Helsinki, Berlin, Madrid, Lisbon, Gothenburg, Greater Manchester, Lisbon and Faro. Karen van Cluysen from Polis, and Geert Pater and Peter Jager from RDW mentioned the sub-concept too.

All actors who quoted this sub-concept agree on the fact that a bottleneck for implementation could be the lack of expertise and capacity to process and store real-time raw user and location data as municipality, at least if the goal is to process and store the data internally. The cities with the largest backlog in data governance are Warsaw, Gothenburg, Berlin, Greater Manchester and Madrid (Appendix 1.6.4).

The second most frequently mentioned sub-concept is 'Discussion of role of municipality – processor vs controller'. The sub-concept 'Discussion of role of municipality – processor vs controller' is quoted in interviews from Brussels, Helsinki, Espoo, Vienna and Lisbon. This discussion is elaborated on by Karen van Cluysen from Polis and TU Eindhoven researcher Valeria Caiati.

The sub-topics are: 'Economically more advantageous to outsource data processing', 'Prevent vendor lock-ins and enhance digital expertise of cities, by acting as processor and controller', 'Outsourcing data processing speeds up the digitization process', 'Act as processor to ensure the privacy of operators', 'Act as processor for upscaling MaaS' and 'Outsourcing data processing, where

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the communication is B to B, which increases operators' feeling of privacy'. The sub-topics show that there are advantages and disadvantages to outsourcing or keeping data processing in-house. This discussion is a possible bottleneck for implementation.

The sub-concept 'Discussion of role of municipality – processor vs controller' is also related to the previously mentioned sub-concept 'Lack of data governance capabilities'. If no expertise is present a third party is required for data processing, and the municipality functions solely as controller and not as processor. This is reflected in the quotes of the sub-concept 'Trusted Third Party' of the Overarching concept "Practical possibilities in implementation". The least developed cities are more likely to advocate the outsourcing of data processing than more developed ones, such as Lisbon and Paris (Appendix 1.7.2). Appendix 1.6.1 to 1.6.11 shows the specific quotes and the associated sub-topics relating to all sub-concepts of 'Bottlenecks in implementation'.

6.9 Practical possibilities in implementation



Figure 19. Sub-concepts of the concept 'Practical possibilities in implementation'.

The interviews show that most stakeholders prefer using a Trusted Third Party for data processing and storing. This path is mentioned 27 times. The sub-concept is quoted in interviews from Helsinki, Espoo, Berlin, Faro, Brussels, Vienna and Antwerp. Additionally, Karen van Cluysen from Polis, Geert Pater and Peter Jager from RDW, the Open Mobility Foundation and Ruud Mollema from the Ministry of I&W elaborated on this sub-concept.

Several advantages for the use of a Trusted Third Party are mentioned in the interviews. According to De Roos Advocaten, there is a legal advantage because smart contracts with Trusted Third Parties can guarantee increased privacy. According to Ruud Mollema, Geert Pater, Peter Jager and Beryl Dreijer, a lot of maintenance is required for the process and storage of mobility data and therefore a Trusted Third Partner could be helpful. Sami Sahala and Augustin Helmut are in favour of using a Trusted Third Party because it facilitates competition and a better price/quality ratio (Appendix 1.7.4).

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Lisbon and Amsterdam are in favour of the 'City data management - act as processor and controller', the second most-frequently quoted sub-concept of 'Practical possibilities in implementation'. This sub-concept is quoted in interviews from Lisbon, Amsterdam and Faro. Beryl Dreijer, the Data Protection Officer (DPO) of Amsterdam, states that city data management is more democratic than using a third party, because cities are not dependent on the capabilities of the third party. Beryl Dreijer states that in-house data management enables further governance digitization. Vasco Mora explains that the Cloud-based systems used by third parties are not required for data processing. He therefore argues that using a third party is unnecessarily privacy-intrusive (Appendix 1.7.1). Appendix 1.7.1 to 1.7.4 shows the specific quotes and the associated sub-topics relating to all sub-concepts of 'Practical possibilities in implementation'.

7 Discussion and Conclusion

7.1 Discussion

In this section the results of the literature review and empirical study are compared and analysed in more detail to formulate a comprehensive answer to the research question: 'What are the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators?' The comparison of the findings from the literature and empirical study are presented in a discussion scheme in Appendix 5.

7.1.1 Value of a data standard

Research by Bachmann *et al.* (2002) shows that a data standard can enable two-way communication in machine-readable format: this functionality offers value, as it enables interoperability and efficiency.³³ Empirical results substantiate this statement and show that two-way communication in machine-readable format can be used for efficient communication of several policies, such as publishing emergency guidance, parking zones, driving zones and slow-speed zones (Appendix 1.1.2 and 1.5). In the empirical research, 'interoperability' is not explicitly mentioned as a value-adding aspect, but it can be concluded that there is a high degree of willingness to align data standards to create interoperability (Appendix 5.1 and 5.2.1). The empirical results suggest that interoperability at the system level cannot be facilitated by a single data standard, therefore all data standards in a system have to be aligned (Appendix 1.2.8).

Research by Zheng *et al.* (2014) indicates that a data standard could improve urban planning. This study addresses that especially in the field of road safety and infrastructural planning a data standard adds value.³⁵ The value-adding aspect of a data standard for infrastructural planning raised in the literature corresponds with the empirical results (Appendix 1.1.2). Road safety, on the other hand, is not mentioned in the empirical results. A reason for this could be that a large part of the interviewees are employees of mobility teams, who generally do recognize road safety as their main priority (Appendix 5.1).

In the empirical results additional ways of improving urban planning are raised: 'Improve public space by right of way management' and 'Remove conflicts with urban management' (Appendix 1.1.2). These sub-topics are not present in the research by Zheng *et al.* (2014), potentially because the sub-topics emerged from an urban and practical perspective (Appendix 5.1).

The empirical results show the monitoring possibilities of a data standard (Table in Appendix 1.1.3). Monitoring offers value to municipalities, as it provides input for policy execution. The empirical results indicate that a data standard could provide insight into travel patterns, trip duration, trip distance, hourly fleet utilization, availability data, data about the status of the assets and parking area performance (Appendix 1.1.3). Monitoring as value-adding aspect of a data standard is absent in scientific literature. A potential reason for this could be the infancy state of data standards for shared mobility operators and the resulting lack of scientific literature on this topic (Appendix 5.1).

Research by Baltra *et al.* (2020) shows that a data standard could enhance regulatory abilities, as data standards can support the regulation of parking and driving zones.³⁴ The empirical results correspond with this topic (Appendix 5.1). Empirical results likewise suggest that vehicle caps and slow-speed zones could be regulated too (Appendix 1.1.4). These use cases are recent developments in the field of Smart Mobility and therefore probably absent from scientific literature (Appendix 5.1).

Garau and Pavan (2013) and Sourbati and Behrendt (2020) indicate that a data standard could support policy analysis and execution. Garau and Pavan (2013) identify the policy objectives 'Stimulation of shared mobility', 'Traffic management' and 'Shift to less private car ownership'. Sourbati and Behrendt (2020) point out that a data standard could increase inclusivity too.^{38,37}

In the empirical results, inclusivity is also mentioned as policy objective. It is suggested that distribution requirements, communicated through a data standard, could contribute to equality (Appendix 1.1.5). 'Traffic management' is not specifically raised as policy objective in the empirical results, yet interviewees emphasize the demand to monitor and steer mobility. In this sense, the concept of monitoring could overlap with traffic management (Appendix 1.1.3 and 1.1.4). Additional policy objectives are addressed in the empirical results, including 'Car reduction analysis' and 'Transit impact analysis' (Appendix 1.1.5). These objectives indicate that, contrary to the literature findings, interviewees are not completely clear on whether shared mobility replaces other forms of transport (Appendix 5.1).

7.1.2 CDS-M

As described in the Results section, CDS-M requests a specific set of queries with a certain level of detail. CDS-M requests the following data hourly: number of unique users, number of trips, average distance, average duration, and pre-aggregated and obfuscated data of trip startpoints and endpoints (Appendix 1.4.1). By requesting the data per hour, cities are unable to act on real-time events. Furthermore, when requesting solely the endpoints and startpoints of trips in a pre-aggregated and obfuscated manner, the following features are impossible: parking and driving zones regulation, daily permit fees regulation, sidewalk management, top-speed calculations regulation, slow-speed zones regulation and road improvement effects analysis.

The current design of CDS-M does not incorporate the possibility for two-way communication. From the empirical results it can be drawn that cities highly value two-way communication: the sub-topic was quoted ten times (Appendix 1.1). In conclusion, only a selection of the value-adding aspects from Table 2 is enabled by CDS-M.

Ross Curzon-Butler explains that CDS-M and the use cases will be further developed with market parties. By taking this path, the opportunity in design 'Co-designing data standard with market parties' is exploited, as is 'Clear use-case mapping' (Appendix 2.2). The other opportunities in design could use further attention in the design process (Appendix 1.4.1).

Ruud Mollema points out that CDS-M in its current version does not incorporate availability data, even though this data is valued by interviewees (Appendix 1.1.3). He emphasizes that multiple data standards are therefore required for a full overview of trip and availability data. Mollema indicates that the use of multiple standards could cause resistance from operators, and stresses that requesting pre-aggregated data creates inflexibility in possibilities because every user has to accept a certain level of detailedness. He highlights that MDS is flexible in its settings and is able to request availability and parking data. Mollema thus thinks MDS might serve better as a uniform standard (Appendix 2.2.1).

Further opportunities and bottlenecks of CDS-M are not present in the empirical results or the literature survey, because of the infancy of the data standard.

7.1.3 Opportunities in design

In the empirical results, 'Clear use-case mapping' is classified as opportunity in the design process of a data standard. It is stated that clear use-case mapping contributes to creating a clear vision and enables target reasoning. Target reasoning is required for drafting processing grounds and compliance with the GDPR (Appendix 1.2.1). Distinct design choices plus processing and storing activities are required for compliance per use case and purpose. This sub-concept is not present in the literature survey, possibly due to the infancy state of data standards for shared mobility operators and the resulting lack of scientific literature on the topic (Appendix 5.2.1).

Polydoropoulou *et al.* (2020), Yanying and Voegelé (2017) and Fenton *et al.* (2020) suggest that co-designing a data standard as a city with market parties is an opportunity in the design process. According to Polydoropoulou *et al.* (2020), co-designing results in high-quality designs. Mikael Ivari agrees with this statement (Appendix 2.15). Yanying and Voegelé (2017) and Fenton *et al.* (2020) indicate that co-designing is a requirement for the upscaling of data governance and MaaS.^{27,62,63} In the empirical results an additional benefit of co-designing is mentioned, namely the ability to foster the relationship between cities and market parties. This finding shares commonalities with the literature, as strong relationships are required for the deployment of MaaS (Appendix 1.5).

From the empirical results it emerged that cooperation with OMF or CEN could serve as an 'Opportunity in design' (Appendix 1.2.3 and 1.2.5). Willingness to align data standards is necessary for cooperation, therefore willingness is seen as opportunity in design (Appendix 1.2.8). The above-mentioned sub-concepts are not discussed in the literature survey, as insufficient information about these organizations and data standards is available. This type of information is predominantly documented in reports or on websites (Appendix 5.2.1).

Empirical results additionally show that cooperation with actors, such as other European cities or departments within the municipality, could serve as an opportunity in the design process. Other ways to join forces are partnerships or participation in European-funded projects (Appendix 1.5). Li and Voegelé (2017) and Polydoropoulou *et al.* (2020) add to this that besides European projects, European subsidies could serve as an opportunity too (Appendix 5.2.1).^{27,62}

Research by Zhang *et al.* (2019), Zouinina *et al.* (2020) and Callegati *et al.* (2015) identifies 'Privacy enhancing techniques' as opportunity in design.^{44,43,41} This deviates from the empirical results in which PETs are not seen as an opportunity but rather as the norm (Appendix 1.3.4).

7.1.4 Bottlenecks in design

Zheng *et al.* (2014) show that obscurity about the level of detail and purpose of a data standard could hinder the design process.³⁵ This obscurity is reflected in the empirical results. Some interviewees prefer detailed trip and availability data, whereas others presume that aggregated trip data is sufficient (Appendix 1.3.1). The empirical results show the unclearness of the desired degree of flexibility of a data standard, which acts as a bottleneck in the design process (Appendix 1.3.2). Some interviewees state that a potential danger could be creating a data standard for cities that is too broad and therefore difficult to manage (Appendix 1.3.5). It is suggested that this could happen due to the lack of mapping needs and use cases beforehand (Appendix 1.3.3).

The bottlenecks in design described above are not present in the literature findings. This could potentially be due to the infancy state of data standards for shared mobility operators and the resulting lack of scientific literature (Appendix 5.2.2).

The literature survey does correspond with the empirical results on 'Privacy discussion', the most frequently quoted sub-concept in the entire study. This makes 'Privacy discussion' the main bottleneck in design. The empirical results reflect the many convictions and opinions about privacy. This ambiguity in 'Privacy discussion' creates difficulties achieving a uniform data standard (Appendix 1.3.4 and 5.2.2).

De Montjoye (2013), van der Sloot and de Groot (2018) and Roessler and Moore (2020) address the 'Ethics of privacy' sub-topic of the 'Privacy discussion'. These scholars state that any restriction of privacy results in restricted self-development and opinion-forming, which disrupts the functioning of democracy.

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Mikael Ivari's statement aligns with the literature findings (Appendix 5.2.2). Yuki Tol, by contrast, believes that privacy reduction is ethically justifiable if personal data contributes to policy efficiency and is processed safely. She argues that policy efficiency ensures the expenditure of taxes on the interests of citizens (Appendix 2.11).

These different conceptions reflect the obscurity of the 'Privacy discussion' (Appendix 1.3.4).^{54,39,53} This obscurity becomes more evident when additional sub-topics of 'Privacy discussion' are compared. Comparing the sub-topics related to the use of a third party for data processing especially result in ambiguity: 'Not much difference legally in using a third party in terms of privacy', 'Using a trusted third party enhances GDPR compliance' and 'A cloud-based system is not necessary and therefore the use of data brokers is privacy-intrusive'. From the comparison of these sub-topics it can be concluded that privacy sensitivity of the use of a third party is unclear (Appendix 5.2.2).

The sub-topics concerning MDS show obscurity as well: 'MDS is GDPR-compliant if clear target reasoning is executed and the principles of GDPR are adhered to' and 'Concerns about whether the full version of MDS is GDPR-compliant'. The degree of GDPR compliance of different MDS versions is unclear (Appendix 5.2.2). Moreover, De Roos Advocaten state that anonymised datasets qualify as personal data if the raw data is not yet deleted by the shared mobility operators. They emphasize that this is problematic, because municipalities are often unaware that data is actually perceived as personal (Appendix 2.25). By contrast, Beryl Dreijer, DPO of the City of Amsterdam, underlines that she is in fact aware of this problem, and that currently the City of Amsterdam does not have enough capacity to implement an open-data policy in all areas (Appendix 2.2.2).

Dreijer further explains that the GDPR is an open-standard framework, which means that its requirements can be interpreted in different ways. She adds that the GDPR in itself does not prohibit the use of personal data: contrastingly, she notes that it supports technological innovation. Still, Dreijer notes that clear target reasoning and sufficient data governance capabilities are required for GDPR compliance (Appendix 2.2.2). These findings are supported by legislation (Appendix 3).⁷⁵

It is Beryl Dreijer's conviction that the datasets requested via data standards are not re-identifiable. She substantiates this statement by using the subjective interpretation of the 'reasonable means criterion'. This viewpoint assumes that datasets are demarcated per project by the use of interdepartmental and project-centred data provision agreements (Appendix 2.25). These agreements include the purpose of the data processing and ensure that projects or departments do not have access to the raw data if the purpose is not the same.^{76,77} In this sense, auxiliary information is not a threat to privacy (Appendix 2.2.2).

This viewpoint contrasts with the statements of De Roos Advocaten and findings from the literature by Mohan *et al.* (2012), Callegati *et al.* (2015) and McSherry (2019). They all interpret the government as one large connected body and add that municipalities could therefore have access to a large amount of data sources on citizens in the case of a portentous political interest.^{46,41,47} In these statements the objective 'reasonable means criterion' is used. This perspective assumes that auxiliary information and the possibility of combining datasets could cause privacy infringement and even re-identification.

The subjective interpretation of the 'reasonable means criterion' is absent in the literature. This is probably because the subjective way of reasoning does not include worst-case scenarios in the risk analysis. It should be noted that in sociological privacy literature worst-case scenarios are often heavily discussed (Appendix 5.2.2).^{46,41,47}

Many of the above-mentioned sub-topics falling under the 'Privacy discussion' are not mentioned in the literature, because they are either about specific data standards, data management models, the GDPR, or municipal issues, which are ordinarily described in empirical sources (Appendix 5.2.2).

7.1.5 Practical possibilities in design

From all sub-concepts falling under 'Practical possibilities in design', just two are mentioned in the literature survey: MDS and GBFS. This low visibility of data standards in the literature is probably due to their practicality. They are tools written in computational codes and are often documented in developers' reports. In scientific literature, analyses are usually made only once data standards have been widely adopted. A major part of the data standards mentioned as sub-concepts of 'Practical possibilities in design' are still under development or in their infancy. MDS and GBFS have been around the longest, which is why these two standards have a presence, albeit limited, in scientific literature. Both concepts are described by Baltra *et al.* (2020).³⁴ Further information about all the design possibilities can be found Appendix 1.4 and 5.2.3.

7.1.6 Opportunities in implementation

Polydoropoulou *et al.* (2020), Zheng *et al.* (2014), Sochor *et al.* (2015), Jittrapirom *et al.* (2017) and Haveman *et al.* (2019) show that 'Demand for a European standard from cities' is perceived as an opportunity for implementation. Polydoropoulou *et al.* (2020) describe that a data standard could fulfil the demand for effective policy execution. All these scholars identify the need for data standards for the deployment of MaaS.^{27,35,60,59,61} Both motives for the 'Demand for a European standard from cities' are present in the empirical results too.

In the empirical results the 'Demand for a European data standard from operators' is perceived as an opportunity in implementation. A reason could be increased convenience for the operators, because the data transmission is standardized and therefore takes less time and effort. In addition, a 'Strong legal framework' is identified as an opportunity in implementation. Neither sub-concept is mentioned in the literature survey, which is probably due to the infancy state of data standards for shared mobility operators and the lack of scientific literature about these data standards and their implementation (Appendix 5.3.1).

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The following three sub-concepts are present in the literature survey as well as in the empirical study: 'Joint trust', 'Pilot strategy' and 'Win-win offer'. Research by Kuan Cheong *et al.* (2007), Janssen *et al.* (2012), Thompson *et al.* (2015), Paskaleva *et al.* (2017) and Yadav *et al.* (2017) identifies 'Sufficient cooperation' as pillar for 'Joint trust'.^{56,57,58,55,26} Sochor *et al.* (2015) and Yanying and Voegelé (2017) show that 'Increased learning and cooperation' is the main benefit of the 'Pilot strategy'.^{60,62}

Findings from studies by Yanying and Voegelé (2017) and Cottrill (2020) indicate that a possible win-win situation could be the city's support for the enlargement of shared mobility in return for data transmission.^{62,40} This specific win-win situation is reflected in the empirical results. The empirical results show another plausible win-win offer, namely the improvement of the image of shared mobility in exchange for data transmission (Appendix 5.3.1).

7.1.7 Bottlenecks in implementation

Cottrill (2020) shows that privacy concerns can result in cities' insufficient adoption of a data standard.⁴⁰ This sub-concept is only mentioned by one interviewee, Mikael Ivari. It is therefore debatable whether this sub-topic acts as bottleneck at the European level (Appendix 1.6.10). Findings by Kuan Cheong *et al.* (2007) and Janssen *et al.* (2012) identify 'Cities' lack of data governance capabilities' as a bottleneck for implementation.^{56,57} This sub-concept is strongly reflected in the empirical results. Thirteen interviewees identified 'Cities' lack of data governance capabilities' as a bottleneck in implementation (Appendix 5.3.2).

Two more bottlenecks in implementation are described in the literature survey: 'Reduced market adoption due to privacy concerns' and 'Trust issues'. The sub-concept 'Reduced market adoption due to privacy concerns' is described by Cottrill (2020) and substantiated in the empirical results by four interviewees.⁵⁶ The sub-topic 'Distrust of market parties in cities' data governance' is raised by Thompson *et al.* (2015).⁵⁸ This statement is reflected in the empirical results by thirteen interviewees. Additionally, two sub-topics of 'Trust issues' are mentioned in the empirical results: 'Cities' distrust in market parties' delivery of qualitative data' and 'Cities' distrust in data brokers' (Appendix 5.3.2).

In the empirical results it is explained that difficulties in institutionalizing a data standard at the European level could be a bottleneck in implementation. Difficulties include the long duration of bureaucratic systems, the demarcation of general directives and their poor mutual cooperation, the heavy requirements for legal inclusion of a European data standard, and the large sense of urgency that must be present for funding (Appendix 1.6.1). The sub-concept is absent in the literature, probably because it covers governance structures that are more a practical than a theoretical or scientific issue (Appendix 5.3.2).

Seven interviewees identify the discussion about the role of the municipality in data management as a bottleneck for implementation. There are many different attitudes in this area. Some interviewees are in favour of outsourcing the data processing.

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Some say it is economically more advantageous, others state it increases operators' feeling of privacy or speeds up the digitization process. Yet others support keeping the data processing in-house to ensure the privacy of operators, prevent vendor lock-ins, and enhance digital expertise of the municipality (Appendix 1.6.3). The sub-concept 'Discussion of role of municipality' is absent in the literature, which could be due to the infancy of data standards for shared mobility and the lack of literature on these data standards and their implementation (Appendix 5.3.2).

The following sub-concepts are not mentioned in the literature for the same reason: 'Discussion implementor', 'Lack of regulations', 'Lack of technical capabilities of shared mobility operators', 'Reduced market adoption due to lack of target reasoning' and 'No urgency for the use of data standards'. According to interviewees from Amsterdam and Helsinki, this lack of urgency is the main attitude of traffic departments and urban planners, who are not used to working with dynamic data and are satisfied with the status quo (Appendix 5.3.2).

7.1.8 Practical possibilities in implementation

None of the 'Practical possibilities in implementation' are present in scientific literature. This could be due to the practicality and infancy of data standards. Few to no analyses have been conducted about the existing data standards and their implementation in scientific literature. Additionally, the sub-concepts of 'Practical possibilities in implementation' are specific to this research objective and oriented to the city's perspective (Appendix 1.7 and 5.3.3).

The sub-concepts of 'Practical possibilities in implementation' are 'City data management', 'Combination of standards', 'MaaS map and toolkit data management' and 'Trusted Third Partner'. Using a Trusted Third Partner is the most opted-for by far. Motives for this are cost efficiency, cities' lack of data governance capabilities, and interviewees' convictions that the use of smart contracts with Trusted Third Partners ensures enhanced privacy (Appendix 1.7.4 and 5.3.3).

7.2 Validity of the study

Semi-structured interviews were conducted in this study. An interview questionnaire was used, but room for leeway was offered if interviewees were unable to answer questions or time was short. It is therefore possible that some subjects did not come up for discussion, although they might have been present. In addition, one hour was set aside for each interview, but in some cases the interviewees would have liked to talk longer about the subject. The completeness of the data and the internal validity can therefore be somewhat disputed in this respect.

In this study a qualitative analysis method, the Grounded theory, was used that fits well with the qualitative data sources. More than twenty interviews were analysed accordingly. The interview results are substantiated by a document survey and observations. Most of the sub-concepts are mentioned by multiple interviewees and can be considered valid.

However, there are a few exceptions, as the following sub-concepts are mentioned less than three times and can therefore not be considered as a European issue but rather as a local one: 'Cooperation with NeTEx' as opportunity in design and 'CDS-M', 'TOMP-API', 'Oslo standard', 'SIRI', 'Opra', 'Shared streets MDS', 'Metrics API' and 'SIVU' as practical possibilities in design. The same applies to 'Difficulties institutionalizing at the European level', 'Discussion Implementor', 'Insufficient adoption due to privacy concerns' and 'Reduced market adoption due to Big Tech market monopoly' as bottlenecks in implementation. The resulting 28 sub-concepts were presented more than three times and could therefore be perceived as valid due to triangulation (Appendix 5). Triangulation increases internal validity.⁶⁴

The external validity of this research could be enhanced by interviewing all major cities in Europe about this subject. The results could then be applied with greater certainty to the European city network as a whole. It would also be of value to interview the shared mobility operators themselves, to validate whether the investigated bottlenecks related to shared mobility operators are actually present. However, due to the study's time limits this was not possible. External validity would have been higher had more social scientists, data specialists and urban planners been interviewed. The legal aspect was relatively overrepresented in this study. This also has to do with time limits. The legal aspect of data standards was the least clear to the Smart Mobility Team at the beginning of the project.

7.3 Research gaps and recommendations for further research

Two research gaps were identified in the literature survey. The first research gap is about the measures municipalities can take to ensure privacy in big data processing, the second about the opportunities and bottlenecks that come with the inclusion of a data standard in European regulations. This thesis has contributed to filling both research gaps.

Regarding privacy measures, it has been shown that it is possible to use principles of privacy, such as the Manifesto of TADA, interdepartmental and project-centred data provision agreements, Data Protection Impact Assessments, Lawfulness Assessments by Data Protection Officers and Smart contracts with Trusted Third Partners (Appendix 2.2, 2.24, 3).

With regard to the European governance structures, it is defined that a data standard must have a high degree of urgency or a public interest, or must be covered by existing regulations or ISO terms. In addition, the General Directives work with a slow bureaucratic system, which could hinder implementation of a data standard (Appendix 1.6.1).

The above-mentioned research gaps should be further filled by future research. Particularly in the area of privacy measures, there is still wide uncertainty among the interviewees. For instance, from the empirical results it cannot be concluded whether the use of a Trusted Third Party increases or decreases the level of privacy (Appendix 1.3.4, 1.6.3, 1.7.4).

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As visible in the discussion scheme, additional aspects of the implementation of data standards are unclear and absent in the literature (Appendix 5). In particular, research into the pros and cons of various data standards and implementation strategies is needed to resolve this ambiguity. Research is likewise needed into which legal framework and digital capabilities cities should acquire to successfully implement a data standard.

The empirical results show that a large part of the use cases suggested by the OMF are not mentioned by interviewees. Further research should determine whether this is due to ignorance or uselessness. Hence further research into use cases for the use of a data standard for shared mobility operators is desirable – especially research into use cases oriented towards urban planners and traffic managers could contribute to determine degree of usability, as empirical results indicate that currently these actors experience the least urgency to use data standards (Appendix 1.6.7).

All in all, recommended areas of further research are the use cases of data standards for shared mobility operators; analyses on the pros and cons of the different data standards, legally and technically; and analyses of implementation strategies.

7.4 Conclusion

This report aims to answer the main research question: *'What are the opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators?'* To this end, the research question is answered in the dichotomy of design and implementation.

'What are the opportunities, bottlenecks and practical possibilities in the design of a European data standard for shared mobility operators?'

The opportunities in design are mapping clear-use cases beforehand, aligning European data standards, and cooperation with stakeholders, similar organizations and European cities to arrive at a qualitative and suitable design. The bottlenecks in design are the lack of mapping needs and use cases beforehand, resulting in an inapplicable data standard that is either too broad or too strict. Inflexibility is a bottleneck to design, as every city has its own needs. Further, the obscurity regarding privacy by design hinders the creation of a uniform, European data standard. There are several data standards that could function as practical possibility in design (Appendix 1.4). From the empirical results it can be drawn that MDS and GBFS are the most widely adopted.

'What are the opportunities, bottlenecks and practical possibilities in the implementation of a European data standard for shared mobility operators?'

The opportunities in implementation are a strong legal framework, stakeholders' demand for a data standard, win-win offers, joint trust, strong cooperation and piloting.

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The bottlenecks in implementation are cities' lack of data governance capabilities; the accompanying resistance of shared mobility operators, which is backed by privacy concerns due to unclear target reasoning; open-data policies; and commercially sensitive data. Lack of regulations can act as a bottleneck in this case, because legal enforcement is then impossible. Discussions about the role of the municipality and the level of implementation could hinder the implementation itself. The same applies to institutionalizing a data standard at the European level due to the high requirements and long duration.

Practical possibilities in implementation are: using a Trusted Third Partner for data processing; executing the data processing and storing within the city with a city-based data management model; using a combination of data standards, each for its own purpose and managed by its own department; and using a MaaS map and toolkit to determine which functionalities of a data standard to use, and whether to outsource the data management.

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Appendices

1. Appendix - Interview results per concept

1.1 Value of a data standard for municipalities

  Enable two-way communication in machine-readable format	FREQUENCY IN PROJECT 10
  Improve urban planning	FREQUENCY IN PROJECT 15
  Monitor shared mobility	FREQUENCY IN PROJECT 10
  Regulate shared mobility	FREQUENCY IN PROJECT 9
  Support policy analysis and execution	FREQUENCY IN PROJECT 12

Sub-concepts of the concept 'Value of a data standard for shared mobility'.

1.1.1

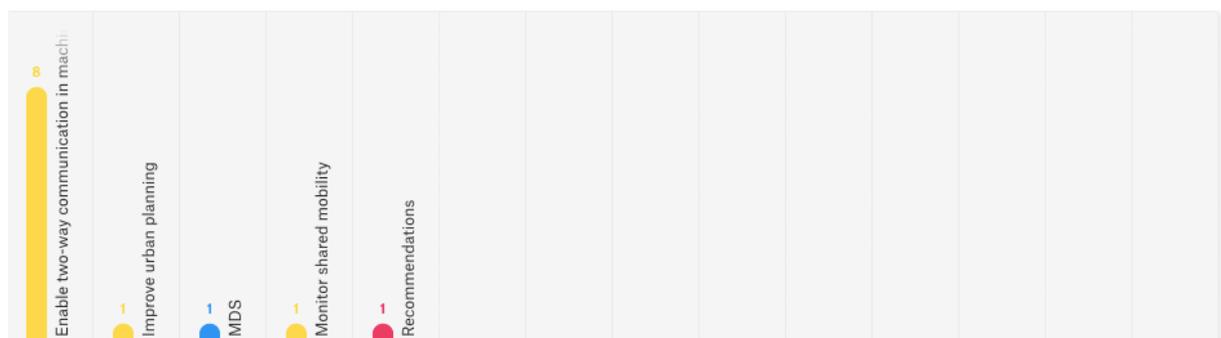
Source	Value of a data standard: Enable Two-way communication in machine-readable format
Most efficient way of policy communication Transcript Interview Philippe Crist, International Transport Forum	<i>'Absolutely, absolutely. The last thing, though I do think that that is quite interesting from the MDS perspective, but you touched on it for CDS-M which is the ability for public authorities to communicate in machine-readable format. What their intent is for the use of public space or for the type of activity. And I think that is essential because it's a different level of intervention, but it is the most direct way of ensuring that the public authority's objectives are being carried out directly in the back-office systems of any operator that is marked operating. To be clear, that should be the case for public transport, it should be the case for freight distribution, it should be the case for anything that has to obey a sign. And I think that is so... So, the</i>

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	<i>mapping part and the machine-readable law or machine-readable regulation part for me, in the functional bins, are the three areas that are important to see and recognize in any specification that I think will have traction over the long run.'</i>
Publish emergency guidance Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'But I think I think it's pretty promising as this policy API program, for example. So, you can set some dynamic ruling. Yet I think it's it seems quite logical and obviously, um, it seems to me it seems very logical if you look at the city at scale, because there are lots of fluxes that could be dynamically managed and even rules and you have a better output from the system.'</i>
Most direct way of policy communication Transcript Interview Philippe Crist, International Transport Forum	<i>'So, if there's a call for an Airbnb shared ride and it's going into the center of Amsterdam at peak time, then automatically that ride gets surge taxed 150%. And there's nothing that can happen. That's just how it happens. So that goes back to the importance of having the push out of public intent in machine-readable language. But I don't think it's enough.'</i>
Publish no park and no ride zones Suvi Kajamaa – Espoo, Finland	We can also regulate the scooters, in where they park or ride, then TR draws a red zone in their app.
Publish preferred parking zones Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'The hotspots are a very interesting thing. What we build here... In this specific area of the parties is really in the center of the business district of Lisbon. There was a scattered, a real mess of scooters on the sidewalks. So, what we developed were virtual docks, hotspots, and we put a very large stamp on the maps, and sometimes we will pull a saying in the application, 'please park here'. And there was a huge magnetization to the left. You can see it's the distance to that hotspot. And you can see that the users stopped dropping the scooters everywhere. The street was much tidier. Another benefit is that the users could easily find the scooters, because they were clustered in those positions.'</i>
Publish preferred parking zones Publish slow-speed zones Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'The hotspots that you saw. So, the virtual docs, on the application, preferred parking. That worked really well to clean the public space. And there was another one, but I think it will be more difficult is the low-speed zones. So, places where you cannot go up to the 25 kilometers an hour accepted by the world coat, but you have to stick down to 15 or 20 or whatever. There's also another thing that I think it will be difficult is to grant that the first time you use such vehicles</i>

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	<i>you are not able to ride it's 25 kilometers an hour. So, it would be like a driver license. The first five minutes, you have to ride at 15 kilometers an hour, the next five minutes, you can ride up to 20 and then you can freely ride.'</i>
Publish emergency guidance Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'The way that we have to process bigger volumes of data, it's something that opens up space for a new like a fourth framework for. And so basically, we're talking about dynamic modeling.'</i>
Publish emergency guidance Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'We are looking at use cases where we have KPIs of high density, so meaning the mopeds, bicycles, or scooters in that place, but also low density, meaning I was expecting to have at least five vehicles close to public transport. And I have none. So, we have to balance things like in plus minus balance making sense of that. We don't want overcrowded systems in one place and absent systems in the other. We want to balance the balance distance throughout the city where people can rely on finding easily a shared vehicle to, and soft dementia vehicle for using. So, we are developing also that see the way that we can communicate operators, that they should rebalance things towards those locations.'</i>
Publish preferred parking zones Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'Yeah, basically for planning, but also because, the city as it is, we've got something like 10 hotspots. We've replaced former parking spots for a hotspot. But those 10, it's only a fraction of the overall hotspots in the city. So, we've got like 30 something, almost 40 hotspots. Only 10 are really in place. And with this data, we expect to also understand, should we be expanding some hotspots? Should we be setting up some different requirements? Where should we set up priorities?'</i>



Profile of quotes labelled as 'Enable Two-way communication in machine-readable format'.

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1.1.2

Source	Value data standard: Improve urban planning
Summary Interview Augustin Helmut - Vienna, Austria	Augustin's opinion is that the municipality should own the shared mobility data. From his point of view this data is needed for urban planning. In Augustin's department they are developing several data-driven decision models for these purposes.
Improve public space by Right of way Management Transcript Interview Valeria Caiati, TU Eindhoven	<i>'But that would be a hard measure and not so much a soft measure. And I think indeed the question is, how do you stimulate that from a government perspective? This is indeed a good question, because I would say that apart from the hard measure, where you have kind of reference to a database, it is indeed, I would say to the municipality should start the conversation with market parties upon these preferences.'</i>
Improve Infrastructural planning based on Route Usage/Demand Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'But we're indirectly trying to treat it like a hotspot, a place by parking in a hotspot next to close to bus stops and also, you know, trying to match different pieces of the puzzle. So, like, we hope for also a MaaS solution.'</i>
Improve Infrastructural planning based on Route Usage/Demand Transcript Interview Valeria Caiati, TU Eindhoven	<i>'Guusje van der Vossen: And if you go into those soft measures, what could be a soft measure that municipality could take to support the usage of shared mobility in a city?</i> <i>Valeria Caiati: And one way to do so is make sure that the demand and supply side are adjusted to each other, that they feed each other well so that citizens always options. This is also, yes, a key element for so that you can either increase the performance of the service provision or also increase the service satisfaction. So, it's a kind of a win-win situation in which both sides are getting value from this new way of policy.'</i>
Improve Infrastructural planning based on Route Usage/Demand Remove conflicts with Curb Management Transcript Interview Mélanie Gidel - Paris, France	<i>'I think maybe we will in steps, but something that we would really like to have is a more precise trip data, do we can decide where to create more bike lanes, for instance. So, you really need to know which roads are used the most, for example. And also thinks like, if they contribute to traffic jams, that kind of issues.'</i>
Improve public space by Right of way Management	<i>'So, we really wanted to have information about the use vehicles, as well as the information that is usually provided to users, the availability of vehicles. So that was not enough for us because we needed more than just a list of at the location of the vehicles that</i>

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<p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>could be used. We needed to know where the vehicles were and where it would be a problem for other users of the public space.'</i></p>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p><i>'The data demand they have in Manchester are mainly about gaining insight in where, how, when, and why people chose their modes. They want to know the intentions behind travel. This means it is a provision of services. And they want to determine where shared mobility will be of good use.</i></p> <p><i>They are also interested in nudging people to take a certain modality, on the basis data on the supply and demand. By nudging they want to avoid overload. In this case, the data could show which leavers to pull.</i></p> <p><i>They state that people make decisions subjectively, so based on perception. They want to understand the gap between perception and reality, by looking at data, and looking at what determines the perception. Traditionally use static preference is used, but they stress that through dynamic data you could possibly determine the real preference. They also want data on inclusivity and accessibility. They want to make sure that it is accessibility for all, so also for the poorest of society.'</i></p>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'The number of vehicles that operators are allowed to have in Paris are limited, yet we need to have a better understanding of how they are used, if they are an alternative for everyone everywhere in the city and if it's worth a lot to develop these services. Yeah, um, and if we need to expand parking areas, that's something we're really thinking about at the moment, if we will create more spaces for them or not.'</i></p>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'The responsibility of the municipality is guaranteeing the fine achievement of some of their societal goals. So, in the sense that the municipality provides public transport services to their citizens. So, in that sense, you see the response of them is so you see it as a responsibility of the municipality to offer all sorts of modality for the citizens in a way that there I mean, it depends on the goal of the government. Of course, the goal is to reduce the private car ownership. So certainly, if that is to provide the citizens with the different transportation options, that will really make, you know, representing one of them compared to their private usage. Yes. And</i></p>

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	<i>if you translate it into practical solutions, then this could be enhancing parking space in specific popular areas for shared mobility or making sure that there are more shared options closed to transport hubs.'</i>
<p>Improve Infrastructural planning based on Route Usage/Demand Analyze road improvement effects</p> <p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<i>'And so, we want to get a bit more grip on the KPIs and the usage of the infrastructure, especially by cyclists. To determine where we should build more cycle lanes also for safety. That's mostly what we want from the trip data. Uh, of course we can, we can build things on the amount of vehicle kilometers and things like that. But as long as we don't have that transversely to all the other modes, it's a little bit strange to have a lot of understanding of one mode that represents 1% of the trips. Um, so the most relevant thing that we are looking at that right now is a little bit of a return on investment for the cycle lanes, but also starting to collect data that can be expanded to other modes such as taxis, and other shared modes, like motor scooters and things like that.'</i>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<i>'Well, I don't think we can say we don't, we're not sure yet whether we want shared mobility to increase. Of course, we do. The question is, where do we want more cars, or kick-scooters rather than bikes or motorbikes? And this is a real question in Paris, because there are a lot of alternatives to this kind of vehicles and they're quite expensive as well. So, not everyone can access such a scooter, for example. So, it's also a matter of policy if we want to privilege scooters in more than the bikes or something else. And the studies we tend to show that people who use scooters are not people who used to travel by car. They are more likely to walk, bike or take public transport. Yeah. So, it might be a positive thing if there are less people in the metro or in the bus specifically. But it is not clear if it really could contribute to decrease car ownership in Paris, for instance, which is already quite low, actually.'</i>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<i>'Well, yes, the first goal of the pilot was to get better understanding on how the parking of the scooters work and how to stimulate the usage. How should the station be built, for example?'</i>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<i>'Yeah, basically for planning, but also because, the city as it is, we've got something like 10 hotspots. We've replaced former parking spots for a hotspot. But those 10, it's only a fraction of the overall hotspots in the city. So, we've got like 30 something, almost 40 hotspots. Only 10 are really in place. And with this data, we expect to also understand, should we be expanding some hotspots?'</i>

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	<i>Should we be setting up some different requirements? Where should we set up priorities?'</i>
<p>Improve Infrastructural planning based on Route Usage/Demand</p> <p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'Yeah, of course for planners, it is so important to get information and data both from the supply side and the demand side, to have an overview on how to allocate the services throughout the city, so it's something related also to the relocation strategies. For example, so you can understand why there is a need for more cars during the morning peak.</i></p> <p><i>And so, if you know that there is a huge demand from me, people, a specific area of the city, then you can also make more and more parking places. So, GPS data could give us information about the demands and demand patterns, and then this data would be useful, if we could match it with their supply data of the transport providers. Then you could increase the satisfaction of the citizens, and this is important for the further development of MaaS. Putting citizens in the center.'</i></p>



Profile of quotes labelled as 'Improve urban planning'.

1.1.3

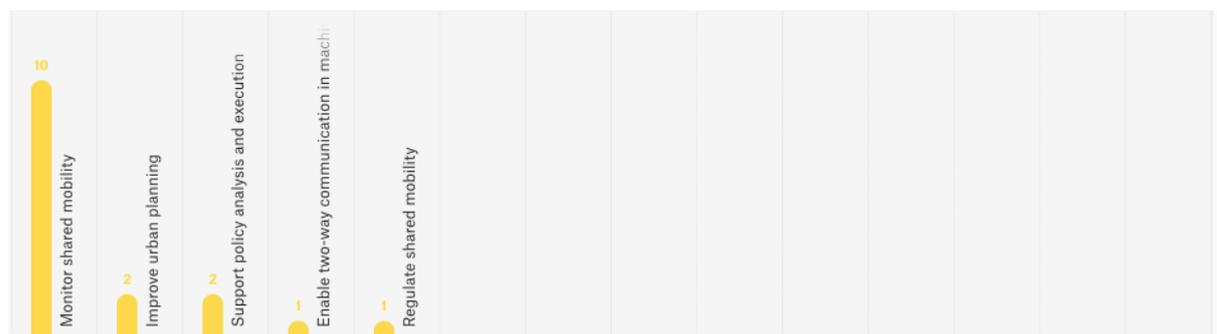
Source	Value of data standard: Monitor shared mobility
<p>Travel patterns</p> <p>Transcript Interview Sami Sahala - Helsinki, Finland</p>	<i>'And then, of course, the basic use cases are that that you could get a better understanding of just the travel patterns in the city.'</i>
<p>Travel patterns</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<i>'And we want to change our methodology in terms of planning with more tactical urbanism, which will require a better monitoring of uses, and the way people use the new infrastructure and public spaces and try to adjust it as soon as we can. So that's another big, big challenge for us.'</i>

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<p>Insight in trip duration Insight in trip distance</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'But what we would like to know is to have a better understanding of the original destinations and the duration so we can really have a better understanding of how this mobility is an alternative to other modes of transport, for instance.'</i></p>
<p>Travel patterns</p> <p>Summary Interview Yuki - Ethics CDS-M</p>	<p>'One particular use case could be the collapsing quays and bridges in Amsterdam. Also, with regard to CDS-M this could be a use case, perhaps insight can be gained into how many taxis drive over the weak quays and bridges and how to divert them.'</p>
<p>Insight in hourly fleet utilization</p> <p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'So, in other groups there are researchers working with the GPS data and they basically use these data also to ask specifically for activity-based models. So, to understand how people move through the city.'</i></p>
<p>Availability data Status assets</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'So, we really wanted to have information about the use vehicles, as well as the information that is usually provided to users, the availability of vehicles. So that was not enough for us because we needed more than just a list of at the location of the vehicles that could be used. We needed to know where the vehicles were and where it would be a problem for other users of the public space.'</i></p>
<p>Travel patterns</p> <p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>The data demand they have in Manchester are mainly about gaining insight in where, how, when, and why people chose their modes. They want to know the intentions behind travel. This means it is a provision of services. And they want to determine where shared mobility will be of good use. They are also interested in nudging people to take a certain modality, on the basis data on the supply and demand. By nudging they want to avoid overload. In this case, the data could show which leavers to pull. They state that people make decisions subjectively, so based on perception. They want to understand the gap between perception and reality, by looking at data, and looking at what determines the perception. Traditionally use static preference is used, but they stress that through dynamic data you could possibly determine the real preference. They also want data on inclusivity and accessibility. They want to make sure that it is accessibility for all, so also for the poorest of society.</p>
<p>Status assets</p>	

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<p>Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'The platform can now raise a flag when a vehicle hasn't moved for more than five days, which is also something in EU regulations that basically without these kinds of tools and digitalization of data, it's impossible to keep track of.'</i></p>
<p>Availability data Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'There's a team of, I think it's 12 guys in the streets, but walking down the streets, you're missing 99% of the action when it comes to shared mobility. So, they haven't been working together with us enough for this pilot project. I think they're missing a real opportunity to actually realize what this kind of data can do for them. So, they're slowly starting to understand how it works and what's possible to do with it. And for example, now we're sending them a weekly report of shared micro mobility vehicles that are parked in the no parking zones.'</i></p>
<p>Parking area performance Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'We are looking at use cases where we have KPIs of high density, so meaning the mopeds, bicycles, or scooters in that place, but also low density, meaning I was expecting to have at least five vehicles close to public transport. And I have none. So, we have to balance things like in plus minus balance making sense of that. We don't want overcrowded systems in one place and absent systems in the other. We want to balance the balance distance throughout the city where people can rely on finding easily a shared vehicle to, and soft dementia vehicle for using. So, we are developing also that see the way that we can communicate operators, that they should rebalance things towards those locations.'</i></p>



Profile of quotes labelled as 'Monito shared mobility'.

1.1.4

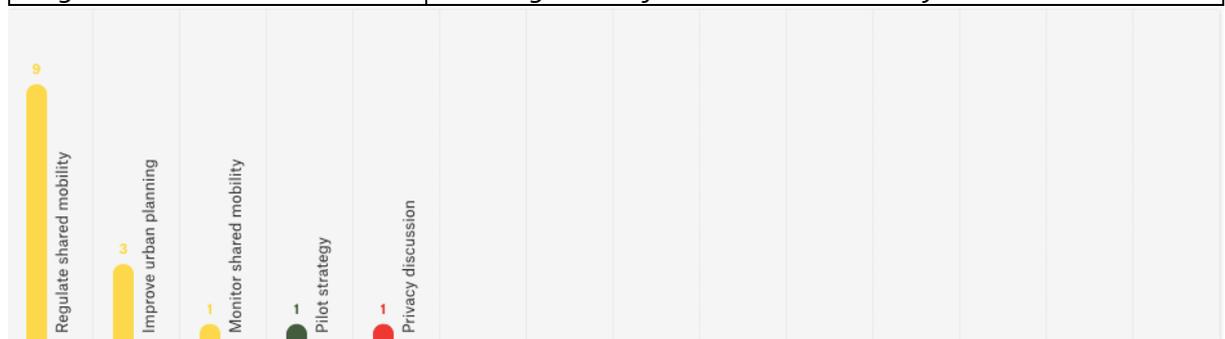
<p>Source</p>	<p>Value of a data standard: Regulate shared mobility</p>
<p>Regulate parking zones</p>	

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<p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'But we're indirectly trying to treat it like a hotspot, a place by parking in a hotspot next to close to bus stops and also, you know, trying to match different pieces of the puzzle. So, like, we hope for also a MaaS solution.'</i></p>
<p>Regulate vehicle caps</p> <p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'I think that the GDPR and privacy are very important. However, I think that the possibilities of the detailed data have a really large value. And therefore, it is maybe worth it to use third parties like Vianova and privacy preserving techniques. The data could really help, achieving sustainability goals and cleaning the city, if I can say so. But basically, I think the data is crucial in understanding whether micro mobility actually functions. Are citizens really using it, and is it the future of MaaS and the end of car-ownership? So maybe the average, aggregated, numbers are not enough. Especially for cities where there is more shared mobility, then you should be able to determine the maximum of vehicles and operators. As a municipality we should have tools to interfere with the operators, for if they are not having a high enough service level.'</i></p>
<p>Regulate driving zones Regulate parking zones</p> <p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'Now, real time isn't too critical. But I guess if we're managing. And the time being we don't have a police force, a municipal police force. But we will be having over the next 12 months something like that. And so, once we do have them, having the act of mobility feed, it can actually also help, particularly in those more critical places, for the police force to step in and basically avoid that people be going in places that they shouldn't, basically.'</i></p>
<p>Transcript Interview Martin Le Francq - Bruxelles region, Belgium</p>	<p><i>'So, I work in the strategy department of smart mobility, but I have colleagues who are actually on the ground to make sure that the regulations are respected, and they are absolutely clueless in how to follow the evolution and the operational side of shared mobility.'</i></p>
<p>Regulate sidewalks</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'So, we really wanted to have information about the use vehicles, as well as the information that is usually provided to users, the availability of vehicles. So that was not enough for us because we needed more than just a list of at the location of the vehicles that could be used. We needed to know where the vehicles were and where it would be a problem for other users of the public space.'</i></p>
<p>Regulate slow speed zones</p>	

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Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'So, we've got scooters that were going up to 20 kilometers per hour. And I believe that we should be bringing down the speed because in what I see some streets, it might be worthwhile to pick up speed where complexity is low, risk is lower. But the wide network, I guess we should break it down to less at most sixteen kilometers per hour, something that's I guess where the security should play out.'</i>
Regulate vehicle caps Transcript Interview Mélanie Gidel - Paris, France	<i>'The number of vehicles that operators are allowed to have in Paris are limited, yet we need to have a better understanding of how they are used, if they are an alternative for everyone everywhere in the city and if it's worth a lot to develop these services. Yeah, um, and if we need to expand parking areas, that's something we're really thinking about at the moment, if we will create more spaces for them or not.'</i>
Regulate parking zones Transcript Interview Martin Le Francq - Bruxelles region, Belgium	<i>'Well, I think we're going to get in be inspired by a few of the use cases that we've actually experimenting right now with Vianova. So, for the moment, it's no parking zones, dedicated parking zones that are not mandatory because it was not foreseen in the policy, in the regulations for shared micro mobility.'</i>



Profile of quotes labelled as 'Regulate shared mobility'.

1.1.5

Source	Value of data standard: Support policy analysis and execution
Blind people use case, polluted sidewalks notification Summary Focus Group Helsinki x Amsterdam	A proposed possible use case for the future is the blind people use case for pedestrian safety.
Publish open data for research	<i>'Because the MDS has got these two fronts. You've got this active front, what's happening now, and what's happened in the past. Guusje van der Vossen: The agency and the provider API?'</i>

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<p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>Jorge G Coelho: Yeah. And so, what we'll be collecting will be more focused on this latter point. It'll be regards to basically past mobility. So, we can basically use it for our research.'</i></p>
<p>Increase equity and public space by distribution requirements</p> <p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'But another thing that I was thinking about right now is another kind of measure that you can consider, which is to try the incentives that you can give to market parties in relation to these characteristics. So, incentives or subsidies could be also a measure through which you can take into account the different characteristics of the citizens in terms of the sense of income or disabilities, or relation to the specific area of the city in which they are living. So, subsidize trips of citizens that are living in a very special area of the city, or like an outer skirt. You can also think to some kind of incentives to give to the operators on the basis of these user preferences, but before doing so you need insight in these preferences and data on the operations of the shared mobility providers.'</i></p>
<p>Impact on transit analysis</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'But what we would like to know is to have a better understanding of the original destinations and the duration so we can really have a better understanding of how this mobility is an alternative to other modes of transport, for instance.'</i></p>
<p>Increase personalized travel options</p> <p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'Guusje van der Vossen: And if you go into those soft measures, what could be a soft measure that municipality could take to support the usage of shared mobility in a city? Valeria Caiati: And one way to do so is make sure that the demand and supply side are adjusted to each other, that they feed each other well so that citizens always options. This is also, yes, a key element for so that you can either increase the performance of the service provision or also increase the service satisfaction. So, it's a kind of a win-win situation in which both sides are getting value from this new way of policy.'</i></p>
<p>Increase personalized travel options Increase equity and public space by distribution requirements</p>	<p>The data demand they have in Manchester are mainly about gaining insight in where, how, when, and why people chose their modes. They want to know the intentions behind travel. This means it is a provision of services. And they want to determine where shared mobility will be of good use.</p> <p>They are also interested in nudging people to take a certain modality, on the basis data on the supply and demand. By nudging they want to avoid overload. In this case, the data could show which leavers to pull.</p>

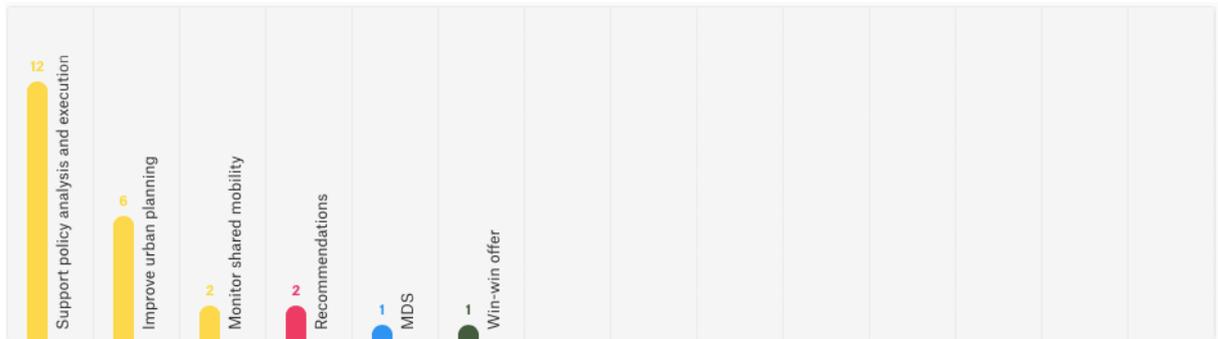
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<p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>They state that people make decisions subjectively, so based on perception. They want to understand the gap between perception and reality, by looking at data, and looking at what determines the perception. Traditionally use static preference is used, but they stress that through dynamic data you could possibly determine the real preference. They also want data on inclusivity and accessibility. They want to make sure that it is accessibility for all, so also for the poorest of society.</p>
<p>Publish open data as incentive</p> <p>Transcript Interview Sami Sahala - Helsinki, Finland</p>	<p><i>'The future goal is to get the data for different functions like traffic planning. But also, to get insight into the city and to do some visualizations on for example how the city bikes are flowing in different times of the day versus the E-scooters. There's no value direct in the data itself, but it sparks and triggers discussion and gets people thinking, this is basically what we want to do. We want people to use all the different kinds of modes, not just their car. I'm also a little bit against the trend of trying to push people back to the public transport as quickly as possible if they don't feel safe there. Let's make sure that they have options with which they feel comfortable. Shared mobility and new mobility modes have a big role there. Just by showing open data about the shared mobility, and letting people know, letting people see that this is how other people have been using it. That incentive is also really helpful for that transformation.'</i></p>
<p>Increase personalized travel options</p> <p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'The responsibility of the municipality is guaranteeing the fine achievement of some of their societal goals. So, in the sense that the municipality provides public transport services to their citizens. So, in that sense, you see the response of them is, so you see it as a responsibility of the municipality to offer all sorts of modality for the citizens in a way that there I mean, it depends on the goal of the government. Of course, the goal is to reduce the private car ownership. So certainly, if that is to provide the citizens with the different transportation options, that will really make, you know, representing one of them compared to their private usage. Yes. And if you translate it into practical solutions, then this could be enhancing parking space in specific popular areas for shared mobility or making sure that there are more shared options closed to transport hubs.'</i></p>
<p>Car reduction analysis Impact on transit analysis</p>	<p><i>'Well, I don't think we can say we don't, we're not sure yet whether we want shared mobility to increase. Of course, we do. The question is, where do we want more cars, or kick-scooters rather than bikes or motorbikes? And this is a real question in Paris, because there are a</i></p>

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<p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>lot of alternatives to this kind of vehicles and they're quite expensive as well. So, not everyone can access such a scooter, for example. So, it's also a matter of policy if we want to privilege scooters in more than the bikes or something else. And the studies we tend to show that people who use scooters are not people who used to travel by car. They are more likely to walk, bike or take public transport. Yeah. So, it might be a positive thing if there are less people in the metro or in the bus specifically. But it is not clear if it really could contribute to decrease car ownership in Paris, for instance, which is already quite low, actually.'</i></p>
<p>Blind people use case, polluted sidewalks notification Transcript Interview Sami Sahala - Helsinki, Finland</p>	<p><i>'Well, the blind person use cases is one. It's actually a really good one. That would be helpful in terms of just pedestrian safety.'</i></p>
<p>Increase personalized travel options Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'Yeah, of course for planners, it is so important to get information and data both from the supply side and the demand side, to have an overview on how to allocate the services throughout the city, so it's something related also to the relocation strategies. For example, so you can understand why there is a need for more cars during the morning peak. And so, if you know that there is a huge demand from me, people, a specific area of the city, then you can also make more and more parking places. So, GPS data could give us information about the demands and demand patterns, and then this data would be useful, if we could match it with their supply data of the transport providers. Then you could increase the satisfaction of the citizens, and this is important for the further development of MaaS. Putting citizens in the center.'</i></p>
<p>Increase personalized travel options Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'Yes. And actually, this is something that that's really important for MaaS, because we need to provide a solution which are really promising but do not feel like citizens are obliged to adopt them. Because it is really important that the citizens are at the center of the decisions made about MaaS, which means that satisfaction needs to be achieved somehow. And one way to achieve this is also by personalizing this service so that the better address the needs and preferences, which is again connected to the data, because if you want to personalize your service, you need more data from the users. So, I see that personalization is a key element to satisfy those needs and convince them to use less cars. But it's also a kind of challenge in terms of data management, data sharing.'</i></p>

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Profile of quotes labelled as 'Support policy analysis and execution'.

1.2 Opportunities in design

Clear use-case mapping	FREQUENCY IN PROJECT 20
Co-designing data standard with market parties	FREQUENCY IN PROJECT 6
Collaboration with the Open Mobility Foundation	FREQUENCY IN PROJECT 5
Cooperation with departments in the municipality to map data needs and possibilities	FREQUENCY IN PROJECT 4
Cooperation with NeTEx	FREQUENCY IN PROJECT 2
Cooperation with other European cities on design and use-case development	FREQUENCY IN PROJECT 9
Joining European funded projects	FREQUENCY IN PROJECT 6
Willingness to align European data standards	FREQUENCY IN PROJECT 16

Sub-concepts of the concept 'Opportunities in design'.

1.2.1

Source	Opportunity in design: Clear use case mapping
Summary Focus Group Helsinki x Amsterdam	'Mapping was needed beforehand.'

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Summary Focus Group Helsinki x Amsterdam	'Helsinki emphasizes that the most important part is the participation of the operators, the involvement of the municipality as a whole, and the mapping of clear use cases.'
Target reasoning for clear vision Internal communications	Ross stresses that besides the dialogue with all stakeholders, a clear vision of the reason why we want to use CDS-M is needed from a planning and city perspective. 'How do we want to process, analyze, alter and store data?'
Processing grounds GDPR Internal communications	According to Beryl, transparency and target reasoning are important for mutual trust.
Processing grounds GDPR Summary Interview Geert Pater and Peter Jager – RDW, Dutch Vehicle Authority	Geert says that a standard that is made 'European' must comply with a number of things. Firstly, the standard must represent a major public task, such as safety or the environment. Recently, the environment has mainly been seen as major ground, says Geert, and he advises me to talk to Bert Timmermans about this. Another processing ground could be the Road Traffic Act, Article 2 which includes traffic flow, road safety and the preservation of infrastructure and sustainability. Another way of making a standard 'European' is to link the standard to an ISO standard or to cooperate with the NEN, National Standardization Institute.
Processing grounds GDPR Target reasoning for clear vision Summary Interview Geert Pater and Peter Jager – RDW, Dutch Vehicle Authority	For all these ways, the reasoning remains the most important. For whom, what, and why is data requested? The reasoning must be completely clear, for the design of the standard, so that it meets the needs and is therefore usable, but also to comply with the GDPR.
Target reasoning for clear vision Summary Interview Geert Pater and Peter Jager – RDW, Dutch Vehicle Authority	He indicates that cities have an important role to play in creating this urgency, because if it takes too long the market players take over this role, and cities are dependent on data brokers and Shared Mobility Operators. Geert gives the tip to promote urgency and persuasion by setting up focus groups with other European cities.
Processing grounds GDPR	How these standards are organized under regulations or as ISO standards can be seen in the figure. Each European standard is either included in an ISO standard or falls under a regulation. In other words, if the CDS-M is to become a

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<p>Summary Interview Geert Pater and Peter Jager – RDW, Dutch Vehicle Authority</p>	<p>European standard, it must be covered by a single regulation or laid down in an ISO standard. Peter agrees with Geert that you have to be able to put it under an existing framework regulation. A regulation is often based on major objectives such as safety or the environment. According to Peter, CDS-M must first be further developed so that the processing grounds and objectives are completely clear. Only then will it be clear which ISO standards are applicable and which regulations are appropriate. It may also be that a new ISO standard has to be formed, which will take years.</p>
<p>Processing grounds GDPR</p> <p>Summary Interview Karen Cluysen, Polis</p>	<p>Karen says that the use case way of thinking is again very important here, because target reasoning is needed to comply with the GDPR. She states that therefore it is important that cities start reasoning from policy goals to demand data. 'What data is needed for monitoring or mapping mobility flows, or for enforcing permit requirements, for example?'</p>
<p>Target reasoning for clear vision</p> <p>Transcript Interview Martin Le Francq – Bruxelles region, Belgium</p>	<p><i>'Well, I think, and again, I'm connecting back to the ITF project and that presentation of Phillip Crist a while ago. Is that, it's not because some data exists that, as an authority, you had a right to take it back. But I think that the process in the approach is different. It's depending on what your goal in terms of policies is, then that defines the actual tool to make it work. And that tool defines the data that you need. We call this approach 'mapping'. Martin le Francq: And this approach I think, is super relevant and makes it GDPR proof. If you work like that, the way you actually use it, the way you store it and stuff like that becomes clear, and you should minimize that to your goal. So, you should have that approach and you share that approach with the providers, I think you can find some common ground and create some kind of a good momentum for data sharing.'</i></p>
<p>Processing grounds GDPR</p>	<p><i>'But the first thing is, to my understanding, I mean, and yes, we always do talk a lot about MDS, but MDS, it's syntax that was pushed out rapidly to deal with a specific problem. It had great ambition. I mean, the ambition was that it would be the language to end all languages, but then scooters appeared, and they had to act really fast. Philippe Crist: So, the structure of the specification right now is to get information from operators, particularly micro mobility operators. In the information that can be encoded within MDS is the route-based information, which is the most difficult from a personal identifiable information perspective, but that never has to be</i></p>

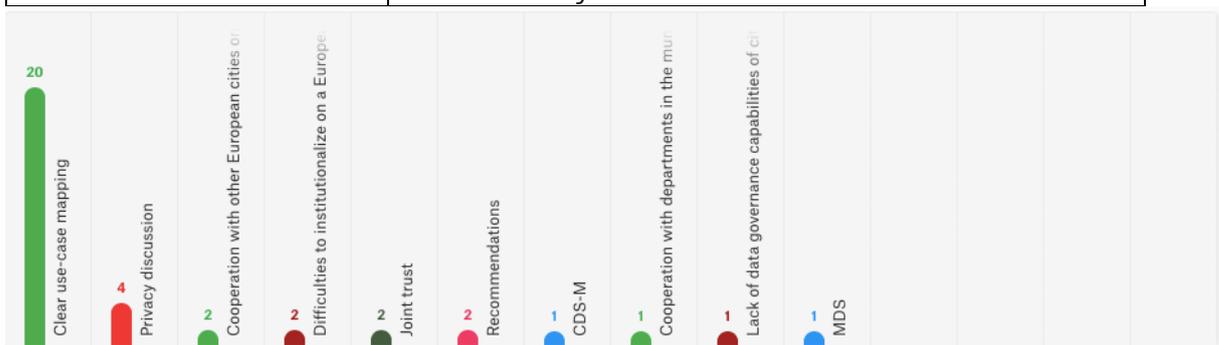
<p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>turned on. So MDS in and of itself, is not GDPR un-compliant, certain uses of MDs when you collect route data are GDPR non-compliant. I think it would be wrong to think that the current structure of MDS is itself is not compliant with GDPR and cannot be. I think it's all about the uses-cases.'</i></p>
<p>Target reasoning for clear vision</p> <p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'It could be parking policy, it could be policing, it could be ticketing, whatever. Philippe Crist: And then the specific action that's the specific data that's necessary for that method to be utilized, to carry out that objective. And in that case, you could see, for example, that maybe a city does need specific scooter location data, but only for, in the case of scooters that are parked where they shouldn't be, only in those cases where there's a high certainty, that that specific vehicle is non-conforming, it doesn't need all the secure location data. It needs that location data. And then there has to be a protocol to deal with that so that data is segregated. It is sent to the appropriate stream of work that carries out the enforcement action, or that allows humans to carry out that enforcement action. And then there is a set of rules on how long that data is kept, et cetera, and when it's destroyed.'</i></p>
<p>Target reasoning for clear vision</p> <p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'And actually, that's where we see the opportunity for CDS-M is to really think about the purpose of these things. And as I say, we recognize that from a regulatory point of view, the agency data that you get from MDS does provide that opportunity to get the regulatory side of things. There's a bike in a particular location. But actually, your point about the discussion of how long is that data usable for? Is it ever stored? Is it just analyzed and then just thrown away? At the moment I don't see that being built into MDS currently. And I think that if you're going to be providing data, there has to be some bigger thinking like you say about how the data is actually being communicated.'</i></p>
<p>Target reasoning for clear vision</p> <p>Processing grounds GDPR</p>	<p><i>'Yeah, so what we're doing right now is we are looking at a number of use cases. So, starting with overall policy objectives that public authorities are responsible for in urban areas, okay, we're not looking elsewhere, in urban areas, and they would be safety, security, environmental quality, traffic flow, parking, you can run down the list. For each of those, there are specific tools that they deploy today to ensure, enforce and carry out, achieve those objectives. And the final bit that we're looking at is what type of data, what is the minimum amount of data that they would need to be able to ingest in those functions to carry out those objectives? And that would relate to data latency, aggregation, spatial and</i></p>

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<p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>chronological, identity, treatment protocols for collecting aggregation, at what point when it's collected, ex-post, during the processing, onsite, how long it's kept for, when it's destroyed in audit functions, what is the ability to audit? For example, are there any kinds of data that is going to be used in an enforcement actions, should be audit after some time. Philippe Crist: Now, maybe you don't need the raw data, you just need the metadata that's been extracted from that, but there has to be a clear legal audit chain that can be used in those instances that people trust.'</i></p>
<p>Target reasoning for clear vision</p> <p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'I think that was a wise thing in the architecture of GDPR. So that's why even though, purely from my own selfish perspective, I think it would be great to have a data lake and then just say, okay, let's go swimming and let's see what we can get out of here, what fish we can catch, I think that that's great for Google. It's not necessarily great for Google, but I can see how a private company could do that. I would be a little more hesitant about the government doing that, which is why I think it is important to have that sort of mapping done.'</i></p>
<p>Target reasoning for clear vision</p> <p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'The mapping can always change. You can say, it would seem that if we had this kind of data, then we could carry out this function better or do something that we can't even do now, but then that has to be tested before you start collecting the data, and you have to be able to provide some certainty that, okay, yes, then if we collect this kind of data, then we can act in this way, maybe that we haven't been able to do before, to carry out our overall policy objective on equity and transport, for example. So, we do need to know where immigrants from Somalia are using shared bicycles for the first time, because we want to integrate that community into the cycling culture in the Netherlands. Philippe Crist: Okay, but that's a lot of specific data that you're asking for, and maybe there are other ways of making sure that you can ensure that that community is integrated without asking for specific data that reveals their identity. So, I think I've actually shifted my position on that and moved away from wanting to be the fishermen in the data lake, to the one that wants to build the data ponds, each with a specific fish inside of it.'</i></p>
<p>Target reasoning for clear vision</p> <p>Transcript Interview Sami Sahala – Helsinki, Finland</p>	<p><i>'So, it's not again, not just the data itself, it's about the justification for the data needs to come from the you need to create in a way, create the need and thus you have to make sure that the city planners understand that they need that data.'</i></p>

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Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	Elnert, refers to a tool of the New Urban Mobility Alliance, in which he sees a solution for the fear of distortion of competition. The tool in question can be used to determine which data is relevant to the policy goal.
Target reasoning for clear vision	<i>'So, everyone can speak on that and try to, to question that, to comment, doubts, to pull requests, to make it better and to become a collaborative work. And showing that it can simply be installed in the solution that's each one of the cities have. It doesn't make sense for me to spend public money, trying to develop similar things throughout Europe, at least all the world and I would like to start these movements of collaborative work between cities, in small steps, but frequent steps. It doesn't need to be major, doesn't need to be a leap of faith. It needs to be some extra use cases, some extra metrics, some extra KPIs on a bi-monthly basis. So, we know that things are growing steadily affirming, but steady, and we can adopt and benchmark things and copy the best practices amongst the cities. That would be a little bit of the goal here.'</i>
Transcript Interview Vasco Mora – Lisbon, Portugal	
Target reasoning for clear vision	<i>'I'll give you a little bit of data and you give me some data back, but according to the metrics and to the use cases that we are focused on, because if Google gave me everything they have, I do not know where to start with. So, the thing again, no, this is, this is true. It's like, even if I had MDS all together, which is quite small standard out, I would probably spend six months just organizing the data to make sense of that. So, I think that what we should look at is use case driven solutions and API driven frameworks.'</i>
Transcript Interview Vasco Mora – Lisbon, Portugal	



Profile of quotes labeled as 'Clear use case mapping'.

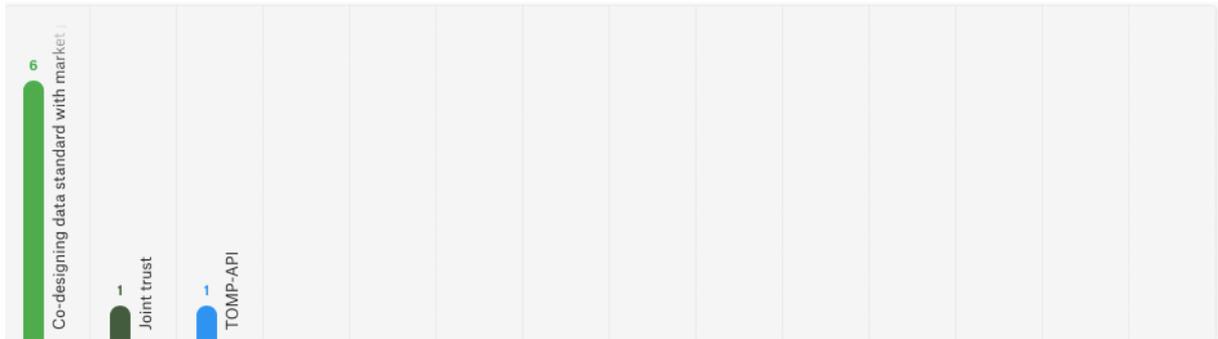
1.2.2

Source	Opportunity in design: Co-designing data standard with market parties
	Ross explains that the Amsterdam way of reaching an ecosystem is cooperating in the development of these standards.

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Summary Focus Group Amsterdam x NeTEX	He says that the data standards, such as the TOMP-API, have never been government owned, only government supported. According to him, this created room for government bodies and private parties to co-create the standard.
Summary Focus Group Open Mobility Foundation x Amsterdam	We want to make sure that a European standard is available and usable for everybody. There we plan to further design the CDS-M cooperatively with all parties involved.
Foster relationship cities and market parties Internal communications	Ross stresses that cooperation with market parties and stakeholders is essential for success and adoption. This cooperation should result from open weekly sessions, workgroups. It is important that people can drop in and out at all times. He emphasized that everyone should feel like they are a part of the project and have the objective to make the city a better place, to nurture the city. Ross tells that possibly a code of conduct could be created, which will enhance participation and furthermore, could enhance the adherence of the license requirements.
Foster relationship cities and market parties Qualitative design Summary Interview Mikael Ivari – Gothenborg, Sweden	He thinks that the private parties should certainly help to develop good mobility services. Although the government must draw up the rules, the private parties must be comfortable and willing and able to share the data.
Foster relationship cities and market parties Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	According to Thierry, the requirement of data sharing in the licence and other regulations will have to be done in cooperative way. Again, he refers to the logistics in the port of Rotterdam where this is already done on a large scale. According to him making it compulsory certainly helps.
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	In the port of Antwerp, a data standard was first drawn up by companies themselves, for a faster and more effective way of working. This only came into the hands of the public port authority after its development. However, in his opinion there should always be involvement of a public entity somewhere in the process.

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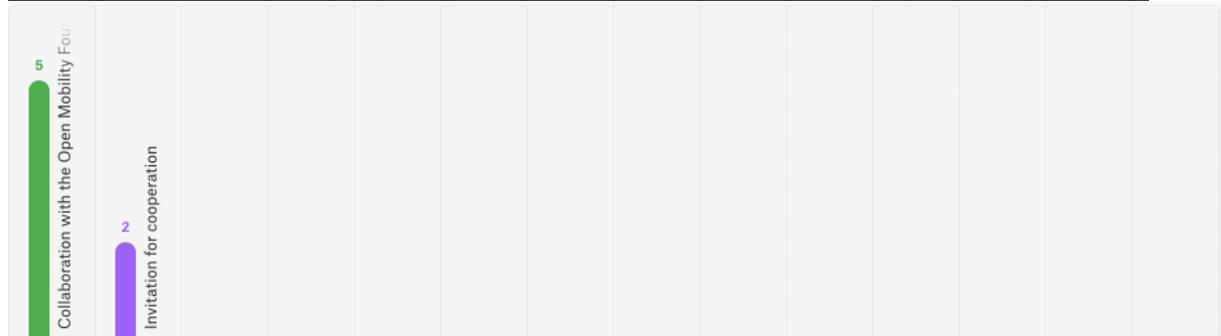
Profile of quotes labeled as 'Co-designing data standard with market parties'.

1.2.3

Source	Opportunity in design: Collaboration with the Open Mobility Foundation
Summary Focus Group Open Mobility Foundation x Amsterdam	Jascha sees strong similarities with the Metric API that OMF is now developing and thinks that the CDS-M can be implemented in it. Jascha invites the City of Amsterdam to collaborate on the design of the metrics API.
Summary Focus Group Open Mobility Foundation x Amsterdam	They do welcome market parties for cooperation.
Summary Focus Group Open Mobility Foundation x Amsterdam	We are really an open-source foundation. We do not want to have a monopoly on standards or MaaS systems. We believe that MDS could serve globally, therefore we want to bring together people all over the world and industries. Therefore, we would like to work together. We welcome you to be on the board and participate.
Summary Focus Group Open Mobility Foundation x Amsterdam	The board of OMF dictated by government agencies and cities. They do welcome market parties for cooperation. Jascha sees that MDS should be altered in a way to support the MaaS system and GDPR. Creating a flexible mechanism to exchange pre-aggregated data could be a solution. OMF would like to cooperate on this topic. A possibility is an EU-fork of MDS, that removes certain features of the MDS and adds the possibility for pre-aggregated data.
	<i>'Yes, I talked to him about Lisbon becoming a member, so I'm already collaborating with them. That's what I told him, but to be an official member, you need to go to the town hall and then to the municipal assembly. And that's bureaucracy over bureaucracy. That's the engineering thought that is talking. And we have a</i>

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Transcript Interview Vasco Mora – Lisbon, Portugal	<i>pipeline of things that we are preparing to join. And OMF is like the fifth. Okay? Because there was a lot of interesting project in Lisbon to participate in some other solutions and other partnerships.'</i>
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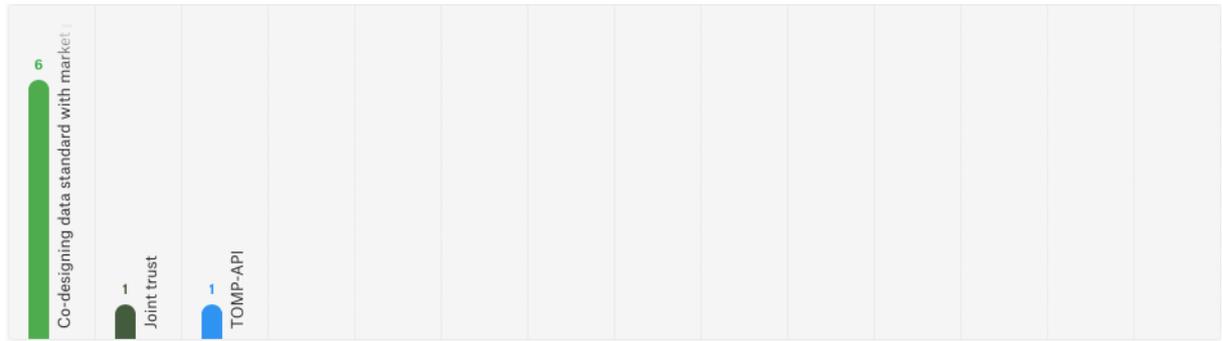


Profile quotes labeled as 'Collaboration with the Open Mobility Foundation'.

1.2.4

Source	Opportunity in design: Cooperation with departments in the municipality to map data needs and possibilities
Summary Focus Group Helsinki x Amsterdam	Helsinki emphasizes that the most important part is the participation of the operators, the involvement of the municipality as a whole, and the mapping of clear use cases.
Transcript Interview Philippe Crist, International Transport Forum	<i>'I totally agree with you because you also have to find the people within your municipality or government that are going to work with the data, because maybe you and I can think of all kinds of nice use cases, but we are not at the regulatory department, or we're not finding people that parked the car wrongly. So, you have to find those people that are demanding for those data to work with them, so the whole culture change to work much more digitized.'</i>
Transcript Sami Sahala – Helsinki, Finland	<i>'That's a good question, because we do not know yet if the city planners will use this data extensively. We still have to figure that out.'</i>
Transcript Sami Sahala – Helsinki, Finland	<i>'So, there's a lot of tradition that if you want to understand new data, you do one study that takes a kind of snapshot and say, hey, this is how it works right now. But to have a real constant real-time information being kind of accumulating, which again is for people who have been working with statistics all their life, that changes their work and I don't know how to help them, but that's something that we should be looking into much more.'</i>

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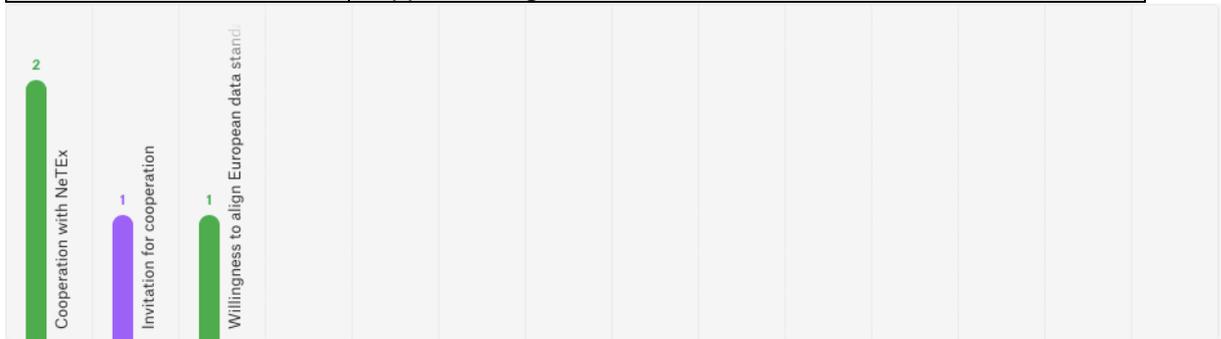


Profile quotes labeled as 'Cooperation with departments in the municipality to map data needs and possibilities'.

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1.2.5

Source	Opportunity in design: Cooperation with NeTEX
Summary Interview Amsterdam x NeTEX	Christophe asks whether NeTEX could be formally included in CDS-M. Ross answers that we should make that possible. 'We need to create an infrastructure in which these data standards can work together. Especially, for MaaS.'
Summary Interview Amsterdam x NeTEX	Christophe says that he thinks it would be great if Amsterdam would join the liaison, that it will enable the next step in aligning all standards. Moreover, he invites Ross to join the working group of 4PT, this working group is designed to support data governance of cities.



Profile of quotes labeled as 'Cooperation with NeTEX'.

1.2.6

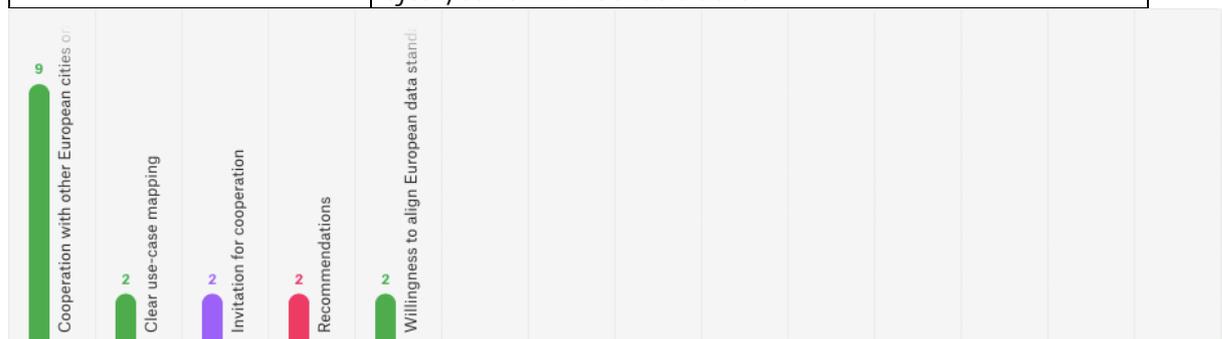
Source	Opportunity in design: Cooperation with other European cities on design and use case development
Summary Interview Augustin Helmut – Vienna, Austria	However, he does mention that he would like to be kept informed about the CDS-M, he thinks it is a good discussion starter, especially in the field of use case development.
Accelerating the digitization process of cities Transcript Interview Benjamin Rabenstein and Frederik Mehler – Berlin, Germany	<i>'Well, to be very honest I think for Berlin as a city, I think that's still a pretty long way to go actually. It's going to take some time to be developed, but sure, it's the way to go. In the long run, we're not going to get around any of these issues. And I think also with other cities it would be best if we could all share our experiences between Amsterdam, Berlin, Vienna, and whoever else is going to be involved because it's just going to be after a while of introduction the same questions and problems which are going to keep arising for everybody I guess.'</i>
Accelerating the digitization process of cities	He indicates that cities have an important role to play in creating this urgency, because if it takes too long the market

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<p>Summary Interview Geert Pater and Peter Jager – RDW, Dutch Vehicle Authority</p>	<p>players take over this role, and cities are dependent on data brokers and Shared Mobility Operators. Geert gives the tip to promote urgency and persuasion by setting up focus groups with other European cities.</p>
<p>Increase of adoption by market parties throughout Europe Accelerating the digitization process of cities Summary Interview Geert Pater and Peter Jager – RDW, Dutch Vehicle Authority</p>	<p>Peter Jager also advises to work with other European cities in the design process, because he agrees with Geert that this increases adoption, urgency and provides better target reasoning.</p>
<p>Increase of adoption by market parties throughout Europe Summary Interview Sarah Eskens, UvA</p>	<p>She agrees that European cooperation may be able to secure a negotiating position with major market players. She thinks this is very important, because she sees the market monopoly of data giants growing more and more.</p>
<p>Accelerating the digitization process of cities Transcript Interview Vasco Mora – Lisbon, Portugal</p>	<p><i>'So, I am keen to exchange with you, all the things we are doing and the use cases and what we are looking for the near future and share that with you and learn from you, what you can also share with us. And just one very enthusiastic note, tomorrow I'll be appointed a vice of EURO CITIES of their working group that works on data specifications. And one of the things we have been discussing is exactly trying to promote a better knowledge and about collective collaborative work amongst cities to look at the subjects. And so, we can try to build different modules together, but that they are all used for the same purpose and in the same way.'</i></p>
<p>Accelerating the digitization process of cities</p>	<p><i>'So, everyone can speak on that and try to, to question that, to comment, doubts, to pull requests, to make it better and to become a collaborative work. And showing that it can simply be installed in the solution that's each one of the cities have. It doesn't make sense for me to spend public money, trying to develop similar things throughout Europe, at least all the world and I would like to start these movements of collaborative work between cities, in small steps, but frequent steps. It doesn't need to be major, doesn't need to be a leap of faith. It needs to be some extra use cases, some extra metrics, some extra KPIs on a bi-monthly basis. So, we know that things are growing steadily affirming, but steady, and we can adopt and</i></p>

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Transcript Interview Vasco Mora – Lisbon, Portugal	<i>benchmark things and copy the best practices amongst the cities. That would be a little bit of the goal here.'</i>
Transcript Interview Vasco Mora – Lisbon, Portugal	<p><i>Gemma Schepers: 'Yeah. I think it's really good that we make the comparison between the different cities and start collecting all those different technical standards and align them. We want to try to get to one uniform standard. What we want to do is to start up discussions, beginning new year, I guess, with a few European cities around the [inaudible 00:06:03] also to discuss together what are the steps of the plans for 2021 and how we can bring this further. So, we want to take the initiative to get the first launch of the meeting together. Is that for you also an option? Are you saying I'm busy with something else?'</i></p> <p><i>Vasco Mora: 'No, no, no, it's, I think it's fantastic that we align exactly the effort towards the same goal, because I think have a lot of similarities and commonalities that we don't explore often, so I think we should do it.'</i></p>



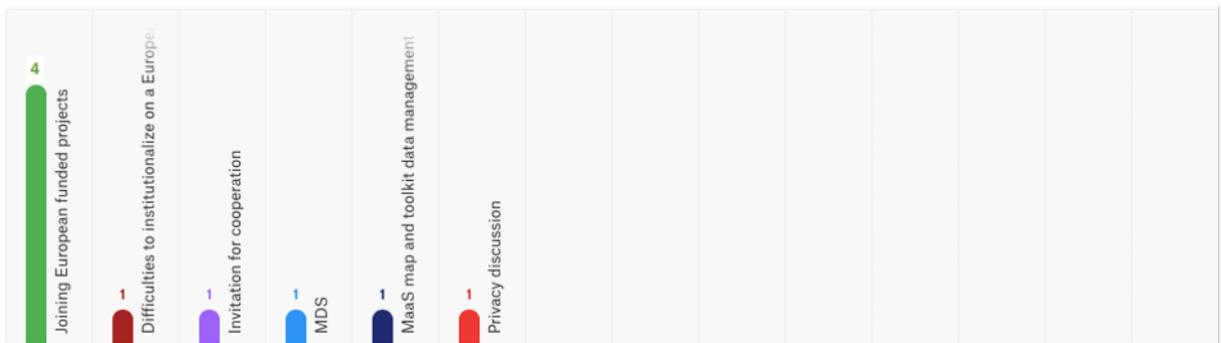
Profile of quotes labeled as 'Cooperation with other European cities on design and use case development'.

1.2.7

Source	Opportunity in design: Joining European funded projects
CEN standard Summary Focus Group Amsterdam x NeTEX	Ross asks if there is a possibility to join the development of these standards. Fabrizio explains that, because they are CEN standards, every country in Europe can be included. The national standardization body can do so. 'Stefan de Koninck is active now', says Christophe. Besides that, parties can join the liaison of NeTEX 5, MDS, GBFS, DATEX 2 and many more are member now. The goal of the liaison is to keep the standards consistent and compatible. Christophe invites Ross to join the liaison.
Subsidized European projects Summary Interview Geert Pater and Peter Jager –	The European Commission subsidizes Smart Mobility projects, but in order for an initiative to be included in

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RDW, Dutch Vehicle Authority	European legislation, the standard must first be adopted in the European Area.
Subsidized European projects Transcript Interview Martin le Francq – Bruxelles region, Belgium	<i>'Well, it's funded by the DG Reform at the European commission level, but it's a project specifically for the Brussels capital region.'</i>
Subsidized European projects Transcript Interview Philippe Crist, International Transport Forum	<i>'And so, we're just trying to carry out, what then are those principles that should be the basic architecture for any data syntax that is developed, in this case, in urban areas? And it's not exhaustive. It's a way of starting to think about, okay, these are the major characteristics of what I should be looking at. Am I doing that? Are there things that our membership, or national governments, are there things at the national level that have to occur for this to happen, are there other levels of government where these decisions can be made? But it's to be a piece on principles to guide data governance around this question of data syntaxes. We're struggling for that. I'm leading work within the ITF on mobility as a service, data governance, and some of the more strategic areas around that. We also are, through a project that is funded through the EU, helping Brussels reevaluate an adaptive regulatory framework for mobilities as a service in the Brussels capital region. Overall perspective, the strategic perspective, and then the implementation perspective we're working on this.'</i>



Profile of quotes labeled as 'Joining European funded projects'.

1.2.8

Source	Opportunity in design: Willingness to align European data standards
Summary Focus Group Amsterdam x NeTeX	Another aspiration is to align CDS-M with standards that are already out there, such as the NeTeX standard.

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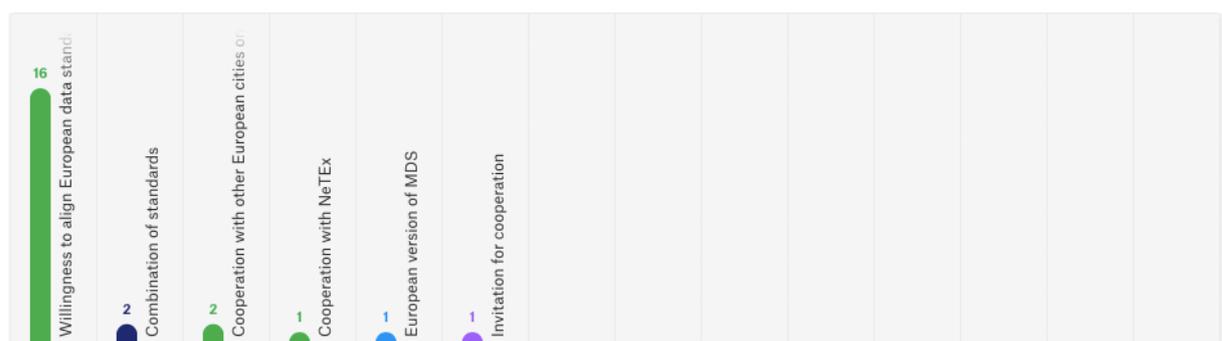
Summary Focus Group Amsterdam x NeTEX	Christophe mentions that it is the most important that these standards such as SIRI, NeTEX and CDS-M use the same definitions, in such there is interoperability. He explains that the same definitions are used in SIRI, NeTEX and Opra. From his point of view, we can have multiple standards for different uses if we make sure that they communicate in the same way.
Summary Focus Group Amsterdam x NeTEX	Christophe says that they have been developing a translation method, a conversion tool, that translates GBFS and MDS in NeTEX. This is especially relevant for the 5th NeTEX version on new modes that they are now developing.
Summary Focus Group Amsterdam x NeTEX	Christophe asks whether NeTEX could be formally included in CDS-M. Ross answers that we should make that possible. 'We need to create an infrastructure in which these data standards can work together. Especially, for MaaS.
Summary Focus Group Amsterdam x NeTEX	Christophe explains that the European Commission has the same goal, to enable a MaaS ecosystem, with all standards needed. They are working on a directive to harmonize these transmission formats.
Summary Focus Group Amsterdam x NeTEX	Ross stresses that aligning standards all comes down to communication. He indicates that all parties have the same goal, ending with one uniform standard. Ross, substantiates that this is the only goals, not profit whatsoever. Christophe and Farbrizio accept Ross' offer and are going to join the CDS-M meetings.
Summary Focus Group Open Mobility Foundation x Amsterdam	Ross asked whether MDS is going to be in line with European standard such as NeTEX and Jascha mentioned that he is in close contact with DG-MOVE and he will attend the NeTEX workgroups as well, to make sure that the standards align. Jascha also mentioned that the OMF has a monthly call with GBFS to aligned data structures and avoid complexity and implementation difficulties.
Transcript Interview Jorge G. Coelho – Faro, Portugal	<i>'Well, I think it is a lot of effort to set up a new standard, but the biggest effort isn't actually to set it up, but to keep it going. And so, in that understanding, I guess for the long run, if there would be a way to align, alter and adopt these wider European standards and have a European understanding that would be a great solution.'</i>
	<i>'And coming back to our present discussion, from our perspective, it's not necessarily a bad thing to have multiple</i>

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<p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>specifications and data syntaxes. What would be bad is if all of these develop without that kind of more fundamental rethink of why share data, for what purposes and what forms and have that have certain clarity. The other thing that it would be, maybe, difficult to deal with in the longer run, if, say, these were structured in completely different ways. Philippe Crist: So, I think it would be helpful to have some basic functionalities that are common across all specifications and how those are carried out within each classification? Well, that might be context specific. It may be relating to the kind of activity that's being considered, but the functionality should be there. And that should be like the major bins that you could recognize. If MDS, you can see, okay, here is a functionality for a location. Here's of location of vehicles. Here's the functionality, highly restrictive functionality for gathering information on routes, on actual carried out routes. Here's the functionality for ID management, identity management, and have those bins identified that way. It makes the mapping between those much easier.'</i></p>
<p>Transcript Interview Sergio Férrnandez Balaguer – Madrid, Spain</p>	<p><i>'But what we are doing is working on how any shared mobility operator can integrate within a Public Transport Authority or public transport operator. So, in this regard, we have like three different missions with three different levels of integration. And that's been done by APIs. So, if you just want to get availability, location, or maybe battery level of these electric mobility vehicles, shared vehicles, let's say you use one API.'</i></p>
<p>Transcript Interview Sergio Férrnandez Balaguer – Madrid, Spain</p>	<p><i>'We are aware that in this working group with the Spanish ministry, the city council as such, municipality, has not been participating. But both the PTA, the Public Transport Authority of Madrid and us as a PTO, we are aware also about some initiatives of the Polytechnic University of Madrid to create interoperability standards, but annotated ones, so semantic ones. And for instance, as we started a long, long time ago initially with our open data policy in 2006, at the moment for instance we are just providing the information of our buses by using GTFS and also by using an API with our own format, but only for the bus.'</i></p>
<p>Transcript Interview Vasco Mora – Lisbon, Portugal</p>	<p><i>'And that's why I think we need to get into... Also, this discussion is that today we have three different opportunities if we collect all these values in Amsterdam and I think we try, we should try to combine them into a single feed or a single way to collect data and to use data.'</i></p>

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<p>Transcript Interview Vasco Mora – Lisbon, Portugal</p>	<p><i>'So, I am keen to exchange with you, all the things we are doing and the use cases and what we are looking for the near future and share that with you and learn from you, what you can also share with us. And just one very enthusiastic note, tomorrow I'll be appointed a vice of EUROCITIES of their working group that works on data specifications. And one of the things we have been discussing is exactly trying to promote a better knowledge and about collective collaborative work amongst cities to look at the subjects. And so, we can try to build different modules together, but that they are all used for the same purpose and in the same way.'</i></p>
<p>Transcript Interview Vasco Mora – Lisbon, Portugal Gemma Schepers, Amsterdam</p>	<p><i>'Gemma Schepers: Yeah. I think it's really good that we make the comparison between the different cities and start collecting all those different technical standards and align them. We want to try to get to one uniform standard. What we want to do is to start up discussions, beginning new year, I guess, with a few European cities around the [inaudible 00:06:03] also to discuss together what are the steps of the plans for 2021 and how we can bring this further. So, we want to take the initiative to get the first launch of the meeting together. Is that for you also an option? Are you saying I'm busy with something else?'</i></p>
<p>Transcript Interview Vasco Mora – Lisbon, Portugal</p>	<p><i>'This data standard has to be in the same language as MDS and GBFS, otherwise, no one understands each other.'</i></p>
<p>Transcript Interview Vasco Mora – Lisbon, Portugal</p>	<p><i>'And right now, we are looking at exactly the opposite. I'm trying to foster that we can expand the SIVU with some in the MDS aspects, and map SIVU in the MDS language. So, we can just merge it as you have forks, you have mergers and we can roll back to using the standard solutions instead of popping up new ones. Because I think that's, that's troublesome. That's a problem for everyone. Now, then we don't know where to pick the vendors and we don't have similar metrics to compare cities. I think that's more difficult.'</i></p>



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Profile of quotes labeled as 'Willingness to align European data standards'.

1.3 Bottlenecks in design

  Discussion on detailedness and purpose of data standard	FREQUENCY IN PROJECT 15
  Flexibility data standard	FREQUENCY IN PROJECT 10
  Lack of mapping needs and use-cases	FREQUENCY IN PROJECT 4
  Privacy discussion	FREQUENCY IN PROJECT 39
  Too broad data standard that is difficult to use for cities	FREQUENCY IN PROJECT 5

Sub-concepts of the concept 'Bottlenecks in design'.

1.3.1

Source	Bottleneck in design: Discussion on detailedness and purpose of data standard
Aggregated trip data for urban planning Summary Interview Augustin Helmut - Vienna, Austria	In his opinion trip data is important to reach this goal, for example to align the infrastructure with shared mobility
Aggregated trip data for urban planning Transcript Interview Benjamin Rabenstein and Frederik Mehler - Berlin, Germany	<i>'And I think the main point is there, can you clarify the questions you want to answer with this data before so that you only get these answers, or do you need to data to answer more questions or something like this? This is a point. So yeah, I think we need not all the data and not in deep detail for manage these services. Therefore, we don't need the exact locations and all these points, the GPS data which is really problematic from personal data. And then, at least we don't need for the monitoring I think in real-time. But a little aggregated, but not on the level of a single trip, I think we should get the data for the planning purposes.'</i>
Aggregated trip data for urban planning	Besides, that DATEX 2 cover roadworks, accidents and traffic management. So, the traffic management is covered, and the regulatory aspect is covered by enforcers on the ground, so in rosses'

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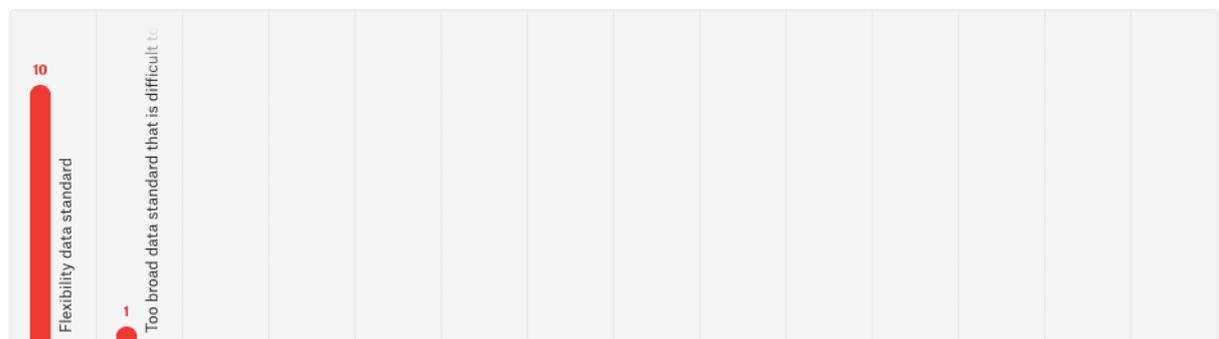
Summary Focus group Amsterdam x NeTEx	opinion a standard for shared mobility only has to be useful for urban planners.
Detailed trip data for regulating Detailed availability data for regulating Summary Focus group Open Mobility Foundation x Amsterdam	Jascha says that aggregated data is not an effective strategy for effective regulation. Because, then it wouldn't be visible which scooter is responsible for the infringement. Moreover, the shared mobility companies could even delete those from the records while aggregating data, to preserve their status.
Aggregated trip data for urban planning Summary Focus group Open Mobility Foundation x Amsterdam	Ross and Tijs have the opinion that the CDS-M should not function as a regulatory tool either.
Detailed raw data offers flexibility Internal communications	Moreover, Ruud states that there is a great advantage in receiving raw data in comparison to pre-aggregated data. He explains that raw data offer flexibility, because it can then be aggregated and stored differently for distinct purposes with the same standard, for both regulatory and urban planning purposes for example
Detailed trip data for regulating Detailed availability data for regulating Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'So basically, what we've got from the previous operators that have been in the city is aggregated data. So, it's not really where we want to be. But with this platform, we will be having the information more detailed.'</i>
Aggregated trip data for urban planning Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'And in terms of strategy and planning, I would guess aggregated street data would be helpful for building the adequate infrastructure in the future.'</i>
Aggregated trip data for urban planning Summary Interview Mikael Ivari - Gothenburg, Sweden	He sees no support for the use of dynamic data sharing in regulating. Because he thinks that new regulations, certainly for shared mobility, take time to implement and get used to.
Detailed trip data for urban planning Transcript Interview Mélanie Gidel - Paris, France	<i>'I think we would need more detailed data because as you mentioned, the question of creating mobility hubs with different modes of transport concentrated in the same area is also something that we want to develop. So, if we only have aggregated data of a neighborhood, it will not be enough for that kind of use. But that would be a good start.'</i>

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<p>Detailed trip data for urban planning Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'I think maybe we will in steps, but something that we would really like to have is a more precise trip data, do we can decide where to create more bike lanes, for instance. So, you really need to know which roads are used the most, for example. And also thinks like, if they contribute to traffic jams, that kind of issues.'</i></p>
<p>Detailed trip data for urban planning Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'OK, yeah, I understand your point, actually, it's something that we've discussed before, and that's also one reason why we have not gone further with MDS, besides lack of technical expertise and resources. As far as we know it has been an issue, the privacy. It's quite sensitive. And we do not want to take any risk with that topic. So, I'm interested in the fact that you want to anticipate and take that issue to account from the very beginning, although it would be a bit of a disappointment in a way, if we cannot access the detailed data that we would, that could be useful also for us. So, it's difficult to find a good balance.'</i></p>
<p>Transcript Interview Sami Sahala - Helsinki, Finland</p>	<p><i>'Do we want to follow the American way where cities are demand this data? That's how it works in the US. This is the information you need to comply. You need to send all this data, basically all of your data to us. And otherwise, you can't have a license to operate in the city. Yeah, and that's just us. That's a bit too much. We don't want, we want more cooperation. In the sense that that we help you guys make business in our city and in return, you help us understand our traffic system.'</i></p>
<p>Aggregated trip data for urban planning Transcript Interview Sergio Fernández Balaguer - Madrid, Spain</p>	<p><i>'So, we commit ourselves that the data they provide will be used only on an aggregated basis to avoid let's say competitive issues among them and privacy issues.'</i></p>
<p>Detailed trip data for urban planning Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'Um, we worked closely with Lolita Reynolds from LADOT Los Angeles Department of Traffic. And we even met her in a commotion event. And what we found is that we would stop looking at the most problematic area in the city of policemen that was curb parking and curb management. So, we dropped a little bit to at the time, the intention of developing the trips now that we have firmly development on the parking, we are looking at involving and that analysis to also make sense of all the investments that we have been doing recently in cycle lanes. And we'd like to have a little bit more the grasp, the feeling of how many people is it throughout the day in the weeks.'</i></p>

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	that if you want to work towards a European data standard, that fosters innovation and collaboration, then the standard must be flexible. The only way to reach that flexibility is if you work with raw data.
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'I really believe that the city level is different, and the city environment is different in each city. So, you do have to consider some kind of local circumstances. And I think the services should adapt also, at some scale, to the city level.'</i>
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'Yes. I think, indeed, I don't think it's possible to standardize a whole system at the European level. I don't think it's going to work, but that's my perspective now.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Well, it is maybe hard to maybe come up with a one size fits all kind of model. The CDS-M is not really flexible now with the aggregated data. For example, big cities are different than, say, less dense, even rural areas. Actually, we want to have a system that works good for everyone and in the end, so we will probably end up with a flexible compromise. And also, here in Helsinki, the standard has to be flexible, because we need to alter it to the demand of the operators, because we do not have the legislative framework to force them to use the standard.'</i>
Summary Interview Yuki - Ethics CDS-M	In addition, Yuki doubts the applicability of a European data standard in all the different areas of Europe. Would a standard that works in Amsterdam also work in a small town in Friesland? Then the standard would have to be very flexible and easy to use.



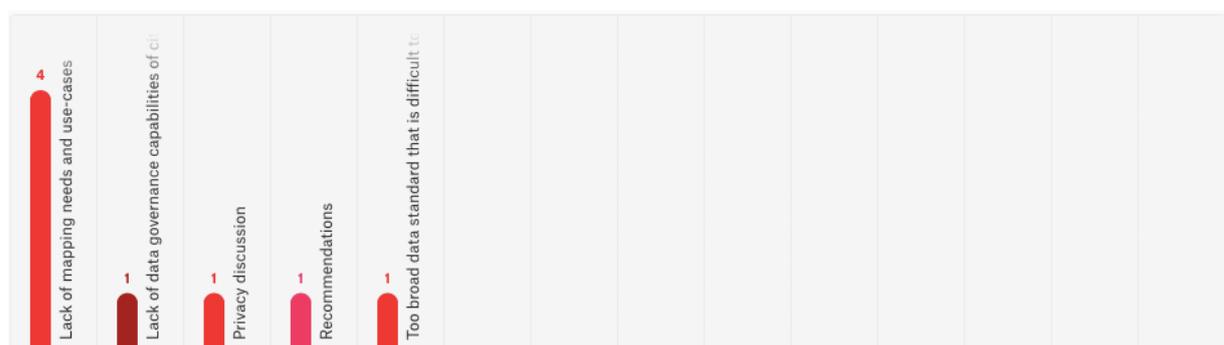
Profile of quotes labeled as 'Flexibility data standard'.

1.3.3

Source	Bottleneck in design: Lack of mapping needs and use cases
Summary Interview Karen van Cluysen, Polis	Philippe Crist of the International Transport Forum is knowledgeable in

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	the technical aspect of data standards and the policy side. He works closely with Polis. In a seminar last week, he indicated that we are still at a too early stage with data-driven policy and the formation of use cases and regulatory frameworks Only when both have been properly worked out, a decision can be made regarding which data standard fits best.
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'I recognize also within the traffic department they still have an old school thinking and about how to manage your operations. You manage your traffic and mobility and safety. And we are also still, I think, still in the infancy phase for developing our strategy in that respect.'</i>
Transcript Interview Philippe Crist, International Transport Forum	<i>'And I think that one of the things we've seen in this whole arena is that the data sharing question is too broad, rarely focused, and there's no clear mapping between a policy objective, the method that a government has to carry out that.'</i>
Transcript Interview Philippe Crist, International Transport Forum	<i>'So I think we're still in the early stages, but my feeling is we don't have this kind of overarching mapping that we need to have between, what are the objectives, what are the actions that allow us to carry out those objectives, and then what is the data that we need to carry out each of those actions in support of that objective and what are the handling rules, et cetera, that must be in place to ensure that if, for example, that data is highly desegregated and possibly commercially sensitive or privacy sensitive that the rules relating to GDPR are fully built into the protocols for handling that data.'</i>



Profile of quotes labeled as 'Lack of mapping needs and use cases'.

1.3.4

Sources	Bottleneck in design: Privacy discussion
MDS is GDPR compliant if clear target reasoning is executed and the	Beryl indicates that you can request raw mobility data for a public purpose, such as urban planning. She does, however, indicate that after retrieval, the principles mentioned in the GDPR: purpose limitation,

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<p>principles of GDPR are adhered to Not much difference legally in using a third party in terms of privacy</p> <p>Internal communications</p>	<p>data minimization, storage limitation, integrity and confidentiality must be met. In other words, purpose reasoning must be very specific and clear, so there must be a clear use case. If the data standard is used for many different use cases, the minimum storage time and the minimum aggregation level for achieving the particular purpose must also be redefined for each use case. These decisions must be laid down in a DPIA. Beryl indicates that she has no concerns regarding the design of MDS as long as the requested data is managed properly. Moreover, Beryl tells us that there is not much difference legally, in terms of guaranteeing privacy, whether we outsource the data processing to a third party or ourselves.</p>
<p>GDPR is an open standards framework</p> <p>Internal communications</p>	<p>She says that the GDPR is an open standards framework, which means that there is a lot of room for interpretation, for example, one thinks the minimum storage period is two days and the other perhaps as much as a week. She therefore indicates that it is important to choose a position in the grey area of the GDPR.</p>
<p>Subjective interpretation of the 'reasonable means criterium' Not enough expertise in municipalities to properly manage open data policies</p> <p>Internal communications</p>	<p>She indicates that privacy is assessed on the basis of technology and other data sources that are in close proximity, the 'reasonable means criterium'. According to her, the Smart Mobility department does not have enough resources to identify someone, because there are bulkheads between the departments. Therefore, the Smart Mobility team cannot access external databases that could cause re-identification. She calls this principle internal responsibility. Personal data is corporate responsibility of the entire B&W. If other departments wish to use the data, it must be aggregated and anonymized.</p> <p>For the extraction of personal data, a processing ground must be used such as a public task. Other foundations that can add strength are the goal of academic research and technological innovation and legal foundations, such as the Road Traffic Act which deals with road safety, traffic flow, accessibility of public functions and informing the road user.</p> <p>The criteria of necessity and proportionality must be met at all times. She emphasizes that retrieving the data is not the problem, after that it must be properly aggregated and stored as open data, that is where the difficulty lies. There is not enough knowledge and capacity in house right now to constantly check whether the open data can still be made anonymous, for example, by new data sources and technology. So, the request of data is not the problem, rather the maintenance of the stored data.</p>

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<p>Using a Trusted Third Party enhances GDPR compliance</p> <p>Summary Focus Group Helsinki x Amsterdam</p>	<p>The city sees itself as 'not responsible' for storing the data, because they do not have access to the detailed data. The usage of such a trusted third part in combination with the aggregation and anonymisation techniques causes that they have the conviction that they comply with the requirements set by the GDPR.</p>
<p>Using a Trusted Third Party enhances GDPR compliance</p> <p>Summary Focus Group Helsinki x Amsterdam</p>	<p>It is emphasized that having an intermediary, in this case Vianova, and the fact that the government receives only aggregated summary data makes citizens less likely to feel like a government that has too much influence ('Big Brother').</p>
<p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>They recognize the GDPR issues, the privacy regulation is still the same in the UK. Their opinion is that there is more work to do around privacy, especially when combining data platforms.</p>
<p>Subjective interpretation of the 'reasonable means criterium'</p> <p>Summary Interview Augustin Helmut - Vienna, Austria</p>	<p>They are not worrying about the threat of combining trip and parking data, because another department of the Municipality is responsible for the parking data.</p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant</p> <p>Summary Interview Augustin Helmut - Vienna, Austria</p>	<p>Augustin believes that by using obfuscation, aggregation and proper archiving, privacy of users of shared mobility can be guaranteed.</p>
<p>Concerns about whether MDS is GDPR compliant</p> <p>Summary Interview Karen van Cluysen, Polis</p>	<p>However, she mentions that there are concerns about MDS in combination with the GDPR, even though the data brokers say that this privacy problem can easily be solved by adding safeguards and disabling certain functions of MDS.</p>
<p>Target reasoning is needed for GDPR compliance</p> <p>Summary Interview Karen van Cluysen, Polis</p>	<p>Karen says that the use case way of thinking is again very important here, because target reasoning is needed to comply with the GDPR. She states that therefore it is important that cities start reasoning from policy goals to demand data. 'What data is needed for monitoring or mapping mobility flows, or for enforcing permit requirements, for example?'</p>
<p>Ethics of privacy</p>	<p>Mikael confirms that in Gothenburg there are also problems with</p>

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<p>Summary Interview Mikael Ivari - Gothenburg, Sweden</p>	<p>receiving data, even from their own sources, they sometimes have problems complying with the GDPR. Mikael wonders how ethics will develop at the local level. 'Should we really want to know everything about our citizens? How much information should we request and what are we going to do with it?</p> <p>Is it worth offering a very good mobility service if nobody can really have private data anymore?' This is a real bottleneck for Mikael in developing the use of data in the future.</p>
<p>MDS is GDPR compliant if clear target reasoning is executed and the principles of GDPR are adhered to</p> <p>Summary Interview Sarah Eskens, UvA</p>	<p>According to the GDPR, the raw real time data requested of MDS can be justified by adding 'safeguards' in the processing and storage of the data, if the raw data requested is 'strictly necessary' for achieving your goal. However, if it is proven that the same goal can be achieved just as well with less data retrieval, MDS will no longer meet the GDPR because the data standard will then no longer be proportional. And the principles in article 5 of the GDPR are no longer met: Purpose limitation, Data minimization, Storage limitation & Integrity and confidentiality.</p>
<p>MDS is GDPR compliant if clear target reasoning is executed and the principles of GDPR are adhered to</p> <p>Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp</p>	<p>Elnert sees the MDS as a good basis for shared mobility, by adapting it to the European view, he thinks it could comply with the GDPR.</p>
<p>Ethics of privacy</p> <p>Summary Interview Yuki - Ethics CDS-M</p>	<p>Yuki also says that the government has many public functions, including providing a pleasant public space and access to mobility for all. Because, residents of Amsterdam pay taxes to perform these tasks, it can be argued that the municipality of Amsterdam should implement its policy as efficiently as possible, in order to deal with tax money with integrity.</p>
<p>Ethics of privacy</p> <p>Summary Interview Yuki - Ethics CDS-M</p>	<p>So, according to Yuki, the questioning of data can be justified if it contributes to making the policy more efficient, even though there may already be another, not data-driven, solution to the policy issue.</p>
<p>Ethics of privacy GDPR is an open standards framework</p>	<p>Yuki recognizes the grey area in the GDPR and states that she considers it important to facilitate an open discussion on this subject, not only between companies and government, but also with citizens.</p>

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<p>Summary Interview Yuki - Ethics CDS-M</p>	<p>Raising questions and points for attention is more important than solving problems, according to Yuki.</p>
<p>Summary Presentation 'Data sharing in Smart Mobility- reflection and solutions of the legal expert', at the MRA-festival</p>	<p>The Working Party 29 states that anonymization is not always achieved and heavily depends on the context. The Working Party advises to take into account the 'reasonable means criterion' in determining whether anonymization is succeeded. The 'reasonable means criterion' maps the concrete means which are needed to re-identify an individual.</p> <p>These criteria are:</p> <ul style="list-style-type: none"> - Time and effort - Costs - Resources available - Publicly accessible data sets - Development of information and communication technologies <p>If the means are present and available to re-identify, then the anonymized is still considered as personal data. Trends that enable easier re-identification are the emerging techniques, open data policies of the government, availability of other government data sets and the storage of raw data by the service providers.</p>
<p>Anonymized datasets qualify as personal data if the raw data is not deleted Summary Presentation 'Data sharing in Smart Mobility- reflection and solutions of the legal expert', at the MRA-festival</p>	<p>In the presentation is concluded that anonymizing data from connected vehicles is problematic. Even anonymized data sets often qualify as personal data, even though people are often unaware of this.</p> <p>The government has the financial and technical capacity to re-identify the datasets. In addition, the government has many other datasets at its disposal with which the initial anonymized dataset can be combined for re-identification.</p>
<p>Anonymized datasets qualify as personal data if the raw data is not deleted Summary Presentation 'Data sharing in Smart</p>	<p>It is explained that data cannot be anonymous if the raw data has not been deleted by the service provider. Even if a dataset is provided to a third party without indicative data, but the main owner has not deleted the raw data. Does the dataset, received by the third party, still fall under personal data, this is stated in WP 29.</p> <p>Mobility providers are often unable to remove the raw data at the time</p>

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<p>Mobility- reflection and solutions of the legal expert', at the MRA-festival</p>	<p>they deliver data to the government. This data is still needed for their own services (personalized travel advice, invoices on use). In other words, even anonymized data requests (e.g., by the CDS-M) are still personal data, which makes the GDPR (and AVG) applicable.</p>
<p>Summary Presentation 'Data sharing in Smart Mobility- reflection and solutions of the legal expert', at the MRA-festival</p>	<p>The 'criterion of reasonable means' has been filled with the interpretation that the government is a large connected body that has access to all data of all the different departments and municipalities and provinces. However, the municipality can also ensure that not every department has access to every dataset (this is already the case). This can be done by means of internal technical and organizational measures through which datasets of different departments and projects can be demarcated. If only the resources of one department and its project (e.g., CDS-M) are included in the 'reasonable means criterion', then this is referred to as subjective interpretation of the 'reasonable means criterion'. If you look at it the subjective way, then the anonymized data can be perceived as non-personal data, because there are not enough means available for re-identification.</p>
<p>Objective interpretation of the 'reasonable means criterium' Summary Presentation 'Data sharing in Smart Mobility- reflection and solutions of the legal expert', at the MRA-festival</p>	<p>Through the use of these measures, the municipality advocates ensuring that anonymized data cannot be de-anonymized. De Roos Advocaten has difficulty with this statement. They argue that these measures do not entirely ensure that data remains anonymized, but only that it has been pseudonymized. Which means that the data does lead back one person, only the name, place of residence and other personal information is not clear, and that thus the GDPR has to be taken into account.</p> <p>Pseudofiction can be turned into re-identification if the measures are undermined by political or social motives, such as the corona crisis, crime or terrorism. When the chips are down, there are political or security reasons for privacy.</p>
<p>Objective interpretation of the 'reasonable means criterium' Summary Presentation 'Data sharing in Smart Mobility- reflection and solutions of the legal expert', at the MRA-festival</p>	<p>De Roos Advocaten conclude that the 'learning by doing' practice of the Ministry of I&W has resulted in a subjective interpretation of the 'reasonable means criterion'. This is unlawful, because according to De Roos Advocaten this this delimitation of data access can always be lifted by political interests. In this case, therefore, the data is not completely anonymous. Therefore, they argue that the GDPR has to be adhered to.</p>
<p>Target reasoning is needed for GDPR compliance</p>	<p>For all these ways, the reasoning remains the most important. For whom, what, and why is data requested? The reasoning must be</p>

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<p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>completely clear, for the design of the standard, so that it meets the needs and is therefore usable, but also to comply with the GDPR.</p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'And actually, in the beginning, we had some concerns in regard to GDPR and also the safe harbor and all those stuff regarding the data. But actually, they're also fully aware of that. And they are compliant. Because obviously they're in talks with us.'</i></p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'Even today, I'm not sure very sure which one was the main driving force. But truth is GDPR is very demanding. And I also understand that they are obviously like directly. You can't identify anyone, but indirectly it might be possible. And so, we asked Populus and Vianova some questions, and both of them are very aware of GDPR. And one common theme between both is that they've got the city divided basically over the territory, dividing the land. And so, what happens is like when you do your renewal analysis, more specific location data will appear if they've got three or more counts. Mhmhm. And so that's a way of working around it.'</i></p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'One of the things, indeed, the GDPR argument I think is very relevant. We need to pay close attention to what's going on from that perspective, but from what I've learned in the past few years... I'm doing this job for two years. Is that with these kinds of formats I think we have to pay close attention to GDPR, of course, but it's not a definite issue with regard with MDS, for example, because there's so many precautions that can be taken in the MDS format.'</i></p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'And maybe you can just uncheck a few boxes that are too sensitive for the operators. So, that's why I'm looking forward for the discussion that we're going to have with the shared mobility solution providers in the process of this ITF project to see what actually their perspective on that is.'</i></p>
<p>Target reasoning is needed for GDPR compliance</p>	<p><i>'Well, I think, and again, I'm connecting back to the ITF project and that presentation of Phillip Crist a while ago. Is that, it's not because some data exists that, as an authority, you had a right to take it back. But I think that the process in the approach is different. It's depending on what</i></p>

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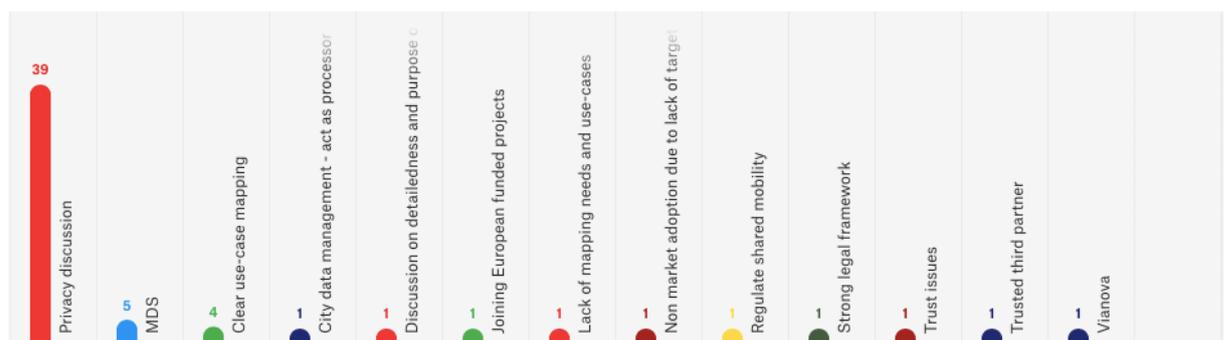
<p>Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>your goal in terms of policies is, then that defines the actual tool to make it work. And that tool defines the data that you need. We call this approach 'mapping'.</i> <i>And this approach I think, is super relevant and makes it GDPR proof. If you work like that, the way you actually use it, the way you store it and stuff like that becomes clear, and you should minimize that to your goal. So, you should have that approach and you share that approach with the providers, I think you can find some common ground and create some kind of a good momentum for data sharing.'</i></p>
<p>Concerns about whether full version of MDS is GDPR compliant</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'OK, yeah, I understand your point, actually, it's something that we've discussed before, and that's also one reason why we have not gone further with MDS, besides lack of technical expertise and resources. As far as we know it has been an issue, the privacy. It's quite sensitive. And we do not want to take any risk with that topic. So, I'm interested in the fact that you want to anticipate and take that issue to account from the very beginning, although it would be a bit of a disappointment in a way, if we cannot access the detailed data that we would, that could be useful also for us. So, it's difficult to find a good balance.'</i></p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant</p> <p>Transcript Interview Mélanie Gidel - Paris, France</p>	<p><i>'I'm not aware that the issues are as sensitive as this, I know we have discussed with some operators that if we start using MDS, we will have to sign an agreement that will precisely describe the uses and we will make sure that it will not be a risk for the privacy of their servers. But I don't think the question is that sensitive, is it?'</i></p>
<p>Target reasoning is needed for GDPR compliance</p> <p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'The emerging question, not just in Europe, but North America, it's gotten to the point of lawsuits, for example, in the case of Los Angeles, the question was, give me what you have and then I, the regulator, will see what's important and useful, and you get into that whole area of privacy overreach, commercial sensitivities, and the incompatibility of that approach to GDPR.'</i></p>
<p>Target reasoning is needed for GDPR compliance MDS is GDPR compliant if clear target reasoning is executed and the principles of GDPR are adhered to</p>	<p><i>'But the first thing is, to my understanding, I mean, and yes, we always do talk a lot about MDS, but MDS, it's syntax that was pushed out rapidly to deal with a specific problem. It had great ambition. I mean, the ambition was that it would be the language to end all languages, but then scooters appeared, and they had to act really fast.</i> <i>So, the structure of the specification right now is to get information from operators, particularly micro mobility operators. In the information that can be encoded within MDS is the route-based information, which is the</i></p>

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<p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>most difficult from a personal identifiable information perspective, but that never has to be turned on. So MDS in and of itself, is not GDPR un-compliant, certain uses of MDS when you collect route data are GDPR non-compliant. I think it would be wrong to think that the current structure of MDS is itself is not compliant with GDPR and cannot be. I think it's all about the uses-cases.'</i></p>
<p>Target reasoning is needed for GDPR compliance Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'So I think we're still in the early stages, but my feeling is we don't have this kind of overarching mapping that we need to have between, what are the objectives, what are the actions that allow us to carry out those objectives, and then what is the data that we need to carry out each of those actions in support of that objective and what are the handling rules, et cetera, that must be in place to ensure that if, for example, that data is highly desegregated and possibly commercially sensitive or privacy sensitive that the rules relating to GDPR are fully built into the protocols for handling that data.'</i></p>
<p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'They have to feel that they understand exactly what the data is going to be used for, and that's hard baked into GDPR in any case, because you have to say what the purpose is for this data collection.'</i></p>
<p>Of the conviction that data brokers working with MDS are GDPR compliant Using a Trusted Third Party enhances GDPR compliance Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'I think that the GDPR and privacy are very important. However, I think that the possibilities of the detailed data have a really large value. And therefore, it is maybe worth it to use third parties like Vianova and privacy preserving techniques. The data could really help, achieving sustainability goals and cleaning the city, if I can say so. But basically, I think the data is crucial in understanding whether micro mobility actually functions. Are citizens really using it, and is it the future of MaaS and the end of car-ownership? So maybe the average, aggregated, numbers are not enough. Especially for cities where there is more shared mobility, then you should be able to determine the maximum of vehicles and operators. As a municipality we should have tools to interfere with the operators, for if they are not having a high enough service level.'</i></p>
<p>Subjective interpretation of the 'reasonable means criterium' Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'And this data is processed with machine learning techniques or that difference. And I suppose that is the main issues related to the privacy. So, they do use separate systems to collect the GPS data and the demographic data. So, the social demographics of people cannot really match the GPS data and you cannot identify travelers.'</i></p>

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<p>Concerns about whether full version of MDS is GDPR compliant</p> <p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'But when we start looking at developing the trips and importing the trips into our system to analyze it, we mentioned that there are potential issues with data and privacy regarding the use of MDS.'</i></p>
<p>A cloud-based system is not necessary and therefore is privacy intrusive</p> <p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'With MiMoGG I can gather all the operators' data and present you solutions. What we believe is that these companies that came knocking on our door, they wanted more than just selling the solutions. They were willing to gather the information for themselves in a cloud-based system. And that is not necessary, to keep it in the cloud. We are transparent, so we developed something that we could use on our servers without sharing it with anyone, MiMoGG.'</i></p>
<p>Concerns about whether full version of MDS is GDPR compliant</p> <p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'But, but one of the things about the GPDR I think it's very simple. If we have a hard regulation in the city to say, this is the way you have to operate, and this is the better you have to share, it's very simple. Or they change the terms and conditions to say to their users that they are going to check with them. And as if they do not share data with the municipality, they cannot operate. The thing that we have in Lisbon is a little bit of a half measure. And because we have a memorandum of understanding and we said that we want MDS but not with a data broker. Some operators said that the trips part of MDS is going to be a little troublesome. So we are figuring that out now.'</i></p>



Profile of quotes labeled as 'Privacy discussion'.

1.3.5

<p>Source</p>	<p>Bottleneck for design: Too broad data standard that is difficult to use for cities</p>
<p>Summary Focus group Open Mobility Foundation x Amsterdam</p>	<p>Maybe a simple standard that delivers aggregated data is more convenient for smaller cities, because no technical data infrastructure is needed.</p>

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<p>Transcript Interview Philippe Crist, international Transport Forum</p>	<p><i>'And I think that one of the things we've seen in this whole arena is that the data sharing question is too broad, rarely focused, and there's no clear mapping between a policy objective, the method that a government has to carry out that.'</i></p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'API driven completely. I think that independently of the solutions that we have I think the most important part is the connectivity. For me it does not matter, Typhon or Java or whatever, what matters to me is the outcome, that it is manageable. That we can update and maintain it over time easily. We have had some vendor lock-ins for specific technologies or solutions. We really hate that, and we are trying to avoid that as much as possible, but this is an API driven approach. So, we develop the catalog, we'd like to broadcast the idea of the catalog with the others. So, they can adopt it. And this would be a new standard. And everything should be structured, in a way that if some aggregator comes into the city, a magical Gator, a Whim, whatever, we don't start the discussion all over again, we give them to them a catalog that has all the end points organized.'</i></p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'I think that the NeTEx is too complex for most cities to adopt easily. So, it's too fast, it's too complex. And we need simple things to start with that we can explain in a one page or not a one-liner, to let people agree on, we want to use this. And if you go to other almighty Datex 2 or almighty Netex, you need a whole meeting just to explain part of it and usually doesn't go well. Okay? So, I think that the smallest beautiful digs can take some place here and breaking things down into modules can be quite effective.'</i></p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'I would rather have a dive in MDS again, because it has evolved since my last deep dive into it. And for instance, if you look at the GBFS+ it also includes vehicle types. Then again, looking at the MDS on what they are doing and what has evolved is important to see, which modules can we pick and use in a simpler standard. To come to a solution that works every day without any hassle. That's what we want.'</i></p>



Municipality of Amsterdam
Smart Mobility Team

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Profile of quotes labeled as 'Too broad standard that is difficult to use'.

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1.4 Practical possibilities in design

  CDS-M	FREQUENCY IN PROJECT 10
  European version of MDS	FREQUENCY IN PROJECT 4
  GBFS	FREQUENCY IN PROJECT 8
  MDS	FREQUENCY IN PROJECT 28
  Metrics API	FREQUENCY IN PROJECT 1
  NeTEx	FREQUENCY IN PROJECT 8
  Olso standard	FREQUENCY IN PROJECT 2
  Opra	FREQUENCY IN PROJECT 2
  Shared streets MDS	FREQUENCY IN PROJECT 1
  SIRI	FREQUENCY IN PROJECT 2
  SIVU	FREQUENCY IN PROJECT 3
  TOMP-API	FREQUENCY IN PROJECT 5

Sub-concepts of the concept 'Practical possibilities in design'.

1.4.1

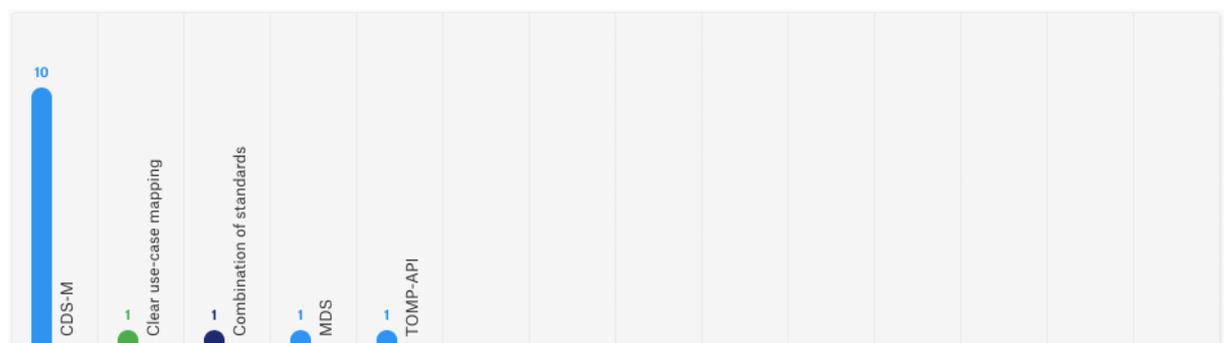
Source	Practical possibilities: CDS-M
Internal communications	

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	Moreover, the CDS-M is unique because of the objective to serve as a standard for all mobility in the future and because the goal is to design it cooperatively with all stakeholders.
Internal communications	Furthermore, he stresses that the design of the CDS-M is going to cover just the obfuscated and aggregated data of start and end points of trips. By keeping the parking- and trip data separate more privacy is ensured. The parking data could be retrieved from the TOMP-API. In this way, the CDS-M and TOMP-API complement each other in the MaaS system of the golden triangle.
Internal communications	Larger adoption and implementation of the CDS-M could be fostered by DOVA, which is a partnership consisting of the 12 provinces, the Amsterdam Transport Region, the Rotterdam Metropolitan Region the Hague and the OV Bureau Groningen Drenthe. The organization consists of two clusters: public transport network and public transport data. Together with CROW-KpVV we form the OV-campus. The objective is that in the future the operators only have to deliver data through one portal with one standard. Not both to the city of Amsterdam and the CROW portal.
Internal communications	Ruud mentions that we should have another look at the further developed version of MDS. He tells that MDS covers all aspects, availability and user data, that are interesting for cities in one standard. He emphasized that this could be clearer for operators, but more difficult to handle for cities, because it is a broader standard. He does say that the end goal is to develop one overarching standard, and in that sense MDS serves that goal better than the CDS-M objectives.
Summary Focus group Amsterdam x NeTEx	His aspiration is to make CDS-M applicable for all mobility, in such the urban planners have a larger view on mobility usage in the city.
Summary Focus group Amsterdam x NeTEx	Ross answers that the CDS-M does not include passengers' information. He tells that in the Netherlands the TOMP-API can be used to retrieve availability data from, but it is not designed for that purpose. The TOMP-API is designed for communication between the shared mobility operators and the MaaS platform providers.
Summary Focus group Amsterdam x NeTEx	From his point of view, the CEN has a more formalized process, so he thinks that they will probably take a little longer to receive the goal. And therefore, he stated that Amsterdam has already begun the development of the CDS-M and TOMP, because Amsterdam hopes that some of the developments will be taken up by the EU Commission in the future.

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<p>Summary Focus group Open Mobility Foundation x Amsterdam</p>	<p>The main driver motivations of CDS-M are urban planning, road safety, inclusivity and greening and managing public space. All these things are focused on the MaaS development and to nurture different mobility modes and their connection. Ross and Tijs substantiate that the CDS-M is designed to function as a policy framework as well as a way of data collection.</p>
<p>Transcript Interview Philippe Crist, international Transport Forum</p>	<p><i>'And actually, that's where we see the opportunity for CDS-M is to really think about the purpose of these things. And as I say, we recognize that from a regulatory point of view, the agency data that you get from MDS does provide that opportunity to get the regulatory side of things. There's a bike in a particular location. But actually, your point about the discussion of how long is that data usable for? Is it ever stored? Is it just analyzed and then just thrown away? At the moment I don't see that being built into MDS currently. And I think that if you're going to be providing data, there has to be some bigger thinking like you say about how the data is actually being communicated.'</i></p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'The functional design right now is based upon polynomials. So, circles of locations, areas so that you don't measure one specific point where the vehicle is parked, but just an area. So, you could measure the trip data from one specific area in the city to another specific area in the city, but not the exact data points but you could see the mobility flows in the city. Retrieving this data in a standardized format from the operators, supplying the dashboard. In this way, you do not need a lot of technical infrastructure to aggregate all this data to a level that you may use it or publish it. So that's the rationale of CDS-M.'</i></p>

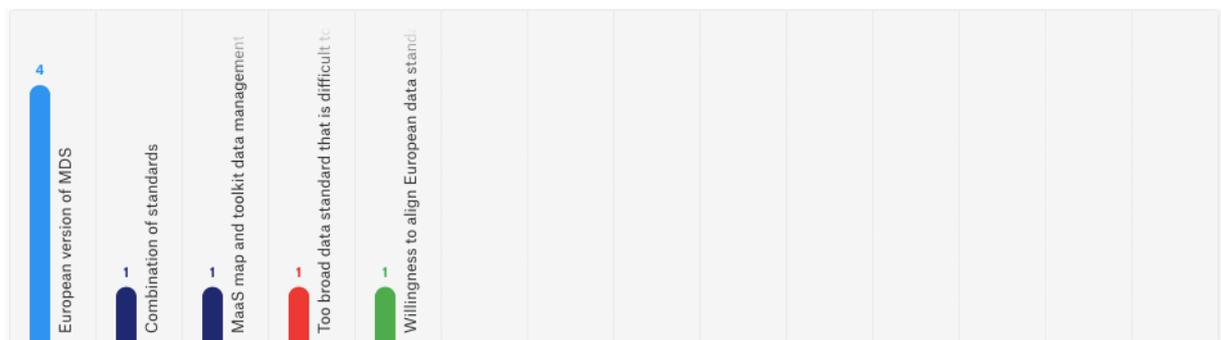


Profile of quotes labeled as: 'CDS-M'.

The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

1.4.2

Source	Practical possibilities: European version of MDS
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'I guess if we have like a wider for example, like if we could improve the MDS, I guess that would be maybe more useful. But maybe even your standard, yes. But more important is a guideline in which data to request, in what ways to aggregate, where you're going to analyze it etc. That like shared understanding of data management within the European context.'</i>
Summary Focus group Amsterdam x NeTEX	The goal is to alter MDS towards a more European focused format now. And if that happens, NeTEX can be mapped in the MDS format as you told before.
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'Vasco Mora: And right now, we are looking at exactly the opposite. I'm trying to foster that we can expand the SIVU with some in the MDS aspects, and map SIVU in the MDS language. So, we can just merge it as you have forks, you have mergers, and we can roll back to using the standard solutions instead of popping up new ones. Because I think that's, that's troublesome. That's a problem for everyone. Now, then we don't know where to pick the vendors and we don't have similar metrics to compare cities. I think that's more difficult.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'I would rather have a dive in MDS again, because it has evolved since my last deep dive into it. And for instance, if you look at the GBFS+ it also includes vehicle types. Then again, looking at the MDS on what they are doing and what has evolved is important to see, which modules can we pick and use in a simpler standard. To come to a solution that works every day without any hassle. That's what we want.'</i>



Profile of quotes labeled as 'European version of MDS'.

1.4.3

Source	Practical possibilities: GBFS
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The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'And also looking at parking data with GBFS, but that does not include vehicle types.'</i>
Transcript Interview Mélanie Gidel - Paris, France	<i>'So, we still use that format that we designed two years ago. But we are about to use also GBFS. Yes, but we are not ready yet and we still do not use it. So, we are still in the transitory phase where we still use a very simple Parisienne format, which is quite convenient, and which has been very useful for us. When we for instance, when we created specific parking zones for scooters and bikes.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'I help implemented the GBFS. So, the General Bike Share Specification for the parking fluids to upgrading that, to including the drapes and all that sensitive part.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'It's referred to part in the MDS. If you go to real time data for parking, there is a cross-reference to GBFS and that's what we are using. But what we have in the memorandum of understanding with operators is MDS in its version 0.2.1 Now I think it's in version 0.4. but it's evolving, but we are stuck in version 0.2.1., because that's what we looked at and developed.'</i>
Summary Focus group Amsterdam x NeTEx	Ross explains that GBFS is more or less included in TOMP, has parts of the GBFS+. Christophe agrees with Ross that standard with different purposes is very effective, because of their dedicated scope.
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'So, we are currently busy with a pilot project for micro mobility data collection on a platform that is called Vianova, a French startup. And this helped us a lot to better understand the different possibilities between, and specifically for shared micro mobility, the possibilities of the GBFS formats, as well as MDS.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'We are not creating a standard, but a data management Model, called MiMoGG. The standard we are using now is GBFS.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'We now use the GBFS, but the only thing about GBFS right now that is that we found that we don't have the vehicle type or trip data.'</i>

The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators



Profile of quotes labeled as 'GBFS'.

1.4.4

Source	Practical possibilities: MDS
Transcript Interview Sami Sahala - Helsinki, Finland	'A de facto standard would be nice, MDS is an option. However, some European cities want to have less privacy intrusive information. But we need a European way of exchanging information.'
Summary Focus group Amsterdam x NeTEx	A downside of the MDS for governments is that they then have to use an intermediary, from which they are dependent
Transcript Interview Philippe Crist, International Transport Forum	'Absolutely, absolutely. The last thing, though I do think that that is quite interesting from the MDS perspective, but you touched on it for CDS-M which is the ability for public authorities to communicate in machine-readable format. What their intent is for the use of public space or for the type of activity. And I think that is essential because it's a different level of intervention, but it is the most direct way of ensuring that the public authority's objectives are being carried out directly in the back-office systems of any operator that is marked operating. To be clear, that should be the case for public transport, it should be the case for freight distribution, it should be the case for anything that has to obey a sign. And I think that is so... So, the mapping part and the machine-readable law or machine-readable regulation part for me, in the functional bins, are the three areas that are important to see and recognize in any specification that I think will have traction over the long run.'
Summary Focus group Open Mobility Foundation x Amsterdam	According to Jascha, most cities do not use the Agency API of MDS. Often this is decided upon privacy reasons. However, this is not a problem, because MDS is flexible, a city does not need to use the agency API, for MDS to work properly.
Summary Focus group Open Mobility Foundation x Amsterdam	According to Jascha, most cities do not use the Agency API of MDS. Often this is decided upon privacy reasons. However, this is not a problem, because MDS is flexible, a city does not need to use the agency API, for MDS to work properly. The Provider API is most often

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	used, and can offer semi-real time to historic, whatever a city prefers. The provider API can enable the transmission of real time data parking data, but not when on a trip.
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'And maybe you can just uncheck a few boxes that are too sensitive for the operators. So, that's why I'm looking forward for the discussion that we're going to have with the shared mobility solution providers in the process of this ITF project to see what actually their perspective on that is.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'And then there is the MDS, which is an all-mighty thing, but it's a little bit daunting and scary also because it's not easy to work with and it's not easy to study into, to adapt for a city. Especially for a city that is always moving and usually has someone like me, or, or even more occupied throughout the week, just to grasp some things and to try to make a decision.'</i>
Transcript Interview Mélanie Gidel - Paris, France	<i>'And, uh, but we are mostly interested, in fact, MDS, which is more complicated to handle. So, we will first make use of the GBFS.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'Because the MDS has got these two fronts. You've got this active front, what's happening now, and what's happened in the past. Guusje van der Vossen: The agency and the provider API? Jorge G Coelho: Yeah. And so, what we'll be collecting will be more focused on this latter point. It'll be regards to basically past mobility. So, we can basically use it for our research.'</i>
Internal communications	<i>Beryl indicates that she has no concerns regarding the design of MDS as long as the requested data is managed properly.</i>
Transcript Interview Philippe Crist, International Transport Forum	<i>'But the first thing is, to my understanding, I mean, and yes, we always do talk a lot about MDS, but MDS, it's syntax that was pushed out rapidly to deal with a specific problem. It had great ambition. I mean, the ambition was that it would be the language to end all languages, but then scooters appeared, and they had to act really fast. So, the structure of the specification right now is to get information from operators, particularly micro mobility operators. In the information that can be encoded within MDS is the route-based information, which is the most difficult from a personal identifiable information perspective, but that never has to be turned on. So MDS in and of itself, is not GDPR un-compliant, certain uses of MDs when you collect route data are GDPR non-compliant. I think it would be wrong to think that the current structure of MDS is itself is not compliant with GDPR and cannot be. I think it's all about the uses-cases.'</i>

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Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'But when we start looking at developing the trips and importing the trips into our system to analyze it, we mentioned that there are potential issues with data and privacy regarding the use of MDS.'</i>
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	Elnert sees the MDS as a good basis for shared mobility, by adapting it to the European view, he thinks it could comply with the GDPR.
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'For a moment we only use two. So, it's policy and provider API indeed. And the policy API is very light for the moment. We basically share the geo-fenced areas for no parking zones and working with parking zones.'</i>
Summary Focus group Open Mobility Foundation x Amsterdam	In this focus group Jascha told us that MDS is designed as regulatory tool, not essentially a planning tool. The main driver motivations of MDS are enforcement, geofencing, managing abended broken vehicles on the street and receiving parking data.
Summary Focus group Amsterdam x NeTEx	In this version the agency API is functional, the API which requests real-time trip data. Ross explains that this API causes reluctance from the shared mobility operators in Amsterdam. He says that these operators are afraid of data breaches, due to the lack of expertise of the government, and moreover they are concerned about the fact that their business model could be discovered by competitors if the data, even if in an aggregated format, is published as open data. The operators see this data as commercially sensitive.
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'It's referred to part in the MDS. If you go to real time data for parking, there is a cross-reference to GBFS and that's what we are using. But what we have in the memorandum of understanding with operators is MDS in its version 0.2.1 Now I think it's in version 0.4. but it's evolving, but we are stuck in version 0.2.1., because that's what we looked at and developed.'</i>
Summary Interview Karen van Cluysen, Polis	Karen recognizes that the interesting thing about MDS is that it not only enables communication from operator to city, but also vice versa. The government can then also communicate its own conditions and rules in a machine-readable way.
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'One of the things, indeed, the GDPR argument I think is very relevant. We need to pay close attention to what's going on from that perspective, but from what I've learned in the past few years... I'm doing this job for two years. Is that with these kinds of formats I think we have to pay close attention to GDPR, of course, but it's not a definite issue with regard with</i>

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	<i>MDS, for example, because there's so many precautions that can be taken in the MDS format.'</i>
Summary Focus group Open Mobility Foundation x Amsterdam	Public authorities are free, private parties pay on the basis on their size
Summary Focus group Open Mobility Foundation x Amsterdam	Ross explains that the CDS-M bypasses this problem, because the trip data is pre-aggregated to a level of k-anonymity, which makes sure that identifying individual is really hard.
Internal communications	Ruud mentions that we should have another look at the further developed version of MDS. He tells that MDS covers all aspects, availability and user data, that are interesting for city sin one standard. He emphasized that this could clearer for operators, but more difficult to handle for cities, because it is a broader standard. He does say that the end goal is to develop one overarching standard, and in that sense MDS serves that goal better than the CDS-M objectives.
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'So particularly the Open Mobility Foundation, they set up the MDS standard. And so that's where we are now. So, they're not currently in the 1.0 standard yet. They're still in the 0.4.'</i>
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'So, we are currently busy with a pilot project for micro mobility data collection on a platform that is called Vianova, a French startup. And this helped us a lot to better understand the different possibilities between, and specifically for shared micro mobility, the possibilities of the GBFS formats, as well as MDS.'</i>
Transcript Interview Philippe Crist, International Transport Forum	<i>'Ross Curzon-Butler: Sure. One more thing on that point then, my understanding is that the GPS location fields for the world's home update and agency are actually required. Philippe Crist: They're required if you're using the agency API, but they're not required for the historic information that is under the provider API, and they're not relevant in the policy API, which is- Ross Curzon-Butler: No, they're not in the policy, I know.'</i>
Summary Interview Augustin Helmut - Vienna, Austria	They would switch off some functions of MDS and only use the obfuscated data of start and endpoints of trips.
Summary Focus Group Helsinki x Amsterdam	Vianova uses MDS as data standard and, so far, the City of Helsinki has not experienced any problems, but they recognize that they haven't had the opportunity to compare it to another standard yet. They indicate that it took some time for the operators to make sure that MDS

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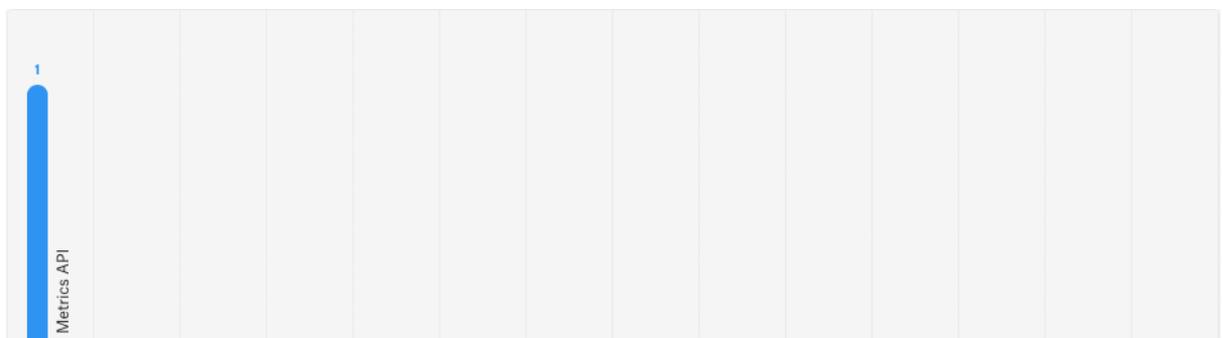
	<p>worked properly with their servers, and this is still an ongoing process. The city of Helsinki does not have a preference for a certain data standard, as long as the operators want to work with it voluntarily and it offers qualitative and reliable data. They say that the use of MDS is not perfect yet, for example, sometimes an average data comes out, which is totally unrealistic, because one vehicle movement has increased the average distance enormously.</p>
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Profile of quotes labeled as 'MDS'.

1.4.5

<p>Source</p> <p>Summary Focus group Open Mobility Foundation x Amsterdam</p>	<p>Practical possibilities: Metrics API</p> <p>The Metrics API is a new initiative of the Open Mobility Foundation. This API workings with metrics, which function as a filter that immediately aggerated the detailed data per domain. The Metrics API could be used by a trusted third-party aggregator or by the city. The metrics API has similarities with the CDS-M but differs in a way that the companies still have to deliver detailed data to an aggregator, and with the CDS-M the operators need to aggregate their data by themselves before communicating it with the city.</p>
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Profile of quote labeled as 'Metrics API'.

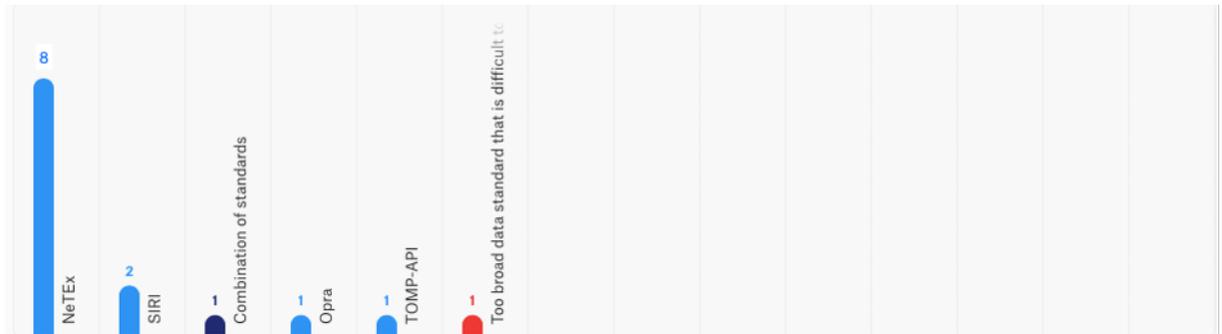
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1.4.6

Source	Practical possibilities: NeTEx
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'And a lot of people from all around Europe are actually contributing to this workshop of NeTEx.'</i>
Transcript Interview Sergio Fernández Balaguer - Madrid, Spain	<i>'And regarding NeTEx, as a mobility language, it's not necessarily open. We considered that. It covers more or less everything, it's quite complex.'</i>
Transcript Interview Sergio Fernández Balaguer - Madrid, Spain	<i>'But in terms of standards, we are following at the moment all the let's say indications coming from Europe, from the European Commission or the European level. We are in a working group together with the Spanish Ministry of Transport, because they will be the national access point according to European regulations. And the format or the scheme they are following is NeTEx, following the European directive or indications.'</i>
Summary Focus group Amsterdam x NeTEx	Furthermore, he explains that GTFSS is a subset of NeTEx. GTFSS only covers the part about the trips, not about the operations. GTFSSRT is a subset of SIRI and offers real-time data to complement GTFSS.
Internal communications	Ruud recognizes that NeTEx can be used for availability data of shared mobility, however he thinks that the TOMP-API would be a better fit, because the NeTEx standard is designed as an exchange standard for real-time open data, not for storage or analysis.
Summary Focus group Amsterdam x NeTEx	The CDS-M does not incorporate parking- or availability data so Ross is keen to know whether the NeTEx could be complementary in that aspect.
Summary Focus group Amsterdam x NeTEx	The NeTEx stand covers the exchange of scheduled information, before the service has been delivered, where SIRI covers the exchange of data in real time, during the service. OpRa covers the exchange of observed information through the Internet of Things, such as roads information, sensors and other curb data. Christophe tells that NeTEx and SIRI work in all code languages and that they are REST APIs.
Summary Focus group Amsterdam x NeTEx	This specification is about car-sharing, taxis, scooters, mopeds, bicycle, Uber etc. Designed to enable integrated multimodal traveling. And they find it very important that NeTEx is compatible with existing standards in this field, like MDS and GBFS. Christophe explains that in the regulations of the European Commission is stated that NeTEx needs to be used for the national access point. OpRa, will be finished next year and will then also be used for the

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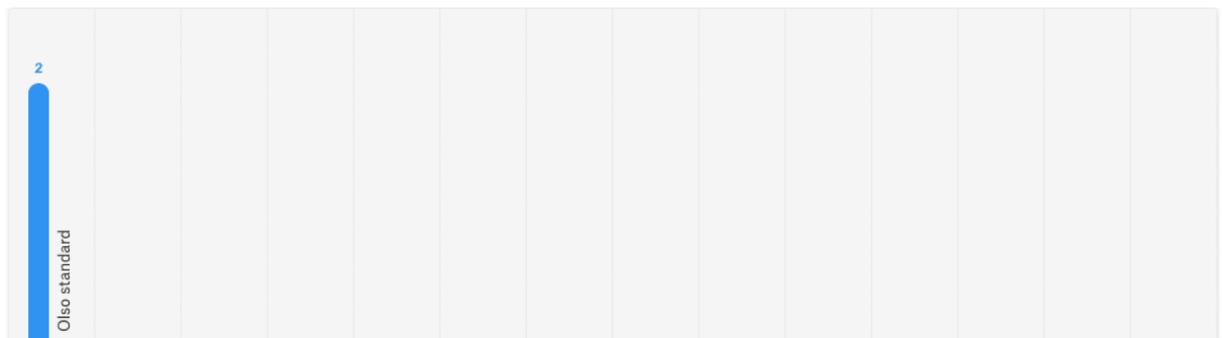
	national access point. Moreover, he explains that OJP, Open Journal Planner, is also a complement to the NeTEx.
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Profile of quotes labeled as 'NeTEx'.

1.4.7

Source	Practical possibilities: Oslo standard
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	In Flanders a standard is currently being developed, the Oslo standard, which is still in its infancy.
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	The Oslo standard (open standard for linking organizations) is used in the various mobility platforms active in Antwerp, as well as in 'Smart to Antwerp', the public MaaS application.



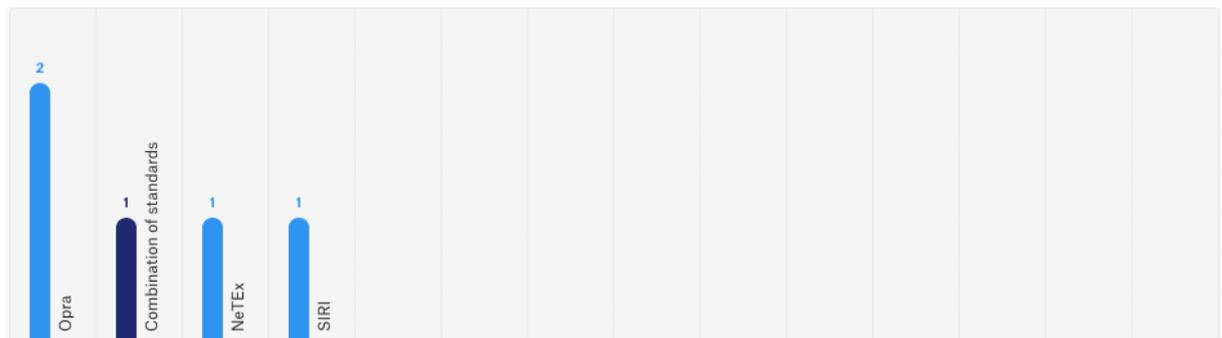
Profile of quote labeled as 'Oslo standard'.

1.4.8

Source	Practical possibilities: Opra
Summary Focus group Amsterdam x NeTEx	OpRa, will be finished next year and will then also be used for the national access point. Moreover, he explains that OJP, Open Journal Planner, is also a complement to the NeTEx.
Summary Focus group Amsterdam x NeTEx	

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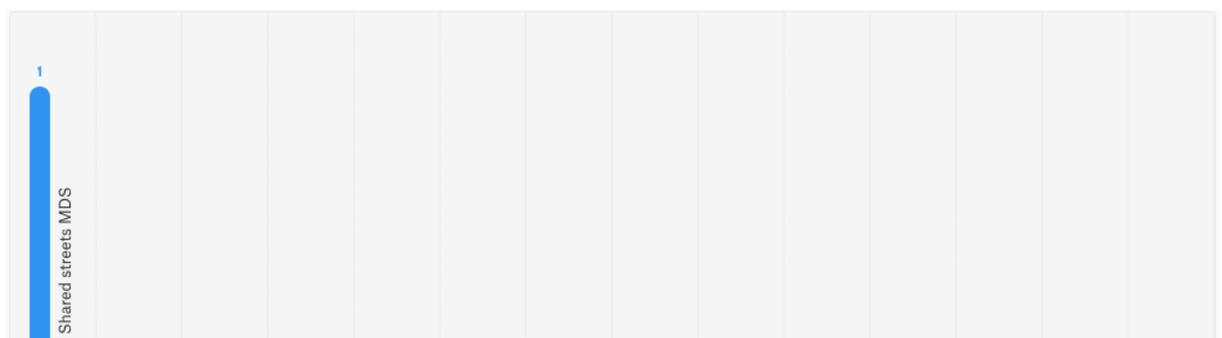
	<p>The NeTEx stand covers the exchange of scheduled information, before the service has been delivered, where SIRI covers the exchange of data in real time, during the service. OpRa covers the exchange of observed information through the Internet of Things, such as roads information, sensors and other curb data. Christophe tells that NeTEx and SIRI work in all code languages and that they are REST APIs.</p>
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Profile of quotes labeled as 'Opra'.

1.4.9

Source	Practical possibilities: Shared streets MDS
<p>Transcript Interview Philippe Crist, International Transport Forum</p>	<p><i>'So, basically, so I mean, I'm sure you know, that even in the US there's a number of different, slightly competing syntaxes and shared streets, which was not so much a data sharing syntax, but it was more of a location referencing system that can then be used for data sharing. And it's been used by Washington DC, for example, that was much more preferred by certain actors like Uber and Lyft that had some fundamental problems with MDS. They've developed a way of automatically aggregating both the point data and the route data as part of the workflow before the data is released through the API to the agency, to the regulator.'</i></p>

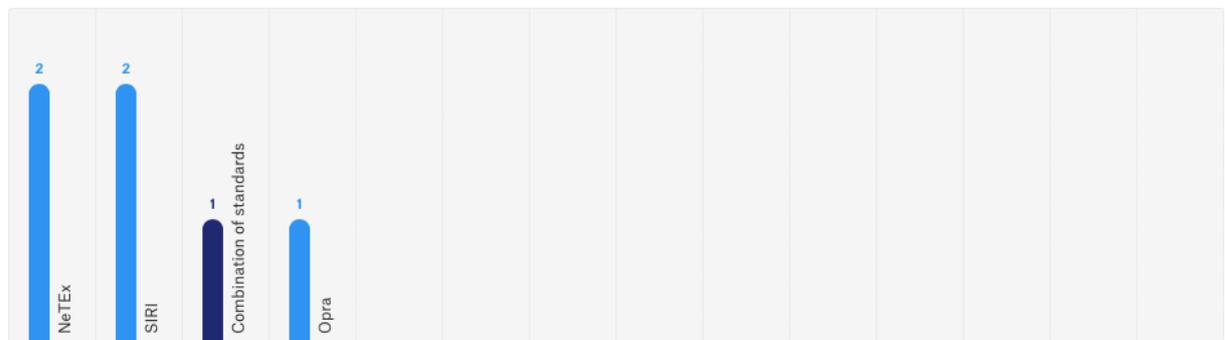


Profile of quote labeled as 'Shared streets'.

1.4.10

The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

Source	Practical possibilities: SIRI
Summary Focus group Amsterdam x NeTEx	Furthermore, he explains that GTFS is a subset of NeTEx. GTFS only covers the part about the trips, not about the operations. GFTSRT is a subset of SIRI and offers real-time data to complement GTFS.
Summary Focus group Amsterdam x NeTEx	The NeTEx stand covers the exchange of scheduled information, before the service has been delivered, where SIRI covers the exchange of data in real time, during the service. OpRa covers the exchange of observed information through the Internet of Things, such as roads information, sensors and other curb data. Christophe tells that NeTEx and SIRI work in all code languages and that they are REST APIs.

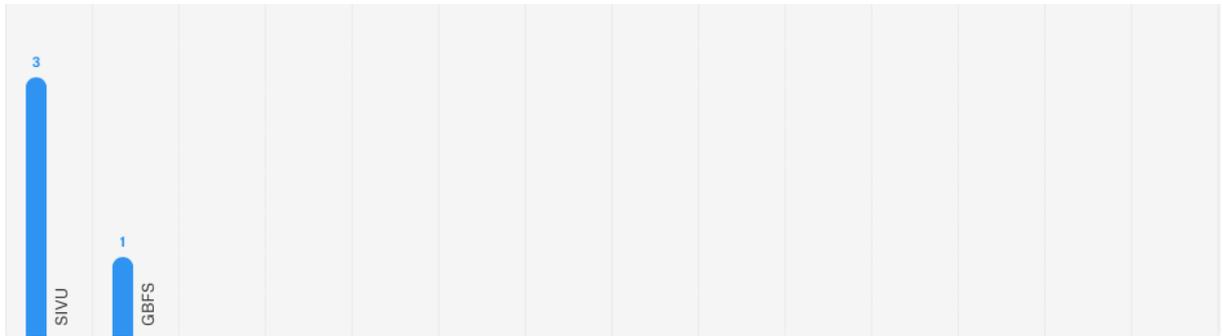


Profile of quotes labeled as 'SIRI'.

1.4.11

Source	Practical possibilities: SIVU
Transcript Interview Mélanie Gidel - Paris, France	<i>'And we created our own format, which is called SIVU. I will send you the link, which is a quite simple format that we decided to use.'</i>
Transcript Interview Mélanie Gidel - Paris, France	<i>'So, we still use that format that we designed two years ago. But we are about to use also GBFS. Yes, but we are not ready yet and we still do not use it. So, we are still in the transitory phase where we still use a very simple Parisienne format, which is quite convenient, and which has been very useful for us. When we for instance, when we created specific parking zones for scooters and bikes.'</i>
Transcript Interview Mélanie Gidel - Paris, France	<i>'The SIVU only updates six times a day every three hours, so it's not enough if we really want to be more reactive in terms of control and see the dynamics of during the day of the reputation of parked vehicles at riding vehicles. So that's one big reason why it is limited that we need to go a bit further. '</i>

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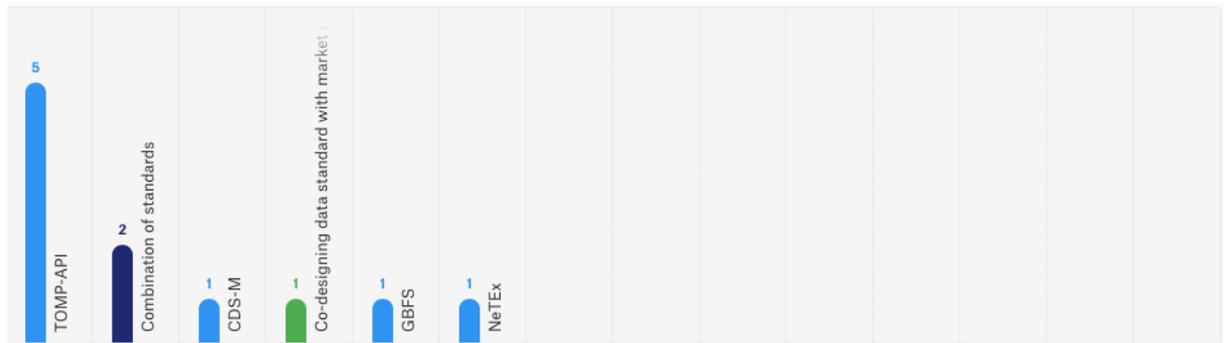


Profile of quotes labeled as 'SIVU'.

1.4.12

Source	Practical possibilities: TOMP-API
Summary Focus group Amsterdam x NeTEx	Christophe wonder how to make a journey plan without passenger's information. Ross explains that this is delivered by the shared mobility operators through the TOMP-API towards the platform providers on which customers can book their trip. That is what the operator delivers through the TOMP, to the platform from which you book your trip.
Summary Focus group Amsterdam x NeTEx	Ross answers that the CDS-M does not include passengers' information. He tells that in the Netherlands the TOMP-API can be used to retrieve availability data from, but it is not designed for that purpose. The TOMP-API is designed for communication between the shared mobility operators and the MaaS platform providers.
Summary Focus group Amsterdam x NeTEx	Ross explains that GBFS is more or less included in TOMP, has parts of the GBFS+. Christophe agrees with Ross that standard with different purposes is very effective, because of their dedicated scope.
Summary Focus group Amsterdam x NeTEx	Ross explains that the Amsterdam way of reaching an eco-system is cooperating in the development of these standards. He says that the data standards, such as the TOMP-API, have never been government owned, only government supported. According to him, this created room for government bodies and private parties to co-create the standard.
Internal communications	Ruud recognizes that NeTEx can be used for availability data of shared mobility, however he thinks that the TOMP-API would be a better fit, because the NeTEx standard is designed as an exchange standard for real-time open data, not for storage or analysis.

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Profile of quotes labeled as 'TOMP-API'.

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1.5 Opportunities in implementation

  Demand from cities for a European data standard for shared mobility operators	FREQUENCY IN PROJECT 15
  Demand from operators for a European data standard for shared mobility operators	FREQUENCY IN PROJECT 4
  Joint trust	FREQUENCY IN PROJECT 8
  Pilot strategy	FREQUENCY IN PROJECT 12
  Strong legal framework	FREQUENCY IN PROJECT 15
  Win-win offer	FREQUENCY IN PROJECT 7

Sub-concepts of the concept 'Opportunities in implementation'.

1.5.1

Source	Opportunities in implementation: Demand from cities for a European data standard for shared mobility operators
Transcript Interview Mélanie Gidel - Paris, France	<i>'And it's enough in a way for the first use cases we've had that we are also aware that it's limited and it's not very convenient for the operators because they have to develop a specific format for parents, which it's not very convenient for them. And they have already mentioned that it would be better if they could use the same format that they use for other cities or regions. So, we are working on developing our own system to use to be a first, first and then maybe later.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'And it's very difficult to make this happen throughout all the operators. Therefore, we need a clear, standardized method.'</i>
Transcript Interview Benjamin Rabenstein and Frederik Mehler - Berlin, Germany	<i>'And we have also planned to get on this platform also the data from the shared mobility things. So also, the life data and the history data of the trips is the plan. And yeah, so it's just a plan and we have the basis for the regulation, but not the things implemented.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'API driven completely. I think that independently of the solutions that we have I think the most important part is the connectivity. For me it does not matter, Typhon or Java or whatever, what matters to me is the</i>

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	<p><i>outcome, that it is manageable. That we can update and maintain it over time easily. We have had some vendor lock-ins for specific technologies or solutions. We really hate that, and we are trying to avoid that as much as possible, but this is an API driven approach. So, we develop the catalog, we'd like to broadcast the idea of the catalog with the others. So, they can adopt it. And this would be a new standard. And everything should be structured, in a way that if some aggregator comes into the city, a magical Gator, a Whim, whatever, we don't start the discussion all over again, we give them to them a catalog that has all the end points organized.'</i></p>
<p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>For digital integration you also need mobility operators to provide the data and a workable commercial model. They expect the data provision to be difficult and think standardization would make it easier.</p>
<p>Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany</p>	<p><i>'I think if the data standard will be unified, that'd be much easier across Europe to deal with the same issues.'</i></p>
<p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>It is much easier to work with a common standard, then if everyone has their own data standard. Having an open standard helps to facilitate an open cooperation and support. Therefore, they are advocates of a uniform data standard and common understanding of how to manage and analyze mobility data.</p>
<p>Summary Interview Karen van Cluysen, Polis</p>	<p>Lisbon aspires to reach an agreement on useful use cases and standards that fit in with it these.</p>
<p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>They are trying to standardize how to bring information in, to try to make it available for customers. They are also looking into the requirement to provide information on ticketing. They are part of the E-hubs project of Interreg, but they have aspirations for a wider mobility hub and a MaaS platform.</p>
<p>Summary Interview Thierry Vanelander and Elnert Coenegrachts, University of Antwerp</p>	<p>Thierry confirms that it is a problem that there is no data standard and adds that there should be a national, if not international, data standard.</p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'So, besides using GBFS, I ask the operators do of deliver the total number of trips and the total number of users that's registered in that day. Okay. I also usually ask for one specific metric, the total number of active users in the last four weeks. So, we know exactly what the ratio is between residents and tourists. We also ask the average traveled</i></p>

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	<i>kilometers, so I think this a little bit what you will also request through the CDS-M, but in a more structured way and through an API, which is much better than just compiling spreadsheets of course.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'That's always, always my point. I think it'll be amazing for you to present the CDS-M that you have and your vision for them, your goals. Why you invented it, why you asked for it. And maybe we can work from that with other cities. And as I told you, we have the same needs. We'd be likely to adopting yours, once it's a little bit more established and so we don't keep changing scenes overnight. That is the goal to have something s and comparable between cities. I think that's the goal for everyone.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Guusje van der Vossen: Do you think we should have some kind of European standard or do you think that's not the way to go? Sami Sahala: No, we should have. Um, let's say you need to have an official standard, at least not straightaway.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'You don't have to start the discussion from the beginning. So, you need to have technical standards, as well as some kind of de facto process as well, which would mean the data governance and use cases.'</i>



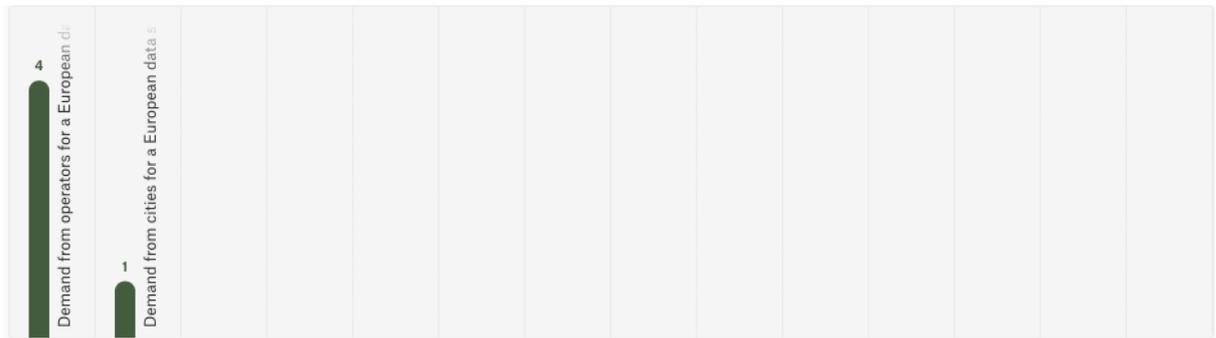
Profile of quotes labeled as 'Demand from cities for a European data standard for shared mobility operators'.

1.5.2

Source	Opportunities in implementation: Demand for a European data standard from operators
Transcript Interview Mélanie Gidel - Paris, France	<i>'And it's enough in a way for the first use cases we've had that we are also aware that it's limited and it's not very convenient for the operators because they have to develop a specific format for parents, which it's not very convenient for them. And they have already mentioned that it would be better if they could use the same format that they use for other</i>

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	<i>cities or regions. So, we are working on developing our own system to use to be a first, first and then maybe later.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'No, they've been quite helpful actually. Also, in general, they've been really forward, coming to talk to the city, they were the ones suggesting using a standardized format and communicate non parking or preferred parking zones. So that's really good.'</i>
Transcript Interview Mélanie Gidel - Paris, France	<i>'So now it's working fine, but it was not immediate. But the thing is that we might give it up because we are aware that it doesn't make sense to be the only place in France to have that format. So, when we will be more comfor with GBFS, I think we will shift and stop asking the operators to provide the data with SIVU.'</i>
Summary Interview Karen van Cluysen, Polis	There is a demand for this from the operators too, because then they do not have to supply data in other forms in a different city every time.



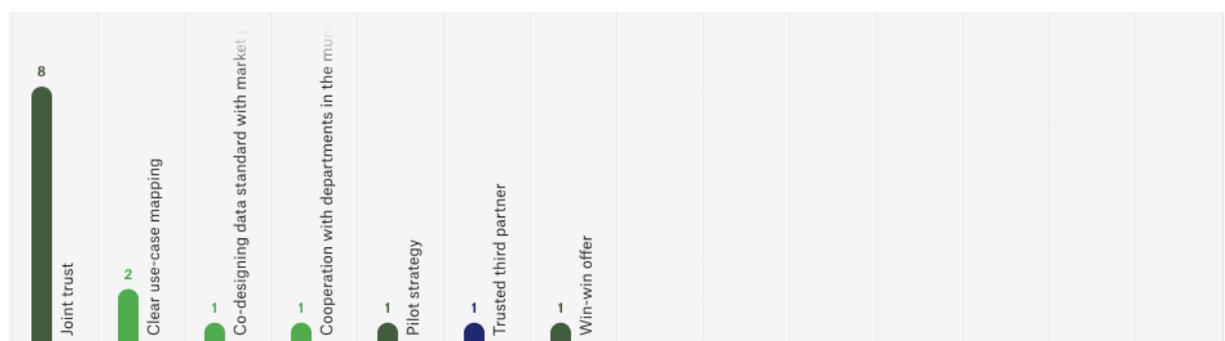
Profile of quotes labeled as 'Demand from cities for a European data standard for shared mobility operators'.

1.5.3

Source	Opportunities in implementation: Joint trust
Internal communications	According to Beryl, transparency and target reasoning are important for mutual trust.
Summary Interview Mikael Ivari - Gothenburg, Sweden	He thinks that the private parties should certainly help to develop good mobility services. Although the government must draw up the rules, the private parties must be comfor and willing and able to share the data
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'He was talking about this kind of trust architecture in data sharing and the three systems, either we don't trust the governments, and providers do everything on their own. We don't trust the providers, we aggregate. And then there's this third-party kind of interface, like</i>

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	<i>Vianova or Populus or Remix or this type of a data broker, I think are interesting in generating the trust in the system. I think it's an interesting approach.'</i>
Summary Focus Group Helsinki x Amsterdam	'Helsinki emphasizes that the most important part is the participation of the operators, the involvement of the municipality as a whole, and the mapping of clear use cases.'
Summary Focus group Open Mobility Foundation x Amsterdam	'Ross states, that if trust is valued, it can also work very well and ensure that the responsibility of the public task is borne.
Transcript Interview Vasco Mora - Lisbon, Portugal	That's a goal, but we have to, to drive the path for that and do way that we believe we can be done is exactly collaborating with the big tech companies, not trying to push them away from the system because we are not strong enough to do so. Uh, let's be honest, but trying to collaborate, I'll give you a little bit of data and you give me some data
Summary Focus Group Helsinki x Amsterdam	The City of Helsinki has not mandated participation in the pilot, thus the two mobility providers joined voluntarily, following an invitation from the city. The voluntary participation of the providers is explained by an employee of the City of Helsinki; he says that by sharing the data the providers enhance their image. By showing their willingness to cooperate with the city, the city gains another picture from them, that the often-negative image which is presented by the media; accidents and nuisance caused by the scooter companies.
Summary Focus group Open Mobility Foundation x Amsterdam	Thus, the presence and lack of mutual trust could be an opportunity and threat for the implementation of a data standard.



Profile of quotes labeled as 'Joint trust'.

1.5.4

Source	Opportunity in implementation: Pilot strategy
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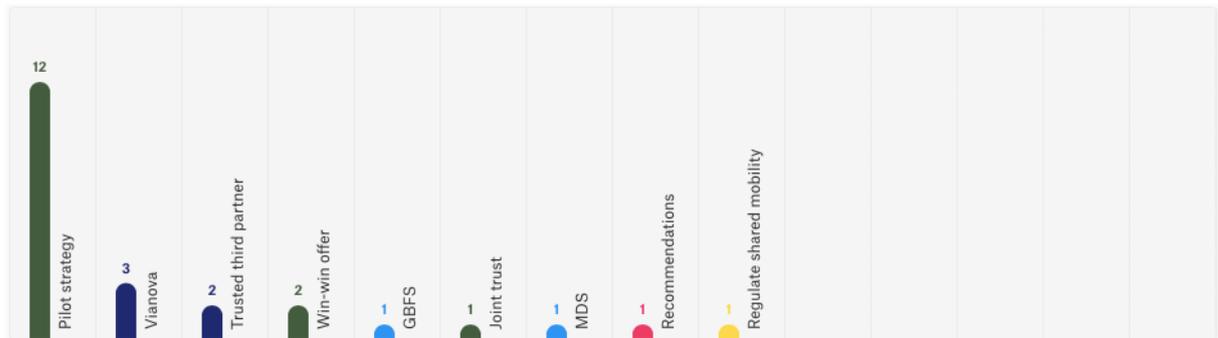
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<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'And for me, the most important thing when working with Vianova is to learn and understand what the possibilities are with the data. We learn more from using a more detailed data standard with a third party, then when we would have used a simple standard by ourselves. All the mistakes by the operators are so transparent on the dashboard of Vianova.'</i></p>
<p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>Because this reasoning often causes problems, Geert advises us to keep the standard small, at least if the aim is to make it 'European' as soon as possible. That is when the chance of inclusion is greatest. He also advises Amsterdam to make extensive use of pilots, so that this 'who, what, why' question can be better answered with use cases. He sees this as an opportunity for the further design of the CDS-M.</p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'I was interested with Vianova, because I think the instruments that companies like Vianova offer can provide us with the kind of learning on what all we can get out from the data, because I think they are quite far on that. One other benefit is that TR has been very willing to share the data, because we have built the trust. I have also been helping them quite a lot with many issues.'</i></p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'Guusje van der Vossen: So Vianova really helps communicating the municipality with TR? Suvi Kajamaa: Yes, definitely.'</i></p>
<p>Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'So, we are currently busy with a pilot project for micro mobility data collection on a platform that is called Vianova, a French startup. And this helped us a lot to better understand the different possibilities between, and specifically for shared micro mobility, the possibilities of the GBFS formats, as well as MDS.'</i></p>
<p>Transcript Interview Sami Sahala - Helsinki, Finland</p>	<p><i>'Guusje van der Vossen: So, what is the win-win situation in Helsinki for those market parties? Sami Sahala: That's what we're trying to find out with the pilot of Vianova at the moment.'</i></p>
<p>Summary Focus Group Helsinki x Amsterdam</p>	<p>The City of Helsinki has not mandated participation in the pilot, thus the two mobility providers joined voluntarily, following an invitation from the city. The voluntary participation of the providers is explained by an employee of the City of Helsinki; he says that by sharing the data the providers enhance their image. By showing their willingness to cooperate with the city, the city gains another</p>

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	picture from them, that the often-negative image which is presented by the media; accidents and nuisance caused by the scooter companies.
Transcript Interview Suvi Kajamaa – Espoo, Finland	<i>The pilot we are really doing as cooperation. Which is helpful for resolving the 'against thinking' in the micro mobility field.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'In that way, we are flexible, and we get more quickly the research, the responses to things that we feel are more important in each moment and big tech companies can have a huge part of that. We are working closely with move it, for instance, to give us information about public transport occupancy, that we don't have a way to measure that right now to improve all GTFS feeds, and to improve the work with each one of the operators in the public transport system. So, they can easily provide a better real-time solution for the catalogs for, everyone. So that's a little bit to the way that we try to work with each one of them, their specialties, and trying to make small, but very effective one-to-one deals or pilots, projects, contracts, whatever that can give us some information that we feel is necessary right now.'</i>
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'Well, I think we're going to get in be inspired by a few of the use cases that we've actually experimenting right now with Vianova. So, for the moment, it's no parking zones, dedicated parking zones that are not mandatory because it was not foreseen in the policy, in the regulations for shared micro mobility.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'With the pilot we want to learn, how to manage data collection. How not to do it? What are the bottlenecks and pitfalls over there? It's not just about learning the technical standard, MDS. It is about learning the process.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'You know, we don't really follow the traditional road map of defining a policy and then executing and implementing a policy. Yes, it's more like trying on this thing and saying wait for development and then the policies. The policies will be taken up by the traditional city planning department at some point, hopefully.'</i>

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Profile of quotes labeled as 'Pilot strategy'.

1.5.5

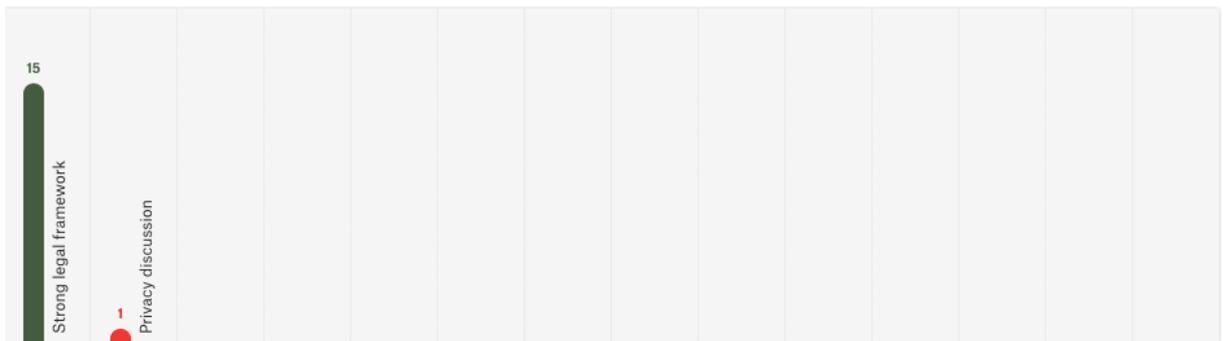
Source	Opportunity in implementation: Strong legal framework
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>And as we are looking at hard regulation or written regulation, then we can really ask people to give us trip-data. We will still need to work through the privacy part of that. And I think that's, once you get to this point, operators will just give you the data. Yeah.</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'And besides that, that they'll enter into a blacklist that makes them ineligible for public contracting within Portugal.'</i>
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'And thanks to that project, we just started basically a couple of months ago, a project with ITF and Philip Crist's team to define and help us create this regulatory framework from us.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>Anything that makes a profit, that's using public space has to pay a tax in the city. So, they're basically exempted of those taxes. And so, with them, we had to remind them that they were exempted of the taxes under the light of the agreement that we signed. And so, one of the items of the agreement was that they had to share their data. And so, since they would be breaching the agreement, they would have to pay taxes.'</i>
Summary Interview Augustin Helmut - Vienna, Austria	Augustin indicates that before using MDS, a strong legal frame has to be in place which mandate the data sharing. They are working in that now. They think that market party participation won't be a problem if the legal framework is affected.
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'But, but one of the things about the GPDR I think it's very simple. If we have a hard regulation in the city to say, this is the way you have to operate, and this is the better you have to share, it's very simple. Or they change the terms and conditions to say to their users that they</i>

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	<i>are going to check with them. And as if they do not share data with the municipality, they cannot operate. The thing that we have in Lisbon is a little bit of a half measure. And because we have a memorandum of understanding and we said that we want MDS but not with a data broker. Some operators said that the trips part of MDS is going to be a little troublesome. So we are figuring that out now.'</i>
Transcript Interview Sergio Fernández Balaguer - Madrid, Spain	<i>'However, for instance, e-scooter companies, they need to apply for a license. That's something relatively new that was set I think by autumn last year, or maybe the year before. '</i>
Transcript Interview Philippe Crist, International Transport Forum	<i>'If you could have a trust, dependable environment in which operators and consumers could interact amongst themselves directly with rules that conform to what the public authority needs to have happen built into smart contracts, that is intellectually quite compelling.'</i>
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	In Antwerp, there are clear rules for the granting of a license, including the requirement of data delivering and the opportunity of re-selling the service. In order to have a well-functioning data standard in Europe, according to Thierry, the major mobility providers will have to accept it and invest.
Summary Interview Karen van Cluysen, Polis	Karen tells us that such a framework is important in order to filter out the negative aspects of shared mobility; this is often done by means of permits and licensing.
Transcript Interview Mélanie Gidel - Paris, France	<i>'And now all these kind of shared mobility operators, they have to pay a fee to use the public space in Paris. And as part of that regulation, they have to provide the data. So, it's not just a matter of charter, which was not a very I mean, we couldn't really check if they respected it or not. It was just a broad agreement from all parties. But now they really have to respect that.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'So, we actually had to have a more active voice and we actually had to warn them that basically if they didn't share information that, besides having to pay taxes that they were exempted... Because that's what's happening.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'The truth is that it wasn't much of an issue. Uh, I mean, I understand that what I get is from the platform side, they are like enforcing that. I'm not sure if the information that the operators are passing on to the platforms, if they are having the same concern. But the truth is the regulation applies also to them. So, the platforms, like Vianova, they shouldn't be sharing raw data, basically.'</i>

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<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'We are looking at the possibility of doing a hard regulation with two or three, with a cap of two or three operators, something like you mentioned, 8000 scooters. And that will be a contract that will be a little bit different of a memorandum of understanding. And then we can simply say, if you don't want to do to play this game, don't come. But if you want to play by the rules and share the data that we have, and we must develop a process to be confident that we are going to use the data in the right way and discarded it as soon as possible.'</i></p>
<p>Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'Well, actually, not really. So, all regulations for shared micro mobility is license based.'</i></p>



Profile of quotes labeled as 'Strong legal framework'.

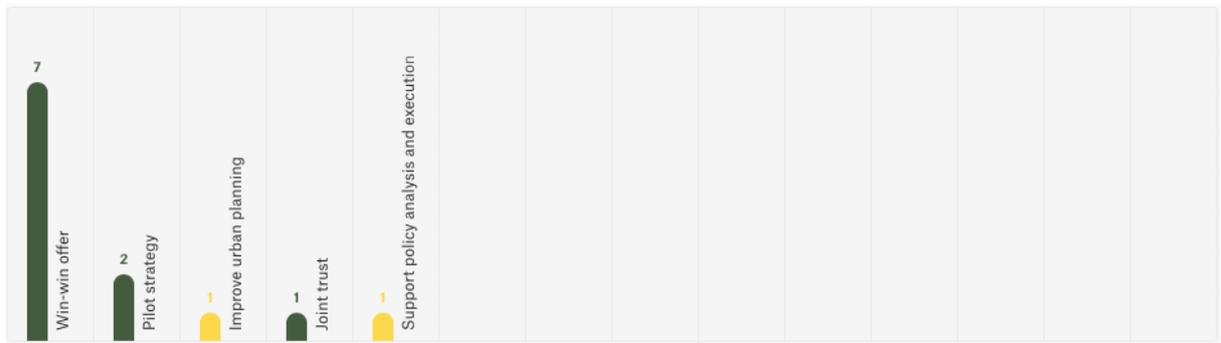
1.5.6

Source	Opportunities in implementation: Win-win offer
<p>Transcript Interview Valeria Caiati, TU Eindhoven</p>	<p><i>'Guusje van der Vossen: And if you go into those soft measures, what could be a soft measure that municipality could take to support the usage of shared mobility in a city?</i></p> <p><i>Valeria Caiati: And one way to do so is make sure that the demand and supply side are adjusted to each other, that they feed each other well so that citizens always options. This is also, yes, a key element for so that you can either increase the performance of the service provision or also increase the service satisfaction. So, it's a kind of a win-win situation in which both sides are getting value from this new way of policy.'</i></p>
<p>Summary Focus Group Helsinki x Amsterdam</p>	<p>The City of Helsinki has not mandated participation in the pilot, thus the two mobility providers joined voluntarily, following an invitation from the city. The voluntary participation of the providers is explained by an employee of the City of Helsinki; he says that by sharing the data the providers enhance their image. By showing</p>

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	<p>their willingness to cooperate with the city, the city gains another picture from them, that the often-negative image which is presented by the media; accidents and nuisance caused by the scooter companies.</p>
<p>Summary Focus Group Helsinki x Amsterdam</p>	<p>The city of Helsinki states that there is a win-win situation, because the city can support the operator's supply management, the operators are now able to better distribute their vehicles across the city.</p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'The most value the shared mobility operators have gotten from the pilot and use of data standards, thus their cooperation with the city, is the increased positive reputation and increased offer in more areas. So, for example, the permissions of those stations, was the one of the negotiations of the pilot. So, if there are 25 stations, half of them is on the city land and half of them are on private land. So, whether it's like a, I don't know, food store, I was communicating with the owner of the of the land whether the station can bring there. The municipality made sure that everybody who wanted to join could have a spot on their land for a station. A lot of citizens got excited and the reputation of shared scooter got bigger and better. So, I think definitely the city played an important role in the negotiation phase.'</i></p>
<p>Summary Interview Thierry Vanellander and Elnert Coenegrachts, University of Antwerp</p>	<p>Thierry thinks that actors want to participate if there is a win-win situation. This win-win situation must be the same for all parties, otherwise the party that makes less profit in sharing the data will refrain from sharing.</p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'In that way, we are flexible, and we get more quickly the research, the responses to things that we feel are more important in each moment and big tech companies can have a huge part of that. We are working closely with move it, for instance, to give us information about public transport occupancy, that we don't have a way to measure that right now to improve all GTFS feeds, and to improve the work with each one of the operators in the public transport system. So, they can easily provide a better real-time solution for the catalogs for, everyone. So that's a little bit to the way that we try to work with each one of them, their specialties, and trying to make small, but very effective one-to-one deals or pilots, projects, contracts, whatever that can give us some information that we feel is necessary right now.'</i></p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'Yeah, but definitely I think with better understanding of user behavior, we can also understand where to create more parking space or other stations.'</i></p>

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Profile of quotes labeled as 'Win-win offer'.

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1.6 Bottlenecks in implementation

  Difficulties to institutionalize on a European level	FREQUENCY IN PROJECT 5
  Discussion implementor - European level, National level, City level	FREQUENCY IN PROJECT 1
  Discussion role of municipality - processor v.s. controller	FREQUENCY IN PROJECT 16
  Lack of data governance capabilities of cities	FREQUENCY IN PROJECT 21
  Lack of regulations	FREQUENCY IN PROJECT 7
  Lack of technical capabilities shared mobility operators	FREQUENCY IN PROJECT 5
  No urgency for the use of data standards	FREQUENCY IN PROJECT 4
  Reduced market adoption due to commercially sensitive data	FREQUENCY IN PROJECT 10
  Reduced market adoption due to lack of target reasoning	FREQUENCY IN PROJECT 3
  Reduced market adoption due to privacy concerns	FREQUENCY IN PROJECT 4
  Trust issues	FREQUENCY IN PROJECT 5

Sub-concepts of the concept 'Bottlenecks in implementation'.

1.6.1

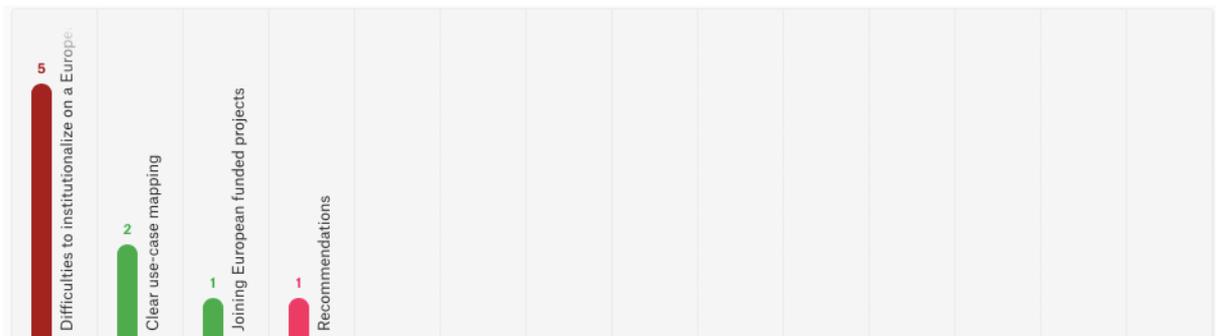
Source	Bottlenecks in implementation: Difficulties to institutionalize on a European level
Long term bureaucratic system Not directly falling within one General Directive	A bottleneck that he foresees is the long time it takes for a data standard to become 'European', due to bureaucratic systems. In addition, he also thinks a potential bottleneck could be the fact that CDS-M does not fall under traditional subjects of the DGs of

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<p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>the European Commission and regulation. He therefore indicates that there must be a great sense of urgency for a data standard for partial mobility at the European Commission and the cities, and he expects that this urgency will have to grow and that it may not yet be sufficient.</p>
<p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>Because the RDW is an authority, they are often in consultation with the European Commission and its General Directives. Geert indicates that there are many different General Directives (DGs). The RDW cooperates most often with DG-REFORM, this Directive is in tasks quite similar to a ministry of economic affairs, the car is included, because it is one of the most important industries in Europe. Besides DG-REFORM he is also aware of DG-MOVE; which tackles infrastructure, emissions, road signs and traffic regulations, and DG-CONNECT; standardization of connections, radio waves and sensors, and DG-RTD; the research directive. So, these DGs each have their own function, but none of them contain data standards for Shared Mobility as a whole, this subject is partly covered by all of them. Shared mobility and its regulations have not yet been laid down or substantiated in a DG.</p> <p>Geert Pater indicates that the DGs do not cooperate well with each other and often do not even know what they are developing and implementing. This is because the DGs are terribly large and layered. For this reason, he expects it to be difficult to attach a data standard for shared mobility to a particular General Directive. Cooperation among these DGS only occurs when there is an important connecting factor, such as safety, cyber security or the environment.</p>
<p>The standard must represent a major public task and fall under a European regulation or ISO standard</p> <p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>Geert says that a standard that is made 'European' must comply with a number of things. Firstly, the standard must represent a major public task, such as safety or the environment. Recently, the environment has mainly been seen as major ground, says Geert, and he advises me to talk to Bert Timmermans about this. Another processing ground could be the Road Traffic Act, Article 2 which includes traffic flow, road safety and the preservation of infrastructure and sustainability. Another way of making a standard 'European' is to link the standard to an ISO standard or to cooperate with the NEN, National Standardization Institute.</p>

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<p>The standard must represent a major public task and fall under a European regulation or ISO standard</p> <p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>How these standards are organized under regulations or as ISO standards can be seen in the figure. Each European standard is either included in an ISO standard or falls under a regulation.</p> <p>In other words, if the CDS-M is to become a European standard, it must be covered by a single regulation or laid down in an ISO standard. Peter agrees with Geert that you have to be able to put it under an existing framework regulation. A regulation is often based on major objectives such as safety or the environment. According to Peter, CDS-M must first be further developed so that the processing grounds and objectives are completely clear. Only then will it be clear which ISO standards are applicable and which regulations are appropriate. It may also be that a new ISO standard has to be formed, which will take years.</p>
<p>A European project could be subsidized only if the standard is widely adopted in the European Area</p> <p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>The European Commission subsidizes Smart Mobility projects, but in order for an initiative to be included in European legislation, the standard must first be adopted in the European Area.</p>



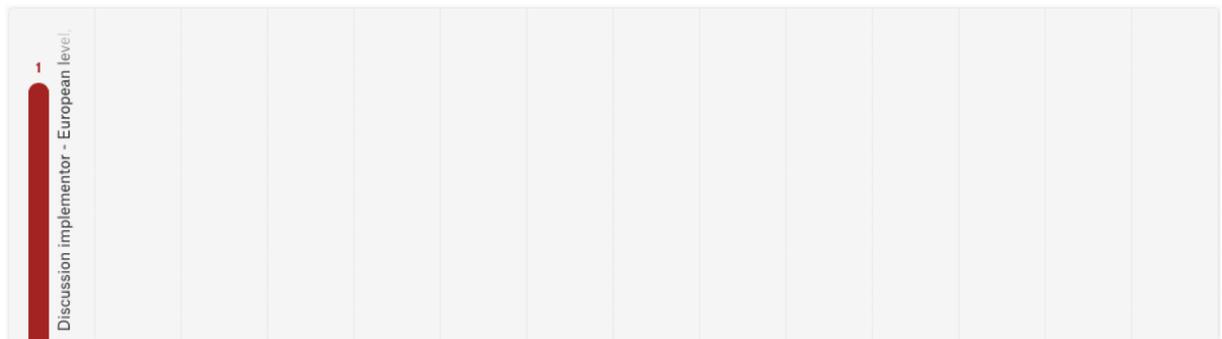
Profile of quotes labeled as 'Difficulties to institutionalize on a European level'.

1.6.2

<p>Source</p>	<p>Bottlenecks in implementation: Discussion implementor</p>
<p>Transcript Interview Sergio Fernández Balaguer - Madrid, Spain</p>	<p><i>'The point is that at least here in Madrid we have too many, from my own point of view too many levels of competencies, responsibilities in this regard because we have European suggestions, instructions, directives, et cetera. Then, it's translated by our national authority, which basically they really don't want to get very much into deep details. They want to leave it kind of quite open, just setting the basic</i></p>

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	<p><i>rules and work on this national license point. But then we have the regional level, which is the government of the region. It's the really the Public Transport Authority, the one that should lead this debate and set the basic framework for all the different mobility operators in the region. I think in Madrid there are about 40 different ones just for public transport, and then you have six e-car sharing companies, maybe another six of e-motor sharing companies. Before the pandemic, before this mobility crisis, I think there were even around 19 different e-scooter companies. Many of them have disappeared. So, it's quite a complex ecosystem and the point is that we, as a public transport operator, don't have the competence to force others to adopt any decision in this regard. That should be done by higher level administration'.</i></p>
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Profile of quote labeled as 'Discussion implementor'.

1.6.3

Source	Bottlenecks in implementation: Discussion role of municipality - processor v.s. controller
<p>Economically more advantageous to outsource data processing</p> <p>Transcript Interview Sami Sahala - Helsinki, Finland</p>	<p><i>'And in the case in London, what is the value of opening up the data instead of owning it? The value was around a hundred and thirty million pounds a year or something or something like that. Anyway, it was huge. This is the proof, that we don't always have to own the services and data. OK, long back story. But this is how we work in Helsinki.'</i></p>
<p>Prevent fender lock-ins and enhance digital expertise of cities, by acting as processor and controller</p>	<p><i>'API driven completely. I think that independently of the solutions that we have I think the most important part is the connectivity. For me it does not matter, Typhon or Java or whatever, what matters to me is the outcome, that it is manageable. That we can update and maintain it over time easily. We have had some vendor lock-ins for specific technologies or solutions. We really hate that, and we are trying to avoid that as much as possible, but this is an API driven approach. So, we develop the catalog, we'd like to broadcast the idea of the catalog</i></p>

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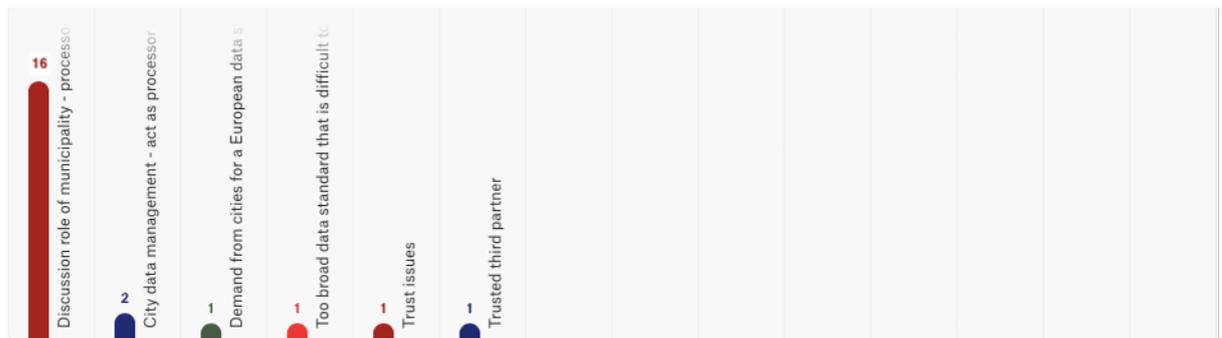
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>with the others. So, they can adopt it. And this would be a new standard. And everything should be structured, in a way that if some aggregator comes into the city, a magical Gator, a Whim, whatever, we don't start the discussion all over again, we give them to them a catalog that has all the end points organized.'</i></p>
<p>Prevent fender lock-ins and enhance digital expertise of cities, by acting as processor and controller Outsourcing data processing speeds up the digitization process Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'Because what do you do if a third party opts out and you do not have the knowledge yourself? So, I think with a private third party, there's always a risk. We do not want to be married to the party. Yeah, like that they are kind of controlling. But then again, they can also help a lot.'</i></p>
<p>Summary Interview Karen van Cluysen, Polis</p>	<p>Brussels is now creating an extensive regulatory framework and is now in the pilot phase with Vianova. Brussels, too, does not yet know whether it wants to internalize or outsource data processing.</p>
<p>Act as processor to ensure the privacy of operators Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'Could you give me a little bit more of context about why you're concerned about using a data broker and a cloud-based solution?'</i></p>
<p>Summary Focus Group Helsinki x Amsterdam</p>	<p>Helsinki indicates that this is a pilot project and that this is also a question which they hope to be able to answer after the pilot project has been completed, whether to outsource the data management or not. Helsinki states that the concern of opting out could be resolved by smart contract, as are now used with the Vianova Pilot.</p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'I don't know if Vianova is the way to go. I do not know whether the platform should be private, or municipality owned. We have the same discussion at the moment with the E-hubs and parking. I am not sure about what is the municipality's role. If companies would let municipalities use their dashboards, then that would also be a solution. However, if there are a lot of operators in the future then a Third Party could be needed in the long run.'</i></p>
<p>Economically more advantageous to outsource data processing</p>	<p><i>'In a way, yes. It is similar. Over the years, I've been using the method that a city has to be an enabler. We should not manage the end user service, unless it's really, really critical that we do. For example, in health care services. But otherwise, it is beneficial that that we enable</i></p>

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Transcript Interview Sami Sahala - Helsinki, Finland	<i>third parties to do job. Again, cost wise it is beneficial, but it also creates more added value as well.'</i>
Economically more advantageous to outsource data processing Summary Interview Augustin Helmut – Vienna, Austria	In his view, working with a data broker is not a problem. On the contrary, he thinks that a large market will emerge for data brokers and a great deal of competition. As a result, data brokers will probably be able to provide the service cheaper and better than the municipality itself.
Act as processor for upscaling MaaS Transcript Interview Valeria Caiati, TU Eindhoven	<i>'In my definition, it is so where I see governments extracting data from all the interactions within the MaaS ecosystem and also providing the physical interactions like video, for instance, maybe dynamic to your friends, go to the streets in rates and tariffs, subsidies, whatever, this exchange of information. And so, the role of the government, local governments as well, is facilitate this communication and cooperation and to lay out their public cause. I see that also as part of the MaaS ecosystem there, too.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'In my opinion, we don't always have to own the data for such a purpose. In the traditional, public sector way of thinking we do. The traditional way is to buy a service with a budget, own the data, analyze it and eventually publish it. But can't we also analyze the data, without owning it? In my opinion, there's not always a reason to own that data. We should only understand the data, which could also be done by using access rights, for example.'</i>
Outsourcing data processing, in such the communication is B to B which increases the feeling of privacy of operators Summary Focus Group Helsinki x Amsterdam	In Sami's opinion Helsinki does not have a need to access the raw data, in his opinion the access to the dashboards is sufficient. If the city would own the data, then they are obliged to publish this data openly and this could cause market parties to withdraw. Another benefit from using a trusted third party, is the increase in the feeling of privacy preservation.
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Should we do it as a as a city? Should outsource it? What are the pros and cons in this kind of approach?'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'So, I think when coming to a uniform standard, we should also think about what the benefits are of using such a middleman there?'</i>
Summary Interview Karen van Cluysen, Polis	The question is whether cities want to internalize this capacity or outsource it to data brokers, to companies like Populus, Vianova and Blue solutions and blue systems.

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<p>Prevent fender lock-ins and enhance digital expertise of cities, by acting as processor and controller</p> <p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'I can tell you that MiMoGG costs about 750,000 euros. It's running smoothly on our server with a very old sober dual guard wich is not consuming a lot of data or energy. So, it was a very nice and cheap options to invite going to the commercial parties which gave us I think a much deeper understanding on what we can do with data, because it would, it would be much easier to spend 20.000 or 30.000 on an annual license just to get access to their platform. But then you have a lock-in effect, and they have access to all the data of the providers. And moreover, we as a city won't learn from the data, we would get beautiful reports, but we would not understand how to use the data of the city, or even be able to describe what is presented. Now we have much better knowledge of what we want to know.'</i></p>
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Profile quotes labeled as 'Discussion role of municipality - processor v.s. controller'.

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Source	Bottlenecks in implementation: Lack of data governance capabilities of cities
Summary Focus group Open Mobility Foundation x Amsterdam	According to Ross, another thing that influences the implementation, are the data governance capabilities of cities. If a standard is too broad and difficult a lot of cities will not adopt it. This could be a possible bottleneck for the implementation of a European carried data standard.
Summary Interview Karen van Cluysen, Polis	An area of tension for these use cases is the lack of experience a lot of cities have in the field of data processing, analysis and management
Transcript Interview Mélanie Gidel - Paris, France	<i>'And, uh, but we are mostly interested, in fact, MDS, which is more complicated to handle. So, we will first make use of the GBFS.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Another challenge is that there are new types of data that that you need to learn how to use and utilize. But what if your whole work process has been for decades focused on using some statistics that get a couple times a year. So, the city planners need to learn how to use more detailed data. So, there's no point in having the data unless you understand how to use it.'</i>
Transcript Interview Benjamin Rabenstein and Frederik Mehler - Berlin, Germany	<i>'But how you can handle this and how you find this point, who is doing this for you I think in my opinion, it's really, it's hard for us to get the infrastructure and a working thing that we get this data and do the things, answer the questions ourselves. I think at the moment, we don't have this infrastructure as the team.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'But we have to understand how to use that new data that is flowing in. How to utilize it and get the most benefits out of that. And personally, I think we suck at that.'</i>
Transcript Interview Sergio Fernández Balaguer - Madrid, Spain	<i>'City of Madrid at the moment doesn't have a proper data management coming from all the shared mobility operators.'</i>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<i>'I think they always said they will do this on an aggregated level, only on an aggregated level at the moment. But we don't have the infrastructure to handle this data. This is always the point, that we don't have the infrastructure also to handle the aggregated ones. We have to get some heat maps, pictures to define some spots where electric scooters could get space to park there. Therefore, we get some pictures, but not like a database or something like this that we</i>

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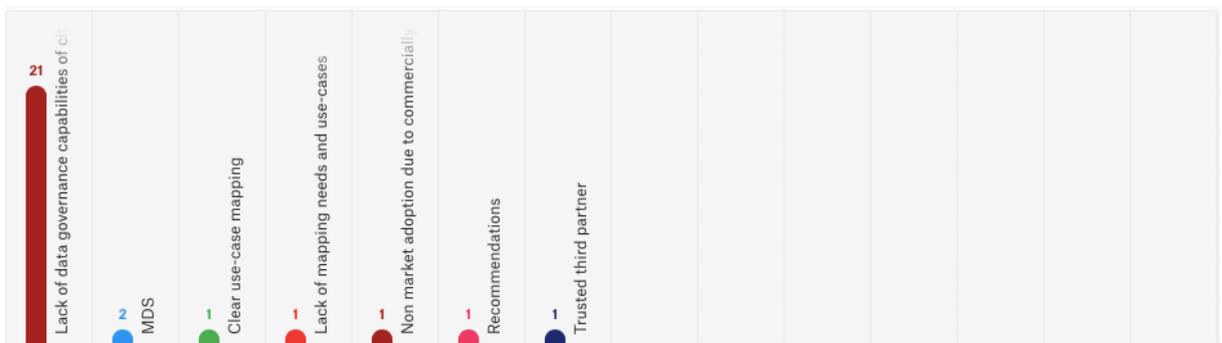
	<i>can look in on ourselves. We don't have the infrastructure and resources for doing this. So this is the point at the moment.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'I'll give you a little bit of data and you give me some data back, but according to the metrics and to the use cases that we are focused on, because if Google gave me everything they have, I do not know where to start with. So, the thing again, no, this is, this is true. It's like, even if I had MDS all together, which is quite small standard out, I would probably spend six months just organizing the data to make sense of that. So, I think that what we should look at is use case driven solutions and API driven frameworks.'</i>
Summary Focus Group Helsinki x Amsterdam	In Helsinki, they have the premise that the city is not going to build a platform or a data management model. They are convinced that this is better left to tech start-ups, or another private party.
Summary Interview Karen van Cluysen, Polis	Karen highlights that even the big cities are still in the infancy phase. 'Madrid, for example, indicated this last time in a meeting, which is quite remarkable because they are very far advanced in other areas of innovation
Summary Interview Mikael Ivari - Gothenburg, Sweden	Mainly static data is used for this visualization, they are not yet in the process of using dynamic data.
Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority	Peter also agrees with Geert that a Trusted Third Party could suiting option. According to Peter, processing and storing mobility data requires a lot of capacity and expertise. Within the RDW, 5 billion license plates are requested per year. The RDW manages the parking and license plate register. Safely storing this data is a major task. The RDW has an entire department with Privacy Officers and data scientists who maintain this system. For every change to the system a privacy impact analysis is made. It is also often necessary to re-occupy the system. Many municipalities do not have this capacity, Peter Jager thinks, which is why it he advises to work with pre-anonymized data, or work with a Trusted Third Party.
Reduced market adoption due to the market monopoly of a Big Tech company Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority	He indicates that cities have an important role to play in creating this urgency for and capability of data governance, because if it takes too long the market players take over this role, and cities are dependent on data brokers and Shared Mobility Operators.

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<p>Summary Interview Karen van Cluysen, Polis</p>	<p>Philippe Crist of the International Transport Forum is knowledgeable in the technical aspect of data standards and the policy side. He works closely with Polis. In a seminar last week, he indicated that we are still at a too early stage with data-driven policy and the formation of use cases and regulatory frameworks. Only when both have been properly worked out, a decision can be made regarding which data standard fits best.</p>
<p>Transcript Interview Sergio Fernández Balaguer - Madrid, Spain</p>	<p><i>'So, for instance, the e-scooters, the city decided to issue licenses to these companies and there are some obligations in terms of at least letting some sort of access to the city officials to check information about the company. But it's not being done in a proactive way. That is, the companies don't provide input or data proactively in some sort of automatic way. And so, the people who is in charge of the city council, they have some user and password, but they need to go to the platform and access as if they were managers of the company let's say. And they have limited access not to all of the data, but just some of the data. So just location or maybe the demand, which is at a certain point of day, et cetera. So, it's not really well advanced.'</i></p>
<p>Internal communications</p>	<p>The criteria of necessity and proportionality must be met at all times. She emphasizes that retrieving the data is not the problem, after that it must be properly aggregated and stored as open data, that is where the difficulty lies. There is not enough knowledge and capacity in house right now to constantly check whether the open data can still be made anonymous, for example, by new data sources and technology. So, the request of data is not the problem, rather the maintenance of the stored data.</p>
<p>Summary Focus Group TfGM - Greater Manchester, Great-Britain</p>	<p>There is no API access or standard yet. They are not in the position to be able to this, due to the lack of people and expertise in data governance.</p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'To be honest, I can say that we are not prepared. We cannot share with them where the traffic lights are and what is the lights on each one of the traffic lights. We cannot share where the stop signs are. So, it's very simple things that I think that we should work on. Otherwise, we will be smashed with someone who will tell us in five years, and we should be able to discuss about these topics in cities and work towards the same goal.'</i></p>
<p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'We still haven't figured that out completely. And now, I guess pretty much learning. So, yeah, it's something that's pretty new. So, yeah, I</i></p>

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	<i>guess it's also like the normal the operations that they're running, it's something that obviously they're not baked or at least the schoolbooks don't mention or the nor the shared mobility and even less this logic of governance by algorithm.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'Well, we're not really consumers of the data, so it's something that we could be playing more of an active role in regard to almost like a pedagogical aspect. But the truth is, it isn't much of a role that we've played out. So, it doesn't mean that we shouldn't do it. But the truth is, up until now, it hasn't been in the place that we could do it ourselves.'</i>



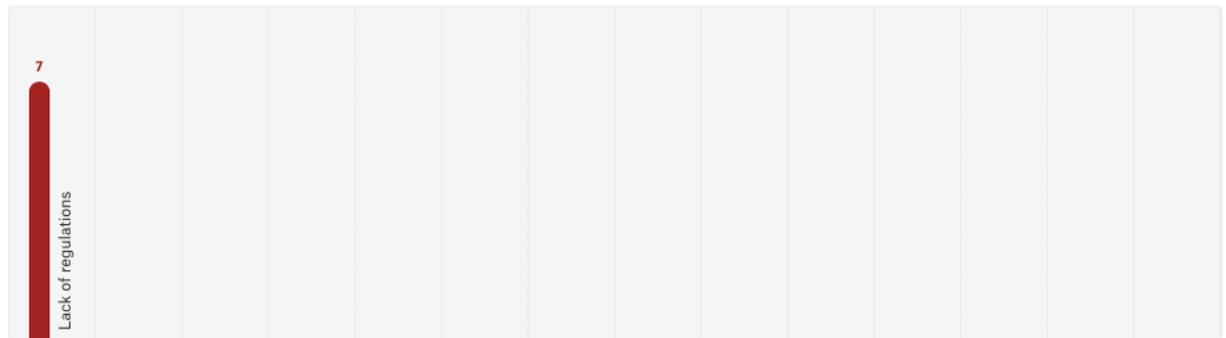
Profile of quotes labeled as 'Lack of data governance capabilities of cities'.

1.6.5

Source	Bottlenecks in implementation: Lack of regulations
Transcript Interview Sami Sahala - Helsinki, Finland	<p><i>'And if you are in a position that you can't get a license for them to use your infrastructure, and the starting point is a little bit different. But we need to be cooperative in a sense that we don't have that starting point. We can't control the legislation here in Helsinki, unfortunately. We can't control the number of E-scooters companies, for example, they are free to come and operate in our cities and us. We can't put out a public tender and then grant a license for just three of them, for example.'</i></p>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<p><i>'And we at the moment have the problem that we don't have a clear appointment with the operators that we get the data because it's not regulated at the moment. We need the changes in laws and things here that they have to get permission from the city when they want to offer their services there, and then they also have to give us the data then. And this is the point where we are planning to change the law and the regulations at this point, and then we have some ideas how we can get the data and use the data, but at the moment we don't have really data.'</i></p>
Transcript Interview Sergio Fernández Balaguer - Madrid, Spain	<p><i>'For instance, car sharing companies, they don't need to apply for a license. So as soon as they are using electric vehicles, as they are exempt from the public parking scheme, they can park for free, they really don't need to apply or ask for a license. And therefore, the type of input they provide to the city is kind of on a voluntary basis.'</i></p>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<p><i>'In Berlin, you don't have already parking fees overall in the city. So, there aren't a lot of streets, only around I think at the moment 20% or something like this of the city center have really the parking fees. This is a thing we really have to implement first, and then the people will think about it. So, there are lots of steps to get over and to do before we can have something like this.'</i></p>
Transcript Interview Suvi Kajamaa – Espoo, Finland	<p><i>'The parking spots in the public areas they have been only guided with time limits. But not with fees. We are changing this in the city centers. We will get certain areas with fixed price; I think most likely starting from next February. So that will hopefully change the business. But basically, in Helsinki, we have these kinds of like a citizen parking commission. We have to change this, because now the shared car companies have the same permits as the citizens, but now</i></p>

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	<i>the parking spaces are getting too full of shared, cars so there is too little space for the citizens. So, it is like a legal issue.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'VOI and TR, they are providing their data, but 'Lime', doesn't. Which is weird, because they are doing it in the U.S., and they have their interfaces ready.'</i>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<i>'We're still working on some issues and having a change of a local specific law which is going to give us more implications and also regulations to ask for specific data and also give the providers a little regulation, how they perform and how many cars, or other assets they can place in public space.'</i>



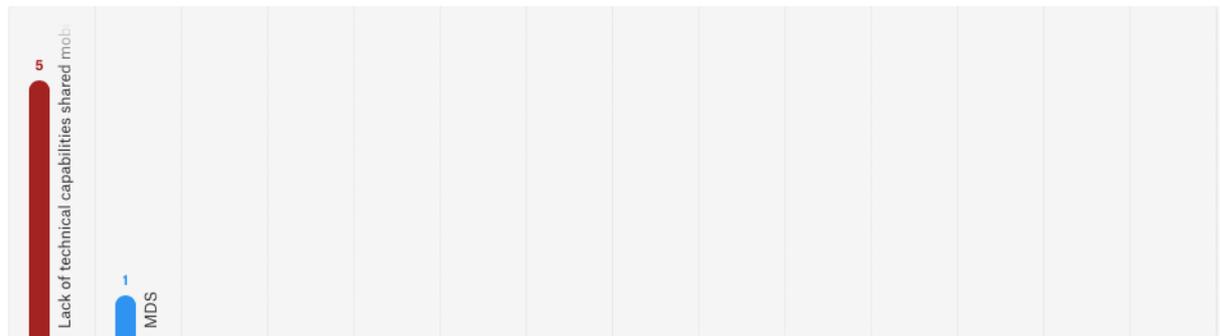
Profile of quotes labeled as 'Lack of regulations'.

1.6.6

Source	Bottlenecks in implementation: Lack of technical capabilities of operators
Transcript Interview Mélanie Gidel - Paris, France	<i>'And actually, it was quite difficult at the beginning to get the operators to provide the correct data through SIVU. For instance, they were small mistakes in geolocation, there were scooters in the middle of the sea or things like that.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'And moreover, often providers do not understand what they have to do to comply to the GBFS because sometimes they come from venture capitalists that just puts 200,000 euros in their hands to explore a solution in Lisbon. And they don't have a clue about it. About APIs and about mobility as a whole. They are just managers trying to make sense of it. And we found that very difficult. It was a hard time putting the providers to provide the correct format according to the published GBFS you will not expecting that.'</i>
Summary Focus group Open Mobility Foundation x Amsterdam	But mis presentation could also be present, because of the lack of technical abilities.

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<p>Transcript Interview Sami Sahala - Helsinki, Finland</p>	<p><i>'It wasn't that easy because the skilled APIs of MDS were not aligned with the APIs the micro mobility companies were using. So, it took a lot of time to get the data flowing, especially in a bit more real time as we would like to have it.'</i></p>
<p>Summary Focus Group Helsinki x Amsterdam</p>	<p>Vianova uses MDS as data standard and, so far, the City of Helsinki has not experienced any problems, but they recognize that they haven't had the opportunity to compare it to another standard yet. They indicate that it took some time for the operators to make sure that MDS worked properly with their servers, and this is still an ongoing process.</p> <p>The city of Helsinki does not have a preference for a certain data standard, as long as the operators want to work with it voluntarily and it offers qualitative and reliable data. They say that the use of MDS is not perfect yet, for example, sometimes an average data comes out, which is totally unrealistic, because one vehicle movement has increased the average distance enormously.</p>



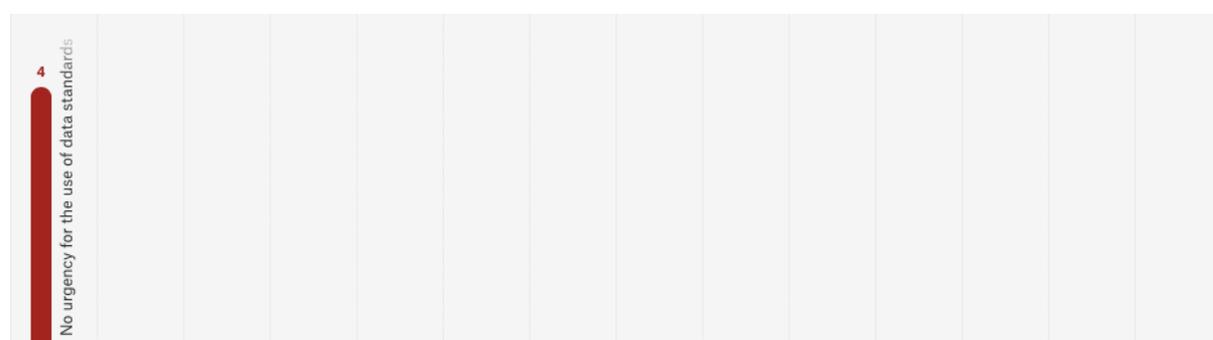
Profile of quotes labeled as 'Lack of technical capabilities of operators'.

1.6.7

<p>Source</p>	<p>Bottlenecks in implementation: No urgency for the use of data standards</p>
<p>Traffic department and urban planners Summary Focus group Amsterdam x NeTEx</p>	<p>Furthermore, he states that in Amsterdam the traffic management and urban planning department do not feel the urgency for real-time trip data, they only use aggregated data and find that sufficient.</p>
<p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>He therefore indicates that there must be a great sense of urgency for a data standard for partial mobility at the European Commission and the cities, and he expects that this urgency will have to grow and that it may not yet be sufficient. He indicates that cities have an important role to play in creating this urgency, because if it takes too long the market players take over this role,</p>

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	and cities are dependent on data brokers and Shared Mobility Operators.
Traffic department and urban planners Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Their current reaction is wow, quite interesting, maybe we will use it once or twice, but that's great. So, they do not see it as a large part of their work method yet.'</i>
Transcript Interview Suvi Kajamaa – Espoo, Finland	<i>'I think in Finland, we still have too much of this 'against thinking' regarding getting rid of your private car. A lot of citizens do not yet understand that the goal should be that we are all multi-users of transport, because I think that's is the prerequisite for finding better sustainable mobility solutions.'</i>



Profile quotes labeled as 'No urgency for the use of data standards'.

1.6.8

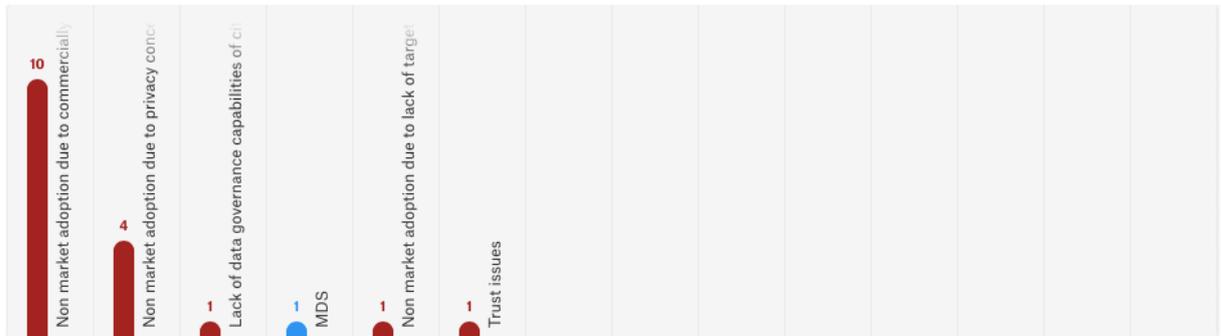
Source	Bottlenecks in implementation: Reduced market adoption due to commercially sensitive data
Internal communications	Beryl indicates that Privacy is often used as a shield not to share data by market parties. She says that privacy is often not a legitimate concern at all, but rather a commercial initiative.
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	However, the parties are not yet making use of this. According to Thierry, this is due to a lack of trust, mainly that parties are afraid of distortions of competition in a horizontal line.
Summary Focus group Amsterdam x NeTEx	In this version the agency API is functional, the API which requests real-time trip data. Ross explains that this API causes reluctance from the shared mobility operators in Amsterdam. He says that these operators are afraid of data breaches, due to the lack of expertise of the government, and moreover they are concerned about the fact that their business model could be discovered by competitors if the data, even if in an aggregated format, is

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	published as open data. The operators see this data as commercially sensitive.
Summary Focus group Open Mobility Foundation x Amsterdam	Market parties often do not want to use that API, because it processes real-time trip data which can be commercially sensitivity, in particular if the city has access to other datasets. The more datasets are combined, the more you understand, the larger the chance of identifying business secrets and business models.
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'So, the companies, are completely against sharing their data with MDS. And we can imagine why, because they were exploring the data themselves and they want to be the sole users of such data.'</i>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<i>'That this is an open data thing and we always have fights between the operators and us and it's always a little bit funny because they [inaudible 00:08:49] that all people have this information and they do not really want to share it.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'There are always data sharing issues, because of the companies' privacy concerns or fear to lose their business secret. Somehow, the image of the use of data by governments is bad, companies some sort of Big Brother issues like now the global government sees when I'm traveling, which is really bad.'</i>
Summary Interview Karen van Cluysen, Polis	This lack of clarity creates reluctance of the market parties, on the one hand because of privacy concerns, but also because of the protection of commercial interests.
Summary Interview Mikael Ivari - Gothenburg, Sweden	Why the private sector is reluctant, according to Mikael, is because the data can be used for multiple purposes. How can they be sure that the data will only be used to optimize mobility? And not by a competitor. Mikael states that the government in Sweden must always be open and provide information if someone asks for it. In Sweden, the government cannot properly safeguard business secrets through this law, the open data policy. As a result, a legal framework is needed to enable the government to use the data to improve mobility, without this data from providers simply being retrievable by anyone.
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'Yeah, this is this has been quite critical. It's something that surfaced with both because both they were better. We signed our agreement and then MDS popped up like a month or two after they started their operation. And, um, and what happened was that the operators were very cautious in regard to the data sharing. Initially, I wasn't sure if</i>

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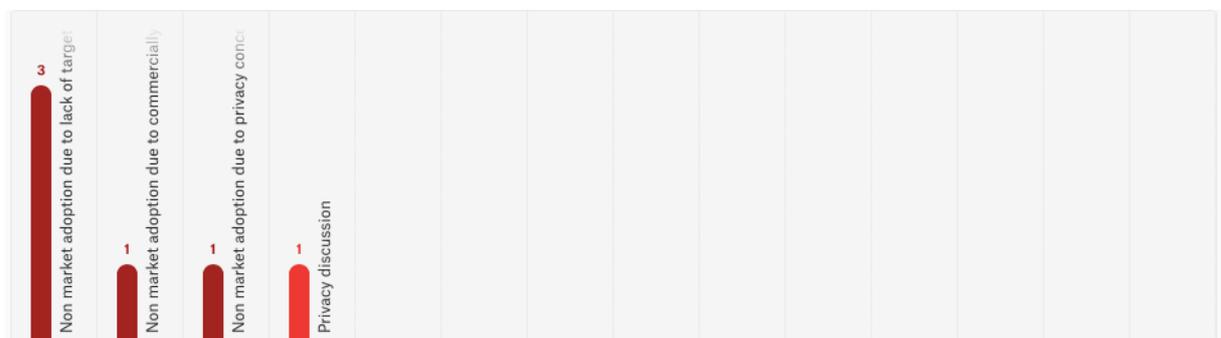
	<i>their concerns were really being GDPR compliance or if they just didn't want to share their data in a very granular manner.'</i>
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Profile of quotes labeled as 'Reduced market adoption due to commercially sensitive data'.

1.6.9

Source	Bottlenecks in implementation: Reduced market adoption due to the ack of target reasoning
Summary Focus Group TfGM - Greater Manchester, Great-Britain	In Manchester, they do recognize the issue of reluctance of market parties to participate. They stress that you need to work out what the relationship looks like. 'There should be clear guidance and legal text about data sharing. You need to determine how to make it fair, but also make it in line with our city objectives.
Transcript Interview Philippe Crist, International Transport Forum	<i>'They have to feel that they understand exactly what the data is going to be used for, and that's hard baked into GDPR in any case, because you have to say what the purpose is for this data collection.'</i>
Summary Interview Karen van Cluysen, Polis	This lack of clarity creates reluctance of the market parties, on the one hand because of privacy concerns, but also because of the protection of commercial interests.

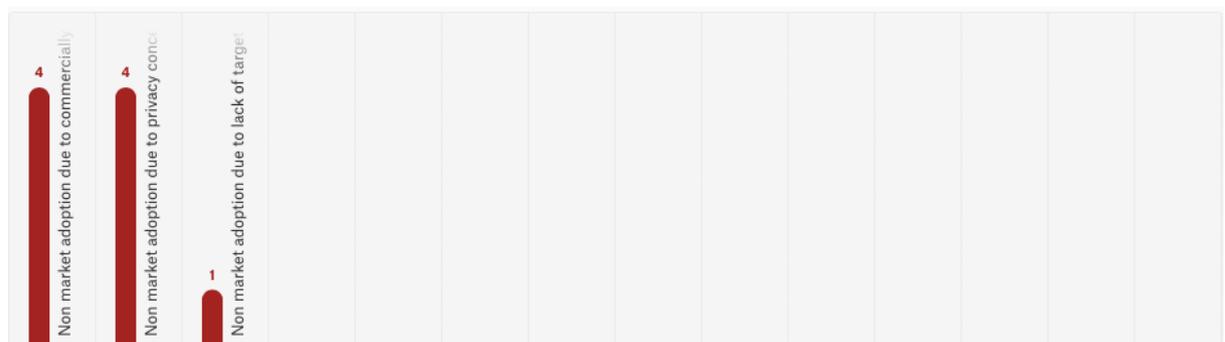


Profile quotes labeled as 'Reduced market adoption due to the ack of target reasoning'.

1.6.10

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Source	Bottlenecks in implementation: Reduced market adoption due to privacy reasons
Internal communications	Beryl indicates that Privacy is often used as a shield not to share data by market parties. She says that privacy is often not a legitimate concern at all, but rather a commercial initiative.
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'There are always data sharing issues, because of the companies' privacy concerns or fear to lose their business secret. Somehow, the image of the use of data by governments is bad, companies some sort of Big Brother issues like now the global government sees when I'm traveling, which is really bad.'</i>
Summary Interview Karen van Cluysen, Polis	This lack of clarity creates reluctance of the market parties, on the one hand because of privacy concerns, but also because of the protection of commercial interests.
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'Yeah, this is this has been quite critical. It's something that surfaced with both because both they were better. We signed our agreement and then MDS popped up like a month or two after they started their operation. And, um, and what happened was that the operators were very cautious in regard to the data sharing. Initially, I wasn't sure if their concerns were really being GDPR compliance or if they just didn't want to share their data in a very granular manner.'</i>



Profile of quotes labeled as 'Reduced market adoption due to privacy reasons'.

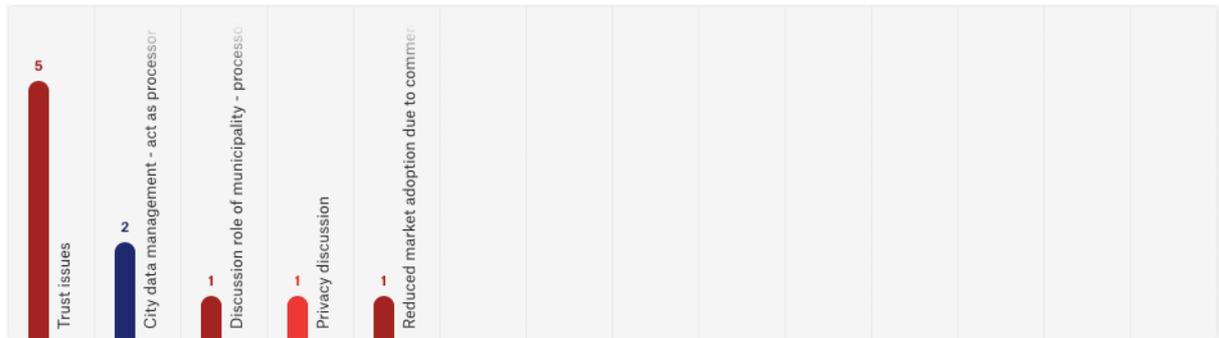
1.6.11

Source	Bottlenecks in implementation: Trust issues
Distrust cities in market parties in delivering qualitative data Summary Focus group Open Mobility Foundation x Amsterdam	According to Jascha, trust is an issue, especially in the U.S. Operators often do not deliver qualitative data, to protect their businesses.

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<p>Distrust in data brokers Summary Focus Group Helsinki x Amsterdam</p>	<p>Amsterdam indicates that they are afraid of outsourcing the aggregation and management of the data to one party, because they expect that when a conflict or problem arises, the intermediary could opt-out and they are left with a vendor lock-in.</p>
<p>Distrust in data brokers Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'Guusje van der Vossen: Could you give me a little bit more of context about why you're concerned about using a data broker and a cloud-based solution?</i></p> <p><i>Vasco Mora: Very simply because we found that the Vianova with the right reports and all the other blues systems guys that knocked on our doors, they were too keen on getting the data. They were not keen on serving the municipality. They were not they didn't ask us what we want. They show us what they have, and they come with a lot of policy options and possibilities that we are not looking for, like charging per bike per day, like finding them. We're saying, no, we are just looking at collecting data and have a better understanding of what these new solutions can bring to the city. And we, we found that they have very interesting reporting system and machinery none of them said I can install a solution on premises and not use the cloud solutions. Okay. And that is very strange. So, they are not selling a service. They are selling a solution that leads to them having complete access to the information off of the providers. And a lot of providers would not fancy with that. And found that these data broker companies were a little bit overdoing it and not looking at the city's requests, but just trying to push their solution forward.'</i></p>
<p>Distrust market parties in data governance cities Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp</p>	<p>However, the parties are not yet making use of this. According to Thierry, this is due to a lack of trust, mainly that parties are afraid of distortions of competition in a horizontal line.</p>
<p>Distrust in data brokers Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'With MiMoGG I can gather all the operators' data and present you solutions. What we believe is that these companies that came knocking on our door, they wanted more than just selling the solutions. They were willing to gather the information for themselves in a cloud-based system. And that is not necessary, to keep it in the cloud. We are transparent, so we developed something that we could use on our servers without sharing it with anyone, MiMoGG.'</i></p>

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Profile of quotes labeled as 'Trust issues'.

1.7 Practical possibilities in implementation

City data management - act as processor and controller	FREQUENCY IN PROJECT 10
Combination of standards	FREQUENCY IN PROJECT 8
MaaS map and toolkit data management	FREQUENCY IN PROJECT 8
Trusted third partner	FREQUENCY IN PROJECT 27

Sub-concepts of the concept 'Practical possibilities in implementation'.

1.7.1

Source	Practical possibilities in implementation: City data management - act as processor and controller
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'And maybe someone else has already a use case which is already important, for the trip-data, as shareable code, we can import it in MiMoGG.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'And what I drafted is exactly to start with micro mobility, because it's simpler than go to roadworks and go then go to networks and by networks, I mean, all the GIS information that we should be able to exchange. But this is like a little bit of a roadmap of what we want, but getting back to the shared mobility, I can, I think I can show you something that we use here for the micro-mobility. I'm working on this with the deputy mayors to be able to share the work. So, it is an open source, it is entitled. It is in post GIS and post-grad school sequel. So, we can share the solution that we have, the code that we</i>

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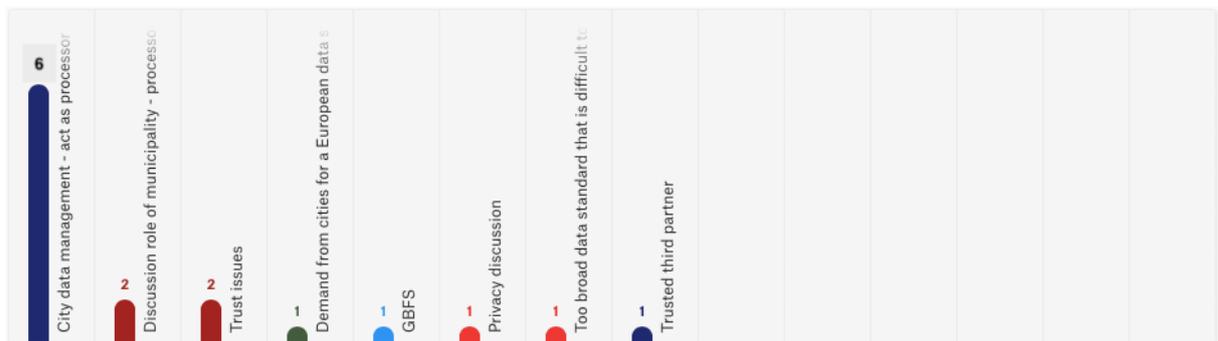
	<i>have developed, and we would like to put it live on GitHub from the municipality of Lisbon this December, like a Christmas gift.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'API driven completely. I think that independently of the solutions that we have I think the most important part is the connectivity. For me it does not matter, Typhon or Java or whatever, what matters to me is the outcome, that it is manageable. That we can update and maintain it over time easily. We have had some vendor lock-ins for specific technologies or solutions. We really hate that, and we are trying to avoid that as much as possible, but this is an API driven approach. So, we develop the catalog, we'd like to broadcast the idea of the catalog with the others. So, they can adopt it. And this would be a new standard. And everything should be structured, in a way that if some aggregator comes into the city, a magical Gator, a Whim, whatever, we don't start the discussion all over again, we give them to them a catalog that has all the end points organized.'</i>
Transcript Interview Vasco Mora - Lisbon, Portugal	<i>'Guusje van der Vossen: Could you give me a little bit more of context about why you're concerned about using a data broker and a cloud-based solution? Vasco Mora: Very simply because we found that the Vianova with the right reports and all the other blues systems guys that knocked on our doors, they were too keen on getting the data. They were not keen on serving the municipality. They were not they didn't ask us what we want. They show us what they have, and they come with a lot of policy options and possibilities that we are not looking for, like charging per bike per day, like finding them. We're saying, no, we are just looking at collecting data and have a better understanding of what these new solutions can bring to the city. And we, we found that they have very interesting reporting system and machinery none of them said I can install a solution on premises and not use the cloud solutions. Okay. And that is very strange. So, they are not selling a service. They are selling a solution that leads to them having complete access to the information off of the providers. And a lot of providers would not fancy with that. And found that these data broker companies were a little bit overdoing it and not looking at the city's requests, but just trying to push their solution forward.'</i>
Internal communications Beryl Dreijer, DPO Amsterdam	She indicates that she finds the constant outsourcing of technical services by the government problematic, because it makes the extraction of data increasingly undemocratic. This is because tech companies have become better at carrying out a public task than the government, in fact. Public task such as analyzing and improving the infrastructure, for example. She indicates that the

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	<p>municipality itself needs to acquire expertise and capacity in order not to become entirely dependent in its policy on these Tech companies and other consultancy services. She calls this the 'Hybrid cloud model'.</p>
<p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'The first step to that direction would be to take the historical data to be only sold by us. And then the analysis would be just like a module that would be reading our databases. So, that's like a first step. But for time being, we're not there yet, and do have lots of solution providers that want to sell platforms. Now, we're quite keen on it because our budget isn't very big. So, like we're not very big to jump on to any platform. But one thing we're certain is like it's more important to sort out the standards and to be having information that has some value and then really to have a platform. The thing is like having access to the information, has the most value.'</i></p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'So, we believe that active mobility is a real good compliment for public transport, but we want to facilitate the backbone of the mobility in Lisbon. So, we needed micro mobility, and therefore we started the development of a data management in late 2017 when 'Lime' knocked on our door at the beginning of the mandate. And we developed the solution okay, that is MiMoGG, we call it a micro mobility geo gatherer. So, it's a solution that we build ourselves, so we do not have to listen to all the companies that keep knocking on our doors, about proposals for writing reports, or a lot of guys that knock on our door saying, I am the best solution for you. With MiMoGG I can gather all the operators' data and present you solutions. What we believe is that these companies that came knocking on our door, they wanted more than just selling the solutions. They were willing to gather the information for themselves in a cloud-based system. And that is not necessary, to keep it in the cloud. We are transparent, so we developed something that we could use on our servers without sharing it with anyone, MiMoGG.'</i></p>
<p>Transcript Interview Vasco Mora - Lisbon, Portugal</p>	<p><i>'Yes, so it results from Postgres SQL called GIS, and Quentin, which are all open-source solutions. This was a little bit the architecture that we have. It's very simple. So, we get to the micro mobility providers data in the, in the feeds, we haven't extract transform and load solutions that we put in these files. Then we inject them into a database and create cubes, analysis topics. So, as you see in the presentation, we also have a reference database that has all the static data about parking and non-parking areas in the city. These cubes are our analytical cells of analysis. And then we can see these analyses per cube in a visualization. So, the first part is getting the</i></p>

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	<p><i>files is the transfer, then putting the data in the geo database, pleading it in the cubes, do an analysis and update. And it is so very simple. I was explaining this to two guys from city that were completely non-technical, and they still understood it. So, the only thing we are missing is a standard that could supply the GiMoGG with real-time trip data in a simple, privacy preserving way.'</i></p>
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Profile of quotes labeled as 'City data management - act as processor and controller'.

1.7.2

Source	Practical possibilities in implementation: Combination of standards
Transcript Interview Philippe Crist, International Transport Forum	<p><i>'And coming back to our present discussion, from our perspective, it's not necessarily a bad thing to have multiple specifications and data syntaxes. What would be bad is if all of these develop without that kind of more fundamental rethink of why share data, for what purposes and what forms and have that have certain clarity. The other thing that it would be, maybe, difficult to deal with in the longer run, if, say, these were structured in completely different ways. So, I think it would be helpful to have some basic functionalities that are common across all specifications and how those are carried out within each classification? Well, that might be context specific. It may be relating to the kind of activity that's being considered, but the functionality should be there. And that should be like the major bins that you could recognize. If MDS, you can see, okay, here is a functionality for a location. Here's of location of vehicles. Here's the functionality, highly restrictive functionality for gathering information on routes, on actual carried out routes. Here's the functionality for ID management, identity management, and have those bins identified that way. It makes the mapping between those much easier.'</i></p>

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Summary Focus group Amsterdam x NeTEx	Christophe mentions that it is the most important that these standards such as SIRI, NeTEx and CDS-M use the same definitions, in such there is interoperability. He explains that the same definitions are used in SIRI, NeTEx and Opra. From his point of view, we can have multiple standards for different uses if we make sure that they communicate in the same way.
Summary Focus group Amsterdam x NeTEx	Have you heard from the Oslo standard? These standards, as well as TOMP and CDS-M that support and incorporate companies and parties that would not be able to be part of higher excluded standards. They are smaller standards, but they should be included in the MaaS eco-system.
Summary Focus group Amsterdam x NeTEx	Ross answers that the CDS-M does not include passengers' information. He tells that in the Netherlands the TOMP-API can be used to retrieve availability data from, but it is not designed for that purpose. The TOMP-API is designed for communication between the shared mobility operators and the MaaS platform providers.
Summary Focus group Amsterdam x NeTEx	Ross explains that GBFS is more or less included in TOMP, has parts of the GBFS+. Christophe agrees with Ross that standard with different purposes is very effective, because of their dedicated scope.
Summary Focus group Amsterdam x NeTEx	The goal is to alter MDS towards a more European focused format now. And if that happens, NeTEx can be mapped in the MDS format as you told before.'
Summary Focus group Amsterdam x NeTEx	The NeTEx stand covers the exchange of scheduled information, before the service has been delivered, where SIRI covers the exchange of data in real time, during the service. OpRa covers the exchange of observed information through the Internet of Things, such as roads information, sensors and other curb data. Christophe tells that NeTEx and SIRI work in all code languages and that they are REST APIs.
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Guusje van der Vossen: Yeah. So, what I hear from you is that the collection aggregated flows of data for city planners could go hand in hand with experimenting with more detailed forms of data. By for example, doing pilots with companies like Vianova. That is a refreshing attitude.</i>

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	<i>Sami Sahala: Yes, you need to open up your view. I don't know how we get there and when we get there, but still, that's something I'm pushing at the moment.'</i>
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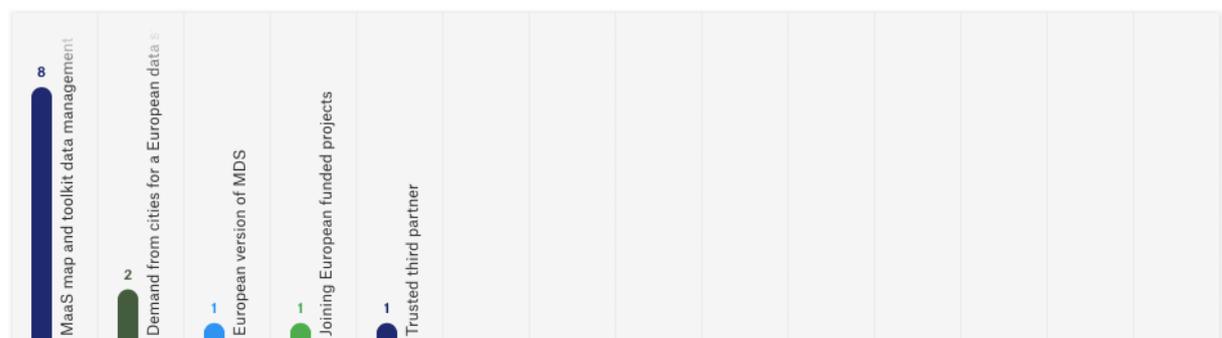
Profile of quotes labeled as 'Combination of standards'.

1.7.3

Source	Practical possibilities in implementation: Maas map and toolkit data management
Transcript Interview Philippe Crist, International Transport Forum	<i>'And so, we're just trying to carry out, what then are those principles that should be the basic architecture for any data syntax that is developed, in this case, in urban areas? And it's not exhaustive. It's a way of starting to think about, okay, these are the major characteristics of what I should be looking at. Am I doing that? Are there things that our membership, or national governments, are there things at the national level that have to occur for this to happen, are there other levels of government where these decisions can be made? But it's to be a piece on principles to guide data governance around this question of data syntaxes.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'But we need a European way of exchanging information. And this should not only be a technical standard, but also a data governance framework (toolkit). So that's as a micro mobility company going to another city, you know how things work.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'I guess if we have like a wider for example, like if we could improve the MDS, I guess that would be maybe more useful. But maybe even your standard, yes. But more important is a guideline in which data to request, in what ways to aggregate, where you're going to analyze it etc. That like shared understanding of data management within the European context.'</i>
Transcript Interview Suvi Kajamaa – Espoo, Finland	<i>'I think that besides offering a data standard, such as the CDS-M, cities need policy guidelines on how to further support shared</i>

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	<i>mobility with data and in general. How could you get out of the data where parking spots and stations should be situated? And what are other, broader measures you could take to offer space for micro-mobility and cycling. To shift to MaaS, which regulations should be place? Is payed parking required? How many parking spots are needed?'</i>
Summary Focus Group TfGM - Greater Manchester, Great-Britain	'It is much easier to work with a common standard, then if everyone has their own data standard. Having an open standard helps to facilitate an open cooperation and support. Therefore, they are advocates of a uniform data standard and common understanding of how to manage and analyze mobility data.'
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	'So, we're trying to work that way to be able to do as much as possible ourselves, but I think with the smart mobility department we should only try to define the use cases and not try to develop some kind of a standard or IT platform. It's not what we are designed to do.'
Transcript Interview Philippe Crist, International Transport Forum	'Yeah. In that vein, it has to be understandable to those that are going to be enacting these policies, so it's almost like they need a guidebook. If this, then that. If that, then this. Because they won't necessarily have the overall understanding. So, I think from the simplicity perspective, it also helps to have that map. The map itself, that mapping exercise has to be dynamic, and it will change, and it should change, and it should be re-evaluated, but it should exist.'
Transcript Interview Sami Sahala - Helsinki, Finland	'You don't have to start the discussion from the beginning. So, you need to have technical standards, as well as some kind of de facto process as well, which would mean the data governance and use cases.'



Profile of quotes labeled as 'Maas map and toolkit data management'.

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1.7.4

Source	Trusted Third Party
Summary Focus group Open Mobility Foundation x Amsterdam	A third party MDS data aggregator could be beneficial, because they could take over a lot of processing work.
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'A third party, which owns the data, could evolve their services quicker than a city. Which results in eventually creating more added value for smaller price tag than if the public sector would have done it. And at the same time the third party creates business and hopefully created other news services as well.'</i>
Transcript Interview Suvi Kajamaa – Espoo, Finland	<i>'And for me, the most important thing when working with Vianova is to learn and understand what the possibilities are with the data. We learn more from using a more detailed data standard with a third party, then when we would have used a simple standard by ourselves. All the mistakes by the operators are so transparent on the dashboard of Vianova.'</i>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<i>'And I agree with the privacy policy issues. That would also be an issue in Germany. If you bring that up as a municipality, there are going to be big discussions in the newspapers and people are going to be like, "I don't want to be dragged down by the senate of Berlin while I'm driving my e-scooter probably drunk through the middle of the city." Nobody really would love that. So yeah, I think without external providers we're not going to make that work. Yeah.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'And In my opinion smaller start-up tech companies have larger capabilities than the municipality. We as a city would just like to do some research on aggregated data about the micro mobility flows in the city.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'And so that's why we need this platform to really... Because it's not cost-effective for us to develop a platform. So basically, we're looking at these.'</i>
Transcript Interview Jorge G. Coelho - Faro, Portugal	<i>'And so, we've been assessing two different platforms. One is the North American Populous. And then there's this European one, the Vianova. We've been assessing both of them to see what demands they meet so we can design our specifications.'</i>
Transcript Interview Benjamin Rabenstein & Frederik Mehler - Berlin, Germany	<i>'At the moment, we definitely do not have the resources to do that in house and I think in the long run it's going to cost some money, but it's going to be more efficient in the long run if some external</i>

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	<i>provider is just going to deal with the data issues and then give you a certain form of aggregated data that you ask for that you can actually work with.'</i>
Transcript Interview Sami Sahala - Helsinki, Finland	<i>'Contrastingly, everybody is just happy to share that information on their phone, for example. So, if take the public sector out of that equation, as we did with the Pilot of Vianova, there is just some B2B arrangements, where you as a user that are part in. The companies experience more freedom, a feeling that you can always sign off. Therefore, the micro-mobility companies are okay with Vianova doing an analysis based on their data, also because the results of the analyses are really high-level stuff. And with this pilot, the city has no access to the raw data, however the end result, analyzed data for the city, is more or less the same. So, if you take public sector out of that, it's going kind of easier for the users as well to say, OK, fine, just use my data.'</i>
Summary Presentation 'Data sharing in Smart Mobility-reflection and solutions of the legal expert', at the MRA-festival	De Roos Advocaten recommend a possible interim solution, namely the Trusted Third Party (TTP). With these parties' contracts could be used, in which is stipulated that these data datasets may not be combined or used for other purposes. And because the data is not public property, there is less chance that political interests will use the data for other purposes. However, this still does not solve the problem that the main owner of the data, the mobility providers, do not remove the raw data. And because of this, the aggregated datasets can never be qualified as totally anonymous, if an objective interpretation of the criterion of reasonableness is assumed
Transcript Interview Suvi Kajamaa – Espoo, Finland	<i>'For example, the stations with forced parking, are communicated through the policy API. By doing so, communicating through the dashboard of Vianova, it was not a lot of work to show TR the zones, before that it was a lot of handwriting. So, if we would have had Vianova in the first place, it would have gone way quicker and easier.'</i>
Summary Interview Sarah Eskens, UvA	Having the data processed by a Trusted Third Party can increase privacy. This is because the municipality itself already has many other datasets of residents which, when combined, provide more detailed information, making the process more privacy sensitive.
Transcript Interview Martin Le Franc - Bruxelles region, Belgium	<i>'He was talking about this kind of trust architecture in data sharing and the three systems, either we don't trust the governments, and providers do everything on their own. We don't trust the providers,</i>

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	<i>we aggregate. And then there's this third-party kind of interface, like Vianova or Populus or Remix or this type of a data broker, I think are interesting in generating the trust in the system. I think it's an interesting approach.'</i>
Summary Presentation 'Data sharing in Smart Mobility- reflection and solutions of the legal expert', at the MRA-festival	However, the GDPR does not prohibit the use of personal data. De Roos Advocaten therefore argues that Smart Mobility should not be impeded by this data. However, such data must be treated as personal data. And privacy preserving techniques and measures should be used as much as possible. Such as the use of TTPs and privacy by design.
Summary Interview Karen van Cluysen, Polis	In addition to bringing a great deal of expertise, these parties can also function as a neutral intermediary between the cities and operators, they act as a Trusted third party.
Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority	In addition, Geert indicates that a Trusted Third Partner would also be a good option for using data standards and processing and storing the shared mobility data. This has already happened before with parking in Amsterdam. RDW uses the parking register and communicates this to the Parking Service Centre, the Trusted Third Party, they have the parking data and communicate this to Parkmobile and the enforcers. This could also be tackled in this way with data from shared mobility in the city.
Summary Interview Augustin Helmut - Vienna, Austria	In his view, working with a data broker is not a problem. On the contrary, he thinks that a large market will emerge for data brokers and a great deal of competition. As a result, data brokers will probably be able to provide the service cheaper and better than the municipality itself.
Summary Focus Group Helsinki x Amsterdam	In Sami's opinion Helsinki does not have a need to access the raw data, in his opinion the access to the dashboards is sufficient. If the city would own the data, then they are obliged to publish this data openly and this could cause market parties to withdraw. Another benefit from using a trusted third party, is the increase in the feeling of privacy preservation.
Summary Focus Group Helsinki x Amsterdam	It is emphasized that having an intermediary, in this case Vianova, and the fact that the government receives only aggregated data makes citizens less likely to feel like a government that has too much influence ('Big Brother').

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<p>Summary Focus group Open Mobility Foundation x Amsterdam</p>	<p>Jascha mentions that European cities do currently only use MDS through a third party to execute their data processing. Third parties such as, Populus, Blue systems and Vianova help them with that.</p>
<p>Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority</p>	<p>Peter also agrees with Geert that a Trusted Third Party could be a suitable option. According to Peter, processing and storing mobility data requires a lot of capacity and expertise. Within the RDW, 5 billion license plates are requested per year. The RDW manages the parking and license plate register. Safely storing this data is a major task. The RDW has an entire department with Privacy Officers and data scientists who maintain this system. For every change to the system a privacy impact analysis is made. It is also often necessary to re-occupy the system. Many municipalities do not have this capacity, Peter Jager thinks, which is why he advises to work with pre-anonymized data, or work with a Trusted Third Party.</p>
<p>Internal communications</p>	<p>Ruud opts as a solution for the broadness of data standards, and the privacy concerns, to use a Trusted Third Party for the data processing and storing. This has been done before with the 'Service Huis Parkeren' for parking data of Amsterdam and worked out really well.</p>
<p>Transcript Interview Suvi Kajamaa – Espoo, Finland</p>	<p><i>'Guusje van der Vossen: So Vianova really helps communicating the municipality with TR? Suvi Kajamaa: Yes, definitely.'</i></p>
<p>Transcript Interview Martin Le Franc - Bruxelles region, Belgium</p>	<p><i>'So, we're trying to work that way to be able to do as much as possible ourselves, but I think with the smart mobility department we should only try to define the use cases and not try to develop some kind of a standard or IT platform. It's not what we are designed to do.'</i></p>
<p>Transcript Interview Jorge G. Coelho - Faro, Portugal</p>	<p><i>'The first step to that direction would be to take the historical data to be only sold by us. And then the analysis would be just like a module that would be reading our databases. So, that's like a first step. But for time being, we're not there yet, and do have lots of solution providers that want to sell platforms. Now, we're quite keen on it because our budget isn't very big. So, like we're not very big to jump on to any platform. But one thing we're certain is like it's more important to sort out the standards and to be having information that has some value and then really to have a platform.'</i></p>

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	<i>The thing is like having access to the information, has the most value.'</i>
Summary Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp	The government cannot do that, he says; "the government is not the best data developer".



Profile of quotes labeled as 'Trusted Third Party'.

2. Appendix - Interview transcriptions and summaries

2.1 Summary Interview Sarah Eskens, UvA

Interviewee: Sarah Eskens, PhD Information law at the UvA

Date: 16th of October

Recommendation: Start the ethical discussion about which position to take in the grey area of the GDPR. Do not choose for the easiest, most innovative option always.

Sarah Eskens indicates that, according to the GDPR, the DPO of the organization must already be involved during the creation of a data standard in order to guarantee privacy by design and privacy by default (see art. 25 GDPR). In addition, it states that organizations are obliged to create a DPIA before requesting the personal data. However, this DPIA only needs to be approved by the internal DPO. Often, the DPIA is also made in consultation with the DPO. The DPO is responsible for compliance with the GDPR. However, interests in small organizations often become entangled, as a result of which the individual character of a DPO decreases.

A DPIA in itself is therefore only approved by the DPO, not by a higher, larger body. The DPIA is just there for the Personal Data Authority to be able to have insight into how the organization operates, when needed. The Personal Data Authority can request the DPIA if something is wrong. This check is ex-post. In addition to a DPIA, an organization has to request and maintain a record of data activities, called 'record of processing activities'. This record also serves as a check. These documentation obligations are recorded with the aim of compliance with the GDPR. Whether this is really the case often does not come to light, only if a company is sued or if there is a 'data leak'.

An accepted DPIA is therefore not equivalent to full compliance with the GDPR. It is only an internal validation. Sarah Eskens, therefore made it clear that the municipality of Amsterdam itself must propose frameworks for what they consider to be 'GDPR-proof' and how much privacy protection the municipality wants to offer. She therefore advised the municipality to enter into dialogue with the Data Protection Authority in order to arrive at an appropriate data standard on a legal level.

In addition, she indicated that she considers the 'trend' of going along with a technique that is already available, but which is quite privacy-sensitive, because there is a rush and others are already using it, could be a dangerous 'trend'. This is a cause for concern, because we as a society are then constantly shifting the norm towards less guarantee of privacy. She says: 'Keep thinking and researching for yourself'. She thinks it's a good thing that the municipality has started to develop its own data standard. She agrees that European cooperation may be able to secure a negotiating position with major market players. She thinks this is very important, because she sees the market monopoly of data giants growing more and more.

According to the GDPR, the raw real time data requested of MDS can be justified by adding 'safeguards' in the processing and storage of the data, if the raw data requested is 'strictly

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necessary' for achieving your goal. However, if it is proven that the same goal can be achieved just as well with less data retrieval, MDS will no longer meet the GDPR because the data standard will then no longer be proportional. And the principles in article 5 of the GDPR are no longer met: Purpose limitation, Data minimization, Storage limitation & Integrity and confidentiality.

Having the data processed by a Trusted Third Party can increase privacy. This is because the municipality itself already has many other datasets of residents which, when combined, provide more detailed information, making the process more privacy sensitive.

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2. 2

Internal communications

2.2.1

Chat with Ross Curzon-Butler, Chief technology Officer at Cargoroo and co-developer CDS-M

Date: 23th of October

Ross tells that GBFS+ a part of the MDS. Ross explains that the Netherlands are fare ahead regarding data management, for example due to the MaaS learning environment and the golden triangle designed by I&W. Moreover, the CDS-M is unique because of the objective to serve as a standard for all mobility in the future and because the goal is to design it cooperatively with all stakeholders. Ross stresses that cooperation with market parties and stakeholders is essential for success and adoption. This cooperation should result from open weekly sessions, workgroups. It is important that people can drop in and out at all times. He emphasized that everyone should feel like they are a part of the project and have the objective to make the city a better place, to nurture the city. Ross tells that possibly a code of conduct could be created, which will enhance participation and furthermore, could enhance the adherence of the license requirements. Furthermore, he stresses that the design of the CDS-M is going to cover just the obfuscated and aggregated data of start and end points of trips. By keeping the parking- and trip data separate more privacy is ensured. The parking data could be retrieved from the TOMP-API. In this way, the CDS-M and TOMP-API complement each other in the MaaS system of the golden triangle.

Larger adoption and implementation of the CDS-M could be fostered by DOVA, which is a partnership consisting of the 12 provinces, the Amsterdam Transport Region, the Rotterdam Metropolitan Region The Hague and the OV Bureau Groningen Drenthe. The organization consists of two clusters: public transport network and public transport data. Together with CROW-KpVV we form the OV-campus. The objective is that in the future the operators only have to deliver data through one portal with one standard. Not both to the city of Amsterdam and the CROW portal.

Ross stresses that besides the dialogue with all stakeholders, a clear vision of the reason why we want to use CDS-M is needed from a planning and city perspective. 'How do we want to process, analyze, alter and store data?'

Ross explains that he is a futurist; he dreams about free car cities which are not polluted. This could be made possible with developed and connected MaaS systems. Data standards make it possible to interoperate between governments, transport operators and MaaS (golden triangle), and eventually transnational.

2.2.2

Chat with Beryl Dreijers, Data Protection Officer municipality of Amsterdam

Date: 12th of November

Beryl indicates that you can request raw mobility data for a public purpose, such as urban planning. She does, however, indicate that after retrieval, the principles mentioned in the GDPR: purpose limitation, data minimization, storage limitation, integrity and confidentiality must be met. In other words, purpose reasoning must be very specific and clear, so there must

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be a clear use case. If the data standard is used for many different use cases, the minimum storage time and the minimum aggregation level for achieving the particular purpose must also be redefined for each use case. These decisions must be laid down in a DPIA. Beryl indicates that she has no concerns regarding the design of MDS as long as the requested data is managed properly.

She says that the GDPR is an open standards framework, which means that there is a lot of room for interpretation, for example, one thinks the minimum storage period is two days and the other perhaps as much as a week. She therefore indicates that it is important to choose a position in the grey area of the GDPR.

In order to make data requests more democratic, she advises making use of the 'Data commons' thought, democratization of data through the consent of inhabitants. She indicates that the publication of open data contributes further democratization and she thinks that this should be done by the municipality, giving something back to the inhabitants adds transparency too.

She indicates that she finds the constant outsourcing of technical services by the government problematic, because it makes the extraction of data increasingly undemocratic. This is because tech companies have become better at carrying out a public task than the government, in fact. Public task such as analyzing and improving the infrastructure, for example. She indicates that the municipality itself needs to acquire expertise and capacity in order not to become entirely dependent in its policy on these Tech companies and other consultancy services. She calls this the 'Hybrid cloud model'.

Beryl indicates that Privacy is often used as a shield not to share data by market parties. She says that privacy is often not a legitimate concern at all, but rather a commercial initiative. Beryl is concerned about the growing cold feet towards the government from businesses and citizens. She calls this the 'privacy paradox', the fact that citizens share all kinds of data via apps on their phones, but do not want to share data with the government. For this reason, Beryl once again advises to use open data and implement the 'data commons' idea. According to Beryl, transparency and target reasoning are important for mutual trust.

Beryl tells us that there is not much difference legally, in terms of guaranteeing privacy, whether we outsource the data processing to a third party or ourselves.

She indicates that privacy is assessed on the basis of technology and other data sources that are in close proximity, the 'reasonable means criterion'. According to her, the Smart Mobility department does not have enough resources to identify someone, because there are bulkheads between the departments. Therefore, the Smart Mobility team cannot access external databases that could cause re-identification. She calls this principle internal responsibility. Personal data is corporate responsibility of the entire B&W. If other departments wish to use the data, it must be aggregated and anonymized.

For the extraction of personal data, a processing ground must be used such as a public task. Other foundations that can add strength are the goal of academic research and technological innovation and legal foundations, such as the Road Traffic Act which deals with road safety, traffic flow, accessibility of public functions and informing the road user.

The criteria of necessity and proportionality must be met at all times. She emphasizes that retrieving the data is not the problem, after that it must be properly aggregated and stored as

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open data, that is where the difficulty lies. There is not enough knowledge and capacity in house right now to constantly check whether the open data can still be made anonymous, for example, by new data sources and technology. So, the request of data is not the problem, rather the maintenance of the stored data.

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2.2.3

Chat with Ruud Mollema, Project director of ICTU, Ministry of Water and Infrastructure

Date: 13th of November

Ruud recognizes that NeTEx can be used for availability data of shared mobility, however he thinks that the TOMP-API would be a better fit, because the NeTEx standard is designed as an exchange standard for real-time open data, not for storage or analysis.

Ruud mentions that we should have another look at the further developed version of MDS. He tells that MDS covers all aspects, availability and user data, that are interesting for city sin one standard. He emphasized that this could clearer for operators, but more difficult to handle for cities, because it is a broader standard. He does say that the end goal is to develop one overarching standard, and in that sense MDS serves that goal better than the CDS-M objectives.

Moreover, Ruud states that there is a great advantage in receiving raw data in comparison to pre-aggregated data. He explains that raw data offer flexibility, because it can then be aggregated and stored differently for distinct purposes with the same standard, for both regulatory and urban planning purposes for example. This flexibility is something which the CDS-M is not able to offer, in its current design. Ruud emphasized that this flexibility is important, because every city aspires to regulate in a different way. This preference is different for all sorts of cities in Europe. Therefore, you don't want to be hindered by the design of a standard. Ruud tells that if you want to work towards a European data standard, that fosters innovation and collaboration, then the standard must be flexible. The only way to reach that flexibility is if you work with raw data

Ruud opts as a solution for the broadness of data standards, and the privacy concerns, to use a Trusted Third Party for the data processing and storing. This has been done before with the 'Service Huis Parkeren' for parking data of Amsterdam and worked out really well.

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2.3 Summary Focus group with the Open Mobility Foundation

Participants: Ross Curzon-Butler (co-developer CDS-M), Tijs de Kler (co-developer CDS-M), Jascha Franklin-Hodge (Executive Director at Open Mobility Foundation) & Michael Schnuerle (Director of Open-Source Operations at Open Mobility Foundation)

Date: 27th of October

[Introduction]

In this focus group Jascha told us that MDS is designed as regulatory tool, not essentially a planning tool. The main driver motivations of MDS are enforcement, geofencing, managing abandoned broken vehicles on the street and receiving parking data. As Ross highlighted in the talk, the CDS-M has quite different objectives. The main driver motivations of CDS-M are urban planning, road safety, inclusivity and greening and managing public space. All these things are focused on the MaaS development and to nurture different mobility modes and their connection. Ross and Tijs substantiate that the CDS-M is designed to function as a policy framework as well as a way of data collection.

According to Jascha, most cities do not use the Agency API of MDS. Often this is decided upon privacy reasons. However, this is not a problem, because MDS is flexible, a city does not need to use the agency API, for MDS to work properly. The Provider API is most often used, and can offer semi-real time to historic, whatever a city prefers. The provider API can enable the transmission of real time data parking data, but not when on a trip.

Jascha explains another reason why cities do not use the Agency API. Market parties often do not want to use that API, because it processes real-time trip data which can be commercially sensitivity, in particular if the city has access to other datasets. The more datasets are combined, the more you understand, the larger the chance of identifying business secrets and business models.

Ross explains that the CDS-M bypasses this problem, because the trip data is pre-aggregated to a level of k-anonymity, which makes sure that identifying individual is really hard.

Jascha stresses that privacy issues are distinct for each use case. For every use case and goal, another aggregation level is approved, as well as the storing limit. He states that therefore, a flexible data standard is needed and a 3th party MDS data aggregator could be beneficial, because they could take over a lot of processing work. Jascha, indicates that with detailed data you can solve use cases better than with pre-aggregated data. Especially regulatory use cases. He says that aggregated data is not an effective strategy for effective regulation. Because, then it wouldn't be visible which scooter is responsible for the infringement. Moreover, the shared mobility companies could even delete those from the records while aggregating data, to preserve their status.

Ross and Tijs have the opinion that the CDS-M should not function as a regulatory tool either. They are, however, curious about the possibility of molding CDS-M in the MDS standard.

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Jascha sees strong similarities with the Metric API that OMF is now developing and thinks that the CDS-M can be implemented in it. Jascha invites the City of Amsterdam to collaborate on the design of the metrics API.

The Metrics API is a new initiative of the Open Mobility Foundation. This API works with metrics, which function as a filter that immediately aggregated the detailed data per domain. The Metrics API could be used by a trusted third-party aggregator or by the city. The metrics API has similarities with the CDS-M but differs in a way that the companies still have to deliver detailed data to an aggregator, and with the CDS-M the operators need to aggregate their data by themselves before communicating it with the city.

According to Jascha, trust is an issue, especially in the U.S. Operators often do not deliver qualitative data, to protect their businesses. But mis presentation could also be present, because of the lack of technical abilities.

Ross states, that if trust is valued, it can also work very well and ensure that the responsibility of the public task is borne. Thus, the presence and lack of mutual trust could be an opportunity and threat for the implementation of a data standard.

According to Ross, another thing that influences the implementation, are the data governance capabilities of cities. If a standard is too broad and difficult a lot of cities will not adopt it. This could be a possible bottleneck for the implementation of a European carried data standard. Maybe a simple standard that delivers aggregated data is more convenient for smaller cities, because no technical data infrastructure is needed.

Jascha mentions that European cities do currently only use MDS through a third party to execute their data processing. Third parties such as, Populus, Blue systems and Vianova help them with that. As OMF, they think that there is not one correct standard that fit within all political and legal contexts in Europe. Therefore, they have designed MDS to be flexible. A common way of communicating with the possibility of making own choices.

The reason why MDS did not create a pre-aggregated data format yet is because of the distrust in operators in America. However, MDS is that flexible, that we could provide this mechanism if it is wanted in Europe. OMF actually want to change MDS to the needs of European cities. They are really welcome to requests. Also, in the governance structure.

Ross asked whether OMF is planning to create an agency API which just registers obfuscated beginning- and end points. Some kind of 'agency-light API' with obfuscated data of start- and endpoints, with a general start and end trip area, such as neighborhoods, and a strict time interval, per hour for example?

Jascha says that the goals of MDS is to be as flexible that you can shift in level of details. This could be possible with obfuscated data points and determining areas. However, a stumbling block for this proposal for the operators is that in every city, the neighborhoods are different.

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So, then the operators still have to change their data processing per city, which is what we want to avoid.

Ross asked whether MDS is going to be in line with European standard such as NeTEx and Jascha mentioned that he is in close contact with DG-MOVE and he will attend the NeTEx workgroups as well, to make sure that the standards align. Jascha also mentioned that the OMF has a monthly call with GBFS to aligned data structures and avoid complexity and implementation difficulties. Jascha stresses that is important that cities take their role in designing data standards, because the cities always work by the public good. Where private parties have a strong incentive to lower the governmental regulation. The board of OMF dictated by government agencies and cities. They do welcome market parties for cooperation.

Jascha sees that MDS should be altered in a way to support the MaaS system and GDPR. Creating a flexible mechanism to exchange pre-aggregated data could be a solution. OMF would like to cooperate on this topic. A possibility is an EU-fork of MDS, that removes certain features of the MDS and adds the possibility for pre-aggregated data.

Ross: Is there an opportunity for board membership of G-5 member?

Jascha: Yes, there are two vacancies at the board level and are really open to it.

Ross: could the board members alter the EU-fork standard?

Michael Schnuerle: EU-fork is possible, you'll just get your own standard. MDS is focused on all modes of transport. A proposal issue is always welcome, it will be taken up in the design process.

Ross: The fear of doing such a proposal is that the previous cooperators potentially lose their effort to a US organization and moreover, there is the fear that operators need to start paying for the MDS EU-fork in the future. We want to make sure that a European standard is available and usable for everybody. There we plan to further design the CDS-M cooperatively with all parties involved.

Jascha: There are no legal possibilities to make restrictions to the use of the current versions of MDS. We are really an open-source foundation. We do not want to have a monopoly on standards or MaaS systems. We believe that MDS could serve globally, therefore we want to bring together people all over the world and industries. Therefore, we would like to work together. We welcome you to be on the board and participate. This will hopefully give you a vision of the culture we would like to build.

Ross: What are the membership costs?

Jascha: Public authorities are free, private parties pay on the basis on their size. We have the same goal: a standard that can open up the market of transportation and mobility. As well health mobility (disability mobility) could be a goal in the future.

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Ross: Shared slack channel between OMF and G-5 would be nice. And OMF could also join our open meetings.

Jascha: we are always happy to help and collaborate.

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2.4 Transcript interview Suvi Kajamaa – Espoo, Finland

Interviewee: Suvi Kajamaa, manager at the traffic department of the City of Espoo, Finland

Date: 28th of October

Used standard: *MDS in a pilot with two operators, provider- and policy API*

Preference: *publicly managed data standard, which offers real-time and detailed trip- and parking data.*

[Introduction]

Suvi Kajamaa: Hi, good to meet you. I am Suvi and I've been working for traffic team of Espoo for about a year now. We have two different departments considering traffic issues. One is for the long-term urban planning. And I'm more in the kind of front office. So basically, we are working with everything which is already here or coming in like, I don't know, next the next decade or so, but not so much in the 2050 or so. And my position is new. So, there hasn't been anybody before me. So, I think this is also like kind of the possibility to build up the need in this field. But basically, my responsibility is everything related to MaaS.

Suvi Kajamaa: I think the city has a role in helping that shared mobility operators are landing in the city. In Espoo we have a strong network of public transport, but these kinds of private services are definitely a good addition to that. So basically, my job is to cooperate with these shared mobility operators, but also with the public transport parties. Currently, we are building the metro line, which is not as big as in other major cities, but this is something that has changed our city a lot. And I think that the municipality should help to let the city evolve more friendly, for people to walk and to bike. This also my responsibility in my work. In Finland we are multiuser, so full of mobility, but still a lot of private car-use. I think in Finland, we still have too much of this 'against thinking' regarding getting rid of your private car. A lot of citizens do not yet understand that the goal should be that we are all multi-users of transport, because I think that's is the prerequisite for finding better sustainable mobility solutions.

Guusje van der Vossen: You mentioned a couple of things. You're building a metro line, to stimulate a car-free city of Espoo. Are there any other MaaS initiatives you are involved in right now?

Suvi Kajamaa: Well, I don't think we are ending up for car free cities. I call Espoo the suburbs of Helsinki, even though I don't think you should say it aloud. But basically, if you go to the center than Helsinki is the center that you go to. And that distance you usually drive by car. There is not a really strong public transport connection.

Suvi Kajamaa: In Espoo itself, there are basically five centers, we have the strategy that those should be walkable areas, but the reality is not really yet there. The connectivity and public transport offer of those five centers are in higher priority. So, most of them have either a metro station or train station and other city services. The planning strategy is that these centers

should be able to reach in a 15- or 20-minute walk, which is already partly achieved in those areas.

Suvi Kajamaa: However, Espoo has still a quite strong reputation of being a car driven city, of course, we are slowly getting away from that reputation. But it is still very present. It just doesn't disappear like that. But for the future, of course, we have the goal to be zero emission if it comes to cars.

Another reason why citizens still use the car a lot is because there is a lot of space in Espoo and there is not often traffic jams or congestion. For example, people from Paris when seeing the congestion, won't realize that there is a traffic jam. It would be just normal traffic in their opinion. I think that's our kind of a benefit that we still have. We still have space in that sense.

Guusje van der Vossen: So, you mentioned that connectivity among the city centers is important in Espoo, is this only last mile connectivity?

Suvi Kajamaa: No also, commuting is important. For example, the metro line goes from Helsinki to Espoo. It has been there from there from the 80s and now the second part will open in a few years. We cooperate with the Helsinki public transport department on this metro line. The end of the metro line now stops only at the border of Espoo. The eastern side where all the big companies and the university is located. In this place the public transport is quite good, however in the rest of Espoo there is not a lot of connectivity. Therefore, we are going to expand the metro line. But shared mobility could be a solution for this last mile travel now.

Suvi Kajamaa: So, our challenge is how to make this part of Espoo interesting for the shared mobility operators, especially the areas where the public transport is not in such a good level. The shared mobility operators are still in the eastern part of the Espoo. As well as the city bikes. The city bikes are operated together with Espoo and Helsinki and the city bikes their service zone is also in this kind of eastern part of Espoo which connects to Helsinki. So, with the same bikes, you can drive on both sides.

Guusje van der Vossen: Okay, so you use your shared mobility to enhance that connectivity in the eastern part of Espoo, but not yet in the whole city?

Suvi Kajamaa: Yeah, well, that's our goal. And we have some pilots. I now, for example that TR now also grown their service area. But I think that's the kind of critical thing. How can we enable that mobility providers come to those areas that are not that are dense? Because, the logic of the business is maybe not so so tempting.

Guusje van der Vossen: And do you have a lot of different mobility operators in the Espoo?

Suvi Kajamaa: Not many at the moment. It's only TR and VOI. But also, in Helsinki, I think only 'Lime' offers scooters. And then we have the city bikes. Mostly, they are in Helsinki. And then we had the 'bond', the electric bikes. And just before Covid they announced that now they are ready to expand to ASPO. But I think Covid maybe did something for their service. So, they also took their bikes away from Helsinki. And at the moment we have only two shared car companies. And also, before Covid, there were a couple of more businesses coming up. I hope

they are just delayed, and they will come later on. So, I think that's one issue. What can cities do to kind of sustain those companies to stay alive?

Guusje van der Vossen: It's nice to see the differences because in France and in Spain, they are flooded by the bikes in the city. And that's why they are making the standards to kind of get grip on where they are all parked and it's not destroying public space. So, in Espoo you would like to enlarge the amount of shared mobility, right?

Suvi Kajamaa: Yeah. Yeah. At the moment we are developing the whole parking system. So far it has been free for cars to park in the city space. The parking spots in the public areas they have been only guided with time limits. But not with fees. We are changing this in the city centers. We will get certain areas with fixed price; I think most likely starting from next February. So that will hopefully change the business. But basically, in Helsinki, we have these kinds of like a citizen parking commission. We have to change this, because now the shared car companies have the same permits as the citizens, but now the parking spaces are getting too full of shared, cars so there is too little space for the citizens. So, it is like a legal issue.

Guusje van der Vossen: I had contact with Thibault from over Vianova and he told me that that you are using MDS in some kind of version in Espoo. Are you also using that with the Car sharing companies?

Suvi Kajamaa: Not at the moment. And of course, the carsharing is very small at the moment. We only have one company with thirty cars. The Vianova pilot is state that funded project, to learn how to develop services like mobility services. The pilot is in cooperation with TR, the scooter company in Espoo. In the pilot are included twenty-five stations where you can park. So, it's not free floating at all, but just for parking. Due to the pilot the station is expanded, which wouldn't have happened without the pilot. Due to the pilot, we gained more insight into for which purposes the shared scooters are used. As a last mile solution to the train or to go to a food market for example, yeah, I think that the pilot has been a very good initiative for us to cooperate with TR.

Suvi Kajamaa: Because now TR sends me every week the number of scooters on the field, the number of flights per week and per day. The number of scooters that have been charged. And also, a map every week that shows the most common routes, from which station to which station. It's clearer where people ride. So, you'll be able see the kind of data from the trips from which station to which station. And we see how many minutes the scooters stand before they go for the next ride. So basically, which stations are busy? We can also see the differences of the weekdays and weekend. And also, which hour of the day they used it.

Guusje van der Vossen: Do you get the data in a file? Or do you only see the dashboard? Does TR send you a file at the end of the week. How do you get the data?

Suvi Kajamaa: They sent me that file at the end of the end of every week, but only the statistical data. And that's one reason why I was interested with Vianova, because I think the instruments that companies like Vianova offer can provide us with the kind of learning on what all we can

get out from the data, because I think they are quite far on that. One other benefit is that TR has been very willing to share the data, because we have built the trust. I have also been helping them quite a lot with many issues.

Guusje van der Vossen: I have another question, do they want to share the data with Vianova, the scooter companies?

Suvi Kajamaa: That hasn't been a problem. They have been willing to share it here like. I think this is very interesting because now with the pilot, with TR, I have got the kind of data from that from the pilot area. TR was also okay with me sharing the data with the state, because the project is state funded project partly. And that was something we wanted to.

Suvi Kajamaa: The pilot we are really doing as cooperation. Which is helpful for resolving the 'against thinking' in the micro mobility field. So, for example, the user survey that we are now doing, we expand the reach to the citizens as well. I am curious how the relation will be after the pilot. How will our cooperation continue?

Suvi Kajamaa: Just in the last couple of weeks, they really expanded their service area a lot, they moved towards the Western part. But still the hotspot of the shared mobility is around the metro. And also, the city bikes are there. In that area the service level is pretty high. So, in that sense, it's easier for them to only go there. But I hope in the spring that they will expand more to the western side, however then the pilot is finished, so I am not sure. It's not a lot of money that they have gained from the state fund. The most value the shared mobility operators have gotten from the pilot and use of data standards, thus their cooperation with the city, is the increased positive reputation and increased offer in more areas. So, for example, the permissions of those stations, was the one of the negotiations of the pilot. So, if there are 25 stations, half of them is on the city land and half of them are on private land. So, whether it's like a, I don't know, food store, I was communicating with the owner of the of the land whether the station can bring there. The municipality made sure that everybody who wanted to join could have a spot on their land for a station. A lot of citizens got excited and the reputation of shared scooter got bigger and better. So, I think definitely the city played an important role in the negotiation phase.

Guusje van der Vossen: So, to summarize what you're saying, interrupt me if I'm wrong, is that it's kind of a two-way deal that you as a city help in the negotiation of station placement, and help to expand and stimulate the shared mobility in the city of Espoo and make the area larger and also inclusivity I guess, of the people that can use it. So, is that the kind of a win-win situation, that you get data from the pilot and in return you stimulate the business?

Suvi Kajamaa: Well, yes, the first goal of the pilot was to get better understanding on how the parking of the scooters work and how to stimulate the usage. How should the station be built, for example? In some cases, a station was not needed, only painted parking spots on the ground of an icon of scooter were sufficient.

Suvi Kajamaa: The station should be visible. I expected feedback of users that they could not find the station fast enough. But this this has surprised me, there has not been negative feedback from pilot even though I think it could have been even more clear, the signs.

Guusje van der Vossen: So, the pilot enabled you to learn about the infrastructural process, but what value does the data bring you specifically?

Suvi Kajamaa: Well, I think the data brings a lot of value. The data creates understanding of the needs of a specific area. Moreover, it offers information about for what purpose people use the shared scooters. As a last mile solution? Do they stimulate public transport use? In Finland we have a little bit of this attitude that these scooters are just for fun, but they are not for like every day-needs. So, I think with this pilot, we can better understand how people are using the scooters, and whether they have extra value for getting towards a MaaS ecosystem and a car-free city. The time of the use also says something, whether the shared scooters are used for work or time with friends, for example a party or to hang out. Do scooters go to a more work-related area or like a living suburb. Is there an increase of shared mobility in the evening, because the bus doesn't run at that time anymore? Only Vianova has access to the TR dashboard, I only receive static data from Vianova. So basically, I get a lot of data, but it's not dynamic data, it is statistical data. But it's a little bit difficult to compare because every week the data looks a little bit different.

Suvi Kajamaa: The Vianova pilot is not for the long term. Therefore, I could arrange the pilot with our own department. If for the long run, the ITC department of the state had to accept it. And I think then that would be more, more heavy process. It was easier to have Vianova on board.

Suvi Kajamaa: And with the pilot now, we only receive abstract data on how many scooters are in the city for example. So, at the moment, we only required to have some sort of numbers of user amounts per month. So, I think we are very much in baby steps going towards receiving more dynamic extensive data. Because the pilot has been so intense, I think now it's a very good moment to change. On the app of TR, I could roughly see how many scooters there are. But if the battery is empty the scooter disappears from the app, but it doesn't disappear from the ground, and those extra things you can see with Vianova. We can also regulate the scooters, in where they park or ride, then TR draws a red zone in their app. This is because of the good relation.

Guusje van der Vossen: Do you use the policy API for communicating these zones? Thibault told me that you are using the provider API, which makes sure that you can see historical data on which scooters are parked where and for how long. What you just told me, the weekly and monthly reports. But are you also planning to or currently using the policy API, which enables to communicate policies, such as no parking zones and geofencing?

Suvi Kajamaa: Well, this is something we now only prototype within this pilot. For example, the stations with forced parking, are communicated through the policy API. By doing so, communicating through the dashboard of Vianova, it was not a lot of work to show TR the

zones, before that it was a lot of handwriting. So, if we would have had Vianova in the first place, it would have gone way quicker and easier.

Guusje van der Vossen: So Vianova really helps communicating the municipality with TR?

Suvi Kajamaa: Yes, definitely. But what is a shame, is that TR cannot put their red zones in the Vianova dashboard. So, it is only communication from municipality to the operators regarding no drive or no parking zones, not the other way around. While I think that, this information would be a really great if it would also come from the like from the service providers towards the municipality. So, we could align it.

Suvi Kajamaa: For example, in the new service area, TR contacted me that they are expanding, and this is where we are planning to expand. And do you have any wishes regarding parking? Then I have a look on their proposal. And then I have a better understanding of their local knowledge so I can easily spot a few points that I do not want them to have parking. So, then I communicate that back and they adjust it in their application. It would be really much easier if I could do that through Vianova. Because, with one operator, it's very easy, but when the smart mobility expands, we need more efficient ways of communicating. But it would be really easy to see that all the data that that a user can see in the application and if that data would be brought to Vianova, that would be done help a lot. Because now basically I should have all the different service providers applications on and then I should what their red zones are.

Guusje van der Vossen: So, it be great if you could have access to a dashboard where you could see all the available shared mobility vehicles in the city of Espoo?

Suvi Kajamaa: Yeah, and that is basically what I see now through the Vianova dashboard. But I don't see the limitations of the driving and parking areas that the providers have built on their own wishes. Do determine what kind of policies I can make, while not interfering with their business. There hasn't been a need for policies that are really strict through to a system, because of the good cooperation. But I think that it would be easier if the companies could also volunteer policies through the Vianova platform. And then we could also compare the policies, because they are often very similar.

Guusje van der Vossen: All right, before we wrap up the conversation. I would like to tell something about the CDS-M and thereafter ask you a couple of questions. CDS-M is developed from the rationale that we as Amsterdam would like to receive data from mobility operators to make such a dashboard, as you mentioned, and to and to enable that direct communication about, for example, the limitation of parking zones. But what we are worried about is that third parties, such as Vianova, do mostly receive Real-Time data from the operators that you don't get, you just get the aggregated data every week, but they do get that specific data and especially with free floating vehicles, it is GPS data and in the GDPR law that location data is perceived as personal data, because you can trace it back to an individual. And that's why we want to make sure that the request phase of the data is no personal data, so we do not have to comply with the GDPR and use privacy preserving techniques and we minimize the risk of infiltrating someone's privacy. The functional design right now is based upon polynomials. So,

circles of locations, areas so that you don't measure one specific point where the vehicle is parked, but just an area. So, you could measure the trip data from one specific area in the city to another specific area in the city, but not the exact data points but you could see the mobility flows in the city. Retrieving this data in a standardized format from the operators, supplying the dashboard. In this way, you do not need a lot of technical infrastructure to aggregate all this data to a level that you may use it or publish it. So that's the rationale of CDS-M. And I'm wondering, would this fit within your policy, within your needs and demands? That you could see the trip data of mobility in the city of Espoo directly from the from the operators?

Suvi Kajamaa: I think that the GDPR and privacy are very important. However, I think that the possibilities of the detailed data have a really large value. And therefore, it is maybe worth it to use third parties like Vianova and privacy preserving techniques. The data could really help, achieving sustainability goals and cleaning the city, if I can say so.

Suvi Kajamaa: But basically, I think the data is crucial in understanding whether micro mobility actually functions. Are citizens really using it, and is it the future of MaaS and the end of car-ownership? So maybe the average, aggregated, numbers are not enough. Especially for cities where there is more shared mobility, then you should be able to determine the maximum of vehicles and operators. As a municipality we should have tools to interfere with the operators, for if they are not having a high enough service level.

Suvi Kajamaa: And for me, the most important thing when working with Vianova is to learn and understand what the possibilities are with the data. We learn more from using a more detailed data standard with a third party, then when we would have used a simple standard by ourselves. All the mistakes by the operators are so transparent on the dashboard of Vianova.

Guusje van der Vossen: Besides parking data, would you also be interested in analyzing the flows of trip data of free-floating vehicles? Also, to analyze user patterns.

Suvi Kajamaa: Yes, and that's something we do with the city bikes. We know from which station to which station the bikes go, and with the E-scooter pilot we are going to analyze that as well in the near future. We will shift to also offering free floating assets, it's easier for everybody if there would be more areas where you can park. Yeah, but definitely I think with better understanding of user behavior, we can also understand where to create more parking space or other stations.

Guusje van der Vossen: In this interview, we had one overarching question, what are the opportunities, bottlenecks and possibilities in the development European standard. And I hear you say that the opportunities are cooperating with market parties learning how we should enhance areas, parking possibilities, availability and connectivity, and a bottleneck could be 'against thinking', and a practical possibility the use of MDS and Vianova?

Svi Kajamaa: Yeah. I don't know if Vianova is the way to go. I do not know whether the platform should be private, or municipality owned. We have the same discussion at the moment with the E-hubs and parking. I am not sure about what is the municipality's role. If companies would let

municipalities use their dashboards, then that would also be a solution. However, if there are a lot of operators in the future then a Third Party could be needed in the long run.

Guusje van der Vossen : So, if there in the future, would be a European standard that would enhance one platform where all the data of the operators could be put into one dashboard that you could operate as a municipality on your own, not with a third party. Would you prefer using that over cooperating with a third party?

Suvi Kajamaa: Yes, yeah for sure. Because, what do you do if a third party opts out and you do not have the knowledge yourself? So, I think with a private third party, there's always a risk. We do not want to be married to the party. Yeah, like that they are kind of controlling. But then again, they can also help a lot.

Guusje van der Vossen: Yeah, from our conversation I hear that they could especially offer a lot of support and knowledge in such a pilot format. These fears of control and privacy were an objective to start the CDS-M project and this is the reason why we are trying to start the discussion about what a European data standard should comply with. How should it be organized to maybe eventually in the future solve the problem of needing to work with a third party to enable data collection.

Suvi Kajamaa: Yeah, and interesting.

Guusje van der Vossen: Are there any questions you would like to ask me or things you'd like to add to the conversation?

Suvi Kajamaa: I think that besides offering a data standard, such as the CDS-M, cities need policy guidelines on how to further support shared mobility with data and in general. How could you get out of the data where parking spots and stations should be situated? And what are other, broader measures you could take to offer space for micro-mobility and cycling. To shift to MaaS, which regulations should be place? Is paved parking required? How many parking spots are needed? More of the urban planning issues that could support smart and sustainable micro mobility. How much space should there be for walking? Do we need to make sure that it is easier to get to public transport by foot and by cycling than by car?

Guusje van der Vossen: Yes. So that's the second thing that comes along with managing and supporting smart mobility, providing space and policy for the development. Yes, that's a nice addition. I will take that with me. I want to thank you; it was really fun talking to you.

Suvi Kajamaa: And how can I follow your work?

Guusje van der Vossen: We are going to make an argumentation document about all the interviews, and I will keep you up to date when that is finished, and I'll share it with you. In that way we will stay connected. Thank you for your time. And you can always contact us.

Suvi Kajamaa: I'll keep that in mind.

Municipality of Amsterdam
Smart Mobility Team

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Guusje van der Vossen: Well, I have a great day.

Suvi Kajamaa: You too. Bye.

Guusje van der Vossen: Bye.

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2.6 Summary Interview Thierry Vanelslander and Elnert Coenegrachts - University of Antwerp

Interviewees: Thierry Vanelslander, Professor in logistics at the University of Antwerp and Elnert Coenegrachts, PhD in shared mobility at the University of Antwerp. Both assist the Municipality of Antwerp with the E-hubs project of Interreg.

Date: 28th of October

Used standard: Oslo standard

Preferences: A European version of the MDS

Thierry confirms that it is a problem that there is no data standard and adds that there should be a national, if not international, data standard. Thierry himself acts in logistics, and in order for all actors in a port to work together, a standard is being developed. However, the parties are not yet making use of this. According to Thierry, this is due to a lack of trust, mainly that parties are afraid of distortions of competition in a horizontal line. Elnert sees the MDS as a good basis for shared mobility, by adapting it to the European view, he thinks it could comply with the GDPR.

In Flanders a standard is currently being developed, the Oslo standard, which is still in its infancy.

Elnert, refers to a tool of the New Urban Mobility Alliance, in which he sees a solution for the fear of distortion of competition. The tool in question can be used to determine which data is relevant to the policy goal.

Thierry thinks that actors want to participate if there is a win-win situation. This win-win situation must be the same for all parties, otherwise the party that makes less profit in sharing the data will refrain from sharing.

In Antwerp, there are clear rules for the granting of a licence, including the requirement of data delivering and the opportunity of re-selling the service. In order to have a well-functioning data standard in Europe, according to Thierry, the major mobility providers will have to accept it and invest. The government cannot do that, she says; "the government is not the best data developer".

According to Thierry, the requirement of data sharing in the licence and other regulations will have to be done in cooperative way. Again, he refers to the logistics in the port of Rotterdam where this is already done on a large scale. According to him making it compulsory certainly helps.

"In China you can see that it works, they impose an obligation to share data with a data standard."

Thierry here makes the comparison between China and Europe. He thinks that in Europe, this way of mandating and quick deployment is not possible.

In the port of Antwerp, a data standard was first drawn up by companies themselves, for a faster and more effective way of working. This only came into the hands of the public port authority after its development. However, in his opinion there should always be involvement of a public entity somewhere in the process.

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In Antwerp, offering shared mobility is linked to the obligation to participate in the development of MaaS, this is included in the permits and pilots. The providers should not only offer their service via their own platform, they should also create the possibility to re-sell, in such they could be advertised on the various MaaS platforms. Elnert thinks that this is a wise step, by doing this the big players do not take over the market with their monopoly. Therefore, Uber does not operate in Antwerp, while they do in Brussels, because in Brussels they do not have such a strong legal framework.

The Oslo standard (open standard for linking organisations) is used in the various mobility platforms active in Antwerp, as well as in 'Smart to Antwerp', the public MaaS application.

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2.7 Transcript interview Sami Sahala– Helsinki, Finland

Interviewee: Sami Sahala, employee at ITS of Helsinki, Finland.

Date: 29th of October

Used standard: MDS in a pilot with three operators, provider API

Preference: We are not yet at the stage of a European data standard, but in the future, I think that would be a good idea. Before we arrive at that point, I prefer piloting with a more difficult data standard (MDS) and detailed data while at the same time using a simple city managed data standard that offers a continuous flow of aggregated data (CDS-M).

[Introduction]

Sami Sahala: In Helsinki we have a separate urban planning and smart mobility department. In the urban planning department, I worked for seven years and I realized that fast innovative mobility solutions were not going to happen there. There needed to be a separate department for that. That is to some extent from the municipality of Helsinki. In that way it is more freedom. I work in that department now. Our department works closely with the economic department. Because, Smart Mobility is not only the traditional work or traffic planning. It is also about enabling new types of services, business. And, you know, that's why economic development is needed. My job is to try to take traffic funding and really get them up to speed. Now, the data collection and maintaining is the highest priority, how do you manage this? Also learning how to make sense of the data, and which use cases are relevant is a big topic.

Guusje van der Vossen: The first questions will be a bit broad because I'm really interested in which strategies you use to support shared mobility within Helsinki. Or is this not a field you work in?

Sami Sahala: You know, we don't really follow the traditional road map of defining a policy and then executing and implementing a policy. Yes, it's more like trying on this thing and saying wait for development and then the policies. The policies will be taken up by the traditional city planning department at some point, hopefully. So, we as the smart mobility, innovation department, work with pilot strategies. With the different pilots and trials, we learn by doing it, and then that becomes policy at some point at least, we influence on that. And then we have the politicians who might see things differently. But then then we will be able to do is to demonstrate that this is what we can do. This can happen and these are the positives and the downsides. And this didn't work, but this actually did happen. That's the process we work with, which is different from the traditional planning perspective.

Guusje van der Vossen: Could you give us some context on the pilots you're working on now?

Sami Sahala: Well, in this particular topic, there's one pilot on collecting the data of shared mobility, we are now doing that with Vianova, the French company. So, we used to have six micro-mobility companies, but now this summer, I think we are down to three or four and out

of all of those companies the two biggest ones, VOI and TR, they are providing their data, but 'Lime', doesn't. Which is weird, because they are doing it in the U.S., and they have their interfaces ready.

Sami Sahala: With the pilot we want to learn, how to manage data collection. How not to do it? What are the bottlenecks and pitfalls over there? It's not just about learning the technical standard, MDS. It is about learning the process. Should we do it as a as a city? Should outsource it? What are the pros and cons in this kind of approach? And that's what we're doing. And it wasn't that easy because the skilled APIs of MDS were not aligned with the APIs the micro mobility companies were using. So, it took a lot of time to get the data flowing, especially in a bit more real time as we would like to have it. And because only two of the companies deliver data then the privacy and business secrets, opening up commercially sensitive data, becomes a problem. It limits a little bit what we can do with the data. If we had three companies, it would make it easier. So that that's so because they are really jealous of the information so that the competition. If anybody can see how we do, how much business we have, how many bikes are present, and how often are they used, because not all companies are on board, we cannot publish the data. That are practical issues that we're just dealing with at the moment.

Guusje van der Vossen: So, you can only use data for internal use right now?

Sami Sahala: Yes.

Guusje van der Vossen: And was it hard to get the two participating companies on board with the pilot?

Sami Sahala: No, they've been quite helpful actually. Also, in general, they've been really forward, coming to talk to the city, they were the ones suggesting using a standardized format and communicate non parking or preferred parking zones. So that's really good. And in that sense, no.

Sami Sahala: But then, for example, it is harder to get access to real-time data as a city. We now only receive data through the Vianova platform and the provider API. And we would like to be able to forward real-time data to an app that provides information for the urban planning department. So that it could basically offer warnings, like there are e-scooter in front of you in 10 meters, that kind of things. And that's something that that shouldn't have any consequence on either of the companies, because they won't be able to get to that information. It is basically just a pinpoint information for that particular person. So that's what we are discussing at home. Can we at least do this, that would be a nice demonstration. And what is the value added of this kind of information for the urban planning department? That is something we would like to find out.

Guusje van der Vossen: Do you have any ideas yet about what kind of added value this data could bring?

Sami Sahala: Well, the blind person use cases is one. It's actually a really good one. That would be helpful in terms of just pedestrian safety. And then, of course, the basic use cases are that that you could get a better understanding of just the travel patterns in the city, and I would be

happy to compare that data against, for example, the city bike data, which we have, that's open data. And how does it change all that? But in terms of research, it might be helpful to not have GDPR so that you could go a little bit deeper with your analysis, but then again, it's early days and we'll see what we can do.

Sami Sahala: The future goals, is to get the data for different functions like traffic planning. But also, to get insight into the city and to do some visualizations on for example how the city bikes are flowing in different times of the day versus the E-scooters. There's no value direct in the data itself, but it sparks and triggers discussion and gets people thinking, this is basically what we want to do. We want people to use all the different kinds of modes, not just their car. I'm also a little bit against the trend of trying to push people back to the public transport as quickly as possible if they don't feel safe there. Let's make sure that they have options with which they feel comfort. Shared mobility and new mobility modes have a big role there. Just by showing open data about the shared mobility, and letting people know, letting people see that this is how other people have been using it. That incentive is also really helpful for that transformation.

Guusje van der Vossen: What we experience here in Amsterdam is that we have real difficulties with cooperating with these market parties and receiving their data. So, what is the win-win situation in Helsinki for those market parties?

Sami Sahala: That's what we're trying to find out with the pilot of Vianova at the moment. There are always data sharing issues, because of the companies' privacy concerns or fear to lose their business secret. Somehow, the image of the use of data by governments is bad, companies some sort of Big Brother issues like now the global government sees when I'm traveling, which is really bad. Contrastingly, everybody is just happy to share that information on their phone, for example. So, if take the public sector out of that equation, as we did with the Pilot of Vianova, there is just some B2B arrangements, where you as a user that are part in. The companies experience more freedom, a feeling that you can always sign off. Therefore, the micro-mobility companies are okay with Vianova doing an analysis based on their data, also because the results of the analyses are really high-level stuff. And with this pilot, the city has no access to the raw data, however the end result, analyzed data for the city, is more or less the same. So, if you take public sector out of that, it's going kind of easier for the users as well to say, OK, fine, just use my data.

Guusje van der Vossen: So, by using a third party the willingness of the market parties to cooperate increases?

Sami Sahala: Yes. Well, the funny thing is that in Finland, I think in the Nordic countries especially, there's a lot of trust in the government. If I give data to the government, I'm fairly sure that it will be handled and managed properly. But when you go towards more central and especially southern Europe and especially outside Europe there is less and less trust in the government. Here in Helsinki, we could just grab all the information into the public sector, but not in not possible in the rest of the world. So, I think when coming to a uniform standard, we

should also think about what the benefits are of using such a middleman there?

Guusje van der Vossen: Yes, because if you look through the citizens eye, then I myself would also be more comfort with the government having my data than a company like Vianova. So that's kind of the paradox between the citizens and the company's preference.

Sami Sahala: Yes but trust also comes with capabilities. And In my opinion smaller start-up tech companies have larger capabilities than the municipality. We as a city would just like to do some research on aggregated data about the micro mobility flows in the city. In my opinion, we don't always have to own the data for such a purpose. In the traditional, public sector way of thinking we do. The traditional way is to buy a service with a budget, own the data, analyze it and eventually publish it. But can't we also analyze the data, without owning it? In my opinion, there's not always a reason to own that data. We should only understand the data, which could also be done by using access rights, for example. A third party, which owns the data, could evolve their services quicker than a city. Which results in eventually creating more added value for smaller price tag than if the public sector would have done it. And at the same time the third party creates business and hopefully created other news services as well. I've kind of always tried to create a little bit of ecosystem there rather than us having one party buying something and just sitting on the data and then sharing it. Yes, there's a little bit of a philosophical difference here as well.

Guusje van der Vossen: Is that also your philosophy behind the MaaS ecosystem as a whole?

Sami Sahala: In a way, yes. It is similar. Over the years, I've been using the method that a city has to be an enabler. We should not manage the end user service, unless it's really, really critical that we do. For example, in health care services. But otherwise, it is beneficial that that we enable third parties to do job. Again, cost wise it is beneficial, but it also creates more added value as well.

Sami Sahala: 10 years ago, when we made the decision that we should stop developing any mobile apps for the local journey planner, at the time when iPhone just came to the market and all that. So, the decision was that we don't do that anymore. We focus on making sure that that the data is as perfect as possible. And we we're putting more efforts on developing to APIs and interfaces and sharing that data. And then also started a kind of continuous support for the developer community. How do you use that data? And then London decided to do the same thing in a couple of years later. London did a study on the results of this decision. What is the value of choosing that kind of approach? And in the case in London, what is the value of opening up the data instead of owning it? The value was around a hundred and thirty million pounds a year or something or something like that. Anyway, it was huge. This is the proof, that we don't always have to own the services and data. OK, long back story. But this is how we work in Helsinki.

Guusje van der Vossen: And is the 'Whim' multi-modal travel application created by the city, or also by a third party?

Sami Sahala: By a third party. A decision along the same lines, that we should not create the end-user service, we should only make sure that Helsinki is a good place for third parties to do their business and add their value. We see MaaS as an added service on top of the actual physical transport service, public transport and city bikes and all that. Again, following the same logic, we help all companies, not just one, but Vianova was the pioneer. We always, try to cooperate, try to help as much as we can.

Guusje van der Vossen: And do you do that solely by pilots or also in other ways?

Sami Sahala: It's more on kind of influencing in the background, because one of the things that we needed to do for MaaS was that to take care of to make sure that the legal framework is good and solid. And to be honest, it's still not perfect. But in here, in the Nordic countries and Finland especially the cities don't have that much regulatory power than in Central Europe in many, many countries have. So, what we need to do is cooperate with the national legislation. And that's what I did for quite a while, actually. And what we did a new national legislation. So, I was working hand in hand with the minister of Transport.

Guusje van der Vossen: Is that the new Transport Act?

Sami Sahala: Yes, that is a huge new package legislation. But the part that was relevant for MaaS was that there is ability for MaaS providers to actually implement anything that meant that they should be able to resell the actual transport services. Without third parties being able to resell services on a platform, there will be no MaaS. So that was important to facilitate. We did this by legislation that basically mandates that if you are a transport provider, you must open your APIs. There are of course different ways to do it, but we did it by forcing it and we did it by convincing. We have a legislation says that everybody needs to open and allow third parties to resell all the transport services. But now the problem is that it's going to take time to really enforce that legislation so that all the transport companies will actually comply with that.

Guusje van der Vossen: Do you mean both public transport as private transport services?

Sami Sahala: Well, yes. We made it mandatory for everyone. Now, Denmark did follow one or two years later, but only for public transport. It is hard to mandate private sector to comply when public sector on transport providers are struggling with that. So, the focus has been on not making the national railways, the biggest transport authority's like in Helsinki to play along. And that's when you enter the big strategy challenges. And there's a lot of resistance in a way, willingness to retain the status quo in the transport sector, which is quite often quite traditional and so on.

Guusje van der Vossen: So, the transport act obliges all parties, to open source their APIs?

Sami Sahala: Yeah, well, it doesn't have to be open source, but it needs to be open in a way that anybody can resell. But the transport providers had a really good excuse that well, what is the format that we need to follow? And it doesn't make sense that everybody has a really different kind of API, now we have a national API on that transport act. We hope to also synchronize to

the rest of Europe at some point, that they will catch up as well. But besides this API, you need strong contracts. It is more than a technical issue, much more than that.

Guusje van der Vossen: And are those agreements pre-formatted?

Sami Sahala: No, not yet. But the national agency should provide lawyers and power to develop such a template. I'm not sure where we stand at that particular one at this point.

Guusje van der Vossen: Could you give me some context on the national API?

Sami Sahala: I can send you the link that it's all English and all documented. It really goes into details and the transport sector. It took a lot of time. I will give you the contact person of the national agency which was in charge of that. So, you can ask all the actual questions to her.

Guusje van der Vossen: Thank you. And is this API for communicating between operators to the platforms? So, from operators to MaaS providers?

Sami Sahala: Yes, it does. The API makes sure that everyone can resell the service of the operators on their MaaS platform. As a city, we don't demand anything at the moment. However, the public transport is the domain the local public transport authority. Of course, they've been opening their APIs towards the city. However, they have a hard time on allowing third parties into their space. But I think we are getting somewhere in a more compromised version of that at the moment. What is the data that the public sector needs to share with the other modality service stakeholders? So, for example, if I do an integrated journey with a taxi and a city bike, do I need to tell to taxi which bus I took? I think that detailed kind of information goes too far. So that is not included in the transport act.

Sami Sahala: Then us as a city, we need other forms of data an APIs, not B2B. And we need to be able to say that what data it is that we want. And also, what kind of approach, what kind of model we want to have here? This is something that I started to discuss with Ruben, I think about a year ago, I think, and then back in spring again, that as in European cities and, well, somewhat leading cities and in Europe as well. Do we want to follow the American way where cities are demand this data? That's how it works in the US. This is the information you need to comply. You need to send all this data, basically all of your data to us. And otherwise, you can't have a license to operate in the city. Yeah, and that's just us. That's a bit too much. We don't want, we want more cooperation. In the sense that that we help you guys make business in our city and in return, you help us understand our traffic system.

Guusje van der Vossen: But if you look at the big platforms and the big players, the, you know, the parties and the winner takes all guys. Yeah. Do you think that this will work in the same way with them? Because you already said, for example, Lime will not share data. We have a hard time with Uber in Amsterdam.

Sami Sahala: But I still think there's a lot of space between the and mandating version of the U.S. and then kind of wide-eyed cooperation that everybody acts on goodwill and needs to be

a little bit of elements from both, I guess that there's need to a little bit of mandated environment, but we need to have much more cooperative ways of working with these companies rather than really distinctive ones, when maybe by default on the other end arguing about stuff. I don't know where we end up with, but we need to find a kind of comfort zone somewhere in there between. Maybe the European de facto way of dealing with city micro mobility relationships or something.

Guusje van der Vossen: Yeah, so how will we enforce it? What will you ask? How much detail and especially the platforms, how will we lock them in to some extent and do the public interest? Because we can do that for operators, that you offer access to your infrastructure, but the platforms that are in there somewhere in the sky, it's harder to do that.

Sami Sahala: It is. It is. And of course, it is different. And if you are in a position that you can't get a license for them to use your infrastructure, and the starting point is a little bit different. But we need to be cooperative in a sense that we don't have that starting point. We can't control the legislation here in Helsinki, unfortunately. We can't control the number of E-scooters companies, for example, they are free to come and operate in our cities and us. We can't put out a public tender and then grant a license for just three of them, for example. I think the good thing is that we are small enough that there's not that much business so that it doesn't get that easily out of hand, and it doesn't cost that much disturbance. But then again, who knows? So, we need to be following the situation carefully all the time. This is the horror that city planners, they don't have that control anymore and that we have that same discussion with the whole mass topic in general as well. It is that disruption and that's good for us. But also, this there's a lot of downsides to certain people that they can't control it anymore.

Guusje van der Vossen: In the Netherlands we have the vision that we need this continuous flow of data for the deployment of the MaaS eco-system, as well as for altering our environment in such a way that we support shared mobility. So, I'm curious if since you are not using things methods of municipality owned data standards and data, how do you ensure that you are going to receive data from the operators in the future? Or do you do not think that's important for achieving such an environment?

Sami Sahala: Yeah, well, is it important? That's a good question, because we do not know yet if the city planners will use this data extensively. We still have to figure that out. Their current reaction is wow, quite interesting, maybe we will use it once or twice, but that's great. So, they do not see it as a large part of their work method yet.

Sami Sahala: Another challenge is that there are new types of data that that you need to learn how to use and utilize. But what if your whole work process has been for decades focused on using some statistics that get a couple times a year. So, the city planners need to learn how to use more detailed data. So, there's no point in having the data unless you understand how to use it. And that's a whole another problem, that how can we do that? How can we help the city planners to understand and have that that need it and then use it? So, there's a lot of tradition that if you want to understand new data, you do one study that takes a kind of snapshot and say, hey, this is how it works right now. But to have a real constant real-time information being kind of accumulating, which again is for people who have been working with statistics all their life, that changes their work, and I don't know how to help them, but that's something that we

should be looking into much more. So, it's not again, not just the data itself, it's about the justification for the data needs to come from the you need to create in a way, create the need and thus you have to make sure that the city planners understand that they need that data. The traffic system is changing, and they're still stuck on just using the age-old statistics and therefore they are not looking at the current and whole traffic system anymore.

Guusje van der Vossen: So actually, what you're saying is that a continuous flow of more detailed data could be helpful in a way. But to the point that we really get results from it, we have to have a learning environment jointly with the city planners?

Sami Sahala: Yes, I believe that it is useful. It's just another task that we need to help everybody understand that. And we will have that continuous flow of data. We are building that, and it will take a few years to have a really good constant understanding of the whole traffic system, what's happening right now on different aspects of not just the cars, but the whole multimodal traffic system. But we have to understand how to use that new data that is flowing in. How to utilize it and get the most benefits out of that. And personally, I think we suck at that.

Guusje van der Vossen: Yeah. So, what I hear from you is that the collection aggregated flows of data for city planners could go hand in hand with experimenting with more detailed forms of data. By for example, doing pilots with companies like Vianova. That is a refreshing attitude.

Sami Sahala: Yes, you need to open up your view. I don't know how we get there and when we get there, but still, that's something I'm pushing at the moment. This local pain has been that we have two distinct departments within the city organization having very different perspectives here, us and the city planners.

Sami Sahala: That is also the case in Amsterdam, that we as Smart Mobility want to learn from today's data, but for which other objective is not really clear, and therefore we can also not explain into the other traffic departments.

Sami Sahala: Actually, could we zoom in a bit on the pilot with Vianova? Because I'm really curious about what data you receive from the, and how you ensure privacy.

Sami Sahala: Yes, of course. But If you really want to go in depth than we should arrange another meeting with the guys who run the pilot now, we could do that. The pilot it's been running since the beginning of this year, and because of the good experience it will continue to the end of this year, maybe longer. As a city we need a little bit more time to make up our minds about if we still want to continue collecting that data or not? I'm guessing there will be a break after the New Year's and then then we'll get back to it in spring when the season really starts. But let's say we have another call on it to go in detail.

Guusje van der Vossen: Yeah, interesting. It would be nice to know more about the digital backhand and the APIs that you use.

Sami Sahala: Yeah, definitely. Yes. Yeah. We were discussing back in the spring that we should really just organized a joint workshop or something just to get this thing going. I'm interested in the big picture and the governance, because that's what we need. I'll sent you can invite for a follow up.

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Guusje van der Vossen: I have one more question, before we wrap it up. My main research question is, what are the opportunities, bottlenecks and practical possibilities of a European data standard? What is your opinion on this, and do you think we should have some kind of European standard or do you think that's not the way to go?

Sami Sahala: No, we should have. Um, let's say you need to have an official standard, at least not straightaway. A de facto standard would be nice, MDS is an option. However, some European cities want to have less privacy intrusive information. But we need a European way of exchanging information. And this should not only be a technical standard, but also a data governance framework (toolkit). So that's as a micro mobility company going to another city, you know how things work. You don't have to start the discussion from the beginning. So, you need to have technical standards, as well as some kind of de facto process as well, which would mean the data governance and use cases.

Guusje van der Vossen: With the CDS-M we are now only focusing on pre-aggregated data, do you think that this this is a beneficial course to keep going?

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Sami Sahala: Well, it is maybe hard to maybe come up with a one size fits all kind of model. The CDS-M is not really flexible now with the aggregated data. For example, big cities are different than, say, less dense, even rural areas. Actually, we want to have a system that works good for everyone and in the end, so we will probably end up with a flexible compromise. And also, here in Helsinki, the standard has to be flexible, because we need to alter it to the demand of the operators, because we do not have the legislative framework to force them to use the standard. Sami Sahala: All right, but let's have another call about the lessons learned from the pilot so far?

Guusje van der Vossen: Yeah, I think it will be a good idea. I think we could learn a lot from this pilot that you are doing.

Sami Sahala: OK, nice. Well, thank you so much. Hopefully we can collaborate in the future.

Guusje van der Vossen: Thank you. Have a good day. And I'll see you soon.

Sami Sahala: Yep. All right. Thank you very much. Bye, bye.

2.8 Transcript Interview Jorge G Coelho – Lisbon, Portugal

Interviewee: Jorge Coelho, Chief Information and Innovation officer of Faro

Date: 29th of October

Used standard: Pilot with 2 operators and Vianova & Populus, MDS provider API

Preferences: A new uniform data standard, or aligned pre-existing standards, but more importantly a shared understanding about the management and use cases of mobility data, some sort of framework or toolbox.

[Introduction]

Jorge G Coelho: Okay. I can't hear you guys. Okay, I understand. You disconnected. Okay.

Perfect. Basically, I was saying that I've got also some background in mobility. I coordinated the Sustainable and Mobility Action Plan for the region, for the region of Algarve previously. And so that's why I'm a bit keener on some issues pertaining to mobility itself. And in regard to what we're doing lately, particularly with the scooter companies, it's something that's quite a blank sheet for majority of our cities. And so, since February 2019, we started off by welcoming the companies. But with this trade-off that they'd have to share data. And over this period, we've also been sorting out having a clearer understanding of what we need, what we have to collect, and also what standard would we be aiming for. And so, at the same time we kicked off in February 2019, we also signed up for the ten Principles for Shared Mobility that's managed by NUMO.

Jorge G Coelho: So, they're not currently in the 1.0 standard yet. They're still in the 0.4. And what we gathered, particularly with the other... Because at the same time, we then have a platform to decode these standards, basically to visualize what's happening. And so, we've been assessing two

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different platforms. One is the North American Populous. And then there's this European one, the Vianova. We've been assessing both of them to see what demands they meet so we can design our specifications.

Jorge G Coelho: Because we're basically going to set out to tender an RFP to contract one of those platforms. So currently, where we are, we haven't collected information in a very smart way. So basically, what we've got from the previous operators that have been in the city is aggregated data. So, it's not really where we want to be. But with this platform, we will be having the information more detailed.

Guusje van der Vossen: Could you repeat the name of the other platform provider?

Jorge G Coelho: The first provider of all was Void, the Swedish company. Those were the first ones. Then came along Flash, which became Circ. And those also left. And finally, we had Bolt that they were here recently and now they've stopped. They halted operation, something around June. And so now Bird is going to start during December, something like that.

Guusje van der Vossen: And Vianova is offering you the service of MDS and also another American company, right?

Jorge G Coelho: Populous. Yeah. They're quite popular in the US, because they've been big sponsors of... I don't know if you're aware of TRB, this big research mobility event that happens in Washington at the beginning of the year. And so, they've been sponsoring different things. So, they show up a bit on that side. Here in Europe, I'm not aware that they're anywhere yet. And actually, in the beginning, we had some concerns in regard to GDPR and also the safe harbor and all those stuff regarding the data.

Jorge G Coelho: But actually, they're also fully aware of that. And they are compliant. Because obviously they're in talks with us. But we are a very small city. We're 60,000 people in the city. But obviously they've been in talks with us because they're obviously looking at the European continent in its whole.

Jorge G Coelho: That being said, basically, what I see in the future, those platforms for us will be helpful regards to analytics. But at the same time, what I see, we're going to set up, before the end of the year, basically, we'll be collecting information to build up almost our cohort of knowledge base, in more like an historical understanding. Because the MDS has got these two fronts. You've got this active front, what's happening now, and what's happened in the past.

Guusje van der Vossen: The agency and the provider API?

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Jorge G Coelho: Yeah. And so, what we'll be collecting will be more focused on this latter point. It'll be regards to basically past mobility. So, we can basically use it for our research.

Guusje van der Vossen: And so, you are using the provider API and the agency API?

Jorge G Coelho: Yes. From the agency API. Yeah. The provider, their endpoints are connecting to this platform. And also, in regards agency, it's quite limited because what's happened is in regards for boundaries, no-go zones, things of the sort, we've sent over shape files. So, it's something that we've also got to get shaped up so we can really have the policy API and also agency API really working, at least to take up the advantage of some of the potentialities in regard to that.

Guusje van der Vossen: So, you're using the provider API for historic database, for building a database, for planning purposes or for what purpose do you want to use that?

Jorge G Coelho: Yeah, basically for planning, but also because, the city as it is, we've got something like 10 hotspots. We've replaced former parking spots for a hotspot. But those 10, it's only a fraction of the overall hotspots in the city. So, we've got like 30 something, almost 40 hotspots. Only 10 are really in place. And with this data, we expect to also understand, should we be expanding some hotspots? Should we be setting up some different requirements? Where should we set up priorities?

Jorge G Coelho: And also, in regard to the no-go zones, we also expect to get more information there. Particularly because we don't have public bikes yet. But we are preparing a tender that's going for a 18-month pilot with public bikes. And we're quite aware, with scooters it wasn't much of an issue, with bikes it will become. Because there are some streets that the sidewalks are very narrow. So, if a bike is left unattended in any manner, it can become a problem for mobility of people who are going by foot.

Guusje van der Vossen: Yeah. The walkability.

Jorge G Coelho: Yeah. It'll become a walkability issue. And so yeah, that's the dynamic issue that I find could be very promising in regard to the policy API. Because we can also throw in events and whatever happens. So, we can dynamically affect how parking taking place, for example.

Guusje van der Vossen: Yeah, so you can communicate the no parking zones?

Jorge G Coelho: Yeah, yeah, yeah.

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Guusje van der Vossen: Great. So now it's clear what you want to achieve with the provider API and with the policy API. But what is the purpose you want to collect real-time data for?

Jorge G Coelho: Now, real time isn't too critical. But I guess if we're managing. And the time being we don't have a police force, a municipal police force. But we will be having over the next 12 months something like that. And so, once we do have them, having the act of mobility feed, it can actually also help, particularly in those more critical places, for the police force to step in and basically avoid that people be going in places that they shouldn't, basically.

Guusje van der Vossen: And would your concern... Because now you're talking a lot about regulative aspects of the standards. Is it a problem, do you think, in the future that those companies, Bird or Circ, don't want to co-operate with you because the regulative aspect is not beneficial for them?

Jorge G Coelho: Yeah, we're quite aware. When we started all of this process because, as it is, even in regard to the regulations and all our regulatory framework, there isn't a mention in regard to shared mobility as a majority of the city. And so, it was quite complicated to fit them in whatever place. So, the first position that our executive team had was that basically we wouldn't be too demanding. More to welcome them and to collectively understand how we should manage. So, it's been an open-mannered process.

Jorge G Coelho: Also, we weren't too demanding even in regard to data and all. So, we were pretty much open. But obviously, for example, for Void they left the city and they showed very little information. And so now, since we have these consultants that are preparing this tender for the public bikes, we really needed the information. So, we actually had to have a more active voice and we actually had to warn them that basically if they didn't share information that, besides having to pay taxes that they were exempted... Because that's what's happening.

Jorge G Coelho: Anything that makes a profit, that's using public space has to pay a tax in the city. So, they're basically exempted of those taxes. And so, with them, we had to remind them that they were exempted of the taxes under the light of the agreement that we signed. And so one of the items of the agreement was that they had to share their data. And so, since they would be breaching the agreement, they would have to pay taxes.

Jorge G Coelho: And besides that, that they'll enter into a blacklist that makes them ineligible for public contracting within Portugal.

Jorge G Coelho: And so, it's a line of discourse that we haven't had. We really had to use it with Void because they weren't sharing information. And so, they finally did. They shared more

information. And so that was the only time that we had to really have a bit more of an active role and it's a more challenging role.

Guusje van der Vossen: So, if I correctly understand it, it's the fact that if they don't deliver data, they have to pay taxes and otherwise they don't?

Jorge G Coelho: As it is now, because we're in a trial period, from February 2019. Since shared mobility doesn't feature in any of the taxes that really exist, or formerly they don't feature up in any point, we have to craft that. And so, the way to work around, to make it possible that they run their operations without waiting to get all our regulatory framework adapted so that they can operate, we opened up a trial period. So currently what's happening is, from February 2019 upwards, we've been running one-year cycles that they have been renewing of this shared mobility experience that's underway.

Jorge G Coelho: So, it's under that light that they are operating. So, they're exempted. Obviously, we could be imaginative, and we could come up in a way to apply the existing taxes to their operation. But it would be something pretty much heavy. And so, we're also quite aware. And also, that's why we signed up for the 10 principles of shared mobility. Because one of the principles actually that we tax them in an equi manner. So, as things have rolled out and you can see, particularly in the United States, some cities really set up very demanding taxes.

Jorge G Coelho: And so, what happened with it directly was that the companies ceased operations. So obviously we've got this understanding that there are some negative aspects, but there are also positive aspects. And so, we don't want to rush them off without having a real understanding what are the impacts and also what is a balanced tax to apply to them? So, it's something we're crafting along the way.

Guusje van der Vossen: Yes. That is the way you can enforce them, but is there another way in which they would co-operate with you because there's a win-win situation, because you give data back to them or extra operating space or any other form in which you would enhance the co-operation?

Jorge G Coelho: Particularly in regard to sharing the data?

Guusje van der Vossen: Yeah, exactly.

Jorge G Coelho: Yeah. Obviously, they're aware of that because they also want to build that shared understanding in regard to where are the needs. So, it's something that, for them, it's good for the city to be aware. And also, to have the data, to drive their decisions based on data to set priorities.

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So, from what we've collected up until now, they've been pretty much co-operative. And also, a way to manage it, besides all the paperwork, what we've got going is these monthly meetings that we have the police forces by, and we have also different stakeholders.

Jorge G Coelho: That was particularly important at the beginning because everything was quite foreign to everyone. And so basically the operators were very keen on understanding the different feedback. So, there was no issue arise that wasn't possible to get a solution. And also, what I drew from them up until now is that they were pretty open to accepting suggestions and also, they see a value in sharing their information.

Guusje van der Vossen: Okay. Nice to know. I have a question about the differences between Vianova and Populus because you work with both. What are the main differences between these two parties?

Jorge G Coelho: Good question. Well, to be honest, Vianova, we've been given access last week with active feeds. So, there I can get a grasp of the platform. In regard to Populus, they will be giving me access now in November, during the month of November. So only then will I really get an understanding what we've got on one side and the other. Because what we're going to also aim for, drawing from this analysis that we're going to do of both platforms, we're going to see what's common to them, what's critical in our understanding.

Jorge G Coelho: And so we'll be inviting at least both to deliver a proposal and basically for them to have an opportunity to give their proposal. And then we'll be contracting. It's going to be particularly critical in regard to the public bikes. Because the public bikes, we won't really understand very granularly what's happening in the city. Because based on this information that we're going to collect during this 18-month pilot, it's going to be on top of that. We're going to launch most probably a five-year contract.

Jorge G Coelho: And so that's why we need this platform to really... Because it's not cost-effective for us to develop a platform. So basically, we're looking at these. It doesn't mean that there might be others. I'm not fully aware.

Jorge G Coelho: Actually, last week I went into more detail into the GitHub-page on MDS that's run by the Open Mobility Foundation. They've got different working groups. And then there's this working group in regard to privacy that you can see who's participating in it. And so, I see different companies. So maybe there might be other companies are doing the same thing. But yet, for now, being the ones who are in touch with us, those two.

Guusje van der Vossen: And have you already talked about a privacy issue about how they're going to ensure it is?

Jorge G Coelho: Yeah, this is this has been quite critical. It's something that surfaced with both because both they were better. We signed our agreement and then MDS popped up like a

month or two after they started their operation. And, um, and what happened was that the operators were very cautious in regard to the data sharing. Initially, I wasn't sure if their concerns were really being GDPR compliance or if they just didn't want to share their data in a very granular manner.

Even today, I'm not sure very sure which one was the main driving force. But truth is GDPR is very demanding. And I also understand that they are obviously like directly. You can't identify anyone, but indirectly it might be possible. And so we asked Populus and Vianova some questions, and both of them are very aware of GDPR. And one common theme between both is that they've got the city divided basically over the territory, dividing the land. And so, what happens is like when you do your renewal analysis, more specific location data will appear if they've got three or more counts. Mmhmm. And so that's a way of working around it. And so that might be, uh, I like what I see in our case. I guess it would be interesting if we could project that the data could be projected onto to power lines also, because we've got like four years, four years of data from Strava for our region. They work with the road network. And so, the city it's basically broken down into different nodes. Every intersection is a node. So, for all these segments of power lines, you've got counts. And so, for us, it would be useful to project the data into those points and then we could have a more comparable, wider comparable setup.

Jorge G Coelho: Well, that's a particular case now. Might be a particular case from that far enough in for us but could be something interesting to also to understand if it's because I'm not like fully aware how they are doing their data processing on it. But one thing I'm sure and each operator does things in a very different manner, and even within some operators, they're not very they don't operate in a normal manner. And so, I see it also as a challenge. And that on the operator side and also on the city side, it's something that might be also quite heterogeneous, I suppose. So, it could be also interesting to build better understanding because in the working groups that are going on, I don't see a working group in the case of the CDS-M, you're working group on the side of the city side of the agency side, because that would be also it could be interesting to see because it could be like a bigger consensus of having like one way of getting their information aggregate to another. So that information is a bit more useful at the time.

Guusje van der Vossen: What we struggled with was the case that the GDPR states that you should only collect the data if it's strictly necessary and the least intrusive way. Um, that are the requirements of necessity and proportionality. Um, and that was also our motivation to start our own standard, the development of it. Um, because. The way by which these companies work is extracting a lot of data and just keeping what you need aggregated and delete the raw data in two hours, if I remember correctly, and then storing that aggregated data for five days. In Amsterdam we are not really sure if we need all that raw data for our policy goals or if we can do with a bit more aggregated data or just a larger sample size for example. For this reason, market parties in Amsterdam really hesitate whether they want to deliver data to, for example, Vianova. Are these concerns not present in the negotiations you are having?

Jorge G Coelho: The truth is that it wasn't much of an issue. Uh, I mean, I understand that what I get is from the platform side, they are like enforcing that. I'm not sure if the information that the operators are passing on to the platforms, if they are having the same concern. But the truth

is the regulation applies also to them. So, the platforms, like Vianova, they shouldn't be sharing raw data, basically.

Guusje van der Vossen: Yes, so you only receive the aggregated data in some form of dashboard?

Jorge G Coelho: Yeah, yeah, yes. In our case, it's only aggregated. We haven't been critical in regard to the aggregation or like the aggregation site, but it's also something that could be useful to have like a wider shared understanding in regard to that so that it can be useful even on different scales within the continental country, region, city.

Guusje van der Vossen: So, you're actually quite comfortable with a third party that is managing, um, the data actually from your citizens that are using the mobility services?

Jorge G Coelho: Well, we're not really consumers of the data, so it's something that we could be playing more of an active role in regard to almost like a pedagogical aspect. But the truth is, it isn't much of a role that we've played out. So, it doesn't mean that we shouldn't do it. But the truth is, up until now, it hasn't been in the place that we could do it ourselves. But is that something that is demanded in the Netherlands?

Guusje van der Vossen: Yes, well, that's kind of a discussion now, if we have to be responsible for the mobility data. But the bigger question now is actually if we need that raw data, because you could also just get the aggregate data from a third party, why don't we just request aggregate data from the operators ourselves and we bypass the third-party aspect? So, we feel like we are responsible for preserving the privacy of our citizens in that way, because you're never always sure what happens with the data, although it's just for two hours in their cloud and then they deleted it, there is a small risk. But yeah, so that's that's the kind of question that we're that we're posing right now. And also, we were trying to do a pilot with Vianova, but it failed, because there was a lot of hesitation for sharing data. And it's the same issue, as you said, maybe it's the privacy, but maybe it's just the fact that they don't want their data shared because it's commercially sensitive. That's why we are planning on developing a standard that requires less detailed data and with which all parties are comfortable with sharing their data. Another problem for this, could be that we are not very clear about what we want. So, we talk a lot about the sharing data and also the conversations about sharing data and the technicalities and the stumbling blocks or whatever. But I expect that if we governments are clearer in what we want and why we want this, it would be much easier, because we have a better rationale to ask for data.

Jorge G Coelho: I recognize also within the traffic department they still have an old school thinking and about how to manage your operations. You manage your traffic and mobility and

safety. And we are also still, I think, still in the infancy phase for developing our strategy in that respect.

Guusje van der Vossen: Yes, indeed, so are talking a lot about data sharing, but not so much about what we do. We do what we do with it. Do we want to regulate or do we just want to be planning for a particular purpose because, you know, they need really different kinds of data for the purposes?

Jorge G Coelho: We still haven't figured that out completely. And now, I guess pretty much learning. So, yeah, it's something that's pretty new. So, yeah, I guess it's also like the normal the operations that they're running, it's something that obviously they're not baked or at least the schoolbooks don't mention or the nor the shared mobility and even less this logic of governance by algorithm. And the truth is we're pretty much heading their way. And I guess the shared mobility is a fertile land to enact that those possibilities. So, I guess it's something that, um. Yeah, it's something we've got to going to working towards. But I think I think it's pretty promising as this policy API program, for example. So you can set some dynamic ruling. Yet I think it's it seems quite logical and obviously, um, it seems to me it seems very logical if you look at the city at scale, because there are lots of fluxes that could be dynamically managed and even rules and you have a better output from the system.

Jorge G Coelho: But the truth is, I guess it's something that even in the way that the city is modeled. And the truth is you've got like PTG and all those big companies that this model and they don't keep on modeling the cities that they almost saw one size fits all, obviously, like it's a bit more nuanced, but they've got these black bottom black box models where you've got these inputs that will give an output. And all the engineers are really pretty comfor with that. But the truth is with how things have been working out and the computation possibilities and the way that we have to process bigger volumes of data, it's something that opens up space for a new like a fourth framework for. And so basically, we're talking about dynamic modeling and that is something that obviously like these black companies will certainly come out with something. But going back to your concerns, is that something that we want?

Jorge G Coelho: Because I guess one thing that holds a big promise for this fourth model for way of modeling is they can be pretty much open. So, and I guess also even OECD held a meeting last week that was called the Morse Code of Quarters of College Law, something like that, but basically reviewing the way that the legislation is designed so that it basically takes in not only the aspect of being machine readable, but actually taking advantage of also machines reading so they you can get these dynamic aspects going in.

Jorge G Coelho: So, this is like a big, big thing, like very complex. But obviously, what has to be broken down into sort of small steps and I guess the shared mobility, it's a pretty I think it's like a quick win to start off and in the end also to try out some traps. And it's quite light, quite dynamic. And so, something we can even play around with, maybe make it like a sort of a sandbox for maybe that can become like a can reduce mobility at large. And in this dynamic

modelling and also artificial intelligence involved in. Also, even if in Amsterdam I've been looking into what you released like two or three weeks ago, something like that was regarded with a platform. So, I don't know where he actually this. You know, it's like a registry now, you guys know better than me, that this registry where you you're showcasing where there are algorithms you've got in place so you can show some light on it and make it transparent. And so, yeah, I guess that's the that's where we're going. Even A.I. is something that can be scrutinized. And so, I guess, um, obviously, like there might be some aspects that we'll need to be obfuscated in. Some you obviously don't want to you know, you don't want to show, like, how you're going to sampling your samples to assess if someone is like stealing or whatever. And that's something you need to keep to yourself. But there's no prejudice in place that you're not giving up more information than is needed.

[further explanation of dynamic modeling]

Jorge G Coelho: But on the business of the future that we want these modes to feed the public transport system. Like we don't want to create competition, like we want to basically have a wider array of services but try to articulate them. Obviously, it's something that you can't do it in a very linear mode. So, you can't, like, demand it. But we're indirectly trying to treat it like a hotspot, a place by parking in a hotspot next to close to bus stops and also, you know, trying to match different pieces of the puzzle. So, like, we hope for also a MaaS solution. But, yeah, we've got to make our way up to. So that eventually becomes an issue also.

Guusje van der Vossen: And, um, so you're also one of your objectives is to create a more car free city.

Jorge G Coelho: Yes, definitely, definitely.

Guusje van der Vossen: You mentioned parking zones, so you're trying to regulate the space. Are you also, um, enforcing, um, and supporting safety issues with the mobility? Are you addressing those things?

Jorge G Coelho: Well, in regard to safety, uh, breaks down into two issues. One would be like in regard to infrastructure. So, like to, uh, that's something that's under way to create like a more there are streets are more, uh, safe for, uh, for bikes and then who goes around in scooters and all. That's one aspect. And then the other would be like to in our communication to advise that people use helmets and all. But the truth is, it's something that we also don't want to that's something we don't want to enforce because, um, well, that's my particular understanding of the city indirectly seems to be signing up for that understanding. But formerly, it hasn't cropped up yet. But, uh, basically my personal things like helmets shouldn't be forced onto people. So, yeah. So, I guess the thing is, the other way around, the scooters should bring down their speed. So, we've got scooters that were going up to 20 kilometers per hour. And I believe that we

should be bringing down the speed because in what I see some streets, it might be worthwhile to pick up speed where complexity is low, risk is lower. But the wide network, I guess we should break it down to to less at most sixteen kilometers per hour, something that's I guess where the security should play out. Not really putting people to go in with helmets wouldn't work in the Netherlands at all. People are reluctant to wear helmets.

8.1.1.1.1

Guusje van der Vossen: In the long run, do you aspire to do it eventually execute the data collection by the city? To create a learning environment with those parties and that you want to stop outsourcing it?

Jorge G Coelho: Yeah. The analytical part that might eventually be what I see a roadmap would be like. The first step to that direction would be to take the historical data to be only sold by us. And then the analysis would be just like a module that would be reading our databases. So, that's like a first step. But for time being, we're not there yet, and do have lots of solution providers that want to sell platforms. Now, we're quite keen on it because our budget isn't very big. So, like we're not very big to jump on to any platform. But one thing we're certain is like it's more important to sort out the standards and to be having information that has some value and then really to have a platform. The thing is like having access to the information, has the most value.

Guusje van der Vossen: for taking these next steps, would a European standard be of help?

Jorge G Coelho: I guess if we have like a wider for example, like if we could improve the MDS, I guess that would be maybe more useful. But maybe even your standard, yes. But more important is a guideline in which data to request, in what ways to aggregate, where you're going to analyze it etc.. That like shared understanding of data management within the European context.

Jorge G Coelho: And even, for example, you've got the public parking data standard that the surveillance that's being worked out, it's pretty much European, but they're aiming for worldwide. And what I see is like you've got these different fronts. And I guess it would be best to take advantage of them to see, like, how we could adapt them to our needs then to maybe make to get a new front going because. Well, I think it is a lot of effort to set up a new standard, but the biggest effort isn't actually to set it up, but to keep it going. And so, in that understanding, I guess for the long run, if there would be a way to align, alter and adopt these wider European standards and have a European understanding that would be a great solution.

Guusje van der Vossen: So, we're planning on having some sort of corporation with OMF, but we don't know yet the form of it. Uh, because now there's a Metrics API and that one works with aggregated data and that is where. Ah yeah. That's what we prefer actually. So, uh, there's an opening to maybe cooperate in this, uh, particular aspect. It would just be nice if we could

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create a larger support base and we would all ask the same format from these parties. That's, that's the goal indeed. We will keep you updated on this.

Jorge G Coelho: OK, look forward to that. Yeah.

Guusje van der Vossen: And we will also stay in contact with the OMF and then at the same time, we'll keep on working on our own standard and see what turns out of it. And, uh, this interview series also kind of a testing matter to see if we're on the right course and if we're serving all the needs of all the European cities. Um. So, we'll keep in contact.

Jorge G Coelho: OK, thank you very much for reaching out and congratulations on your efforts and yeah, look forward to the outcome.

Guusje van der Vossen: Have a nice day!

Jorge G Coelho: Bye.

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2.9 Summary interview Karen van Cluysen, Polis

Interviewee: Karen van Cluysen, secretary general at Polis

Date: 29th of October

***Recommendation:** Keep the European discussion around data governance going, and make sure that there is a common understanding of use cases and interoperability among standards.*

Karen is secretary general at Polis, which is a network of cities with several European cities as members, including Amsterdam. Polis tries to facilitate the discussion on data standards and the communication of experiences between European cities. Polis also often works with European projects and within grant programmes of the European Commission, in which Polis represents the voice of the cities. They are a party committed to improving mobility and other sustainability issues in cities. In the light of shared mobility, Polis aspires to facilitate the dialogue between the operators and the cities. In addition, they are committed to developing a regulatory framework with regard to commercial shared mobility and data sharing.

Karen tells us that such a framework is important in order to filter out the negative aspects of shared mobility; this is often done by means of permits and licensing. The discussion about data governance that is going on, is about which standards should be used, and what use cases are sui for this shared mobility data, an example is the use case of geo-fencing. According to Karen, these use cases need to be elaborated further, because they are currently under-developed. This lack of clarity creates reluctance of the market parties, on the one hand because of privacy concerns, but also because of the protection of commercial interests. That is why it is important for cities to be very clear about which data they want to request for which exact purpose. Building an overview of these use cases is what Polis is now working on, creating a kind of toolkit for the cities and information and clarity for the operators. The New Urban Mobility alliance (NUMO) and Populus also contribute to this, they have made an overview on how specific data can contribute to the implementation of policy goals.

An area of tension for these use cases is the lack of experience a lot of cities have in the field of data processing, analysis and management. The question is whether cities want to internalize this capacity or outsource it to data brokers, to companies like Populus, Vianova and Blue solutions and blue systems. In addition to bringing a great deal of expertise, these parties can also function as a neutral intermediary between the cities and operators, they act as a Trusted third party.

Karen mentions that there is still a lot of discussion about which data specification should be used as standard. Polis would like to play an accompanying role in this decision-making process and to ensure greater convergence between the cities. There is a demand for this from the operators too, because then they do not have to supply data in other forms in a different city every time.

Philippe Crist of the International Transport Forum is knowledgeable in the technical aspect of data standards and the policy side. He works closely with Polis. In a seminar last week, he indicated that we are still at a too early stage with data-driven policy and the formation of use

cases and regulatory frameworks. Only when both have been properly worked out, a decision can be made regarding which data standard fits best. He also indicated that we may not even have to choose a single standard, because when there is interoperability among all specification, and they use the same definitions this won't be needed.

Karen says that many cities are now opting for different paths. For example, Amsterdam is designing its own standard, Paris already has one, 'SIVU', and Lisbon is working with different standards. An exploration phase is now underway.

Polis is trying to map out all these exploratory activities to make an overview of how far different cities are in digitization. Karen highlights that even the big cities are still in the infancy phase. 'Madrid, for example, indicated this last time in a meeting, which is quite remarkable because they are very far advanced in other areas of innovation. Brussels is now creating an extensive regulatory framework and is now in the pilot phase with Vianova. Brussels, too, does not yet know whether it wants to internalize or outsource data processing.'

Karen recognizes that the interesting thing about MDS is that it not only enables communication from operator to city, but also vice versa. The government can then also communicate its own conditions and rules in a machine-readable way. She says that this is not yet the case with other standards. However, she mentions that there are concerns about MDS in combination with the GDPR, even though the data brokers say that this privacy problem can easily be solved by adding safeguards and disabling certain functions of MDS.

Karen says that the use case way of thinking is again very important here, because target reasoning is needed to comply with the GDPR. She states that therefore it is important that cities start reasoning from policy goals to demand data. 'What data is needed for monitoring or mapping mobility flows, or for enforcing permit requirements, for example?'

Polis wishes to help with this. They plan to communicate the work done by NUMO to cities in a user-friendly way. Polis now has a survey running among their members about data needs and data formats. She thinks that this survey provides a good overview of the preferences and state of affairs. Polis wants to tune their explanation of NUMO's work to this. The results from this survey together with NUMO's work could be a good starting point for the next step in this data governance discussion. Lisbon expressed the need for such a discussion. Lisbon aspires to reach an agreement on useful use cases and standards that fit in with it these. Polis would like to facilitate this discussion and invites Amsterdam to present the results of this graduation research in the follow up with other European cities.

2.10 Summary Interview Geert Pater and Peter Jager - RDW, Dutch Vehicle Authority

Interviewees: Geert Pater, manager and data scientist at RDW

Peter de Jager, Senior adviser and enterprise data architect RDW

Additional participants: Larisa Wentholt, Manager Applied Innovation & Exemptions at RDW

Date: 30th of October

Recommendation: Cooperate with a European cities on mapping of use cases, target reasoning and the development of the standard. Try to make sure that the standard is adopted widely, before reaching out to the European Commission. RDW advises to make use of a Trusted Third Party for data processing and storing, as is done with 'Service huis parkeren'.

Geert Pater is currently working on setting up the legislation behind autonomous vehicles, besides that he is also involved in projects that enhance the connectivity of these vehicles with the (charging) infrastructure. Because the RDW is an authority, they are often in consultation with the European Commission and its General Directives. Geert indicates that there are many different General Directives (DGs). The RDW cooperates most often with DG-REFORM, this Directive is in tasks quite similar to a Ministry of economic affairs, the car is included, because it is one of the most important industries in Europe. Besides DG-REFORM he is also aware of DG-MOVE; which tackles infrastructure, emissions, road signs and traffic regulations, and DG-CONNECT; standardization of connections, radio waves and sensors, and DG-RTD; the research directive. So, these DGs each have their own function, but none of them contain data standards for Shared Mobility as a whole, this subject is partly covered by all of them. Shared mobility and its regulations have not yet been laid down or substantiated in a DG.

Geert Pater indicates that the DGs do not cooperate well with each other and often do not even know what they are developing and implementing. This is because the DGs are terribly large and layered. For this reason, he expects it to be difficult to attach a data standard for shared mobility to a particular General Directive. Cooperation among these DGs only occurs when there is an important connecting factor, such as safety, cyber security or the environment. The European Commission subsidizes Smart Mobility projects, but in order for an initiative to be included in European legislation, the standard must first be adopted in the European Area. Geert therefore recommends focussing on the urban network and subsidies to expand the CDS-M, and then at later stage you could try to make the standard be 'European' from a legal point of view.

Geert says that a standard that is made 'European' must comply with a number of things. Firstly, the standard must represent a major public task, such as safety or the environment. Recently, the environment has mainly been seen as major ground, says Geert, and he advises me to talk to Bert Timmermans about this. Another processing ground could be the Road Traffic Act, Article 2 which includes traffic flow, road safety and the preservation of infrastructure and sustainability. Another way of making a standard 'European' is to link the standard to an ISO standard or to cooperate with the NEN, National Standardization Institute.

For all these ways, the reasoning remains the most important. For whom, what, and why is data requested? The reasoning must be completely clear, for the design of the standard, so that it meets the needs and is therefore usable, but also to comply with the GDPR.

Because this reasoning often causes problems, Geert advises us to keep the standard small, at least if the aim is to make it 'European' as soon as possible. That is when the chance of inclusion is greatest. He also advises Amsterdam to make extensive use of pilots, so that this 'who, what, why' question can be better answered with use cases.

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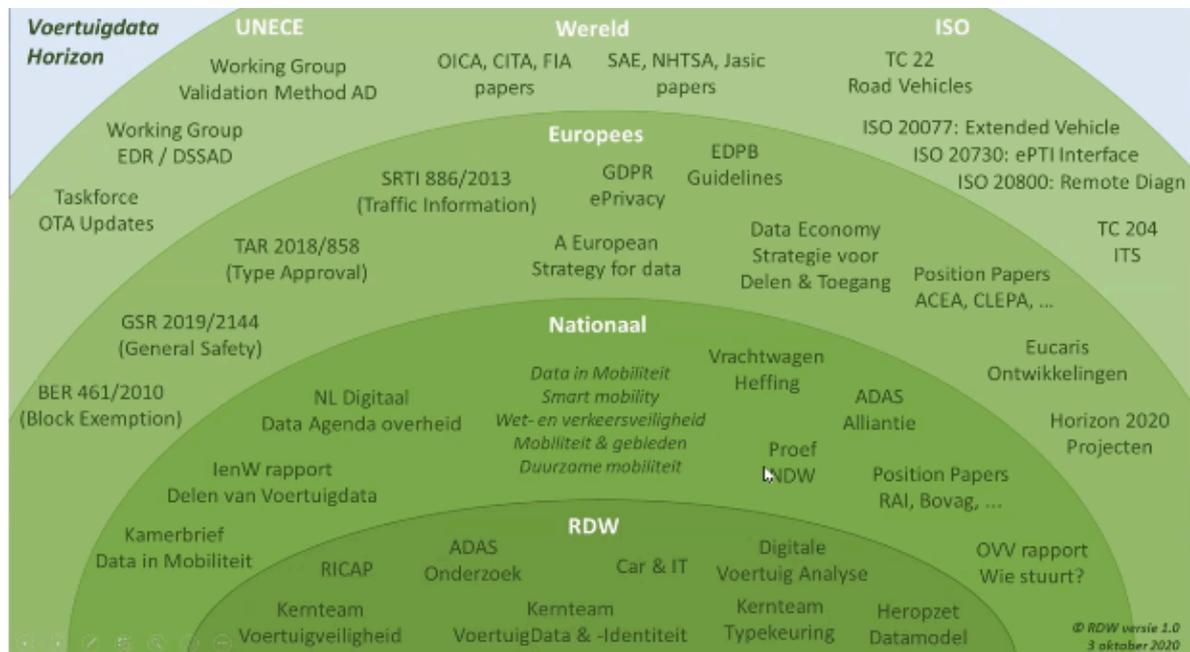
He sees this as an opportunity for the further design of the CDS-M. A bottleneck that he foresees is the long time it takes for a data standard to become 'European', due to bureaucratic systems. In addition, he also thinks a potential bottleneck could be the fact that CDS-M does not fall under traditional subjects of the DGs of the European Commission and regulation. He therefore indicates that there must be a great sense of urgency for a data standard for partial mobility at the European Commission and the cities, and he expects that this urgency will have to grow and that it may not yet be sufficient. He indicates that cities have an important role to play in creating this urgency, because if it takes too long the market players take over this role, and cities are dependent on data brokers and Shared Mobility Operators. Geert gives the tip to promote urgency and persuasion by setting up focus groups with other European cities.

In addition, Geert indicates that a Trusted Third Partner would also be a good option for using data standards and processing and storing the shared mobility data. This has already happened before with parking in Amsterdam. RDW uses the parking register and communicates this to the Parking Service Centre, the Trusted Third Party, they have the parking data and communicate this to Parkmobile and the enforcers. This could also be tackled in this way with data from shared mobility in the city.

As a final tip Geert advises us to look at what the WP 29 has written about data of partial mobility.

Peter de Jager tells us that the current car standards, EDR and DDSAD are both elaborated in an ISO standard, so that the regulations are technically compliant. The EDR functions as a high frequency black box. This black box is consulted during the reconstruction of an accident. The DDSAD is used to identify whether the driver or the car's system was driving during an accident, e.g. lane keeping system. How these standards are organized under regulations or as ISO standards can be seen in the figure. Each European standard is either included in an ISO standard or falls under a regulation.

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In other words, if the CDS-M is to become a European standard, it must be covered by a single regulation or laid down in an ISO standard. Peter agrees with Geert that you have to be able to put it under an existing framework regulation. A regulation is often based on major objectives such as safety or the environment. According to Peter, CDS-M must first be further developed so that the processing grounds and objectives are completely clear. Only then will it be clear which ISO standards are applicable and which regulations are appropriate. It may also be that a new ISO standard has to be formed, which will take years. Peter agrees with Geert that perhaps the network of cities is a better route for adoption, then no compliance is needed with regulations or ISO-standards, and it does not take as long as implementing it in the European Commission. If the CDS-M is widely adopted by the European cities then it will be incorporated easier into the regulations, because of increased urgency. Peter Jager also advises to work with other European cities in the design process, because he agrees with Geert that this increases adoption, urgency and provides better target reasoning.

Peter also agrees with Geert that a Trusted Third Party could be a suiting option. According to Peter, processing and storing mobility data requires a lot of capacity and expertise. Within the RDW, 5 billion license plates are requested per year. The RDW manages the parking and license plate register. Safely storing this data is a major task. The RDW has an entire department with Privacy Officers and data scientists who maintain this system. For every change to the system a privacy impact analysis is made. It is also often necessary to re-occupy the system. Many municipalities do not have this capacity, Peter Jager thinks, which is why he advises to work with pre-anonymized data, or work with a Trusted Third Party.

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2.11 Summary interview – philosopher Yuki Tol

Interviewee: Yuki Tol is Master of Philosophy and currently works for the Smart Mobility Team of the municipality of Amsterdam. Yuki did not want the interview to be recorded.

Date: 2 November

Recommendation: Data standards could be a good way to support efficient policy execution, which is a public task. The 'data commons' thought could support more detailed data for learning and research. Start the privacy dialogue with other European cities and decide which attitude to choose in the grey area of the GDPR.

During our conversation Yuki told us that at the moment governments often buy data from market parties for internal use. She questions this, because the data of the market parties often comes from the users of the service, the inhabitants of Amsterdam. These inhabitants are part of Amsterdam and she wonders whether it is therefore not strange that the municipality, which is actually a representation of the inhabitants and their wishes, has to pay for these data? It is also arguable that the data of the inhabitants is actually already part of the city of Amsterdam. All companies have access to data of the inhabitants of the city, but the municipality that wants to use the data for the public interest has no access to anything.

Yuki also says that the government has many public functions, including providing a pleasant public space and access to mobility for all. Because, residents of Amsterdam pay taxes to perform these tasks, it can be argued that the municipality of Amsterdam should implement its policy as efficiently as possible, in order to deal with tax money with integrity.

If data from shared mobility providers, by means of the CDS-M, can contribute to the most efficient implementation of policy, it is in the public interest and serves the citizens. According to Yuki, in this case there is something to be said for requesting data from shared mobility providers on the basis of permits, however, if it can be guaranteed that this is done safely and only for that specific purpose.

So, according to Yuki, the questioning of data can be justified if it contributes to making the policy more efficient, even though there may already be another, not data-driven, solution to the policy issue.

Yuki stresses that it is remarkable that companies have access to so much data about the city that the city itself does not have access to. She believes that the inhabitants of the city should have autonomy over their produced data. This idea is called the 'commons-think', this way of thinking includes that residents themselves can decide who has access to their data, and who is allowed to use which data for which purpose, for example to improve the shared mobility offer in Amsterdam. In this way of thinking, residents can also choose to revoke this permission at any time.

Yuki indicates that she thinks that cities can receive much more detailed data from residents directly. Also, because the inhabitants have no commercial interest and often want to cooperate in improving their city.

One particular use case could be the collapsing quays and bridges in Amsterdam. Also, with regard to CDS-M this could be a use case, perhaps insight can be gained into how many taxis drive over the weak quays and bridges and how to divert them.

Yuki recognizes the grey area in the GDPR and states that she considers it important to facilitate an open discussion on this subject, not only between companies and government, but also with citizens. Raising questions and points for attention is more important than solving problems, according to Yuki.

In addition, Yuki doubts the applicability of a European data standard in all the different areas of Europe. Would a standard that works in Amsterdam also work in a small town in Friesland? Then the standard would have to be very flexible and easy to use. In addition, she wonders whether certain minorities would be harmed? For example, people without telephone or digital knowledge? Or people who have no access to shared mobility due to physical or mental abnormalities or their budget? If shared mobility is seen as part of the mobility vision of the future, this is a good thing to think about. In addition, the data analysis model should be looked at carefully, so that there is no data discrimination.

Yuki recommends starting the European discussion on all these topics.

2.12 Transcript Interview Valeria Caiati – TU Eindhoven

Interviewee: Valeria Caiati, Urban planning researcher at the TU of Eindhoven

Date: 2nd of November

Recommendation: Data standards with real-time data could be used to improve the supply and distribution of shared mobility and the service quality. Moreover, trip data could jointly with soft measures, such as preference surveys, contribute to improvements in personalized travels and user satisfaction, which is important for the deployment of MaaS.

[Introduction]

Valeria Caiati: Within our research group we try to investigate how people move in the city, which transportation they used and their relation to data activity, travel factors. So these are the kind of data which are important for us, the data in relation to the citizens preferences for new mobility services and also the current use of these new transport, most of which are available in the cities. And so, these data are important to estimate travel patterns and help policymakers find soft measures to change citizens travel behavior.

Guusje van der Vossen: And you mentioned that you're mostly using the static preference data format so that our surveys mostly?

Valeria Caiati: Yes, basically these are the places where the website which collects data about the demographics, also age, gender, income, education, but also travel related kind of statistics of distance. How many cars that are available in the household or if they have a driving license or not, if they have a season ticket for public transport, or if they already have a car sharing a membership. If they use protection schemes, for instance, like Uber surveillance. So, this type of information and then we also use this static preference model in which we present the respondents with different identities. So, in my case, for instance, one survey conducted, I asked the citizens if they were willing to join or not. And I possess the monthly price for a subscription to this kind of service or the transportation most that would be included in public transport that shared information. And they included the other characteristics, like, for instance, the social influence, since it is also something which is very important in decision making and initial determination. So, for instance, I then I the respondents to see that if they want to subscribe or not. Also, considering the decision of the friends, relatives or colleagues in the social networks, which is something which is in addition to transportation, that is very important for decision making. So, this is the kind of static the preference experiment in which, as I say, the respondents were presented with different choice identities, with the different choices, and they were asked to choose which of the two they preferred to choose. And then in these kind of questionnaires like surveys are important, this is needed to develop more comprehensive assumptions about the attitudes of people. Like if people are the more inclined to adopt innovative mobility services or if they are inclined to use this technology enabled services or if they have some kind of issue concerns relating to the collection of all this data.

Guusje van der Vossen: So, all these things help policymakers to understand that, if so, what are the main factors, the main variables that could affect the citizens decision for adopting a new mobility service?

Valeria Caiati: Yes, so most of the time you're collecting real quality data through surveys to make sure that you know what adoption factors for, for example, Mobility as a Service to enhance the mobility service ecosystem. So, these are the three main protagonists of those factors. And this is just one type of data collection for these decision models. But there are also researchers in my group that are working with the GPS data, for instance.

Guusje van der Vossen: Yes. You said that you are in the researcher group where others are working with GPS data. Can you elaborate a little bit on this? And their approach and how they deal with privacy, for example.

Valeria Caiati: Yes. So, there are researchers working with the GPS data and they basically use these data also to ask specifically for activity-based models. So, to understand how people move through the city. And yes, the main thing in using this data that is in making sure most of the times is the GPS data collection and that to kind of a small group of people which expressed their willingness to join this side of things. So, they consent to collect certain type of data. Then

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you can have a lot of information, GPS data, but also social, demographic information, but sometimes just like age and gender.

Guusje van der Vossen: So, you need an agreement of everybody that signs up for the research?

Valeria Caiati: Yeah. Yeah. So basically, they are focused on this small group of people and agreeing to sharing those data. And in that sense, you are also so very small sample size. And this data is processed with machine learning techniques or that difference. And I suppose that is the main issues related to the privacy. So, they do use separate systems to collect the GPS data and the demographic data. So, the social demographics of people cannot really match the GPS data and you cannot identify travelers.

Guusje van der Vossen: And in your research group, do you also use data from sensors, smart city sensors?

Valeria Caiati: Yes, we do. We measure the number of cars going by or to air pollution sensors. Yes. And cameras. Yeah, but I'm not I don't know how they use this data to make models and learn from them.

Guusje van der Vossen: Yeah. And you just mentioned that, that there's a threat of combining the two data databases, the quality database from the adoption factors and the GPS data. And then how are they kept separate?

Valeria Caiati: The two have two separate systems, one system that is processing the travel data, but that's the private data of the users and another system which kept the personal information of the user solution to the names etc. So, the travel data is not automatically connected with the personal information.

Guusje van der Vossen: Yeah, and so the data standard that we're designing is using GPS or real-time data. And so, we're wondering how that kind of data could contribute to developing a MaaS ecosystem or urban planning? But do you have a sense of how that could contribute?

Valeria Caiati: You mean the GPS data and the traffic pattern?

Guusje van der Vossen: Yeah. So yes, for travel patterns.

Valeria Caiati: So basically, I mean, I'm just thinking so I would say this. I never like using smartphones. And then we did the cost of the release end of digital trace of how they are moving around the cities. So basically, you can collect different kinds of information, such as when they leave in the morning and the afternoon when they are out from the home and when they come back. And in that sense, also, if they are not collecting personal information, you can extract actually this kind of information from their partner about this, because if you collect data, information of how people move and I know that at eight o'clock an individual is moving every day from the same location, it is very likely that that location is there. And if at the five, six o'clock they come back to the same location, in that sense, you can easily think that the location is the. So, it's the kind of information that you can probably collect from this data, so

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you need to be very cautious. Yes. Also try to then use this data for a certain kind purpose and keep the data safe passage.

These people of my research group, the one that was talking to you before, I think they use GPS, they do so by a mobile application that the participants can download on their phone. Due to the accelerator, they can track what mode you are using, and the GPS data tells you how they move through the city.

Guusje van der Vossen: We are asking these questions is because we're developing the data standard. And the first objective is to do so is to get a grip on how to share mobility is moving within the city and to gain control in some sort of way. And the other objective was to learn from it. And then the third objective could be how could we use this data for planning purposes for the city? And that part is still quite unclear because, as you mentioned, GPS data or travel patterns are not widely used for planning purposes. So, we're wondering, is it actually valuable for urban planners or are we just thinking that it will be valuable?

Valeria Caiati: Yes, they are indeed relevant for the planners because in that where you can collect more accurate data based on the science of people. With all this data, you can then understand the moral side of it, which is kind of like, I don't know, looking only at the citizens perspective.

Guusje van der Vossen: Yeah. So, the CDS-M is a standard to make sure the transmission from data from transport operators to cities. So, parties like bike sharing car companies towards the municipality to in that way make sure that the municipality has insight in where the vehicles are parked. If they're not disturbing the public space and where they travel from neighborhood A to B. So that's what it's designed for. To also make sure that we have insight into the demand aspect.

Valeria Caiati: Yeah, of course for planners, it is so important to get information and data both from the supply side and the demand side, to have an overview on how to allocate the services throughout the city, so it's something related also to the relocation strategies. For example, so you can understand why there is a need for more cars during the morning peak.

And so, if you know that there is a huge demand from me, people, a specific area of the city, then you can also make more and more parking places. So, GPS data could give us information about the demands and demand patterns, and then this data would be useful, if we could match it with their supply data of the transport providers. Then you could increase the satisfaction of the citizens, and this is important for the further development of MaaS. Putting citizens in the center.

Guusje van der Vossen: And do you think that this is the job of the municipality, or do you think that because, of course, these businesses do have the data already, do you think it's their responsibility of that of the municipality to also act on those demands?

Valeria Caiati: The responsibility of the municipality is guaranteeing the fine achievement of some of their societal goals. So, in the sense that the municipality provides public transport services to their citizens. So, in that sense, you see the response of them is, so you see it as a

responsibility of the municipality to offer all sorts of modality for the citizens in a way that there I mean, it depends on the goal of the government. Of course, the goal is to reduce the private car ownership. So certainly, if that is to provide the citizens with the different transportation options, that will really make, you know, representing one of them compared to their private usage. Yes. And if you translate it into practical solutions, then this could be enhancing parking space in specific popular areas for for shared mobility or making sure that there are more shared options closed to transport hubs.

Guusje van der Vossen: Yeah. So that you can improve the multimodal intermodal trips?

Valeria Caiati: Yes, and besides that you could also use soft measures, all in terms of service provision, but those types of nudges for citizens to adopt more sustainable behaviors. And in that sense, it's important to understand that the citizens' characteristics, the preferences so that you can better provide personalized driving suggestions for them and also incentivize them to use more sustainable transportation modes instead of using the private car.

Guusje van der Vossen: And if you go into those soft measures, what could be a soft measure that municipality could take to support the usage of shared mobility in a city?

Valeria Caiati: And one way to do so is make sure that the demand and supply side are adjusted to each other, that they feed each other well so that citizens always options. This is also, yes, a key element for so that you can either increase the performance of the service provision or also increase the service satisfaction. So, it's a kind of a win-win situation in which both sides are getting value from this new way of policy.

Guusje van der Vossen: Yes, so actually, you say that, of course, a data standard could help with hard measures such as infrastructural measures, but besides that, you should also need quality data to know the preferences of the users and the businesses to make sure that they are fit well together. And you need both measures, for better service quality and service satisfaction to create a future MaaS eco-system?

Valeria Caiati: Yes. And actually, this is something that that's really important for MaaS, because we need to provide a solution which are really promising but do not feel like citizens are obliged to adopt them. Because it is really important that the citizens are at the center of the decisions made about MaaS, which means that satisfaction needs to be achieved somehow.

Valeria Caiati: And one way to achieve this is also by personalizing this service so that the better address the needs and preferences, which is again connected to the data, because if you want to personalize your service, you need more data from the users. So, I see that personalization is a key element to satisfy those needs and convince them to use less cars. But it's also a kind of challenge in terms of data management, data sharing. I don't know if it is clear.

Guusje van der Vossen: I think it's clear to me. It's just that I'm wondering how could we enhance that personalization? Because we're not the ones offering the assets that shared mobility operator's business. And of course, you could go into dialogue with them and discuss the

findings you get from your data. Hey, I see there's more demand in this area. Could we do something about that? Are there any measures that we could take as a municipality to support a personalization of transport possibilities? If you want a successful MaaS eco-system, then it should not be a one size fits all kind of system. But it should be something that, as I say, put really good citizens at the center with their needs and preferences.

Valeria Caiati: And so to do this, you have to consider the needs that you have to consider the preferences, you have to consider the kind of statistics maybe there is more than a soft measure, but maybe a half measure is that you develop a kind of centralized system where you are assured that there is a central spot where users can indicate their preferences or maybe even due to physical or mental restrictions, which because you could imagine that users don't want to lay out all their preferences with the number of MaaS providers and the number of transparent operators. So, you could say, I'm not saying that I proposed it, but you could say, OK, let's do that in some spots, maybe public, and have users indicated preferences there. And everybody who is operating in Amsterdam or in the Netherlands should use this as a reference for customer preference.

But that would be a hard measure and not so much a soft measure. And I think indeed the question is, how do you stimulate that from a government perspective? This is indeed a good question, because I would say that apart from the hard measure, where you have kind of reference to a database, it is indeed, I would say to the municipality should start the conversation with market parties upon these preferences.

Valeria Caiati: But another thing that I was thinking about right now is another kind of measure that you can consider, which is to try the incentives that you can give to market parties in relation to these characteristics.

So, incentives or subsidies could be also a measure through which you can take into account the different characteristics of the citizens in terms of the sense of income or disabilities, or in relation to the specific area of the city in which they are living. Subsidize trips of citizens that are living in a very special area of the city, or like an outer skirt. You can also think to some kind of incentives to give to the operators on the basis of these user preferences, but before doing so you need insight in these preferences and data on the operations of the shared mobility providers.

Guusje van der Vossen: Well, yeah, because we were also discussing that when designing the data standard, we want to include certain norms, such as sustainability, but also inclusiveness. And then it's also mentioned in one level playing field strategy. And so, we're also thinking about how could we enhance inclusiveness in this city? And that's one way in which the data could be used. If we indeed subsidize shared mobility parking spots in certain neighborhoods don't have access to the service now. So, yes, indeed, these are also things we are thinking about.

Valeria Caiati: In my opinion, the government really plays a key role in the development of MaaS, because, for instance, yesterday I was reading a book about large firms and they were

presenting in the case of Sao Paulo in Brazil, in which the state of Cibolo, they make the kind of credit for the hailing services like Uber, which are based on the amount of kilometers that they are providing throughout the city. So, if a mobility service provider will want to delivery service in the city, it's basically to be a credit which is based on the amount of credits that is going to do. But this is not just that. They are also considering if they poor families should pay less, as is the same now with public transport. So, in that way, you can also take into account these societal issues and also achieve some specific goals from the government perspective.

Guusje van der Vossen: Very interesting what you're saying. It's interesting because obviously you can kind of steer the mobility providers in this way.

Valeria Caiati: Yes, it's going to be a tough strategy and you need new strategies because also the business model of our city is changing because we assume a constantly flowing system of mobility with as little as parked vehicles as possible, because that's the real world. Yeah, well, since we now earn a lot of money for our car taxes, you need something else to make up for your infrastructure costs.

Guusje van der Vossen: Then I have just one more broad question for you. We're talking about the MaaS eco-system and everybody defines it a bit differently. So, I'm just wondering, what is your definition and future goal of a mass ecosystem?

Valeria Caiati: It's a hard question, the definition differs, and it must not be a buzzword that they are just using because it's sincere. Well, I see MaaS as a kind of a multilayered ecosystem, so in which there are different layers which are represented by the infrastructure, the digital, the structure of the government, that the governance of the digital infrastructure and also at the center of this that are the citizens. So basically, I see MaaS as an ecosystem in which every part of this system needs to cooperate with the other actors which are involved in that system. So, it's kind of a complex and interconnected system.

In my definition, it is so where I see governments extracting data from all the interactions within the MaaS ecosystem and also providing the physical interactions like video, for instance, maybe dynamic to your friends, go to the streets in rates and tariffs, subsidies, whatever, this exchange of information. And so, the role of the government, local governments as well, is facilitate this communication and cooperation and to lay out their public cause. I see that also as part of the MaaS ecosystem there, too.

And to achieve this, I think that the public sector, represented by the local and the national governments, could have a very important role, because in that sense, you can really achieve the goals which are related to this and then environmental sustainability, but also the social system, which is something that sometimes when we are talking about MaaS, we forget.

Guusje van der Vossen: Thank you. Is there anything you would like to add to the conversation before we wrap it up?

Valeria Caiati: No, thank you for this call and the opportunity to talk to you.

Guusje van der Vossen: No problem. Thank you so much for participating. I'll keep you up to date on the research.

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Valeria Caiati: Thanks, that would be great. Have a nice day! Bye.

Guusje van der Vossen: You too. Bye, bye.

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2.13 Transcript Interview Mélanie Gidel – Paris, France

Interviewee: Mélanie Gidel, manager at the smart mobility department of Paris

Date: 4th of November

Used standards: SIVU, GBFS

Preferences: European version of MDS

[Introduction]

Mélanie Gidel: The Department of Transport and Public Works at the city of Paris, and I'm in charge of promoting a data driven culture in our services, which are very unequal in this matter. Some are very advanced, and others are less advanced.

Mélanie Gidel: So, most of my job consists in being very trying to be helpful and reassure everyone. And so just use cases and try to help to improve the quality of the data we produce and the way we use it.

Mélanie Gidel: So that's what I am trying to do. And I'm afraid today my colleague in charge of Cheyanne McGinity couldn't be here. But if I am not able to answer some of your questions, I will ask her, and we can completely turn this topic here.

Mélanie Gidel: Thank you.

Mélanie Gidel: So, the overarching question of this interview, I will just tell you that one to give some context, that is, what are the opportunities, bottlenecks and practical possibilities for the creation of a universe data center for mobility operators.

Guusje van der Vossen: So, which are mobility operators? We mean private companies that offer your mobility in a city so shared by the companies or your car companies, bike sharing, scooter etc. So, first of all, I would like to ask you what kind of companies are operating in a city of Paris and do you receive any data from them?

Mélanie Gidel: Yes, there are quite many companies that have started operating in Paris for the last few years. Basically, of course, bicycles, scooters, motorbikes and also car-sharing operators with or without a station out there. They have to provide data to us first. I mean, it started, I think, two years ago in 2018 when all these operators started taking more and more place and creating a user complex in the city. So, it was a first phase of work with them to sign the charters of good practices.

Mélanie Gidel: And these charters also ask them to provide us data about where, how many and where the vehicles were located in the city. And we created our own format, which is called SIVU. I will send you the link, which is a quite simple format that we decided to use, because, first of all, it was not very easy to get the data from the operators because they were quite reluctant to share it. So, we had to find a compromise with them. So, as we could go and move on and also, we were not able, at a technical point of view, to use very complex set of data. So that was a compromise, we thought, quite pragmatic for them and for us. So that format is still used today. So, regulations have changed.

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Mélanie Gidel: And now all these kind of shared mobility operators, they have to pay a fee to use the public space in Paris.

Mélanie Gidel: And as part of that regulation, they they have to to provide the data. So it's not just a matter of charter, which was not a very I mean, we couldn't really check if they respected it or not.

Mélanie Gidel: It was just a broad agreement from all parties. But now they really have to respect that.

Mélanie Gidel: So, we still use that format that we designed two years ago. But we are about to use also GBFS. Yes, but we are not ready yet and we still do not use it. So, we are still in the transitory phase where we still use a very simple Parisienne format, which is quite convenient and which has been very useful for us. When we for instance, when we created specific parking zones for scooters and bikes.

Mélanie Gidel: And it's enough in a way for the first use cases we've had that we are also aware that it's limited and it's not very convenient for the operators because they have to develop a specific format for parents, which it's not very convenient for them. And they have already mentioned that it would be better if they could use the same format that they use for other cities or regions. So we are working on developing our own system to use to be a first, first and then maybe later.

Guusje van der Vossen : I also I researched SIVU. And it also struck me that indeed it is a kind of simpler version of GBFS. And this SIVU enables the transmission from operators to the local authorities, right?

Mélanie Gidel: With the regulations we have, they have to provide us to the data, yes, they have to. The thing is that we are not organized yet. Yeah. The technical point of view to use the data, but there are already supposed to provide it to us and some of them have already given us the keys and access codes for the data. And we're starting the test with our technical team in the following days. So, we still haven't finished working on that yet. And as you said, SIVU is very simplified in relation to these to these formats. It was designed rapidly to make sure that the vehicles were out anywhere bothering the public space. So, we really wanted to have information about the use vehicles, as well as the information that is usually provided to users, the availability of vehicles. So that was not enough for us because we needed more than just a list of at the location of the vehicles that could be used. We needed to know where the vehicles were and where it would be a problem for other users of the public space.

Guusje van der Vossen: So, because this is you know, you have the GPS point where it is and you see in what mode it is, parking or riding, and if it is working or not. So, what extra data do you need then? Do you mean trip data, or do you mean complaints or issues with the vehicles concerning the users?

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Mélanie Gidel: The SIVU only updates six times a day every three hours, so it's not enough if we really want to be more reactive in terms of control and see the dynamics of during the day of the parked and riding vehicles. So that's one big reason why it is limited that we need to go a bit further. And, uh, but we are mostly interested, in fact, in MDS, which is more complicated to handle. So, we will first make this GBFS working. But what we would like to have a better understanding of the original destinations and the duration so we can really have a better understanding of how this mobility is an alternative to other modes of transport, for instance.

Mélanie Gidel: The number of vehicles that operators are allowed to have in Paris are limited, yet we need to have a better understanding of how they are used, if they are an alternative for everyone everywhere in the city and if it's worth a lot to develop these services.

Mélanie Gidel: Yeah, um, and if we need to expand parking areas, that's something we're really thinking about at the moment, if we will create more spaces for them or not.

Guusje van der Vossen: Thus actually, you need some kind of real-time parking data. I hear from you. And besides that, you would like to have insight into trip data. And is that just your data from neighborhood to neighborhood, or is that data from, um, for example, from parking space to parking space?

Mélanie Gidel: I think we would need more detailed data because as you mentioned, the question of creating mobility hubs with different modes of transport concentrated in the same area is also something that we want to develop.

Mélanie Gidel: So, if we only have aggregated data of a neighborhood, it will not be enough for that kind of use. But that would be a good start.

Mélanie Gidel: I think maybe we will in steps, but something that we would really like to have is a more precise trip data, do we can decide where to create more bike lanes, for instance. So, you really need to know which roads are used the most, for example. And also thinks like, if they contribute to traffic jams, that kind of issues.

Guusje van der Vossen: So, you're actually not sure yet whether the shared mobility should be enhanced and if you need to support it for transitioning to a more sustainable mobility network. And that's why the data would contribute to that insight?

Mélanie Gidel: Well, I don't think we can say we don't, we're not sure yet whether we want shared mobility to increase. Of course, we do. The question is, where do we want more cars, or kick-scooters rather than bikes or motorbikes? And this is a real question in Paris, because there are a lot of alternatives to this kind of vehicles and they're quite expensive as well. So, not everyone can access such a scooter, for example. So, it's also a matter of policy if we want to privilege scooters in more than the bikes or something else. And the studies we tend to show that people who use scooters are not people who used to travel by car. They are more likely to walk, bike or take public transport. Yeah. So, it might be a positive thing if there are less people

in the metro or in the bus specifically. But it is not clear if it really could contribute to decrease car ownership in Paris, for instance, which is already quite low, actually.

Guusje van der Vossen : But I that's one of the goals you have?

Mélanie Gidel: Yes, of course. Guusje van der Vossen: And do you want the data standard to be sui for your shared of cars as well, besides bikes, scooters and kick-scooters?

Mélanie Gidel: Oh, yes, actually we're part of a, uh, small working group of the National Access Point where we discuss this. And I would be curious to know the format you want to define that to national level would be real-time data, aggregated data, a mix of both. What do you have in mind?

Guusje van der Vossen : Well, the design that's that's developed right now is the first functional design, and that's based on real time data, but aggregated data to anonymity so that it creates the possibility that also cities with less digital infrastructure could also use new standards because there are not a lot of safeguards needed afterwards in processing and storing to ensure that there's privacy.

Guusje van der Vossen: But the thing that we that we're also experiencing is that, in fact, then you you are not able to really regulate geo-fencing, for example. The trip data will be aggregated from neighborhood to neighborhood. So. you would have mobility flows, but you will not be able to see which specific streets are used in the most common sense you could imagine from point A to B, what is the fastest route which streets are possibly used? But you're not seeing the real GPS data from point A to B, you just see the streams. And that's due to privacy concerns, actually. And maybe you have been talking to Vianova and the providers. But what they're doing is collecting, real time data, real time GPS data, and its privacy sensitive, actually. And you need a really mature infrastructure to ensure the privacy of the citizens and the mobility provider. So that's kind of the course we're going towards right now is to create a standard that already ensures privacy in the beginning. And yeah, but the downside of it is that you you're not able to have such in detailed data about it, for example. And yet which specific routes are used the most.

Mélanie Gidel: OK, yeah, I understand your point, actually, it's something that we've discussed before, and that's also one reason why we have not gone further with MDS, besides lack of technical expertise and resources. As far as we know it has been an issue, the privacy. It's quite sensitive. And we do not want to take any risk with that topic. So, I'm interested in the fact that you want to anticipate and take that issue to account from the very beginning, although it would be a bit of a disappointment in a way, if we cannot access the detailed data that we would, that could be useful also for us. So, it is difficult to find a good balance.

Guusje van der Vossen: Yeah, yes. Yeah. That's exactly the problem we're facing as well in Amsterdam. And one big thing that contributes to that concern is that our private shared companies in Amsterdam are really reluctant to share their data as well as you have in Paris. And we also want to really hear their concerns and collaborate with them on these standards. That's also the goal of CDS-M to create working groups in which we cooperate with these companies and make sure that there is a standard that everybody is comfortable with in which sharing the data. Yeah, it would be really nice if you could have real time data GPS data, but on the other hand, there are really big concerns that they could be combined with other data sets and then individuals could be identified or that the data sets will be used in another context. So, the issues and concerns are real in that aspect. But how are you dealing with that or planning to do with that?

Mélanie Gidel: I'm not aware that the issues are as sensitive as this, I know we have discussed with some operators that if we start using MDS, we will have to sign an agreement that will precisely describe the uses and we will make sure that it will not be a risk for the privacy of their servers. But I don't think the question is that sensitive, is it?

Guusje van der Vossen: Well, it depends if you will be using the agency API which retrieved real-time trip data, or if you will only use the provider API as city which uses historic data.

Mélanie Gidel: No, no. We would have the provider API to start with, at least.

Guusje van der Vossen: Yeah. Then there are not real privacy concerns.

Mélanie Gidel: It just those concerns are really visible with the MDS. As you search. Indeed. Yes.

Mélanie Gidel: So, you're planning to create a very different format, or will it just be something similar GBFS or MDS? Or at least with less privacy concerns? What do you have in mind?

Guusje van der Vossen: The standard will be aligned with MDS, only the data will be requested in a pre-aggregated way. The mobility flows from neighborhood to neighborhood. So that would be the difference with the CDS-M and the MDS. It is quite similar to the metrics API of MDS. And we're now also discussing that with OMF, if there's a possibility to mold CDS-M in that Metrics API or do another collaboration.

Guusje van der Vossen: And also, while I think that what we see is everyone is now busy and starting with these questions, so I think we have the first to deliver some first products on which we can have a broader discussion as well as home on that, as well as in Europe, as we know, which might lead to a European standard in the future. So, a standard that we're making, it's not it's not the end goal yet. I mean, it's just the first draft which will be developed, as is how we think it should be altogether different cities and where we want to go to.

Guusje van der Vossen: Yeah, so actually, the only thing to do will not be possible with the CDS-M that were drafting right now is, for example, geo fencing goes for geo fencing. You would need Real-Time GPS data of the vehicles that are operating in the city, but also the planning purposes that you mentioned many, for example, widening streets or creating extra bike lanes. Our view is that we don't need real time data for that. We could also use historic data details and historic data for the planning purposes. So that is also the thing we're facing is for the planning aspect. You actually don't need real time data. You could also have historical data sets, but maybe for our or for parish peak or something, but for the regulating aspect, for geo fencing or for parking violations, you do need real time data because otherwise you can do that.

Guusje van der Vossen: So, actually, we're seeing that there's a division between the two goals for which you can use data for planning purposes, for deregulating purpose and for deregulating purpose. You would like to have real time data, but for the planning purposes,

urban planners don't use real time usually. So, that's why we're also trying to design the aggregated mobility flows, because those flows are of value for the poor urban planners next to detailed parking data. So, you could also enforce regulations and that is kind of the objective of the design of CDS-M and to do all that in the least intrusive way.

Guusje van der Vossen: So, you mentioned that you aspire to create mobility hubs and heat maps, are there any other goals that you'd like to achieve or policies that could be supported by data in your point of view?

Mélanie Gidel: Well, uh, we, um, we are trying to take into account active mobility in our regulation system, streetlights, etc., and so far only classic vehicles are taken into account. And so we are trying to change our system so as bikes, but pedestrians will also be taken into account. So that's another issue we have at the moment. So as the life is made easier to pedestrians and the bicycles cetera, and not only for cars. So that's one big issue we have at the moment, I think data will be a key on that. And well, we are also considering totally transforming our public space and reducing the number of parking spaces by 60 thousand in the next six years. So that's a huge project. And we have several projects at the moment about smart working and so that we can make sure that we optimize the way parking spaces are used. So that's another big data challenge. And we want change our methodology in terms of planning with more tactical urbanism, which will require a better monitoring of uses, and the way people use the new infrastructure and public spaces and try to adjust it as soon as we can. So that's another big, big challenge for us. But I guess all cities share all these issues at the moment. Yes. And another challenge we have is how to gain a better understanding of pedestrian uses in Paris because we have a number of counters, sensors for bikes and cars. So that but we are very bad at knowing how pedestrian use public space. So that's another issue we have that we have started working with a data collected by mobile phones. And yes, there is another thing that we are quite interested in that also is the promotion of electric mobility. So we also need to better monitor electric charging stations and all that. And for that, we of

course, we need to use the data we have or produce better data if there is a shortage of information.

Guusje van der Vossen: So, if I refrain it, you're actually in a learning process of how to use specific data for policy purposes and learning how to get the most value out of it, actually. Just like everyone, I guess, and it's the same thing we're facing here. So, we're all on the same path, I have the feeling.

Guusje van der Vossen: So, just to pose the overarching question, if there will be a European data standard, in your point of view, what data, if we just for a moment don't think about the privacy concerns, what should the European standard then deliver, in your point of view, to make all the policy execution as efficient as possible? It is a really progressive question, I know, but I'm just wondering.

Mélanie Gidel: Well, I think we would love to know how public space is used to make sure it is safe and comfort and friendly for everyone, whether you have problems to move or if you have children et cetera. And so, the data we would need for that would be, information about the flows, I guess, of people. And more qualitative data may be about their feelings in the public space. Do they have a feeling of safety or comfort? We do not know precisely what people think. We can observe and make specific surveys once in a while. But that would be very interesting, I think, to have that data, uh, more probably I mean, because I'm sure planners probably think things that are quite different from what people experience in the field. Sometimes we may have different views of the same situation we observe. So, I think that would be great if we had that. I know there are a lot of companies that come in. They say they will build those fantastic mobility platforms and we will know everything and regulate to push a button that everything will be perfect. And I'm quite skeptical about these plans, because we tend to forget that technology and the data is not neutral yet, it shouldn't be a substitute to a human qualitative assessment of the situation. For example, we wanted the data to know where we should alter the infrastructure, about where it was most necessary. But at the end of the day, the infrastructure reconstructed was quite far from reality. The decision was made in consultation with local authorities, the neighborhood level in consideration with the many constraints, because you need to keep an access for the human say. Yeah. And all these things mattered more than the original data we had about where the infrastructure was needed.

Mélanie Gidel: I think we we've had many experiments in Paris, you know, small, more proof of concept with a data startups and big companies. And the conclusions were not always very, very positive. Yeah, it was interesting. And we need to confront ourselves with another way of working, with data and new methods and everything. Of course, we're very open and very interested whether it will help everyone. But on the other hand, we are also aware of the limits of these methods.

Mélanie Gidel: And actually, it was quite difficult at the beginning to get the operators to

provide the correct data through SIVU. For instance, they were small mistakes in geolocation, there were scooters in the middle of the sea or things like that. But they little by little, they corrected the mistakes. And now it's quite all right. They play the game of the day. They cooperate to what we to what we asked.

Guusje van der Vossen: Nice. And is the tax system related to the usage of the SUVI? Do you need to pay more taxes if you don't use it, or are you really obliged to use the SIVU in the license?

Mélanie Gidel: They to abide, OK.

Guusje van der Vossen: So you don't have problems with the enforcement of it? They do use it.

Mélanie Gidel: Yeah, they do use SIVU now. But it took some time at the beginning. So, I mean, this is two years old now. Yeah. So now it's it's working fine, but it was not immediate. But the thing is that we might give it up because we are aware that it doesn't make sense to be the only place in France to have that format. So, when we will be more comfor with GBFS, I think we will shift and stop asking the operators to provide the data with SIVU. But if your proposition for CDS-M, that is interesting. I mean, of course we will look at it. May maybe a shift to your proposition.

Guusje van der Vossen: Sure. Thank you. Yeah. Well, thank you for all your information. It is a lot and it's really valuable for the research. Do you want to discuss anything with us, or any other things to add?

Mélanie Gidel: OK, well, there's another one last question, which is quite technical. I don't know if you you had to go the geolocation data. I mean, the X Y coordinates that we get. Have you experienced with your own studies or with what other cities said? Do you think this data is very, very valuable for a parking enforcement? Because what we have observed is that the precision is not very good, and our parking lots are very small and it's very difficult to know just from the data without being on the field if a vehicle is properly part of it. Yes, is it a problem you've observed already?

Guusje van der Vossen: Yeah, well in Brussels the data is a reason to start looking on the ground to see whether an offence is actually being committed. But enforcers are still needed.

Mélanie Gidel: So, yes, indeed, it is hard because then also with the geo fencing, you need to take a larger zone because you're not really sure whether are in fact, if you are fencing. Yeah. Yes. So, yes, that's something that capacity set and also researchers that are dealing with

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dubious data. OK, thank you very much and good luck with your research. It will be very interesting for everyone.

Guusje van der Vossen: Thank you so much. Have a great day.

Mélanie Gidel: Have a good day. Bye bye.

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2.14 Summary Focus Group TfGM– Greater Manchester, Great Brittan

Participants: Sam Li, Senior Innovation Officer Transport for greater Manchester
Ian Inglis, Senior Project Manager at Transport for Greater Manchester
Michael Dod, Digital Service Manager at Transport for Greater Manchester

Date: 4th of November

Used data standard: None

Preferences: A uniform data standard and framework on how to manage and analyze mobility data.

Sam, Ian and Michael work at the innovation team of TfGM, the local Public transport operator of greater Manchester. The core focus of the innovation team consists of running pilots, innovation products to determine the opportunities and risks.

Manchester does not have a one shared mobility operator now, and they will expand upcoming year. They had shared bikes, but this left. They are working on a new shared bike scheme, which includes a requirement around data, but not a high priority.

Currently they launched an E-scooter trial, the shared mobility operator that is now present in greater Manchester. There is a data requirement with the providers. There is no API access or standard yet. They are not in the position to be able to this, due to the lack of people and expertise in data governance.

Michael tells that they are starting to put together a set of requirements for a single TfGM map and some data requirements. The TfGM map is designed for the MaaS platform that they are now developing as well. This would need to be able to integrate all future mobility services. They are working with the municipality but expect to use a digital developer for this app.

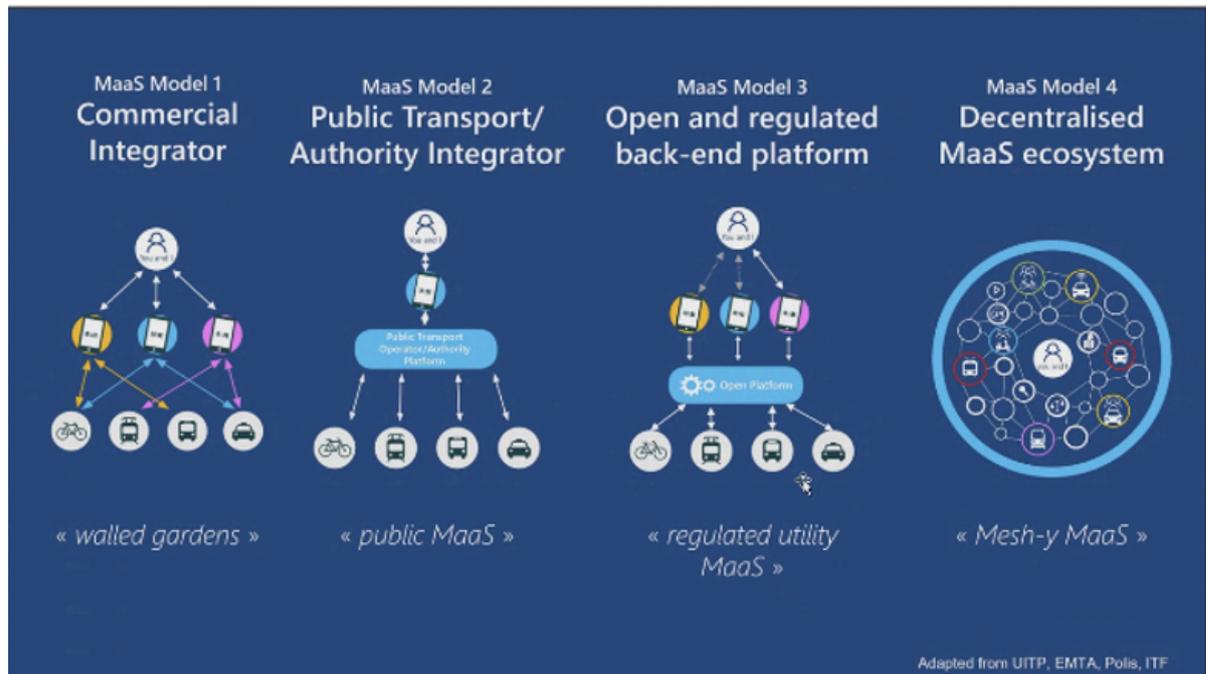
In Manchester, they do recognize the issue of reluctance of market parties to participate. They stress that you need to work out what the relationship looks like. 'There should be clear guidance and legal text about data sharing. You need to determine how to make it fair, but also make it in line with our city objectives.' They hope that the MaaS platform will give TfGM more control over the shared mobility operators in the city.

In greater Manchester they aspire to work by the open data policy. There is an agreement on the about opening up all data. Any data sets they can publish, they want to open publicly. They are looking into that now with the design of the TfGM map.

They wonder whether they should be mandating data requirements to all mobility services. They encourage that as a municipality you should be in the middle of the MaaS system.

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They are moving towards model three. They create a back-end platform, the digital infrastructure, as a trusted player in the middle. This back-end platform integrates mobility offers and demand as a whole. They sit in the middle and offer all of that.



They have fallen into the middle facilitator role. They are more likely to be model C and D. They connect the supply, so applications, smart city integrations and ITS integrations, to the mobility demand. They see the data and understand it, so that they can manage the data better.



Different model of relationship

- Model A: TfGM is the MaaS operator and uses in-house resources – direct
- Model B: TfGM is the MaaS operator but outsources all of its responsibilities (becomes commissioning authority) – external provision of services
- Model C: TfGM is the MaaS operator but outsources all of its responsibilities except financial transactions – operational commissioning
- Model D: TfGM is part of a MaaS joint venture formed to manage and operate the system – joint provision eg partnership
- Model E: TfGM is the MaaS operator but shares platform/resources with other providers to make financial savings and bring efficiency – Spin-out, mutual
- Model F: Private sector is the MaaS operator and has its full control on its operation – private sector operation

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In Manchester they have created the vite-mix. A vision for 2040, about the right mix of mobility in the city. So the ratio between buses, trams, walking, cycling and shared mobility. They aspire to be carbon neutral in 2038. With this vite-mix they have tried to understand what the ideal mode is for a certain trip with an algorithm. They have not determined which leavers they have to pull to achieve this mix.

The model for Maas has changed in the past years. The focus is moving towards a Maas for governance. Maas could be an interesting proposition could as help as a basis for the economic/financial model. In greater Manchester we are behind the curve, the bike hire that will only go live next year. They have a basic DRT system. One major car operator and now a trial e-scooter operator.

They are trying to standardize how to bring information in, to try to make it available for customers. They are also looking into the requirement to provide information on ticketing. They are part of the E-hubs project of Interreg, but they have aspirations for a wider mobility hub and a MaaS platform.

For physical integration you need both capital and revenue funding. For digital integration you also need mobility operators to provide the data and a workable commercial model. They expect the data provision to be difficult and think standardization would make it easier.

Currently they use GTFS for the public transport. They recognize the GDPR issues, the privacy regulation is still the same in the UK. Their opinion is that there is more work to do around privacy, especially when combining data platforms.

The data demand they have in Manchester are mainly about gaining insight in where, how, when, and why people chose their modes. They want to know the intentions behind travel. This means it is a provision of services. And they want to determine where shared mobility will be of good use.

They are also interested in nudging people to take a certain modality, on the basis data on the supply and demand. By nudging they want to avoid overload. In this case, the data could show which leavers to pull.

They state that people make decisions subjectively, so based on perception. They want to understand the gap between perception and reality, by looking at data, and looking at what determines the perception. Traditionally use static preference is used, but they stress that through dynamic data you could possibly determine the real preference. They also want data on inclusivity and accessibility. They want to make sure that it is accessibility for all, so also for the poorest of society.

It is much easier to work with a common standard, then if everyone has their own data standard. Having an open standard helps to facilitate an open cooperation and support. Therefore, they are advocates of a uniform data standard and common understanding of how to manage and analyze mobility data.

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2.15 Interview with Mikael Ivari – Gothenburg, Sweden

Interviewee: Mikael Ivari, Senior Advisor at Urban Transport Administration of Gothenburg

Date: 4th of November

Data standard used: None

Preferences: Working on a data standard step-by-step cooperatively with market parties, in such they are comfort. Creating a data standard which does not collect a lot of personal data and which cannot be used to track citizens.

Mikael tells that in Gothenburg they started with a digital database in 1996. The database provides a picture of road navigation through the country, in cooperation with local authorities. The authorities use the same format so that it looks the same all over the country. Many roads in Sweden are owned by the forest industry, so there had to be cooperation between public authorities and private parties. By means of a geographical map combined with laws and regulations, the infrastructure is mapped out. Mainly static data is used for this visualization, they are not yet in the process of using dynamic data.

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[Mikael talks about the way of following rules in the city, among other things the parking policy that has to be enforced]

In Gothenburg CTTVs and camera images are used for planning purposes. Images are also used to ensure road safety, for example in the event of an accident, active action is taken from a control room. They work with vertical control in the city. Where they act under national and European legislation. By which they are regulated in their 'Smart City' policy. Initiatives are taken in the field of smart city, especially on the scale where it encompasses the entire city.

[Mikael gives an example of air quality measurements in buses]

He thinks that the static data on laws and regulations can be used for later possibilities. He sees no support for the use of dynamic data sharing in regulating. Because he thinks that new regulations, certainly for shared mobility, take time to implement and get used to. He thinks that the private parties should certainly help to develop good mobility services. Although the government must draw up the rules, the private parties must be comfortable and willing and able to share the data. Most services, such as the infrastructure map, in Sweden now consist of data from one side, the government. But he prefers a way of working in which data comes from two sides, from the government and from the mobility providers.

Why the private sector is reluctant, according to Mikael, is because the data can be used for multiple purposes. How can they be sure that the data will only be used to optimize mobility? And not by a competitor. Mikael states that the government in Sweden must always be open and provide information if someone asks for it. In Sweden, the government cannot properly safeguard business secrets through this law, the open data policy. As a result, a legal framework is needed to enable the government to use the data to improve mobility, without this data from providers simply being retrievable by anyone.

Mikael confirms that in Gothenburg there are also problems with receiving data, even from their own sources, they sometimes have problems complying with the GDPR. Mikael wonders how ethics will develop at the local level. 'Should we really want to know everything about our citizens? How much information should we request and what are we going to do with it? Is it worth offering a very good mobility service if nobody can really have private data anymore?' This is a real bottleneck for Mikael in developing the use of data in the future. According to Mikael, the development of a standard should take it easy. He supports a step-by-step approach. Above all, care must be taken not to take too big a step at once. This can cause delays or technical and ethical problems.

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2.16 Transcript interview Martin le Francq – Bruxelles' capital region, Belgium

Interviewee: Martin le Francq, smart mobility department of Bruxelles' capital region

Date: 5th of November

Additional participants: Daan van der Tas

Used standard: *MDS in a pilot with two operators, provider- and policy API*

Preference: *publicly managed data standard, which offers real-time and detailed trip- and parking data.*

[Introduction]

Martin le Francq: Here in the Brussels capital region. There's another level of governance, which is the municipalities. There are 19 municipalities in the Brussels capital region, but I work for the regional level. I am involved mainly in mobility as a service and shared mobility policies. I basically work alone, but I try to connect the people who are relevant for some projects. So as transversal as possible as possible to build teams. And for example, for data collection, for shared mobility, we have existing regulations, but they are kind of old school with car sharing, for example, it's sort of based on a yearly report, I have PDFs. So, it's kind of not very useful when we actually want to follow the evolution of these types of services and analysis of our numbers.

Martin le Francq: So, while learning about the possibilities, we've heard, of course, about existing data formats and data brokers, I think they call themselves. So, we are currently busy with a pilot project for micro mobility data collection on a platform that is called Vianova, a French startup. And this helped us a lot to better understand the different possibilities between, and specifically for shared micro mobility, the possibilities of the GBFS formats, as well as MDS.

Martin le Francq: And from my perspective, we don't have yet really a will to make one format or another mandatory, we're just exploring the possibilities. We see that it requires quite a lot of development for the operators to actually make one format happen. So, we're still following the evolution of these formats, keeping a close eye on what's [inaudible 00:02:09] been doing at the Open Mobility Foundation, which I think is very interesting.

Martin le Francq: But for the longer term, our main project which will actually guide and define our data governance framework will be a project that's being currently carried out with ITF, International Transport Forum, and the team of Philip. So, we won European Projects for the creation of a regulatory framework for mobility as a service and shared mobility. And thanks to that project, we just started basically a couple of months ago, a project with ITF and Philip Crist's team to define and help us create this regulatory framework from us.

Martin le Francq: So that will be, I think, our guiding thread during our process, during the 12 next month, it's going to be ending at the end of August next year. And we'll be discussing with

all involved stakeholders in this kind of landscape and framework. So, it will be interesting to see everybody's perspective on what is actually required.

Martin le Francq: I was a little bit long, sorry, but this gives you the framework of what we're doing here currently. So, I would say, we're mostly exploring possibilities for the moments, in terms of data sharing.

Guusje van der Vossen: Yeah, it's interesting because I'm also going to talk to Philip so he will, of course, tell us a bit about the legal framework project. And is that a private project with Bruxelles or is it on European or a national level?

Martin le Francq: Well, it's funded by the DG Reform at the European commission level, but it's a project specifically for the Brussels capital region. Basically, I had seen, I think it was in October last year, at an event here in Brussels, I saw a keynote intervention by Philip Crist, it was the first time that I saw him or heard about him. It completely blew my mind. I thought it was really, really on point and not forgetting that all this technology, eventually the goal is to put the citizen in the center.

Martin le Francq: And this approach was 100% in line with our sustainable urban mobility plan, which is called Good Move. And the data that you would require is only in the purpose of a better quality of life and better management of these types of sources. So, his approach is really, I thought, on point, and therefore, when I applied for the European Projects, there was a section where you could see who would be helpful for this kind of mission. And I said, "Oh, ITF, Philip Crist." And it worked out

Guusje van der Vossen:

Nice. All right. Daan, do you want to introduce yourself or did you already do that?

Daan van der Tas: No, I didn't. I'm happy to do that, of course. I'm in the smart mobility team and I'm trying to create a full blown MaaS ecosystem in Amsterdam where I kind of act like a snow shuffer. There are a lot of topics to move forward. And so, the availability of shared mobility, interoperability policy. Also, working with the data, because we were talking a lot about assembling data, but okay, what are we going to do with it? So, yeah, it's quite broad field, but data, of course, is very essential. So we're very happy that 'Guusje' is putting all her energy in that to help us in that.

Daan van der Tas: Maybe one addition to what I was telling, when she told that we are working from Amsterdam to create a standard, but we do it in fact together with other big cities and the ministry. So, we also try to create a kind of, at least, a national standard, but preferably also international.

Martin le Francq: Okay. Interesting. Yes. It's still in the process of these, I think, it's seven mass pilots at the national level or more. I don't remember exactly number.

Daan van der Tas: Well, of course we have indeed, the six or seven one is still yet to be started. We do have these policies, sorry, pilots where indeed we learn a lot and create all kind of new stuff around it. But luckily, it's not the only thing that we're doing. For example, in Amsterdam, we're also creating 20 e-hubs where we also want to impose, or not impost, not the correct word, but inform some kind of interoperability. So, acceptance and implementation of an API, the TOMP-API, I don't know if you've heard of it. So that's one of the things we're doing.

Daan van der Tas: We of course have the pilots in Amsterdam, whichever one of the seven, which has centers around our business districts. We have also other shared mobility that we want to integrate into the mass platform or at the conceptual platform, because it's not yet there yet. But also, to indeed enforce, again, interoperability by using the TOMP-API for scooters and bicycles.

Daan van der Tas: And our policy regarding shared cars is a little bit old. So, in new policy, we also want to have shared cars adopting the TOMP-API standard.

Martin le Francq: Great. Interesting. Just out of curiosity. So, you said it's a smart mobility team in the city of Amsterdam administration. How big is it? How many of you are?

Daan van der Tas: Yeah, we, as a team, are with 25 people. And that it is part of the innovation department. So, I would say the smart mobility program is run by the innovation department, but in our more operational line, we have also in the department with people that are also active with all things related to creating more supply of shared mobility. So, we have a separate program, which is the shared mobility program, which is responsible for creating as much as possible supply and of course dealing with issues around the offer of shared mobility in our city.

Guusje van der Vossen: Yeah, so we have a traffic department and a smart mobility department that's mainly focused on new innovations regarding mobility.

Martin le Francq: Very interesting.

Guusje van der Vossen: Yeah.

Martin le Francq: Good.

Guusje van der Vossen: Well...

Martin le Francq: So, you are developing your own format then, or considering developing one. And basically, my main question was, as we are also considering the evolution and what we should look for in the future in terms of data sharing, I was wondering the process that led you to this when there are existing formats that are quite flexible as well. I don't have an ICT

background, so I'm not an expert in that regard, but from what I understand, it's marketed as open data, open-source kind of formats and I was wondering what they do to this.

Guusje van der Vossen: Well, there are two main reasons why the CDS-M project started. The first one is the American companies, like Lime, Void, Bird, they have contracts with Vianova firms so they already deliver data to them. But the parties that are operating in Amsterdam are mainly local startup parties and they are really strict regarding the GDPR, and also reluctant to share their data.

Guusje van der Vossen: And we are not completely sure whether that is due to the GDPR, or they're just reluctant to share their commercially sensitive data and they use the privacy reason. But that is one reason. So, they're really reluctant to use MDS, for example, because it processes real-time data. And in their point of view, it's not a GDPR compliant in the first place.

Guusje van der Vossen: Of course, you can do processing activities, and add safeguards, and codes of conduct, but in the first place, their opinion is why do you need these real time data, for example, for urban planning, because you could also do it with your aggregated datasets. So, in what way is that compliant to GDPR and in what way is that strictly necessary, and the least intrusive way to achieve your goals?

Guusje van der Vossen: And that also has to do with the fact that we are not completely... It is not completely clear which specific types of data we want to use for specific policy goals. So, that has also to do with the vagueness we still have here in the smart mobility team and the municipality have answered them. So, that is one reason.

Guusje van der Vossen: And the other reason is that GBFS is only using parking data. And we would also like to make heat maps. And then you have to use MDS in this case. So, we are searching for a standard that could also supply us with parking data, but as well as mobility flows that is GDPR proof, or at least less intrusive than real-time data.

Guusje van der Vossen: So, now the design is focused on extracting pre-aggregated data that shows mobility flows from neighborhood A to B. And in that way, you could create heat maps and you also can use parking data, but you don't need the real-time data of the companies, so you don't have to follow them all the time. The downside is that you have to trust these companies that they are delivering you the right pre-aggregated data. That is the motive why we started CDS-M project in the first place.

Martin le Francq:

Okay.

Guusje van der Vossen:

Yeah.

Martin le Francq:

Very interesting. One of the things, indeed, the GDPR argument I think is very relevant. We need to pay close attention to what's going on from that perspective, but from what I've learned in the past few years... I'm doing this job for two years. Is that with these kinds of formats I think we have to pay close attention to GDPR, of course, but it's not a definite issue with regard with MDS, for example, because there's so many precautions that can be taken in the MDS format.

Martin le Francq: And maybe you can just uncheck a few boxes that are too sensitive for the operators. So, that's why I'm looking forward for the discussion that we're going to have with the shared mobility solution providers in the process of this ITF project to see what actually their perspective on that is.

Martin le Francq: And I'm also careful about the cost argument and the expenses arguments from the providers. So, I was also curious to see from your development of this new format how motivated are the providers. They're willing to develop this format together with you and make the investment for that format. Or did you have a feedback from them?

Guusje van der Vossen: Daan, do you know? Because they're going to use the same method as they did with the TOMP working group. That's what I'm aware of. So, they want to create working groups together with these companies and create the standards cooperatively.

Guusje van der Vossen: So, actually they just send the invite like, "Hey, we're going to make this standard. It's going to be included in a permit, so you have to comply with it. But if you want to have a say in how this is going to be designed, then you can take part in the working groups and we'll make it together."

Guusje van der Vossen: This is going to be the working method, but first we have to have the first draft and that is almost finished. And then the working groups will be set up. But Daan, I'm not quite sure about the financial part actually. Do you know about it? Oh, you're muted.

Daan van der Tas: Well, of course, the financial I think is an issue. Right? So, indeed, the API has been accepted by a few parties in the... Well, around all those buyer agreements have been made for them to accept it on API. But now when the moment is there, indeed, they complain about the high cost. The same API is more... I would say that's a more costly thing than a data standard. And the data standard is very much will-be couples to giving commercial parties access to our public space. So, to put it very bluntly, you have to get rid of your supply in our city. And, of course, we do acknowledge the fact that these can be costly things. And that's especially the reason that we want to create standards, so that people and the parties don't have to implement a standard per city or even per country.

Daan van der Tas: So, that's the way we want to deal with this. And also, like 'Guusje' already indicated, we now have quite light and non-intrusive requests for data, so we also assume that this will not be very costly for modern suppliers of shared mobility to implement.

Martin le Francq: Okay, good.

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Daan van der Tas: And I was wondering about the thing that you will be doing with ITF. What is the use case that you envision? What are you going to do with the data?

Martin le Francq: Well, I think we're going to get inspired by a few of the use cases that we've actually experimenting right now with Vianova. So, for the moment, it's no parking zones, dedicated parking zones that are not mandatory because it was not foreseen in the policy, in the regulations for shared micro mobility. And it's definitely, I guess, the most useful use case is from the operational side of things. So, I work in the strategy department of smart mobility, but I have colleagues who are actually on the ground to make sure that the regulations are respected and they are absolutely clueless in how to follow the evolution and the operational side of shared mobility.

Martin le Francq: There's a team of, I think it's 12 guys in the streets, but walking down the streets, you're missing 99% of the action when it comes to shared mobility. So, they haven't been working together with us enough for this pilot project. I think they're missing a real opportunity to actually realize what this kind of data can do for them. So, they're slowly starting to understand how it works and what's possible to do with it. And for example, now we're sending them a weekly report of shared micro mobility vehicles that are parked in the no parking zones.

Martin le Francq: The platform can now raise a flag when a vehicle hasn't moved for more than five days, which is also something in EU regulations that basically without these kinds of tools and digitalization of data, it's impossible to keep track of. So, suggesting using that. And in terms of strategy and planning, I would guess aggregated street data would be helpful for building the adequate infrastructure in the future. I think what you said, Guusje, about, "We don't know exactly what to do..."

Guusje van der Vossen:
[foreign language 00:20:26].

Daan van der Tas:
[foreign language 00:20:53]

Guusje van der Vossen:
Yeah. Cliffhanger.

Daan van der Tas:
[foreign language 00:21:01].

Guusje van der Vossen:
[foreign language 00:21:11]

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Guusje van der Vossen:

Hey, you're back.

Martin le Francq:

Hear me?

Guusje van der Vossen:

Yeah.

Daan van der Tas:

Yes. We lost you.

Martin le Francq:

Actually, I could still see and hear you.

Guusje van der Vossen:

Really. Oh, we were just talking Dutch. Did it sound funny to you?

Martin le Francq:

I have sometimes hard time to understand the Dutch accent, but I can speak Dutch.

Guusje van der Vossen:

Really?

Martin le Francq:

Yeah. Not so good. Not so good. No. So when was I cut? I don't remember. I don't know.

Daan van der Tas:

You were going to tell that you were referring to Husha saying that we don't know precisely what we were going to do with the data. And I think you had some [inaudible 00:21:49] there.

Martin le Francq:

Well, I think, and again, I'm connecting back to the ITF project and that presentation of Phillip Crist a while ago. Is that it's not because some data exists that, as an authority, you had a right to take it back. But I think that the process in the approach is different. It's depending on what your goal in terms of policies is, then that defines the actual tool to make it work. And that tool defines the data that you need. We call this approach 'mapping'.

Martin le Francq: And this approach I think, is super relevant and makes it GDPR proof. If you work like that, the way you actually use it, the way you store it and stuff like that becomes clear,

and you should minimize that to your goal. So, you should have that approach and you share that approach with the providers, I think you can find some common ground and create some kind of a good momentum for data sharing.

Guusje van der Vossen: And you didn't experience any reluctance when setting up the pilot with Vianova, especially regarding the regulating aspects like parking violations.

Martin le Francq: Well, actually, not really. So, all regulations for shared micro mobility is license based. And the data share part of the regulations is very, very light. So, contribute to the Vianova platform was definitely going much further than the actual regulations. But nine operators out of 10 said, "Okay, we'll do that, we'll work with you." But we didn't enforce any kind of format. We basically said, "What are you using?" And that would work out. So, we tried MDS, some operators are MDS based. Some other are GBFS. And actually, our docked bike share program, they don't even know. Which is kind of weird.

And to go back to the use cases I recently saw, I was following the Twitter account of open mobility foundation and they apparently shared a list of possible use cases. I haven't read it through, but I thought it was very interesting to actually see that open to the public and suggest the possibility of the format. So, I think we will get inspired by that as well, and actually define what, Oh, "that's an interesting use case and let's try it out".

Guusje van der Vossen: I also bumped into NUMO today, new urban mobility Alliance. And they also have a lot of use cases written down, which I'm going to read into. So that's also really interesting.

Daan van der Tas: Will you include all those findings in your report and it's all the use case that you ran into, et cetera, et cetera, all the raw material?

Martin le Francq: That's the intention. Yeah. That's the goal. ITF does have an obligation to share the results of every project that they are contributing to. So, there's going to be some reports one early next year. I think for the data governance part and at the end of next year, which will be about the whole project, basically that will be available through ITF. And I mean, we can definitely keep in touch. I'm very interested in what you do there in Amsterdam. Hopefully one day we'll be able to come visit you and see all the things that you're doing there after the pandemic, of course, but I met some colleague of yours during the policy events, policy work groups events, and that was really interesting just to see what's going on there.

Guusje van der Vossen: And Martin could you give me a bit more context about what the regulatory framework that you're developing with ITF, what it will consist of? Is it the practical outcomes of the GDPR in comparison with the shared mobility operators or is it also both include parking regulations or?

Martin le Francq: Well, it's actually a very wide range of work that they're going to carry out. Their current process is to what they call the 'MaaS Readiness Assessment'. So, I sent a ton of different documents and regulations, existing regulations in the Brussels capital region. And

they're reading through all of them and doing an analysis, a gap analysis of the current situation and the ideal situation where mobility as a service and innovative mobility solutions can actually develop themselves some kind of framework that is enticing new ideas and new solutions. And the result of the project will be a set of recommendations for creating this kind of framework. So, about data governance, but actually the way to do it has not been defined yet. Either we would have to change a few of the existing regulations, or we create some kind of a new regulations that governs them.

Martin le Francq: So, it's not very accurate as to how it's going to be done yet, but the current processes we'll be actually highlighting the different to do list actually that's the process going on right now. We had our first webinar that was two weeks ago with about hundred stakeholders that attended. The idea was to raise interest in re-raise awareness about the project and create a group, a work group to build upon in the future stages of the project. And one of the questions is a how do you think it should happen? is the actual framework enough, or do we have to change everything, or do we have to create new regulations? Those things we actually ask stakeholders as well.

Guusje van der Vossen: Interesting

Martin le Francq: Yes, it's not very accurate yet, but the whole project is really fascinating, really happy to be actually leading the project for process mobility and really curious to see the results.

Guusje van der Vossen: Interesting. And is shared mobility that applied in the whole region of Brussels?

Martin le Francq: Yes, actually. So, we have currently two sets of regulations, one that is aimed to car sharing services and more recent one since early last year about sharing lack of mobility services. And you can clearly see the difference of time that regulations were applied and created for different reasons and it's not really comparable in terms of the things that the operators have to comply to. For example, car sharing services, has an obligation to cover the whole territory of the Brussels capital region.

Martin le Francq: This policy is not in the shared micro mobility regulations, which is weird, but basically there were different ministers and different governments at the time of the reduction of the two policies, so it's a bit different. In terms of accessibility and equity. Again, there are requirements in the caution aspect of regulations, but nothing in the shared mobility one. I would say with a few steps back that share micro mobility regulations is probably a bit too light. I think the approach of the Minister Mrs. Smith at the time was basically, okay, we have investors willing to come to Brussels and provide new solutions and clean and almost active mobility solutions to people in Brussels.

Martin le Francq: So, let's be inviting and let them be there. And so, for example, there's no conditions for exiting the market. So that's why last summer, for example, a lot of new providers arrived. They comply to all the requirements and the regulations; they got the license.

They could basically announce that they were there, active in Brussels. And then two, three weeks after that some would leave. So, it's been quite a rollercoaster in terms of activity in the markets, in the shared Michael Luigi market specifically.

Daan van der Tas: Okay. So, okay. Because you do it somewhat differently from the Netherlands, because we have basically prohibited the offering of shared mobility in the city and we grant permits by exception. And so, in that way, we regulate entrance to the markets. And you say that the regulations or the requirements towards micro mobility is somewhat more relaxed. Are they then also from a more recent date or are they older than the policy regarding car sharing?

Martin le Francq: Yes. Car sharing was a thing. Car regulation states from 2013 and the shared micro mobility dates from 2019.

Daan van der Tas: Okay.

Martin le Francq: So, there's quite a big gap between both. But I can actually understand the difference of approach between us and then Brussels. You have a much better starting situation in terms of mode share. You have really an important bike modal share in Amsterdam, which is not the case in Brussels. So, we were more inviting for micro mobility solutions to try to take a few percentages off the private car use.

Daan van der Tas:

Yeah.

Guusje van der Vossen: So, a totally different question, but are equity and accessibility also pillars of the view that Philip has about putting their citizen in the center? Because these things are very important for citizens of course.

Martin le Francq: Yes.

Guusje van der Vossen: And that's also a driver to make this regulatory framework? I appreciate it.

Martin le Francq: Yes. And we're going to see how we actually have to carry it out, of course. But we are seeing maybe a possibility of creating subsidies for these kinds of trips that are being made. So, we'll try to implement in our regulatory framework, an architecture or basically a system that would allow us to easily subsidize a few of the trips.

Martin le Francq: That's more from a strategy point of view. It's not being approved by the political level yet. I think it's might be a little too soon, but the ideas and specifically in the last few months during the COVID pandemic and this new idea have been more and more discussed. And I think it does have a really interesting point. And I'm slowly suggesting these ideas at the political level and see how they react. I think we have a new minister in charge of

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mobility, which is really progressive and open to these kinds of ideas. So, let's try it out and see how it goes.

Daan van der Tas: And because when we talk about equity, inclusivity, now you finance probably most virtually. So, most events going back and forth to get people that are disabled or something?

Martin le Francq: Yes, there are indeed, that's operated by the public transport operator. But I think probably the most interesting, I think, prospect in the development of these new solutions, is specifically designed for people with reduced mobility service, new services for this kind of profile.

Martin le Francq: I think there's not a lot of ideas for the moment because you have to be subsidized to actually make it work. There's no market for the private sector. And creating this kind of environment I think would be able to generate a lot of innovation in these type services. So, we're really looking forward to that indeed. And definitely one of the main policies in this development is accessibility and inclusiveness. And I never know exactly the English word for that.

Guusje van der Vossen:

Inclusivity, it is. But inclusiveness is the same. So that is a beautiful cool, actually. To go back to the Vianova Pilot, I'm just wondering, because they have three different APIs. Do you know which APIs you use in the pilot? Do you use all three of them or only the provider and policy API?

Martin le Francq: For a moment we only use two. So, it's policy and provider API indeed. And the policy API is very light for the moment. We basically share the geo-fenced areas for no parking zones and working with parking zones.

Martin le Francq: But indeed, my job is to actually investigate what's possible with this kind of platform, actually try to learn what it is, what it's about. But my job is also to involve the relevant people in the administration in Brussels Mobility. And the people from the operational side would be more interested in the policy API. They're not really active in the project, so on. It's still a work in progress. Hopefully they'll be more involved.

Guusje van der Vossen: Because I'm wondering, so at this moment, you also don't receive heatmaps or any other form of maps or dashboards from Vianova that give insights into the rush hour or hotspots in the city?

Martin le Francq: Yeah. We do have possibilities of analytics, which are quite accurate actually. If you wish I do have the window that is open for Vianova, so I can share it with you, can share my screen share. So, we do have analytics for trips and feed size. That's in the past 30 days.

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Martin le Francq: And you see, we have divided the territory in districts, very small districts. So, we can see from and where most of the trips are actually happened. If we go further in time, we can definitely see the impact of the first and now second lockdown. Yeah. So, it's got quite a powerful tool actually.

Daan van der Tas: Can you also measure trips from, to? So, from one neighbor to the other?

Martin le Francq: Yes. And that you can see here. So again, I try to involve the data analysis people from Brussels Mobility. I'm not one of these persons, so I'm not an expert in that. I wouldn't know exactly how it works, actually.

Daan van der Tas: Okay.

Martin le Francq: I can see already, from this street that you have x number of departures. Yes, you can see that here. And we can generate also heat maps from that, but that's an application that would be available in the next version of the platform, which will be available very soon, actually.

Daan van der Tas: Okay.

Martin le Francq: More detailed information out of this platform. This version, sorry.

Guusje van der Vossen: And how often is it updated? You don't know?

Martin le Francq: We started the project in October last year, and it's the first time that they have really a new interface. Basically 2.0 version of Vianova. But I know that they've been working on different functionalities and applications basically every month since we started the project.

Guusje van der Vossen: Yes. Because I see on your screen that it says, "Last 12 months". So, is that the information that you're seeing right now? Of the last year?

Martin le Francq: Yeah. That's it. So yeah, we started basically a year ago. You can see that different providers started to share their data at different stages of the project. It's been quite hard, with some of them, to actually start the project but eventually, everybody jumped in and we are now quite happy with the results.

Guusje van der Vossen: Yeah. Nice. It looks cool at least, the interface. That's also something that is remarkable, that everybody I talked to that already works with Vianova is getting data from them, from the dashboards. But it's not real-time data that they're receiving right now. So, in that sense, you could say to the market parties here in Amsterdam, "Don't you worry. We won't be able to see real-time data. We just see data from the last 12 months, or from the last week. And don't worry." And on the other hand, and that's kind of the paradox in this discussion

that we're having right now is, "Okay. But if we only get such data, why don't we use a less intrusive standard that already gives us that data", that pre-aggregated data actually that is now visible on your map, that could also be done by less intrusive data standards. So yeah, that's the discussion point, actually.

Guusje van der Vossen: Do you want a third party involved, having access to all that raw data and making your aggregated data platform for you? Or do you want to do yourself in-house, and don't have that raw data, but do have the same maps? Of course, you can learn more from the raw data. So Vianova will have way better insights, then we will. But the end result is kind of the same. So still, I mean, Vianova is still developing, and maybe in the future you will have a way more in-detail dashboard.

Martin le Francq: But that's a definitely an interesting thinking process. And again, I saw another presentation by Philip Crist, I'm kind of a fanboy here. He was talking about this kind of trust architecture in data sharing and the three systems, either we don't trust the governments, and providers do everything on their own. We don't trust the providers, we aggregate. And then there's this third-party kind of interface, like Vianova or Populus or Remix or this type of a data broker, I think are interesting in generating the trust in the system. I think it's an interesting approach

Guusje van der Vossen: Yeah. That's really interesting. I'm going to ask him about that. The trust architecture upcoming week. Maybe I'll also be a fanboy after that.

Daan van der Tas: Yeah. I will try to be there too.

Guusje van der Vossen: Sure, yeah.

Martin le Francq: And he's a really good speaker during the keynotes videos, he's a really good to showman as well.

Daan van der Tas: Nice.

Martin le Francq: It's always good to see.

Guusje van der Vossen: Let's see if I have some more questions for you that I'm forgetting about. Well, I think we have already talked about why are you using this strategy? Well, that is because you want to learn from the data and that's why you're doing these pilots, right? If I say it correctly, to get insight into this data and how you should work with it, but also have insights into maybe certain urban planning practices or in regulating the parking violations and parking zones. Yeah. Well, if we jump into the future, do you think it would be a value to have a European data standard, eventually? If our digital infrastructure is more mature of the municipalities and we could maybe handle the data ourselves, that there is some kind of European data standard so that all the companies can use the same format?

Martin le Francq: Well, when I look at how Brussels is managed, the administrative landscape of Brussels, I think it would be hard for us to actually be able to completely manage this kind of development. We do have sort of IT department for the Brussels capital region administration, which is called CIRB. And we're working with them for basically the platform of the future data lake for mobile chat service, and we will climb onto what they're actually doing, in terms of big data platforms. So, we're trying to work that way to be able to do as much as possible ourselves, but I think with the smart mobility department we should only try to define the use cases and not try to develop some kind of a standard or IT platform. It's not what we are designed to do. So, if we do it, I think it would be very clumsy doing it.

Martin le Francq: So that's not a goal per se. In that regard, I think some kind of standards are important. Definitely for the development of innovation, in terms of mobility solutions and mobile solution providers. And there has to be some kind of standards. Otherwise, if each city has something different, it's definitely going to be too complicated and too expensive for this. And favor the big companies only, that do have the investment power to develop this kind of formats for each different city. On the other hand, I really believe that the city level is different, and the city environment is different in each city. So, you do have to consider some kind of local circumstances. And I think the services should adapt also, at some scale, to the city level. But really looking closely at what you are doing, at what the European Commission is doing, in terms of the process that Victoire Champenois is currently leading, in terms of data sharing. I think you've heard about her right, Victoire Champenois?

Guusje van der Vossen: Yes.

Martin le Francq: She's working with DG MOVE.

Guusje van der Vossen: Yeah, I'm also going to have a talk with her. She was at the panel discussion, right?

Martin le Francq: Yes. She is doing also an interesting process. And a lot of people from all around Europe are actually contributing to this workshop of NeTEx. So, I think the results will also be interesting. And they are considering, should we normalize, standardize a few of the things? What should we standardize, et cetera? So, I think on the European level, there are some interesting things that should be standardized. National level, as well. And then local level is interesting, as well. I think we should do some sort of mapping of what should be standardized at what level, to make it easier for everybody. And we're really early in the process, I think. Still, basically, don't what to do, and we'll see clearer along the way. That's my perspective.

Guusje van der Vossen: Yes, indeed. So, the ultimate goal is learning, and retrieving insights into which part should be standardized. But the ultimate goal, in your point of view, is not to come to a whole standardized European data standard or data management framework, but just to standardize a couple of things, to make sure that it's easier and clearer to everyone.

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Martin le Francq: Yes. I think, indeed, I don't think it's possible to standardize a whole system at the European level. I don't think it's going to work, but that's my perspective now. It might change in the future, because these things evolve so quickly. So that's our view for the moment.

Guusje van der Vossen: Thank you. So, Daan, do you have anything to add, maybe questions about the MaaS ecosystem?

Daan van der Tas: Yeah. Thank you, Guusje. Indeed, I was waiting for that moment. Because what is your view concerning the threats that big tech companies, probably silicon-based, will take over at the mobility space with big verticals, with one platform, offering all kinds of modalities? How do you look at that, and how do you recognize that fear and how do you want to prevent that from happening?

Martin le Francq: Well, there's a very different approach between us, [PGME 00:50:20], and the [MEZB 00:50:22], which is the PTO here in Brussels. We're working closely together for the most approach, of course, because they are really important and they have to be a big part of the of the game, of the chess board. But they're super scary about basically booking.com happening to mobility.

Daan van der Tas: Yep.

Martin le Francq: With Googles and Apples and the Amazons of this world. So, they are really, really scary and being careful during the development of it. From my perspective, I don't think that's too big of a threat. I think if you're clever enough in the development of the regulatory framework, we can actually make them contribute to the whole system, with a few tricks. For example, our most policy will be, okay, let's go ahead and use public back end platform for mobility sales and service. It's not mandatory to contribute, but if you want to get access to public transport data... Tickets, sorry, public transport tickets, you would have to contribute to the platform.

Martin le Francq: For example, Uber was active in Brussels. They could say, okay, we live in a paralleled system, but we don't get to sell public transport tickets. So, if they want to integrate public transport tickets, such as they did in Denver, I think, they would have to redo the whole platform and share the data and generate activity in the whole system. And I also think that it's way too soon to be scared of the Googles of this world, specifically in terms of mobility. And I think we can design some kind of KPIs that would be interesting to follow the evolution and the importance of Google in the mobility system.

Martin le Francq: If we define some kind of threshold for these KPIs, that would raise the flag, and then we can all sit down around the again, okay, let's discuss how the framework would evolve. I think it's possible to define these KPIs, and raise a flag when the danger, the actual threat, is there. For the moment, I don't think it is. So that's what we're going to do. Again, during the ITF project, it's an idea that we're going to discuss, and try to define which KPIs are relevant for highlighting this potential threat.

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Daan van der Tas: Very interesting. Yeah. Because you could say that if the KPIs are met, that the threshold is reached, you're basically too late. That could be... Because I think that many views also say yes, that the mobility transition is moving more slowly than, for example, Airport hotels and Airbnb and whatever, since it is about mobility, involving cars, infrastructure, municipalities, whatever. But it will go in the same direction if we don't act wisely.

Martin le Francq: But here, for example, I think the comparison between Amsterdam and Brussels is very relevant. For example, due to your actual mode share that you have in Amsterdam, compared to ours, which is, I mean, car is very present in Brussels. It's changing fast, but it's very present. And therefore, in our sustainable urban mobility plan, which is called Good Move, which I highly suggest you to check out on our website, goodmove.brussels, or whatever, you can Google it and you'll find it. But development of shared mobility is really a very high goal, an important goal. So, we have defined concrete and tangible actions for development, for shared mobility and mobility as a service. So, it's a goal in itself to develop these kinds of service and increase their market share.

Daan van der Tas: Yeah. And you have more space, I think? Physically.

Martin le Francq: Probably, probably. It's been a while, I haven't been to Amsterdam, but yes, that's likely. Yeah.

Daan van der Tas: I worked in Brussels for quite some years when I worked at Fortis. So I know the situation a little bit. I think you have more space.

Martin le Francq: Okay. Yeah, yeah. Yes, that's a thing to consider. So that, again, to refer to the local scale, local level context, I think that is important to consider. Something that's applicable here, I don't think it's necessarily applicable in Amsterdam, and vice versa.

Daan van der Tas: Yeah.

Martin le Francq:

Anyway, that's my two cents.

Guusje van der Vossen:

Do you have any questions for us?

Martin le Francq: I think I will have, but I have to leave very soon, sorry. So I won't start the discussion now or the questions now, but-

Guusje van der Vossen: You can always email me with the questions.

Martin le Francq: Yeah. That's it. I think, if I think of something, I won't hesitate to send an email, and don't hesitate to do the same back. Yeah, I'm really happy to have met you...

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Guusje van der Vossen: You, too.

Martin le Francq: And hopefully we'll be able to share our insights and expertise in the future. I would be very interested to do so, at least.

Daan van der Tas: Yeah. I'm very much interested, and I'm very happy to have met you, and I hope to continue the conversation.

Martin le Francq: Yeah, me too.

Guusje van der Vossen: Thank you.

Martin le Francq: Good luck and see you soon, hopefully.

Guusje van der Vossen: Have a good day.

Daan van der Tas: Bye.

Martin le Francq: Yeah, you too.

Guusje van der Vossen: Bye-bye.

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2.17 Summary Focus Group Helsinki x Amsterdam

Participants: Tijs de Kler, developer CDS-M, Gemma Schepers, manager smart mobility team of Amsterdam, Daan van der Tas, project lead MaaS Amsterdam, Ross Curzon-Butler, Chief technology Officer at Cargoroo and co-developer CDS-M, Sami Sahala, manager at ITS in Helsinki, Juho Kostianen, Project Manager at City of Helsinki, Janne Rinne, Project manager at Forum Virium Helsinki

Date: 5th of November

In this focus group the City of Helsinki present their experiences and finding from the use of MDS with the Vianova platform. In the beginning of the meeting Sami re-addresses that Helsinki has one of the most open data systems in the world. They see the municipality as a facilitator of innovation, especially in the data field, they always try to support and cooperate with new businesses. Furthermore, the government is obliged to publish public data openly, in such it is available for everyone.

After this notion they start their presentation on the pilot they are doing with Vianova and the micro-mobility providers in Helsinki. The pilot is about the transmission of detailed data from the operators to a third party, in this case Vianova, after which the third party visualizes this data in their dashboard, moreover Vianova sends a weekly report of aggregated abstract data to the municipality. As a result, the government does not receive the data from the operators. "Mobility insights is what we get, they present it in the dashboard."

The city is using the data they have access to in the dashboard to control and monitor mobility in the city. They explain that two legal agreements had to be made in advance of the pilot. The first, was a contract between the city and Vianova, this agreement is about the processing of data. The second was between the city and the operators, this agreement includes the licensing obligation of the providers. These agreements include information about how the data is stored, anonymised, processed, used and applied. These agreements have been drawn up jointly by the ICT department and the legal department of the city. The agreements include target-reasoning and the description of clear use cases. Mapping was needed beforehand. A proposed possible use case for the future is the blind people use case for pedestrian safety.

The city currently receives aggregated information on mobility in the city. It is very generic information; "We never receive vehicle-IDs, we never receive anything related with the actual identity of the end-users". The Vianova platform is capable of providing vehicle IDs and number plates, and other forms of detailed data, but the city of Helsinki is not interested in this kind of data.

The city sees itself as 'not responsible' for storing the data, because they do not have access to the detailed data. The usage of such a trusted third part in combination with the aggregation and anonymisation techniques causes that they have the conviction that they comply with the requirements set by the GDPR.

The City of Helsinki has not mandated participation in the pilot, thus the two mobility providers joined voluntarily, following an invitation from the city. The voluntary participation of the providers is explained by an employee of the City of Helsinki; he says that by sharing the data the providers enhance their image. By showing their willingness to cooperate with the city, the

city gains another picture from them, that the often-negative image which is presented by the media; accidents and nuisance caused by the scooter companies.

The city of Helsinki states that there is a win-win situation, because the city can support the operator's supply management, the operators are now able to better distribute their vehicles across the city.

Vianova uses MDS as data standard and, so far, the City of Helsinki has not experienced any problems, but they recognize that they haven't had the opportunity to compare it to another standard yet. They indicate that it took some time for the operators to make sure that MDS worked properly with their servers, and this is still an ongoing process.

The city of Helsinki does not have a preference for a certain data standard, as long as the operators want to work with it voluntarily and it offers qualitative and reliable data. They say that the use of MDS is not perfect yet, for example, sometimes an average data comes out, which is totally unrealistic, because one vehicle movement has increased the average distance enormously. Helsinki states that most European cities are still in the pilot phase, just like Helsinki, and therefore they find it too early to establish one uniform data standard.

In Sami's opinion Helsinki does not have a need to access the raw data, in his opinion the access to the dashboards is sufficient. If the city would own the data, then they are obliged to publish this data openly and this could cause market parties to withdraw. Another benefit from using a trusted third party, is the increase in the feeling of privacy preservation.

It is emphasised that having an intermediary, in this case Vianova, and the fact that the government receives only aggregated summary data makes citizens less likely to feel like a government that has too much influence ('Big Brother'). In Helsinki, they have the premise that the city is not going to build a platform or a data management model. They are convinced that this is better left to tech start-ups, or another private party.

If the city does want to have access to more detailed data for research for example, the city of Helsinki proposes the 'My data' initiative. This is an initiative in Helsinki which is quite similar to the data commons thought. In 'My data' citizens can decide for what purpose their data may be used by the municipality.

Amsterdam indicates that they are afraid of outsourcing the aggregation and management of the data to one party, because they expect that when a conflict or problem arises, the intermediary could opt-out and they are left with a vendor lock-in.

Helsinki indicates that this is a pilot project and that this is also a question which they hope to be able to answer after the pilot project has been completed, whether to outsource the data management or not. Helsinki states that the concern of opting out could be resolved by smart contract, as are now used with the Vianova Pilot.

Helsinki emphasizes that the most important part is the participation of the operators, the involvement of the municipality as a whole, and the mapping of clear use cases Amsterdam

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explains that these are also issues they face with the CDS-M. Amsterdam invites Helsinki to take part in the CDS-M working group. Helsinki is happy to participate.

[Amsterdam explains how the discussion about a data standard should reach a higher level]

[Helsinki confirms that they have some common priorities]

[Helsinki wonders what use case is being used in Amsterdam]

Amsterdam explains the possibilities of a use case with, for example, taxis and waste lorries.

[Amsterdam explains that there is also an ethical discussion on the use of the data about which position to choose in the grey area of the GDPR]

[The next steps in bringing this discussion, are elaborated on, distinguishing between the technical, policy, political and ethical aspects]

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2.18 Summary interview Jordi Ribe and Mariona Conill de Azpiazu, Metropolitan area of Barcelona

Interviewees: Mariona Conill de Azpiazu, Mobility engineer at Sustainable Mobility Department at Àrea Metropolitana de Barcelona (AMB), and Jordi Ribe, Mobility & Urban Innovation at the Barcelona City Council

Date: 10th of November

Used standards: GBFS

Preferences: Not clear

Jordi recognizes the demand for one uniform standard in the shared mobility sector. He says that it is needed to organize cities. However, he sure whether the city should be owner of this data. In Barcelona now, the city only retrieves parking data through GBFS. This requirement of data sharing is included in the licensing. In Barcelona they have the 'Smou' app on which all shared mobility mopeds and bikes are visible. In Barcelona they already use a system for data processing and storing, but Jordi is wondering whether Barcelona's municipality should be owner of future trip data. He thinks the ownership should be a mix. He does not believe in a model where public administration is managing all the data. He also does not believe in the other side, completely managed by a private company.

Jordi sees the biggest bottleneck in the reluctance of data sharing of the big companies, like google and Uber. He thinks that if they won't follow, the smaller companies will hesitate to adhere too. Therefore, Jordi stresses that it is important to cooperate and make sure that there is a win-win situation. That it is not one-way traffic, so that the city should also deliver data to the companies, that they would not have had access to otherwise.

He finds it remarkable that the Big Tech companies never participate in European, or city projects. He indicates that it is important to co-create on some sort of exchange platform in which the city can publish policy data, infrastructural data and other forms of data that are valuable for the companies, such as from the fire- and policeman, or public transport information. In this way, the city must ensure that there is a need for companies to work together with them. However, Jordi doubts whether there are enough use cases in which this is the case. His concerns are also with the urban planners of the city of Barcelona themselves, if they have the 'need' for this trip data provided by the CDS-M or MDS. There must be a need from both sides and a win-win situation. Only then a data standard will work in his opinion.

Mariona explains that in the Metropolitan Area of Barcelona (AMB), no shared mobility is used. Next year the city bikes will arrive in the area. Therefore, in AMB there is not an urgency to retrieve real-time data in any way. Their priority is to offer excellent public transport services, in such the private car is used less. The AMB they use historic public transport and CTTVs and sensor data for urban planning, and from their point of view that is sufficient.

At AMB they are not that concerned about the standards now. They are interested in getting to know the experience of the other cities in Europe, especially how they integrate these data standards in their systems.

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Jordi indicates that he would like to be kept informed about the CDS-M and would also like to contribute to the design process.

2.19 Summary interview Marta Trzaskowska – Warsaw, Poland

Interviewee: Marta Trzaskowska, Production Engineer & Technologist at the city of Warsaw

Date: 10th of November

Used standards: None

Preferences: A standard that offers a win-win situation

Marta tell that there are two operators active in Warsaw that offer of electric kick scooters, Lime and Dot. Both first agreed to deliver data, but currently they do not, because they stated that the data is commercially sensitive, and it would harm their business. In Marta's opinion this is part of their strategy. Besides, the kick scooters there are four to five car sharing companies. Which is mix of electric and not electric cars. There is one motorbike sharing operator in the city. On top of that the city of Warsaw has a public bike sharing system, called Nextbike.

The kick-scooters are treated the same as the city bikes, regarding legislation. Both may not drive faster than 25 km\hour. The kick-scooters are a big success in Warsaw. They overthrew Warsaw in 2017 when the public bicycles were on the break, in the winter. The break of the public bicycles is between November and February. This was the perfect time for the kick-scooters to arrive. The steps are mostly used for the last mile solutions. Public bikes as well.

Marta says that the steps are threatening pedestrians and cyclist safety and the steps are polluting the public space. The steps do not have a long lifetime and are often left on the streets. She explains that it is cheaper to buy new steps than to replaced old ones. Sometimes, the steps are even put in public buses to transfer them. She indicated that this is also a burden to the citizens.

The problem is that the shared mobility cannot be regulated in Warsaw. They do not have regulatory framework for this purpose and do not work by licenses. On top of that Poland values free market very much. There is no legislation that could enforce a standard. Therefore, she states that a standard should have a win-win aspect and should be broad and pre-aggregated, so that companies have no concerns about losing their position.

Marta tells that the city does have a mature technical infrastructure and would be able to integrate CDS-M in their system. They already gather real-time data from the public transport operators and the city bikes. She recognizes that open data boosts entrepreneurship and therefore the city publishes all public mobility data openly.

She identifies that the 'blind people' use case is very relevant for the implementation of data standards. This is a use case in which companies might want to participate voluntarily.

2.20 Transcript Interview Philippe Crist, International Transport Forum

8.2 **Interviewee:** Philippe Crist Philippe Crist, Advisor, Innovation and Foresight at ITF - International Transport Forum

8.3 **Additional participants:** Ross Curzon-Butler and Daan van der Tas

Date: 11th of November

Recommendation: A syntax based on clear use cases and mapping with multiple levels of detail which is interoperable with other standards in the Smart Mobility field.

[Introduction]

Philippe Crist:

International Transport Forum with the OECD. We are an intergovernmental body working on transport policy across 62 member countries, of course, the Netherlands, all the EU countries, Asia, North America, South America. And in the last 10 years, there's been a particular focus or a request from some of our member countries to help them address both the pace of change that they're facing and how, from a regulatory perspective, to address many of the new services and some of the new technologies that are being rolled out for which they feel their current regulatory frameworks are no longer sufficient, and in some cases where they feel they have no regulatory frameworks. And there's always a question of whether they do need one.

Philippe Crist:

So of course, in this whole sphere of work, we've been doing a lot of work around new mobility services, around ride sourcing, car sharing, macro mobility, but not only those. We've done a lot of work on trying to help frame what are the higher-level principles that should guide that assessment of if and when policy needs to be put in place or modified, then what are the guiding principles that should help lead that?

Philippe Crist:

Of course, all roads lead to data. When you talk about anything that's digital or that's platform based. The current work that we have now is our sixth stream of work on helping our member countries in sub national governance within our countries deal with new forms of data, data governance, et cetera, and broadly at first, it was just to help them understand that there were a tremendous number of new sources of data that they weren't always aware of and certainly did not access in trying to assess the impact of the policies or to help guide their policies. And one of the things that, at the outset, was difficult for them to grasp was that a lot of the most actionable data, but highly biased data was no longer the data that they were producing, but it was data that was in the private sector.

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Philippe Crist:

I'm saying that, because you have to understand from our perspective, our first focus wasn't on the kind of business to business data sharing for example, or other MaaS based data syntaxes like MaaS Global and a few others. Our focus was more on the operator to regulator and regulator to operator communication. And specifically, because of that shift away from the public sector, collecting, managing, processing data to the private sector, having a lot lower latency, high frequency, as I said, somewhat biased, but certainly interesting data to use.

Philippe Crist:

The emerging question, not just in Europe, but North America, it's gotten to the point of lawsuits, for example, in the case of Los Angeles, the question was, give me what you have and then I, the regulator, will see what's important and useful, and you get into that whole area of privacy overreach, commercial sensitivities, and the incompatibility of that approach to GDPR.

Philippe Crist:

I would roll back a little bit to the things that you were saying, and then we should talk about how what you're proposing now might address that? But the first thing is, to my understanding, I mean, and yes, we always do talk a lot about MDS, but MDS, it's syntax that was pushed out rapidly to deal with a specific problem. It had great ambition. I mean, the ambition was that it would be the language to end all languages, but then scooters appeared, and they had to act really fast.

Philippe Crist:

So, the structure of the specification right now is to get information from operators, particularly micro mobility operators. In the information that can be encoded within MDS is the route-based information, which is the most difficult from a personal identifiable information perspective, but that never has to be turned on. So MDS in and of itself, is not GDPR un-compliant, certain uses of MDs when you collect route data are GDPR non-compliant. I think it would be wrong to think that the current structure of MDS is itself is not compliant with GDPR and cannot be. I think it's all about the uses-cases

Ross Curzon-Butler:

Sure. One more thing on that point then, my understanding is that the GPS location fields for the world's home update and agency are actually required.

Philippe Crist:

They're required if you're using the agency API, but they're not required for the historic information that is under the provider API, and they're not relevant in the policy API, which is-

Ross Curzon-Butler:

No, they're not in the policy, I know.

Philippe Crist:

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So, if you want scooter location and scooter routes, so you would activate the provider API, then you would get into that data that's being reported. It's interesting because I think now, they're recognizing that, and I don't know if you've seen the shared streets module for MDS?

Ross Curzon-Butler:

No.

Philippe Crist:

So, basically, so I mean, I'm sure you know, that even in the US there's a number of different, slightly competing syntaxes and shared streets, which was not so much a data sharing syntax, but it was more of a location referencing system that can then be used for data sharing. And it's been used by Washington DC, for example, that was much more preferred by certain actors like Uber and Lyft that had some fundamental problems with MDS. They've developed a way of automatically aggregating both the point data and the route data as part of the workflow before the data is released through the API to the agency, to the regulator.

Philippe Crist:

I mean, there are, again, that's the technical workaround, but I think going back to what I said and the MDS is still in its nascent stages, I would think that more mature syntax, and I'm not talking about MDS, it would be any syntax, would have multiple levels of detail that could be turned on or off according to the specific task, and that's the main point I want to get back to here.

Philippe Crist:

These MDS, others have come up because they have a very specific problem that they needed to manage relatively rapidly. What we find and what we advise our countries to think about is that there really has to be some, especially when it is a regulator asking for information, there has to be some purposefulness in the type of information that is being shared and asked to be shared.

Philippe Crist:

Regulators, governments have the ability to compel action, and that requires a higher standard of transparency when they ask for information that allows them to force people to act in one way or the other. And I think that one of the things we've seen in this whole arena is that the data sharing question is too broad, rarely focused, and there's no clear mapping between a policy objective, the method that a government has to carry out that. It could be parking policy, it could be policing, it could be ticketing, whatever.

Philippe Crist:

And then the specific action that's the specific data that's necessary for that method to be utilized, to carry out that objective. And in that case, you could see, for example, that maybe a city does need specific scooter location data, but only for, in the case of scooters that are parked where they shouldn't be, only in those cases where there's a high certainty, that that specific

vehicle is non-conforming, it doesn't need all the secure location data. It needs that location data. And then there has to be a protocol to deal with that so that data is segregated. It is sent to the appropriate stream of work that carries out the enforcement action, or that allows humans to carry out that enforcement action. And then there is a set of rules on how long that data is kept, et cetera, and when it's destroyed.

Philippe Crist:

But aggregate data on where things are being parked, that's something that doesn't require that level of detail. So I think we're still in the early stages, but my feeling is we don't have this kind of overarching mapping that we need to have between, what are the objectives, what are the actions that allow us to carry out those objectives, and then what is the data that we need to carry out each of those actions in support of that objective and what are the handling rules, et cetera, that must be in place to ensure that if, for example, that data is highly desegregated and possibly commercially sensitive or privacy sensitive that the rules relating to GDPR are fully built into the protocols for handling that data. And so, what I've described to you is basically a project that we're doing right now, which is to try to at least carry out with the principal ... Or two to outline what the principles of that mapping should be.

Philippe Crist:

And coming back to our present discussion, from our perspective, it's not necessarily a bad thing to have multiple specifications and data syntaxes. What would be bad is if all of these develop without that kind of more fundamental rethink of why share data, for what purposes and what forms and have that have certain clarity. The other thing that it would be, maybe, difficult to deal with in the longer run, if, say, these were structured in completely different ways.

Philippe Crist:

So, I think it would be helpful to have some basic functionalities that are common across all specifications and how those are carried out within each classification? Well, that might be context specific. It may be relating to the kind of activity that's being considered, but the functionality should be there. And that should be like the major bins that you could recognize. If MDS, you can see, okay, here is a functionality for a location. Here's of location of vehicles. Here's the functionality, highly restrictive functionality for gathering information on routes, on actual carried out routes. Here's the functionality for ID management, identity management, and have those bins identified that way. It makes the mapping between those much easier.

Ross Curzon-Butler:

Yeah, I agree that's actually an effort has been undertaken by the ministry. They're in the process of producing a document that's talking about very specific standards relating to some of those areas. And actually, that's where we see the opportunity for CDS-M is to really think about the purpose of these things. And as I say, we recognize that from a regulatory point of view, the agency data that you get from MDS does provide that opportunity to get the regulatory side of things. There's a bike in a particular location. But actually, your point about the discussion of how long is that data usable for? Is it ever stored? Is it just analyzed and then

just thrown away? At the moment I don't see that being built into MDS currently. And I think that if you're going to be providing data, there has to be some bigger thinking like you say about how the data is actually being communicated.

Philippe Crist:

Yeah, no. Absolutely, absolutely. The last thing, though I do think that that is quite interesting from the MDS perspective, but you touched on it for CDS-M which is the ability for public authorities to communicate in machine-readable format. What their intent is for the use of public space or for the type of activity. And I think that is essential because it's a different level of intervention, but it is the most direct way of ensuring that the public authority's objectives are being carried out directly in the back-office systems of any operator that is marked operating. To be clear, that should be the case for public transport, it should be the case for freight distribution, it should be the case for anything that has to obey a sign. And I think that is so... So, the mapping part and the machine-readable law or machine-readable regulation part for me, in the functional bins, are the three areas that are important to see and recognize in any specification that I think will have traction over the long run.

Guusje van der Vossen:

And Philippe, you just told us that you are basically working on a project which is really about those headers, those policies, and what do you want as a government, for what reason? Can you tell us all about it?

Philippe Crist:

Yeah, so what we're doing right now is we are looking at a number of use cases. So starting with overall policy objectives that public authorities are responsible for in urban areas, okay, we're not looking elsewhere, in urban areas, and they would be safety, security, environmental quality, traffic flow, parking, you can run down the list. For each of those, there are specific tools that they deploy today to ensure, enforce and carry out, achieve those objectives. And the final bit that we're looking at is what type of data, what is the minimum amount of data that they would need to be able to ingest in those functions to carry out those objectives? And that would relate to data latency, aggregation, spatial and chronological, identity, treatment protocols for collecting aggregation, at what point when it's collected, ex-post, during the processing, onsite, how long it's kept for, when it's destroyed in audit functions, what is the ability to audit? For example, are there any kinds of data that is going to be used in enforcement actions, should be audited after some time.

Philippe Crist:

Now, maybe you don't need the raw data, you just need the metadata that's been extracted from that, but there has to be a clear legal audit chain that can be used in those instances that people trust. And so, we're just trying to carry out, what then are those principles that should be the basic architecture for any data syntax that is developed, in this case, in urban areas? And it's not exhaustive. It's a way of starting to think about, okay, these are the major characteristics of what I should be looking at. Am I doing that? Are there things that our membership, or national governments, are there things at the national level that have to occur for this to

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happen, are there other levels of government where these decisions can be made? But it's to be a piece on principles to guide data governance around this question of data syntaxes. [crosstalk 00:03:30].

Ross Curzon-Butler:

My apologies, I actually have to run to another meeting.

Philippe Crist:

All right. I was just going to say, you should take a look at WRI, World Resources Institute has done in this field of micro mobility, and so I'll send Guusje a link afterwards, and it's very much that approach, but only for micro mobility, and that kind of mapping approach.

(WRI, Center for Sustainable Cities hosts NUMO, the New Urban Mobility alliance, which channels tech-based disruptions in urban transport to create joyful cities where sustainable and just mobility is the new normal, <https://policydata.numo.global/>)

Ross Curzon-Butler:

Okay. Interesting. Very much. Philippe, would you be open for me to give you a secondary call at some point, just so that-

Philippe Crist:

Yeah, absolutely, absolutely.

Ross Curzon-Butler:

My Apologies. I had another meeting in my diary that I have [crosstalk 00:17:01].

Philippe Crist:

That's all right, no problem.

Ross Curzon-Butler:

But it sounds very interesting. I think there's a lot of overlap actually in the objectives that we're trying to achieve here, so if we could chat further, it would be-

Philippe Crist:

Yeah, absolutely. No problem. And at a minimum, what we can do is also involve you in that work, so that you can be a participant and observe what other people are doing in that field.

Ross Curzon-Butler:

That'd be brilliant.

Philippe Crist:

Yeah. Either contact me directly or through Guusje, and then we can carry on. But I can... What time is it? I can stay on for a little bit longer if-

Ross Curzon-Butler:

Yeah, no. It's only me that has to jump off, so apologies.

Philippe Crist:

All right.

Ross Curzon-Butler:

All right, speak to you [crosstalk 00:17:34].

Philippe Crist:

Cheers.

Ross Curzon-Butler:

Bye, Ross.

Guusje van der Vossen:

Bye-bye

Daan van der Tas:

No, because I think with all the talks within the city of Amsterdam and also in the course of all of the interviews that Guusje arranged and I attended here and there, is that indeed this question about, okay, what do you want and what do you need it for? I think it's a still ill explored area, and we see that also on a national level. So during this week, I had a meeting together with people from the ministry, and consultants that saw this an opportunity to create what we call policy trees, policy trees where you could indeed think of working from higher level goals towards more specific goals and following data requests, and also trying to see if we could then create a function, a team of people that would work in the iteration. So, collecting the data, seeing how it would add up to your government duties, then seeing, we might want to have somewhat more information to be even better at certain tasks, and then trying to work that into a standard, but also of course, in the local policies and then move from there. So that's something that we're thinking of arranging.

Philippe Crist:

I think on that specific point, I have a great sympathy with that view, that by looking at data, we can find new solutions. But I also recognize that it's a difficult step to take when you're a government, because you can compel action, uniquely compelled action that a company can't, or an individual can't when you have that data. And so, either you have two philosophies, one is, trust us. Give us that data and we'll think of the use cases, and we'll explore, and of course we'll communicate with you and go through a public consultation, and we're not going to do

things that you don't want us to do but let us explore around the data and think about what we can do with this data. And that tends to lead to a situation where you over ask for, or you ask for a lot of data. And then it's like the Google approach, we suck in all the data and then we're going to see what's going to happen, and maybe we'll find new use cases, use cases that aren't related specifically to our work, but that are helpful in other areas.

Philippe Crist:

I think that is a slightly dangerous route to take, because then you need people providing, or you need entities providing that data, and they need to trust, at least to participate in this, and to be active participants, not opponents. They have to feel that they understand exactly what the data is going to be used for, and that's hard baked into GDPR in any case, because you have to say what the purpose is for this data collection. I think that was a wise thing in the architecture of GDPR. So that's why even though, purely from my own selfish perspective, I think it would be great to have a data lake and then just say, okay, let's go swimming and let's see what we can get out of here, what fish we can catch, I think that that's great for Google. It's not necessarily great for Google, but I can see how a private company could do that. I would be a little more hesitant about the government doing that, which is why I think it is important to have that sort of mapping done.

Philippe Crist:

The mapping can always change. You can say, it would seem that if we had this kind of data, then we could carry out this function better or do something that we can't even do now, but then that has to be tested before you start collecting the data, and you have to be able to provide some certainty that, okay, yes, then if we collect this kind of data, then we can act in this way, maybe that we haven't been able to do before, to carry out our overall policy objective on equity and transport, for example. So, we do need to know where are immigrants from Somalia using shared bicycles for the first time, because we want to integrate that community into the cycling culture in the Netherlands.

Philippe Crist:

Okay, but that's a lot of specific data that you're asking for, and maybe there are other ways of making sure that you can ensure that that community is integrated without asking for specific data that reveals their identity. So, I think I've actually shifted my position on that and moved away from wanting to be the fishermen in the data lake, to the one that wants to build the data ponds, each with a specific fish inside of it.

Daan van der Tas:

I totally agree with you because you also have to find the people within your municipality or government that are going to work with the data, because maybe you and I can think of all kinds of nice use cases, but we are not at the regulatory department, or we're not finding people that parked the car wrongly. So, you have to find those people that are demanding for those data to work with them, so the whole culture change to work much more digitized. And today, it's

already in everything itself, which I think it starts indeed with policy mapping, and looking into, okay, what is the less intrusive and most efficient way to carry out our government tasks?

Philippe Crist:

Yeah. In that vein, it has to be understandable to those that are going to be enacting these policies, so it's almost like they need a guidebook. If this, then that. If that, then this. Because they won't necessarily have the overall understanding. So, I think from the simplicity perspective, it also helps to have that map. The map itself, that mapping exercise has to be dynamic, and it will change, and it should change, and it should be re-evaluated, but it should exist.

Daan van der Tas:

Yeah. And it's preferably not reinvented per city.

Philippe Crist:

Oh God, no, no, no. I think that the fundamental principles are the same in any city.

Daan van der Tas:

Correct.

Philippe Crist:

And in any case, you are interacting with entities and commercial actors who will be present in multiple cities. And my work isn't about making things easier for Uber or for any other actor, Swapfiets or whatever, but it's about how you at least enable them to rapidly deliver services that do benefit the whole population, and having some kind of uniformity, not just in the Netherlands, but outside the Netherlands as well is important.

Daan van der Tas:

Yeah. Hey, maybe because I also have other questions that I would like to raise to you.

Philippe Crist:

Yeah.

Daan van der Tas:

But maybe to round this off, because you said you will share a link with us. Is that specifically the project around the mapping exercise or was it something related?

Philippe Crist:

No specific... So, what WRI did is they, about a year ago, we sat down with them and agreed that they would do an approach based on specific use cases, format mobility, and try to understand what specific data would allow them to answer a question that a public authority might have. And so basically, it's built almost as a toolkit or learning kit for public authorities to

say, okay, I want to increase the use of micro mobility devices in a low-income neighborhood. What information do I need to carry out that policy objectives?

Philippe Crist:

And so, then they can click or select this, then they can see, okay, you need aggregate data, probably aggregated by a week, even month is fine, over this level of geographic detail, and that's probably sufficient to answer the question whether or not an operator is achieving that aim. And so I'll send the link and you can see, you can play around with it. The idea for us is to move that beyond micro mobility and to kind of extract from that these generalizable principles that should allow any city or regional public authority to undertake that same mapping exercise.

Daan van der Tas:

Great. Great. It sounds very interesting. Are we as Amsterdam already involved in this or no?

Philippe Crist:

So, in the project, no. You can be.

Daan van der Tas:

Just ask Ross to being involved.

Philippe Crist:

So, there's participate in ... Sorry, there's two things. There's the project team itself, which is a group of ... [inaudible 00:26:30]. The International Transport Forum has a corporate partnership board. This corporate partnership board are a number of companies that countries have asked to advise the International Transport Forum on issues relating to innovation. And so these companies come together and say, "Look, you should look at X, Y, or Z."

Philippe Crist:

We put together these teams with the companies ourselves, mainly the secretary doing most of the work. And then use this as a way to communicate to our countries what the private sector feels is maybe something that's off of our member's radar screen.

Daan van der Tas:

[crosstalk 00:01:18].

Philippe Crist:

Yeah. So, it's a way of scanning when it's happening in the private sector and bringing it upstream to the public sector faster than had been before. That was the main reason they put this in place, was because they were tired of waking up one morning and seeing something, they had not anticipated at all on their streets and thinking, "Okay, well now what do we do about this?" So, it was trying to get some stream information. So, the members of the group are only those companies and some of our country representatives, but when we have

meetings, we invite people to participate in the meetings. And so that is something that you can participate in.

Daan van der Tas:

Okay, well maybe we can see indeed amongst each other's ... we will join. And maybe if you have some information on the project, that could help us [crosstalk 00:28:06].

Philippe Crist:

I'll send the link to email, and a description of the project. You already had a first working meeting. We'll have another one on the 23rd of November. And actually, I can even ask you guys to present the work that you're doing with [CDSN 00:02:30]. Is that something interesting? (project NUMO)

Guusje van der Vossen:

I don't know if we're already far enough with the CDS-M.

Philippe Crist:

Yeah, yeah, yeah. Okay. See amongst yourselves.

Guusje van der Vossen:

Yeah, we will discuss with Ross, who is our leading man now on the CDS-M. Thanks anyhow, for the invite.

Philippe Crist:

Yeah.

Daan van der Tas:

And the other question that I have, because one thing that we're starting with is also the issue of platforms and the winner-takes-all. We could imagine Uber or Airbnb or Booking like situations on mobility en masse, especially. We see that we can control with our permits the wheels on the streets, but not so much platform playoffs. So, what is your view on this? Because there is also a good thing in platforms.

Daan van der Tas:

They can create scale; they can create a good service that might convince people to indeed start using those services and get rid of their own car. So, here is also the aspect of it, but at the same time, we would like to prevent all the defects that could happen if you have indeed one single player taking it all. So [crosstalk 00:29:56] from happen?

Philippe Crist:

We're struggling for that. I'm leading work within the ITF on mobility as a service, data governance, and some of the more strategic areas around that. We also are, through a project that is funded through the EU, helping Brussels reevaluate an adaptive regulatory framework for mobilities as a service in the Brussels capital region. Overall perspective, the strategic perspective, and then the implementation perspective we're working on this.

Philippe Crist:

I don't think there's an easy answer yet around platform governance. There are a number of models. There's what Vienna has in place. There is what Berlin has in place. There's what Madrid is putting in place. I think all of them have interesting elements. None of them are satisfactory from my perspective, in terms of really trying to maximize the potential of platforms to serve as a real basis for alternatives to cars, but also avoid some of the anti-competitive effects of having a single player.

Philippe Crist:

Strangely enough, one of the experiments, if you will, coming out of the Dutch MaaS pilots is one that goes along with some of the messages that we had on what might be the way forward. And that's the Sony distributed ledger technology-based mobility as a service ecosystem that was trialed. So, it only ran for two hours. Or I don't know how long it ran, but it was just an experiment in if you could have a decentralized, distributed platform and system that allows full, open participation. And through its central architecture avoids that kind of concentration.

Philippe Crist:

I think going forward, that is one interesting potential development. The downside of it is that it's technically not matured, and it may never be. So, who knows? But the idea of getting around the de-materialization of the platform itself is something that is attractive. If you could have a trust, dependable environment in which operators and consumers could interact amongst themselves directly with rules that conform to what the public authority needs to have happen built into smart contracts, that is intellectually quite compelling.

Philippe Crist:

But as I said, there was a lot of technical details that need to be addressed. We call that the meshy mess world, where you have a mesh of interacting actors and the rules are set into the interaction. But yeah, like with anything with DLTs or blockchain, that's not for anytime soon. So, I think then, what's the default, then? It's more rigid or more stringent rules around access to platforms, or it's a public platform operator. And when it comes to a public platform operator, what we see typically is that, at least in Europe, public transport is always going to be a core component of mobility as a service.

Philippe Crist:

And therefore, they would like to see themselves as the platform operator, but that doesn't really function because part of the openness that you're looking for. It means that some of these services would compete and draw revenue away from and de-brand or reduce the brand

identity of public transport. And so, you can't trust that the public transport operator would make the best decisions in terms of allowing services onto the platform that might diversify services for people, but maybe hurt themselves in the short run.

Philippe Crist:

I mean, I think in the long run, it does help public transport to have these services present in the ecosystem. It just doesn't help public transport as they're configured today. And so then you have the public transport ... you have the public platform operator. There's a lot of questions about how agile, how effective that player can be.

Philippe Crist:

And then finally, then you have this platform wars approach where Uber has their own platform, NS has their own platform. Everyone's got their own platform. Amazon's got their own transport platform. Airbnb is doing shared rides. And when it comes to the actual effect on the street of having all these different things, I don't know what it is. Unless, and here's going full circle, unless they have to take into account the regulatory intent of public authorities in their APIs, because it's built directly into the back-office systems. So, if there's a call for an Airbnb shared ride and it's going into the center of Amsterdam at peak time, then automatically that ride gets surge taxed 150%. And there's nothing that can happen. That's just how it happens. So that goes back to the importance of having the push out of public intent in machine-readable language. But I don't think it's enough.

Daan van der Tas:

Yeah. And Phillippe? And because to develop, to build on this, then it would be indeed the error that the mobility operators on your streets that you have, because you can have this infrastructure that you can offer or prevent them from using ... So, this is the power and the force that you can use them to implement these backbone APIs and put it like that. Or APIs in their back-office systems.

Daan van der Tas:

So that would then be the way to regulate, and that would then work its way through the platforms that it also cannot so rise through the city of Amsterdam without this extra surge charge. But unless indeed you create a kind of public platform, maybe using public transport operators, but assume that we would have something like public transport, that you would monopolize the information streams, access to the [SSs 00:10:22]. And then you could have something of a [inaudible 00:36:26] platform players.

Philippe Crist:

But having that direct access that public intent into the back-office systems of operators doesn't mean a single operator can't emerge and squash our competition. As long as they conform to what they have to conform, they can find other ways of market dominance. Including through their branding, through loyalty programs, through additional services

[inaudible 00:36:55] building, non-transport services. So, if you get X points per year, then you have 20 gallons or 20 liters of coffee or whatever. All the coffees you can drink.

Philippe Crist:

So, there are all these ways of gaining market domination. And so even though that might lead to a situation where on the street, there's slightly less, or possibly hopefully a lot less congestion. Then if that weren't in place, you still might have a single operator dominating the market and using that market dominance in ways that are counterproductive to consumer welfare in other domains outside of the transport domain.

Daan van der Tas:

Can you please repeat the last point you made?

Philippe Crist:

So, what you might have is a single operator or an [inaudible 00:37:45] of one or two or three operators, each conforming with the rules of operation. They're set and pushed out by the public authority and machinery of reform. And therefore, complying to what in the transport domain has to happen. But because of all these other things, and because they have a monopoly power, they might be leading to suboptimal consumer welfare outcomes in other areas.

Philippe Crist:

So, it could be by not overcharging, but by setting above market prices for their services that they can get away with, because they're a monopoly operator. Or because they have an agreement, or an unspoken agreement with two or three other competitors. So, there's those things that have to be taken into account. That's not the domain necessarily for transport authorities, but it is something to be mindful when you have a system that leads to natural domination, natural market domination.

Daan van der Tas:

Yeah, but maybe it's also interesting because we talked about policy rules and policy trees, etc. But what we are doing now is even one step before that, is that we are trying to draw up what we call a set of principles, preconditions, the Amsterdam principles, preconditions, the Amsterdam support provided, the Amsterdam preconditions or rules basically for the game, which are even more on somewhat more higher-level saying things about inclusivity, not only on a private level or personal level, but also on an economic level. So, meaning how do we think about smaller shops at the city?

Philippe Crist:

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Yeah, absolutely.

Daan van der Tas:

For example, about indeed using the streets, individual is collective mobility, and more important, individual mobilities. So, all principles that we then translate into more concrete measures that we would like to land in our policy governments.

Philippe Crist:

And some of which can be addressed in the way in which you create a data syntax and others that cannot. My feeling, the more I look at this, mobility is a service or intermodal transport is hoped to be a compelling enough offer that it would draw people away from cars, sometimes for some car trips, maybe for all car trips for some people. If it's able to do that, then that create some benefits for cities at sometimes, in some areas when there are fewer cars accessing the streets and globally, when they're fewer cars driving around.

Philippe Crist:

But for that to happen, then the offer has to be quite compelling and just simply putting out a MaaS app or creating a MaaS ecosystem will not be enough for that change to happen. You can have the best MaaS app and the best thought-out back office ecosystem and communication between the public authority going seamlessly, back and forth with operators. That's not going to change what happens. The first thing that cities have is the actual platform, which is the built environment, the city and you can do a lot in there without even having to have any kind of digital architecture or ecosystem to change them. And I think Amsterdam knows about that. Now what you're trying to do is then on top of that, how do you find a way of bringing together the hard architecture, the hard infrastructure of the city, and the MaaS infrastructure of the market for mobility services in the city. But you can't do just this, the soft without doing the hard, and you probably can get away a lot by doing just the hard without the soft.

Daan van der Tas:

Yeah, exactly. We have 250,000 parking spots in Amsterdam, and we are now going to get rid of 10,000, which is regarded-

Philippe Crist:

Or five years, is that right?

Daan van der Tas:

Yeah, exactly. So, this is regarded as a big step, but if you look at total, it's quite low. When you speak of Paris, I saw somewhere, and I don't know what the validity of the presentation was, but they were talking about one out of two. So, from every two, removing one-

Philippe Crist:

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In ten years.

Daan van der Tas:

In ten years.

Philippe Crist:

So, it's a publicist.

Daan van der Tas:

That helps.

Philippe Crist:

Well, it does help, but I think one of the things that having a healthy, competitive open mass ecosystem is to allow the choices that can replace car travel. That said in Paris, it's probably similar to what Amsterdam is. In Paris, about 34% of all Parisian households inside Paris own a car.

Philippe Crist:

So, a lot of the car traffic is not actually Parisian car traffic, its car traffic coming into the city and through the city. And so, for that it's not a MaaS app that's going to help. It's actually doing what they've done, widening sidewalks, winding pavements, putting place access machines to try to divert that bulk of the car travel. But having a more seamless way of accessing the multiple services that are available to you, including some car-based services where it makes sense, taxis, Ubers, et cetera, allows a car free life to be much ... or a car light life to be much easier. And I think one of the great unfortunate things that we've seen is many cities, not in Amsterdam, not in Paris, but in many cities, we've made it impossible to live life as a fulfilled citizen without access at some point to a car, to own a car.

Philippe Crist:

And I think if we can design a system where being a fulfilled citizen does not require that ownership because we have other options, then somehow, we've succeeded in providing better choices for people. It should be as easy to live without a car in a city as with a car. It should be easier in many cases.

Guusje van der Vossen:

Yeah, it's all about scarcity. And today, we had a meeting with Berlin which is of course, a big city. Only 20% of their parking spots are paid parking spots. So, for the other 80%, we talked about the push and the pull factors. So, if you want to push people towards MaaS by getting rid of cars, then you have to have a hard time there.

Daan van der Tas:

And in Amsterdam, it's more crowded, especially in the inner ring, our [inaudible 00:44:40] put it like that. And I think that we really have this idea that we could get rid of a lot of car traffic in this area with what we call distanced parking [crosstalk 00:44:54] In this area, but [crosstalk 00:44:58] with the parking rights, and then I can go there with a scooter or whatever with the public transport. And then also for inbound traffic, you could arrange for that indeed to have a car free life. And maybe when we're dreaming about autonomous vehicles, you could also see something, a mix between a car and a van that can take up these tasks.

Philippe Crist:

I think on that, you're right to point out scarcity, and it's also the architecture of scarcity, that we have built cities just to the limit where it almost makes sense to use a car in many of the core areas when it's not terribly busy, so off-peak hours, but it is extremely difficult to do that at peak hours.

Philippe Crist:

But that architecture of the city that structural framework of the city has to be changed, not massively, but sufficiently to make it clear that at most hours it does not make sense to use a car. So, imagine a supermarket and you drive of course, to a supermarket, but you don't drive your car into the lanes in the supermarket to pick your goods. No, you get out and you take a cart and then you put your things in the cart. Where in our cities right now, where we're driving our cars into the lanes in the supermarket, and we're all stuck there and trying to get our cereal or peanut butter and it doesn't work that way.

Daan van der Tas:

That was a great metaphor.

Guusje van der Vossen:

Indeed a great metaphor.

Philippe Crist:

Haha, All right great I think time is up. I'll send the link along. It was really nice to speak to the three of and hopefully we'll carry on this conversation in the near future, maybe even in Amsterdam at one point.

Ross Curzon-Butler:

Yeah, that'd be great. Thank you very much.

Guusje van der Vossen:

Thank you.

Philippe Crist:

Thank you all.

Guusje van der Vossen:

Bye bye.

Daan van der Tas:

Bye.

Philippe Crist:

Bye bye.

2.21 Interview Sergio – Madrid, Spain

Interviewee: Sergio Fernández Balaguer, Municipal Transport Company Madrid

Date: 11th of November

Used standard: Own data management model, with GTFS and GBFS.

Preferences: More insight in other services in the city, and a notional or European initiative on regulatory- and governance frameworks for shared mobility.

[Introduction]

Guusje van der Vossen: And I'll start the recording now. First of all, I'll just introduce myself. I am Guusje and I'm doing my internship right at the Smart Mobility Team of Amsterdam and I'm helping Daan and Gemma with their CDSM project, which stands for City Data Standard Mobility, CDSM. And in this project, we design a data standard for the transmission of data between shared mobility operators and the municipality. And this CDSM is designed cooperatively with the G5, so with the five largest cities of the Netherlands. So, it's also becoming a national standard eventually. And we are designing this standard as part of the mass ecosystem that we're building right now together with the Ministry of Water and Infrastructure in Netherlands.

Guusje van der Vossen: And with this standard, we want to collect trip data and not real-time GPS data, but every hour we would request the aggregated data from the transport operators. And it's aggregated in a way that we can see if the vehicle travels from a certain neighborhood to another neighborhood to be able to create heat maps, but as well, bypass the GDPR. Because if we request it in an aggregated way and we don't receive the GPS data ourselves, then we don't have to comply with the GDPR and we also ensure privacy for our citizens. So that's kind of the goal of the CDSM. And by being able to see where a trip starts in a certain neighborhood and where it ends, we can make these heat maps and add certain bank lanes, riding streets. But also, if there are certain hot spots where a lot of scooters for example start their trip, we could make sure that there is enough parking place.

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Guusje van der Vossen: And just for a bit of context, the ministry already designed another API, the TOMP API. And that is an API that ensures the transmission between the operators and the platforms. So that one transmits data about whether and where the vehicles are parked. So that is the stationary data, the parking data. And the CDSM is the trip data. But if we license the TOMP API and the CDSM on the permits, then we could also extract the parking data from the TOMP API and the trip data from the CDSM so you could both regulate on the parking with the TOMP API and have insight in the movements in the city for planning purposes. So that's how these two standards are complementary.

Sergio Fernández Balaguer: Could you repeat what's the name of the API? The first one is TOMP?

Guusje van der Vossen: Yeah, so T-O-M-P. It's a shortening for Transport ... I have to search it up. I can send it to you.

Sergio Fernández Balaguer: Okay. No problem. The other one is just trip API, right?

Guusje van der Vossen: Yeah. The other one is CDSM, City Data Standard Mobility.

Sergio Fernández Balaguer: Ah, okay.

Guusje van der Vossen: And the other one is TOMP API. Wait, I'll just search it up now for you because it's nice to know. But I'm not involved in the TOMP project, so that's why I only know the shortened version, because in the municipalities we shorten everything. I don't know if that's the same case in Madrid.

Sergio Fernández Balaguer: Okay. Yeah. I have kind of the brochure or the summary, the roadmap of the City Data Standard. But yeah, I just wanted to know [crosstalk 00:03:55] about this other one.

Guusje van der Vossen: I've just sent it to you in the chat. That's also the GitHub site so you can really see the code as well. And it stands for Transport Operator Mobility as a Service Provider API.

Sergio Fernández Balaguer: Okay. Perfect. Thank you.

Guusje van der Vossen: You're welcome. And the City Data Standard - Mobility, the first draft is almost finished and then we'll also put it on GitHub, so I can send it to you in a couple of weeks I think. I'm just texting you also the CDSM so you can copy that as well. There we go. So those are the two APIs that we're working on right now, and the CDSM is a reaction on the MDS and the GBFS. I don't know if you know these standards.

Sergio Fernández Balaguer: The CDS-M is based on MDS you said?

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Guusje van der Vossen: It's reactionary, because a lot of market parties in Amsterdam and in Holland are really reluctant to share realtime data.

Sergio Fernández Balaguer: About the privacy.

Guusje van der Vossen: About the privacy. So, there are real privacy issues and therefore we started the CDS-M project because we do want to get our trip data, but a lot of parties don't want to share it through MDS. And the other reason is that then we need a data broker because the municipality now can't handle real-time GPS data constantly in a secure way. So, then you are also dependent on a data broker and the long-term goal is that we don't need to use a data broker for our planning purposes. So that's why we are designing the CDS-M. So, it's kind of a light version of the MDS and the MDS now has also designed a metrics API which is kind of similar to the CDS-M, but it's still in the design phase. So, we are also in contact with the OMF, with the Open Mobility Foundation to collaborate on maybe a version of the metrics API that is similar to the CDS-M, because we do want to make it compatible with MDS anyway because some cities on Europe already use MDS. I'm actually not quite sure if you use MDS.

Sergio Fernández Balaguer: No, we don't use it.

Guusje van der Vossen: No? Okay. I already thought so. So, we do want to make it compatible with for example MDS and with the new NeTEx standard that is coming out. So, we also have contact with them.

Sergio Fernández Balaguer: Okay.

Guusje van der Vossen: Yeah. So that's a bit of the context about CDS-M.

Sergio Fernández Balaguer: Okay. Interesting. I must admit that I am not an expert myself in all these topics. And that's why I was kind of motivated to help my colleagues from the IT department to really provide the technical input about the problem, is that he is not very fluent in English. So, we had kind of a preparatory meeting two days ago to take a little bit of the information that you provided to us by email. So, I don't know really what kind of information or input you expect from us or you want from us. So yeah. Let's see if I am able to provide anything useful to you.

Guusje van der Vossen: We'll just see where it goes. This morning I had a talk with Berlin for example and they don't receive data at all from shared mobility operators. And that is also a nice attitude to hear because the goal of CDS-M is to also make it applicable for all the European cities, so we don't want to make it too complicated. So, it's also just good to hear from other European cities what kind of data they would like to receive, which data they would like to have for their planning purposes, and if we could also include all these things in the CDS-M because we're still drafting it. And also, to check whether we're on the right course and if other cities are interested in maybe joining the CDS-M working group that will be started in a couple of weeks, in which we would also really like to collaborate with other European cities to make sure that it just facilitates all the needs and demands.

Guusje van der Vossen: So it's kind of the first contact about the CDS-M and it making sure that it aligns with your needs and demands and see how you manage data management, because there are a lot of questions about that regarding privacy, but also if you want to do in house. So just a bit of your attitude toward data standards and if you're planning to use them in the future, if you're using them already. That's kind of the context we're searching for.

Sergio Fernández Balaguer: Okay. So, let's go for it. I will try to provide some sort of comprehensive input. But first of all, you need to take into account that I'm talking as the PTO, as the public transport operator. We are the public transport operator of the City of Madrid. We are fully owned by the City of Madrid. However, I think I will be able to tell you something about how the city is currently managing the data. So, if I start from the city side, as far as I know, the City of Madrid at the moment doesn't have a proper data management coming from all the shared mobility operators. So, depending on which type of operator, the city gets some sort of input for all of them. For instance, car sharing companies, they don't need to apply for a license.

So as soon as they are using electric vehicles, as they are exempt from the public parking scheme, they can park for free, they really don't need to apply or ask for a license. And therefore, the type of input they provide to the city is kind of on a voluntary basis.

Sergio Fernández Balaguer: However, for instance, e-scooter companies, they need to apply for a license. That's something relatively new that was set I think by autumn last year, or maybe the year before. With this confinement and all the time, I spent at home, I miss the point on the time. But yeah, it's something quite recent. So, for instance, the e-scooters, the city decided to issue licenses to these companies and there are some obligations in terms of at least letting some sort of access to the city officials to check information about the company. But it's not being done in a proactive way. That is, the companies don't provide input or data proactively in some sort of automatic way. And so, the people who is in charge of the city council, they have some user and password, but they need to go to the platform and access as if they were managers of the company let's say. And they have limited access not to all of the data, but just some of the data. So just location or maybe the demand, which is at a certain point of day, et cetera.

Sergio Fernández Balaguer: So, it's not really very well advanced. And despite some initiatives in other cities such as Brussels for instance or Lisbon where I'm aware that they are already testing or at least working on MDS, in Madrid that's not the case. So that's from the city side of view. From our own point of view as a public transport operator, we've been working on data incoming from all the mobility operators since several years ago because we are developing the mobility as a service platform we have of the City of Madrid. So, it's been several years in contact with the shared mobility operators and signing agreements. So, we commit ourselves that the data they provide will be used only on an aggregated basis to avoid let's say competitive issues among them and privacy issues.

Sergio Fernández Balaguer: But in terms of standards, we are following at the moment all the let's say indications coming from Europe, from the European Commission or the European level. We are in a working group together with the Spanish Ministry of Transport, because they will be the national access point according to European regulations. And the format or the scheme they are following is NeTEx, following the European directive or indications. So, it should have started November last year, but there has been delay, and so in terms of standards as such, we are not really pushing either the development of another one or just MDS. But what we are doing is working on how any shared mobility operator can integrate within a Public Transport Authority or public transport operator. So, in this regard, we have like three different missions with three different levels of integration. And that's been done by APIs. So, if you just want to get availability, location, or maybe battery level of these electric mobility vehicles, shared vehicles, let's say you use one API.

Sergio Fernández Balaguer: But then, the next step would be if you have or if they want to be integrated with us or with any Public Transport Authority, in order to let third parties, book the service. So, in that case, you need to really invoke that booking and make it possible. And then, the last step of integration would be to have economic agreements. That means in terms of arranging special fairs. If you combine, I don't know, a bus plus car sharing or a train plus e-scooter. So that is something that should be done among the different operators of this services hub. The challenge there is how to distribute those costs between the different operators. And we have developed some sort of guidelines or statements or principles in this regard.

Sergio Fernández Balaguer: And regarding NeTEx, as a mobility language, it's not necessarily open. We considered that. It covers more or less everything, it's quite complex. We are aware that in this working group with the Spanish ministry, the city council as such, municipality, has not been participating. But both the PTA, the Public Transport Authority of Madrid and us as a PTO, we are aware also about some initiatives of the Polytechnic University of Madrid to create interoperability standards, but annotated ones, so semantic ones. And for instance, as we started a long, long time ago initially with our open data policy in 2006, at the moment for instance we are just providing the information of our buses by using GTFS and also by using an API with our own format, but only for the bus. And then for the bicycles, we know also the GBFS for the bike sharing teams, but we haven't applied it yet for our own bike sharing system.

Sergio Fernández Balaguer: In Madrid, we are managing the bus service, the underground parking facilities, the tow trucks for parking enforcement, the cable car, and the bike sharing system. But we haven't applied yet these [inaudible 00:17:12]. And really, we share right now our data just via APIs and we think that the basic aspect would be to have some sort of minimum knowledge of comprehensiveness between the issuer and the receiver in terms of the format. But anyway, the one that makes the integration will need some sort of effort to put all this together. So, in terms data, that's what I'm aware of in the case of Madrid. I don't know if this is useful anyhow. I think that, and you already mentioned, for us I guess, also for the city administration it would be very valuable to enrich the origin and destination matrices. So, the same comment you made before, because that is basic to make better planning. So that is absolutely key.

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Sergio Fernández Balaguer: The point is that at least here in Madrid we have too many, from my own point of view too many levels of competencies, responsibilities in this regard because we have European suggestions, instructions, directives, et cetera. Then, it's translated by our national authority, which basically they really don't want to get very much into deep details. They want to leave it kind of quite open, just setting the basic rules and work on this national license point. But then we have the regional level, which is the government of the region. It's the really the Public Transport Authority, the one that should lead this debate and set the basic framework for all the different mobility operators in the region. I think in Madrid there are about 40 different ones just for public transport, and then you have six e-car sharing companies, maybe another six of e-motor sharing companies. Before the pandemic, before this mobility crisis, I think there were even around 19 different e-scooter companies. Many of them have disappeared. So, it's quite a complex ecosystem and the point is that we, as a public transport operator, don't have the competence to force others to adopt any decision in this regard. That should be done by higher level administration.

Guusje van der Vossen: Yeah. So, I'm just wondering, because the public transport is totally public, are you also planning to build an app for the MaaS ecosystem with all these different shared mobility providers on it?

Sergio Fernández Balaguer: Indeed, we already have one. It is called MaaS Madrid. But that was developed and launched as, at least as the first phase, just an aggregator app in the last political period. And last year, we had local and regional elections and the new city government has another vision at the moment, a mass let's say initiative. So, before we had more this concept of having the public sector as the ruler of the mass ecosystem, even becoming a provider of mass services. So, as a mass operator let's say. And now, the vision has changed a little bit and now we just want to become a facilitator. But we have more that vision of a marketplace let's say. So at least that is what I understood from the latest input I got from the responsible, the city councilor and [inaudible 00:21:49] as well. So now we want to basically be a provider of some sort of modules. We, as a public transport operator with a very, very extensive experience in Madrid, we have for instance very advanced ticketing and payment systems.

Sergio Fernández Balaguer: So, we have developed a module called [inaudible 00:22:17] that allows all these sorts of transactions, even with third parties. We have also, we are very good also in route planning. So, we have also developed a module regarding this topic. And also, regarding safety, privacy, and managing clients. We have also a module for this identity managing of users. So the idea as far as I know is that instead of developing a MaaS platform as such and becoming a mass operator, we want to open the door to cooperate with private providers and let them use one of these modules to promote or to push mobility as a service. So also thinking about bundling services and of course depending also on the vision of the Public Transport Authority. Because the paradox here in Madrid is that in this specific topic, we as a public transport operator, we are more advanced than the Public Transport Authority. So, we are trying to convince them to follow our approach, but they are the ones that can't really let's say push this idea and convince all the public transport operators to follow this same approach.

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Guusje van der Vossen: So, you are the largest public transport operator?

Sergio Fernández Balaguer: I mean, we are the second one after the subway company in terms of millions of passengers transported every year. But in terms of number of public services we are the biggest one, and we are the biggest one also at a national level. We have 2200 buses, we transport around 400 million passengers, 440 million passengers a year. And yeah, we cover the whole municipality, whereas the subway, they have some areas where there is no service. The subway lines don't reach but we cover the whole city. And we have then, for instance for the bike sharing we have 220 bike stations with around 2500 bikes. All of them are pedelecs, all of them are electric bikes. And then in terms of underground parking facilities and charging services for electric vehicles, we have 23 parking areas with 11000 parking lots and more than 100 charging stations with eight fast charging ones. So, in terms of like mobility operator, we are the biggest one. But yeah, for instance the subway, they are not so proactive in this regard. So as far as I know, mobility as a service initiative have been done in Madrid by us and also by the railway company, which depends on the national Spanish ministry.

Guusje van der Vossen: But there is not yet one application on which you can book your train, bus and and micro-mobility trip?

Sergio Fernández Balaguer: No. There are some initiatives which cover some of the modes of transport, but there is no ... as far as I'm concerned, there is no app that covers really all. We have some apps which are already well known as Moovit or ... What's the other one which is also well known? I don't remember the name. But it's also very well known. But in terms of ticketing and payment, there is no one yet. CityTrips is the other one I was thinking of.

Guusje van der Vossen: So, you manage the buses and the city bikes in Madrid?

Sergio Fernández Balaguer: Yeah.

Guusje van der Vossen: And you've built your own data management system for the city bikes? They are dockless?

Sergio Fernández Balaguer: Yeah.

Sergio Fernández Balaguer: At the moment, you have both. You have station based and you have dockless ones. These dockless ones were launched just a couple of months ago. The system is called BiciMAD GO. And the regular system is BiciMAD.

Guusje van der Vossen: Nice, because I haven't heard of that one. How do you spell it, BiciMAD?

Sergio Fernández Balaguer: B-I ... I will text it here in the chat.

Guusje van der Vossen: Okay. And that one probably only offers the parking data, or not?

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Sergio Fernández Balaguer: And parking data, we already have developed a system to provide real-time information on the parking lots we have all the parking's. But the problem is that it has a limited utility. Its usefulness is limited because we cover just our own parks, but not the rest of the private parkings or public parkings which are managed by other companies. And that is something that should be also steered by higher level administration, either the municipality or the region.

Guusje van der Vossen: I see. In the Netherlands, we also have several transport operators, but none ... Well, they are also offering some bikes, but those bikes are mainly used by tourists, I don't know if that's the same in Madrid, but not by citizens. And they are not as developed and mature as your organization I think, and therefore there's probably more responsibility with the municipality and that's why we are really steering the data infrastructure to also deliver for example the TOMP API to transport operators. Like, "Hey, we have this. You can use it in such a way that also startups can use it," but that is a big difference in the Netherlands with you guys.

Sergio Fernández Balaguer: Yeah. There is something else I just want to share with you regarding this topic. One, is for instance we have this open data policy and we have an open data portal that provides the input, the information, the data both in Spanish and English. So, I can send you the link. But also, we have kind of a library of our own APIs published ... I think that it's published. Here, I think this is it. Just let me check. Otherwise, I can ask Andreas if he can. Just let me check a second, I will send.

Guusje van der Vossen: Sure, thank you.

Sergio Fernández Balaguer: Now, I have sent you this other link of what we call Mobility Labs Madrid. It's kind of a library, like an open platform, an interoperable platform that allows the exchange of ideas, initiatives, and data. And it has this kind of bilateral flow. So, you have for instance an API REST, fully functional, documented, so you can develop your apps using EMT data. And you have also [inaudible 00:33:38] your applications to give more visibility to your solutions. And it's interesting because it allows either to download or to upload information. So, this is the next link, I'll put it here. This has been developed by us also, this Mobility Labs.

Sergio Fernández Balaguer: And the final one is this API Docs, which I think is this one, this link. Yeah. It's the API Docs yeah, Andreas confirms. Good. So, it's this API Docs and you can have all the repository of our ... that's it, there you have. So, I think in these three links you can find quite a lot of input on what we are doing now.

Guusje van der Vossen: Wow. Looks cool. It's still loading the English version. But I see indeed that you can have access to all the static data via the first link, and the other link has the APIs on it. "We have published a fully functional [inaudible 00:35:12]."

Sergio Fernández Balaguer: In the Mobility Labs Portal, I think part of is translated into English. I don't know if it's fully translated or not. But at least you have some explanations on how it works. And then in the API Docs library you have ... everything is in English.

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Guusje van der Vossen: And with the application of MaaS Madrid, are a lot of private parties also involved?

Sergio Fernández Balaguer: In the MaaS Madrid initiative?

Guusje van der Vossen: Yeah.

Sergio Fernández Balaguer: Yeah. I mean, at the moment, if I recall, there are 19 different private mobility operators which have agreed in sharing their data. And so, when you open the app, that's the information it shows. But as I mentioned, I think right now it's in a kind of a standby situation. So, we haven't really promoted that much or marketed or published that much, because the vision has slightly changed, and we had also some big internal changes at the company right before the pandemic. So, we are still waiting for ... yeah, everything settles a little bit. And the new CIO of the company defines this new strategy, and we have a clear vision, which is our roadmap.

Guusje van der Vossen: But would it be valuable for you? Because the CDS-M is really focused to be used by city municipalities eventually, but also in Amsterdam we have an open strategy so the heat maps and the data will be visible for everyone. So, I'm wondering, would that insight also be of value, that kind of insight, those heat maps where all the shared mobility is operating in the city, would that be of value for your organization?

Sergio Fernández Balaguer: For sure, yeah. Yeah, for sure.

Guusje van der Vossen: That's good to know.

Sergio Fernández Balaguer: Totally, totally. It's something we have done kind of in a very shy way. I remember, I think it was last year we agreed with a company to provide the data from our bike sharing system so they developed some sort of heat maps. But that's let's say everything we got as a just singular initiative. The point is that all this data, I mean when I see what other cities are doing, I really envy you because at least at Madrid City Council I think we are still suffering lack of skills. So maybe it's because of the type of structure we have, the way we manage internally our human resources, or because we are subject as a public entity.

Sergio Fernández Balaguer: But we are not flexible enough to hire young, new profiles of employees of people just to work on these topics which are really new and many times we really don't have the necessary skills. I know at the city council level the topics about data management and all this is done by the traffic management department. So, here is a person there called Javier Rodriguez which is in charge of that. If you have some more official input from the city side, I can put you in contact with them. But yeah, we have another person which is working in big data. But this is still something that, it needs more resources, and we need to [inaudible 00:39:34] a little bit more on that.

Guusje van der Vossen: Yeah. I think they're really happy to maybe contact them because in the CDS-M, they would like to add other cities to the mailing list and if they are willing to, also to incorporate into working groups if they like, but it's not necessary. But we would like to have contact with them to just at least invite them to the process if they want.

Sergio Fernández Balaguer: Yeah, [crosstalk 00:40:08], yeah. So, what I would do then is to reply to your email, putting you in contact with the general director and the [inaudible 00:40:20] director of this traffic management department.

Guusje van der Vossen: That would be nice. We could invite him as well. I think I have a clear vision of your organization and I'm going to dive into the API library just because I'm very curious and I find it really interesting. And we'll for sure just keep you updated, but I think that the CDSM, if it's going to be implemented, will be implemented by the city council, at least that's the purpose. Of course, it will also be just open on GitHub when it's finished. And it is open source, so everyone can use the API. So, we will just keep you updated on that part. Do you have any questions to me?

Sergio Fernández Balaguer: Not really. I guess if I had a higher IT background, I would have. But being honest, I don't have any at this stage. Nevertheless, yeah, we can just keep up on this communication channel. Whatever you need from us, please let us know and we will try to provide the most meaningful input. It's a pity that my colleague couldn't attend. But if there is any specific question that was not addressed during our chat, just let me know and I will try to get the input and send you an email.

Guusje van der Vossen: Thank you so much.

Sergio Fernández Balaguer: Okay.

Guusje van der Vossen: I will do so.

Sergio Fernández Balaguer: Thanks to you.

Guusje van der Vossen: Have a nice evening, enjoy it.

Sergio Fernández Balaguer: Yeah, thank you. Bye, bye.

Guusje van der Vossen: Bye, bye.

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2.22 Interview Benjamin Rabenstein and Frederik Mehler – Berlin, Germany

Interviewees: Benjamin Rabenstein, Senate Department for Environment, Transportation and Climate Protection of Berlin & Frederik Mehler, Project Coordinator at the Senate for Environment, Traffic & Climate Protection of Berlin

Additional participants: Daan van der Tas

Date: 11th of November

Used standards: None

Preferences: Flexible and simple uniform data standard

[Introduction]

Daan van der Tas: And I'm responsible for creating a full blown MaaS ecosystem in Amsterdam, which is a broad topic and involves various topics like our platform strategy, setting preconditions to operation in our public space, having enough supply of the different modalities in our space and even more. And of course, also arranging our position in a digital infrastructure is a relevant issue. For that reason, I am very much interested indeed to learn about your strategies on collecting data from operators and possibly also platform parties and, what is your strategy? How do you or did you solve the puzzle? Yeah, that's my interest.

Benjamin Rabenstein: Okay. Thank you. I am Benjamin, I'm also the innovation team, a one person innovation team you can call it in our team about strategies and policies. And new mobilities and shared services is a big topic there. And yeah, the data problem, serving the data, getting the data from the providers and so on is always a big topic, because as you already told, planning, so history data, what trips are made and also life data for managing the services, I think these are two points you already focused on, you have to have in mind when you talk about this data. And we at the moment have the problem that we don't have a clear appointment with the operators that we get the data because it's not regulated at the moment. We need the changes in laws and things here that they have to get permission from the city when they want to offer their services there, and then they also have to give us the data then. And this is the point where we are planning to change the law and the regulations at this point, and then we have some ideas how we can get the data and use the data, but at the moment we don't have really data. We have some little [inaudible 00:02:54] they give us but we don't have an overview of all. This is the point we are in in Berlin at the moment.

Guusje van der Vossen: All right.

Benjamin Rabenstein: Frederik? [foreign language 00:03:02] muted.

Frederik Mehler: There we go. Can you hear me?

Guusje van der Vossen: Yes, we can hear you.

Benjamin Rabenstein: Yes, yes.

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Frederik Mehler: Okay. I was muted. Okay, I'll do a short introduction, last but not least. My name is Frederik, I'm also part of the team here of traffic policy and strategic mobility solutions and I work mainly on cycling, but also on more innovative, more modern projects like innovative mobilities with Benjamin together. And I have a small connection with the Netherlands, I did my master's in Nijmegen at the Radboud University and I really much like your approach about a shared scheme for different cities or even countries in the EU because I think it's a broad topic and there is still much that can be actually promoted or developed in this field of mobility, so I'm looking forward to hear what your plans are and maybe we can contribute a little bit. But yeah, as Benjamin said, we're still working on some issues and having a change of a local specific law which is going to give us more implications and also regulations to ask for specific data and also give the providers a little regulation, how they perform and how many cars, or other assets they can place in public space. So, we're working on that slowly but steady.

Guusje van der Vossen: All right. Just to start off with to clarify because I did a little bit of background research and I jumped into the Jelbi application. So, I was wondering if you gather data from the BVG, because I read that it's a semi-public agency. Is that correct?

Benjamin Rabenstein: Yeah, this is correct. This is a public agency, but yeah, they are only semipublic so they are working on this topic a little bit on their own and we don't have the full control of this and we don't get the data at the moment from the Jelbi app. So, this is also a thing we are working on in the city, how we work together therefore with the Jelbi and the department we are, and yeah, how it fits together, the different approaches, yes.

Guusje van der Vossen: Because I read that the Jelbi does have a lot of operators on the platform, so it is possibly a big pillar for the MaaS ecosystem and I'm wondering, how do you see the municipality of Berlin as part of the MaaS ecosystem in Berlin? Do you have a method or strategy for the development of that MaaS ecosystem in the future?

Benjamin Rabenstein: Yeah. I think this is the point, that we don't have the full strategy at the point that we implement it step by step. So, we have at the moment some different players who drive things to get forward too, because yeah, the speed is always a big point in this field, how fast you can implement some services and solutions. And yeah, changing laws to get it from a full complete view that you say, "You have to give us the data," and you regulate this all, it's not the thing, what your operators do there. I think it's a good point and in innovation, you always have something like this in my opinion that you have some who go fast forward and try things and others who come then and try to get standards for the data, try to get this in laws and good regulation and this is the point where we have some parallel things we've seen there.

Guusje van der Vossen: All right. And I also read something about an open data portal, that you are trying to develop that, or is that already in place? Because I also read that you're building upon transmission standards. So that kind of struck me because we are also building on the CDS-M transmission standard. So, I was wondering how far that was.

Benjamin Rabenstein: Yeah. I think the open data portal from whole Berlin for all kinds of data, a hub, is already implemented. And there is a strategy behind that you do it for data of different areas step by step. And we have therefore also a law that we will do this with mobility data, and there we always have a discussion about the data from the public transport with all the time s and all these things, that this is an open data thing and we always have fights between the operators and us and it's always a little bit funny because they [inaudible 00:08:49] that all people have this information and they do not really want to share it, but yeah, they also will and we will get this. And we have also planned to get on this platform also the data from the shared mobility things. So also, the life data and the history data of the trips is the plan. And yeah, so it's just a plan and we have the basis for the regulation, but not the things implemented. So, it I think fits really good together and we are really happy about this interview and to learn from each other.

Guusje van der Vossen: Yeah. We also experience those things here in Amsterdam, especially the reluctance of market parties in sharing their data. So that was also one of the objectives, why we started to develop the CDS-M, because if we can't put a standard on the permits, we're most likely not going to receive data voluntarily. So that is indeed a big objective for the design of CDS-M.

Daan van der Tas: Sorry, Guusje, that I interrupt-

Guusje van der Vossen: Sure, go ahead.

Daan van der Tas: ... because to put some nuance to this, I think that we as a government don't ask too defined enough what we want, which makes it also difficult for another party to answer to your question. And I think that the reluctance is very much related to privacy issues. And when you say that you have struggles with collecting data, is that also on a statistic level of data, so more aggregated level? Are they willing to share that with you or not?

Benjamin Rabenstein: I think they always said they will do this on an aggregated level, only on an aggregated level at the moment. But we don't have the infrastructure to handle this data. This is always the point, that we don't have the infrastructure also to handle the aggregated ones. We have to got some heat maps, pictures to define some spots where electric scooters could get space to park there. Therefore, we get some pictures, but not like a database or something like this that we can look in on ourselves. We don't have the infrastructure and resources for doing this. So this is the point at the moment. But we are planning to get this infrastructure and want to have this data, so we are in this planning process at the moment. Okay, thanks.

Guusje van der Vossen: And is shared mobility a part of your mobility and smart city strategy to become climate neutral in 2050? Are you actively supporting it, or do you just enjoy the free market?

Benjamin Rabenstein: This is a good question. This is not so clear at the moment. So, our position is that we say, yeah, it helps to get climate free at this point. But it's not sure how it

helps and if all this is ... We have different kinds of shared mobilities. So, we have car sharing, we have e-scooters, we have bike sharing. So, a point is that when we make all electric and have more energy consumption, that the people don't walk and use just a bike with their own power and this is a development, we don't really think that it leads to a better transport there but we always have the view that it's better to take an e-scooter than take a private car.

Benjamin Rabenstein: So, this is always the point, which service really leads to the people let their private car stay there, or better sell the private car so that we get the space in the city and the way they move is also better. But we don't have the clear point that we support all, but this is also a way we ... or what we try with the point to regulate it, that we can only support parts of it and not all. Shared mobility is good, and we want to support it. So yeah. How you support shared mobility in Holland, have you the same view that it's not all the good thing?

Guusje van der Vossen: Daan, do you want to answer this one in the MaaS concept, or not? You're muted.

Benjamin Rabenstein: You're muted.

Daan van der Tas: Can you please repeat the question?

Benjamin Rabenstein: So, do you have the view that all shared mobility services you have in the city is good and helps you to fulfill your aims, or do you want difference there, that one thing you want to support and the other service not, and how you do it?

Daan van der Tas: Yeah. I think, yeah, that's an interesting question and I think that I can answer it from a few perspectives. One of the things which is very iconic is the electric kick scooter. We don't have them yet in Amsterdam, especially not as a shared service because basically we don't want them. Our regulator is now into assessing if it's technically okay to have kick scooters on the streets in the Netherlands. And the expectation is that they will be allowed on our streets, so we cannot prevent people from buying a kick scooter and going on them through our streets. But we can prevent shared kick scooter companies from entering our public space because basically we forbid everything and then we give licenses or permits to do some kind of an activity around shared mobility and we will not do it most likely for shared kick scooters. So that's one that we don't want because we have narrow streets. Probably you have been in Amsterdam, and we have a very crowded center and it's already quite a challenge to accommodate all the different modalities that you have nowadays, let alone introducing kick scooters. So that's one.

Daan van der Tas: The other thing is that we are also really looking into the topic of hubs, e-hubs where you have designated places for shared mobility, and we have them in our public space around metro stations or at other spots in our city. But we will also have them, and we see them more and more in our more or less private spaces because we want to get rid of cars on our streets, so we want to have all those cars underneath a building, in parking under a

building. But then you're not anymore in the public space, then you're in the private space most of the times. And how will we deal with those kinds of hubs where you also have some kind of shared mobility? Maybe only for the residents of that building. Then, it can be quite clear if it's a small community of people having a few cars and bikes of their own, you can most likely see that as just another way of having your own car.

Daan van der Tas: But when those buildings get bigger or even when there is a designated spot for a whole neighborhood where people should park their car and there will also be offering of shared mobility, then it becomes more interesting because we do want to have interoperability amongst all those different hubs so that we build upon a total mass ecosystem. And we don't have our vision completely set out in that respect. So, returning to your question, is all shared mobility wanted or contributing to mass? Well, it depends a little bit.

Benjamin Rabenstein: Okay.

Guusje van der Vossen: And Frederik, I was just wondering because you're an urban planner, what is your view on a data driven urban planning strategy in Berlin? In what ways could mobility data contribute to executing policies in your point of view?

Frederik Mehler: Well, to be very honest I think for Berlin as a city, I think that's still a pretty long way to go actually. It's going to take some time to be developed, but sure, it's the way to go. In the long run, we're not going to get around any of these issues. And I think also with other cities it would be best if we could all share our experiences between Amsterdam, Berlin, Vienna, and whoever else is going to be involved because it's just going to be after a while of introduction the same questions and problems which are going to keep arising for everybody, I guess. I think if the data standard will be unified, that'd be much easier across Europe to deal with the same issues. And I was actually wondering maybe, do you know about if there is anything from the States already? Because for example the scooter schemes were developed there a little bit early and maybe municipalities in California or something developed some data schemes already to get them to exchange? Because I didn't look that up and I was just wondering if they maybe got an early kickstart on that issue.

Guusje van der Vossen: That's indeed correct, you have the General Bikesharing Specification that a couple of cities are already using, like Brussels and also Madrid. A lot of those cities had those kick scooters already and they polluted the sidewalk, so it was kind of a need to use the GBFS. But GBFS is only collecting parking data, so not trip data. And indeed, in Los Angeles the Open Mobility Foundation [crosstalk 00:20:13] designed the mobility data specification, MDS. And that is a bit broader specification with more APIs. And that also uses real-time data, real-time trip data and real-time parking data to create dashboards. And in Amsterdam, we're a bit concerned about the privacy issues regarding real-time data collection, especially real-time trip data collection, because then you also have the vehicle IDs that you register as well as the GPS location and concerning the GDPR, that is perceived as personal data.

Guusje van der Vossen: So, then you're collecting personal data of your citizens as a municipality and that's kind of a discussion, do you want to collect that personal data of your

citizens? And if you do, how do you manage the data in such a way that you ensure privacy and security? So, for that reason, a couple of data brokers are active right now, companies like Vianova and Populus that actually offer this service to municipalities to process and store the data in such a way that is privacy preserving and secure. However, then you still receive just a dashboard of aggregated data and that's why we also started the CDS-M project, because we're having the discussion, should you use a data broker that actually does have the real-time data, or should we use a standard that requests already aggregated data so nobody owns the real-time GPS data besides the operator? So, in that sense, you kind of secure the privacy of your citizens a bit more maybe if you don't trust the data broker.

Guusje van der Vossen: So that's a discussion that we're also having here in Amsterdam. Should we use a data broker and MDS for example or do we want to further design CDS-M in such a way that we can handle it in house in Amsterdam? Or, do we don't want that responsibility and we don't want to store that data ourselves? Do we need to store that data, or do we only need dashboards? That's kind of the discussion we're having right now. So yeah, the CDS-M is actually a result of the schemes that were already out there to answer your question.

Guusje van der Vossen: Yeah. And what would you prefer as the City of Berlin right now: to have a data broker manage mobility data or to have it in house to do it yourself in the future? Yeah, it's a hard question maybe and a bit guessing, but just tell me what you think. It doesn't matter.

Benjamin Rabenstein: Yeah. I think it's really a hard question. If you want to do it on your own, handle the data, or only get the solutions out of the data and the answers you want from this data? And I think the main point is there, can you clarify the questions you want to answer with this data before so that you only get these answers, or do you need to data to answer more questions or something like this? This is a point. So yeah, I think we need not all the data and not in deep detail for manage these services. Therefore, we don't need the exact locations and all these points, the GPS data which is really problematic from personal data. And then, at least we don't need for the monitoring I think in real-time. But a little aggregated, but also on the level of a single trip, I think we should get the data for the planning purposes.

Benjamin Rabenstein: But how you can handle this and how you find this point, who is doing this for you I think in my opinion, it's really, it's hard for us to get the infrastructure and a working thing that we get this data and do the things, answer the questions ourselves. I think at the moment, we don't have this infrastructure as the team. But there is also a plan to get more IT infrastructure. Also, with the open data portal and all these things, they're developing this. So, I'm not sure if we come to a point where we say, "Okay. We have this infrastructure now. We can do it on our own." I think the plan at the moment is let's do something just for us and to get the data then for the planning process. Therefore, we need someone to aggregate this then and have just some matrices or something like this where we can look then in the planning process. Frederik, what do you think? This was just for me.

Frederik Mehler: I think I agree with that. At the moment, we definitely do not have the resources to do that in house and I think in the long run it's going to cost some money, but it's going to be more efficient in the long run if some external provider is just going to deal with the

data issues and then give you a certain form of aggregated data that you ask for that you can actually work with. Because I'm not an IT guy, and I think most planners or mobility people working here, it would just not be possible actually to deal with the big form of un-aggregated data. I think we would need to clarify at first, what kind of data do we need for planning and strategic processes in the long run? And then, tell some external provider, "This and that we're going to need," and maybe real-time data is not really relevant for us.

Frederik Mehler: And I agree with the privacy policy issues. That would also be an issue in Germany. If you bring that up as a municipality, there are going to be big discussions in the newspapers and people are going to be like, "I don't want to be dragged down by the senate of Berlin while I'm driving my e-scooter probably drunk through the middle of the city." Nobody really would love that. So yeah, I think without external providers we're not going to make that work. Yeah.

Daan van der Tas: And I think you indicated you and also, we should first think of, okay, what do we want to do with the data? And I think that's something that we see over and over and over again also with our side by Guusje and I are in the innovation team and we are a big team, so we have a lot of ideas about the future and not tomorrow, but the day after tomorrow, which makes us to some extent ahead of others, while at the same time we still also do not have a really keen idea on what we will want to do. We can talk in general terms like we want to steer mobility, we want to regulate mobility, we want to, I don't know the English word for [foreign language 00:30:15], Guusje, maybe you know.

Guusje van der Vossen: 'Unfortunate'.

Daan van der Tas: But we want to see if e-scooters are parked in the wrong destination and maybe find them. But all those use cases still have to be detailed. And I think that's a big part of the work that we see for the coming years, is to lay out this digital program. "Okay. What are all the public paths that we have that we want to digitize, and what then consequently do we need on data?" And we don't have this roadmap yet. And I'm lobbying to start to work on this as soon as possible.

Guusje van der Vossen: Yeah. It's really important. And indeed, what I'm sensing now because I'm halfway through the interview series and I also had a couple of interviews with urban planners as well. Some other people also said like, "I'm not an IT guy, I'm an urban planner. I have nothing to do with real-time data. I mean, I can gather insights from historic aggregated data and heat maps from the city, but real-time data ... I'm only looking at historic data. So that kind of opened my eyes because there is this kind of love for data. We just want to have the data and then execute data driven policies. But if urban planners can't handle the real-time data or don't know how to get value out of it, then why should we collect real-time data for that purpose?"

Guusje van der Vossen:

So, it's becoming kind of clear that there's some division between real-time data and historic data and the purpose, and that you need real-time data for regulating if you have a regulating problem, for example polluted sidewalks. And that you'll need historic aggregated data sets for urban planning purposes. So, we're also still doubting and discussing about whether this should be collected in one standard or not, because these are two different data requests. But yeah, we're working on that. And just out of curiosity, I have a question. In your department, are you executing some sorts of smart city pilots or smart mobility programs right now?

Benjamin Rabenstein: Yes, we are. A new project called MEISTER. This is working with e-mobility and there we have a pilot where we have some parking spaces where we have a barrier that we can ... just the words I'm missing, sorry.

Guusje van der Vossen: That's okay.

Benjamin Rabenstein: We can use an app to block the parking space and this is just for the e-mobility and the charging stations that there the parking space cannot be blocked by another vehicle or something like this. This is a small pilot we do at the moment from an EU project, and yeah, we have some German research projects just working on the topics, how dense you can get the people together and how organized the mobility then for it just when you build new flats, and how you handle this not in the city center but more outside. And this is always the problem. Also, the shared mobility services, we always see it in the city center and there we have the pollution of the sidewalks and so on. But we have there also good public transport. But more outside where the people say, "We need this. We don't have the offer of these services," and how you can get these together. Therefore, we have some research projects on a national level.

Guusje van der Vossen: Nice. Daan, do you have any questions to ask? Because for me, it's kind of clear that you indeed would prefer to have a European data center so you could adjust your digital infrastructure to it. You would like to have data about the heat maps and the smart mobility, but first there has to a regulatory framework in place. That's what I'm sensing. But you are open for collaboration and for further information on the CDS-M. So, we will of course keep you updated if you want-

Daan van der Tas: I do have a question. Sorry, I was muted.

Guusje van der Vossen: That's okay.

Daan van der Tas: It's about your platform strategy or your fears. So, I see the mobility transition as one of the transitions that is started but is yet to be completed where you have seen other transitions like hotel rooms or renting your public space, traffic, Booking.com, Airbnb, what have you with big dominant players. And we in Amsterdam to some extent fear that this might happen to in the mobility space. Which could lead on one side to a quick take up of concepts like mobility as a service. When the big tech parties put their shoulders behind this, underneath this, it could go very rapid. On the other hand, it could also lead to a lack of inclusivity both on a personal level but also on an economical level. So smaller parties that will have to have such

high fees or costs to the big tech parties that they are not able to operate. And that's definitely something that we do not like. So how do you look at this from your perspective? What are your ideas? What are your strategies, if any?

Benjamin Rabenstein: Yeah. Good question. We also discussed the point that at the moment when we look on the kick scooters, we see that every company put a lot of kick scooters on the street. Just the people don't load this app and then only use the kick scooter from this company. This is why they all put a lot of them on the streets, so that they only use them and the barrier to download a second app is high. So, when you look from our view, it's not important which company offers a kick scooter at the moment. So, we thought about perhaps the municipality should offer a platform where they have to give the data in and you can just see, "Okay. There is a kick scooter, not important which company." And I can take it over this platform, and this is just from the municipality. So not from a tech concern, but from the city, something like this. This was a thing we thought about and we'll discuss this in the process for the regulations we will set on with the operators also.

Benjamin Rabenstein: And we have something like this, near this with Jelbi. This is from the public transport operator. And so, this is also a company. We discussed already, semi-public but not really. We cannot really get the data and all the things. But perhaps this is also not natural enough. So perhaps we need there a platform where this is really a task for the municipality to collect this data and show what are the possibilities there, where are the vehicles and so on. This is something we think about. Yeah, I think this is a first step. We think this would be nice to have when you take the perspective from the persons who want a mobility service and with the free market of the operators, they really don't want it at the moment. But some are working together with Jelbi, others not.

Benjamin Rabenstein: And our focus in our regulation will also be that we get the connection between the public transport and the shared modes. Yeah. Something like [inaudible 00:40:04] but also, what can we do that people really use it in connection and not the private car and then the shared [inaudible 00:40:16] or something like that? So how we can get an impact in this field. And we have these ideas and think in this way, but yeah, what it will be in the end of the day we don't know. But in my opinion, it should be a platform where you have all the different companies together and it's not important from which one. And all the cars, all the e-scooters, and all the bikes and what we all will see next, what modes and so on.

Daan van der Tas: Yeah. And thank you. You touched upon one thing briefly because you talked about trying to get people from their private care using indeed different modes in combination as a good alternative. For us, that's also a big driver behind our efforts regarding mobility as a service because we also have another program which is really trying to get rid of private car ownership. Again, crowded streets, blah, blah, blah. A lot of cars taking space without doing anything. Do you also have a strong policy related to get people out of their private cars, or is that a kind of side catch or spinoff that you hope to get?

Benjamin Rabenstein: I think the strategy is that we want this, but the implementation is not yet so far. And this is also a problem for the shared services, because when you have a really

hard policy just with parking fees and so on. In Berlin, you don't have already parking fees overall in the city. So, there aren't a lot of streets, only around I think at the moment 20% or something like this of the city center have really the parking fees. This is a thing we really have to implement first, and then the people will think about it. So, there are lots of steps to get over and to do before we can have something like this.

Benjamin Rabenstein: So, this is, with push and pull factors we have a lot of things to do yet until we come to this point. So, this is a little bit the problem at the moment. So, in my opinion, I always have to say when someone comes with a really good idea of a really innovative concept and things, and I say, "Okay. It's nice. It would be good perhaps. But we first have to implement parking fees, otherwise this will not work also. And this is something that we have to handle, that the implementation of such in my opinion fundamental things of mobility policy is not yet implemented. And we have to focus on that. And then, we also look at the information, did it work? But this is a really more fundamental point with have to get over at the moment.

Daan van der Tas: So basically, you only can work with the pull factors.

Benjamin Rabenstein: Yeah.

Daan van der Tas: Okay. Yeah, that's clear.

Frederik Mehler: I would add a little something to that. It's true, we're working on pull factors all the time, which works for a certain amount of people which is educated enough, motivated enough, and have the personal resources to think about their mobility behavior. I think for this group of people, pull factors also work and we're just trying to develop different mobility solutions for those who can cover their distances in their daily drive with other forms. But yeah, especially if you look at the parking issue, we're, to be honest, a bit behind. But it's also due that it's just a really unpopular issue in Germany. We're so used to having basically free parking in all public space around, and people are used to that for decades now so it's a really key issue to work on this. But for every politician, for every planner it's a big deal because population just doesn't like it. It makes you become really unpopular in the public opinion. But if you compare public parking in Berlin to Amsterdam or to Copenhagen or to Stockholm, we definitely could push our prices way more up to actually have an effect.

Frederik Mehler: And yeah, we're discussing then smaller issues. "What's up if we raise the fee from one Euro to two Euro per hour in certain parts of the city?" But at the end of the day, two Euros per hour is still ridiculous if you're being really honest. And it just takes more time, but it's such an unpopular issue that people don't really want to touch the parking problem at the moment.

Daan van der Tas: Yeah. Because we do have parking prices around the complete of Amsterdam, especially within the big ring, the highway which is around Amsterdam-

Guusje van der Vossen:

It's 7.50 per hour in the center.

Daan van der Tas:

Yeah. But still, that's only for people that are kind of inbound. If you're a resident, you have a parking license. I have one. Sorry, we have two in our household and I think they cost us 150 per three months, which is heavily subsidized. If you look at the square meter price in Amsterdam, if you relate it to the price of real estate, it's ridiculous that I only pay this little money to park my car, which is again idle most of the time. To be honest, I already got rid of my car, so I do have the license but not the car. But that's another thing. And also, we have to move cautiously there because if we say, "Okay. We are going to transfer to the economical price," then we also have a political disaster, yes. Okay. I have no more questions left. Thank you.

Guusje van der Vossen: No, it was a really interesting talk and it is of great value of the research and we will include it. And of course, we'll keep you updated on the CDS-M and maybe invite you to collaborate on several aspects. So, you will hear from me.

Frederik Mehler: Perfect.

Benjamin Rabenstein: Thank you.

Guusje van der Vossen: Yeah and have a good day.

Daan van der Tas: Thank you, bye, bye.

Frederik Mehler: Okay, thanks for the interview.

The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

2.23 Summary interview Augustin Helmut – Vienna, Austria

Interviewee: Augustin Helmut, smart mobility department Vienna

Date: 13th of November

Used standard: None (is going to use MDS upcoming year)

Preferences: A flexible standard such as MDS

Helmut explains that currently in Vienna they have quite an antique system of data collection for shared mobility operators. The operators send a report of yesterday's activity via mail every morning. They aspire to update this and are planning to use MDS in the future. They are exploring this option right now. They would switch off some functions of MDS and only use the obfuscated data of start and endpoints of trips. They are not worrying about the threat of combining trip and parking data, because another department of the Municipality is responsible for the parking data. They already retrieve parking data there and have created a dynamic map of the availability of assets. This is already in place, because there were a lot of complaints about mopeds and shared bike polluting the sidewalks. The map is used to regulate the spots where the vehicles are parked and the maximum number of vehicles. The shared mobility operators feed this parking map directly. Augustin does not know which standard is used for this transmission.

Augustin indicates that for using MDS, a strong legal frame has to be in place which mandate the data sharing. They are working in that now. They think that market party participation won't be a problem if the legal framework is affected. Augustin believes that by using obfuscation, aggregation and proper archiving, privacy of users of shared mobility can be guaranteed.

Augustin's opinion is that the municipality should own the shared mobility data. From his point of view this data is needed for urban planning. In Augustin's department they are developing several data-driven decision models for these purposes. In his view, working with a data broker is not a problem. On the contrary, he thinks that a large market will emerge for data brokers and a great deal of competition. As a result, data brokers will probably be able to provide the service cheaper and better than the municipality itself.

He says he recognizes shared mobility as a solution to reduce private car usage and therefore wants to stimulate shared mobility. In his opinion trip data is important to reach this goal, for example to align the infrastructure with shared mobility. He does indicate that there are probably many more use cases, than just improving the infrastructure, that can support shared mobility.

From his point of view is a disadvantage of CDS-M that the scope of the data request has already been determined in advance. He does not think this will work in every environment and for this reason he prefers MDS, because this standard is more flexible. However, he does mention that he would like to be kept informed about the CDS-M, he thinks it is a good discussion starter, especially in the field of use case development.

Municipality of Amsterdam
Smart Mobility Team

The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

2.24 Transcript Interview Vasco Mora – Lisbon, Portugal

Interviewee: Vasco Mora, Advisor of Lisbon's Mobility Deputy Mayor & Vice chair at EUROCIITIES data standards working group

Additional participants: Daan van der Tas and Gemma Schepers

Date: 16th of November

Used standard: GBFS

Preferences: A simple standard that offers parking- and trip data that could be mapped in MDS. A European, simple version of MDS that is shaped cooperatively with other cities, as well as a data management model and clear use cases.

[Introduction]

Vasco Mora: And that's why I think we need to get into... Also, this discussion is that today we have three different opportunities if we collect all these values in Amsterdam and I think we try, we should try to combine them into a single feed or a single way to collect data and to use data. And we are just looking at parking, at SIVU from Paris, and also looking at parking data with GBFS, but that does not include vehicle types, and then there is the MDS, which is an all mighty thing, but it's a little bit daunting and scary also because it's not easy to work with and it's not easy to study into, to adapt for a city. Especially for a city that is always moving and usually has someone like me, or, or even more occupied throughout the week, just to grasp some things and to try to make a decision.

Vasco Mora: So, I am keen to exchange with you, all the things we are doing and the use cases and what we are looking for the near future and share that with you and learn from you, what you can also share with us. And just one very enthusiastic note, tomorrow I'll be appointed a vice of EUROCIITIES of their working group that works on data specifications. And one of the things we have been discussing is exactly trying to promote a better knowledge and about collective collaborative work amongst cities to look at the subjects. And so, we can try to build different modules together, but that they are all used for the same purpose and in the same way.

Vasco Mora: And what I drafted is exactly to start with micro mobility, because it's simpler than go to roadworks and go then go to networks and by networks, I mean, all the GIS information that we should be able to exchange. But this is like a little bit of a roadmap of what we want, but getting back to the shared mobility, I can, I think I can show you something that we use here for the micro-mobility. I'm working on this with the deputy mayors to be able to share the work. So, it is an open source, it is entitled. It is in post GIS and post-grad school sequel. So, we can

share the solution that we have, the code that we have developed, and we would like to put it live on GitHub from the municipality of Lisbon this December, like a Christmas gift.

Vasco Mora: So, everyone can speak on that and try to, to question that, to comment, doubts, to pull requests, to make it better and to become a collaborative work. And showing that it can simply be installed in the solution that's each one of the cities have. It doesn't make sense for me to spend public money, trying to develop similar things throughout Europe, at least all the world and I would like to start these movements of collaborative work between cities, in small steps, but frequent steps. It doesn't need to be major, doesn't need to be a leap of faith. It needs to be some extra use cases, some extra metrics, some extra KPIs on a bi-monthly basis. So, we know that things are growing steadily affirming, but steady, and we can adopt and benchmark things and copy the best practices amongst the cities. That would be a little bit of the goal here.

Gemma Schepers: Can I add something before 'Guusje' starts with her interview? First of all, congratulations with your chair.

Vasco Mora: Only tomorrow.

Gemma Schepers: Yeah. I think it's really good that we make the comparison between the different cities and start collecting all those different technical standards and align them. We want to try to get to one uniform standard. What we want to do is to start up discussions, beginning new year, I guess, with a few European cities around the [inaudible 00:06:03] also to discuss together what the steps of the plans for are 2021 and how we can bring this further. So, we want to take the initiative to get the first launch of the meeting together. Is that for you also an option? Are you saying I'm busy with something else?

Vasco Mora: No, no, no, it's, I think it's fantastic that we align exactly the effort towards the same goal, because I think have a lot of similarities and commonalities that we don't explore often, so I think we should do it.

Gemma Schepers: We do the invite and make the agenda and that's it. Okay. Then we Guusje the is for you

Guusje van der Vossen: Well, first of all, you said you are creating some sort of data center with the municipality of Lisbon. Could you give me a little bit more context about what you're designing specifically?

Vasco Mora: We are not creating a standard, but a data management Model, called MiMoGG. The standard we are using now is GBFS. It's referred to part in the MDS. If you go to real time data for parking, there is a cross-reference to GBFS and that's what we are using. But what we have in the memorandum of understanding with operators is MDS in its version 0.2.1. Now I think it's in version 0.4. but it's evolving, but we are stuck in version 0.2.1., because that's what we looked at and developed. But when we start looking at developing the trips and importing

the trips into our system to analyze it we mentioned that there are potential issues with data and privacy regarding the use of MDS.

Vasco Mora: So, the companies, are completely against sharing their data with MDS. And we can imagine why, because they were exploring the data themselves and they want to be the sole users of such data. Um, we worked closely with Lolita Reynolds from LA DOT Los Angeles Department of Traffic. And we even met her in a commotion event. And what we found is that we would stop looking at the most problematic area in the city of policemen that was curb parking and curb management. So we dropped a little bit to at the time, the intention of developing the trips now that we have firmly development on the parking we are looking at involving and that analysis to also make sense of all the investments that we have been doing recently in cycle lanes. And we'd like to have a little bit more the grasp, the feeling of how many people are it throughout the day in the weeks.

Vasco Mora: And so, we want to get a bit more grip on the KPIs and the usage of the infrastructure, especially by cyclists. To determine where we should build more cycle lanes also for safety. That's mostly what we want from the tripdata. Uh, of course we can, we can build things on the amount of vehicle kilometers and things like that. But as long as we don't have that transversely to all the other modes, it's a little bit strange to have a lot of understanding of one mode that represents 1% of the trips. Um, so the most relevant thing that we are looking at that right now is a little bit of a return on investment for the cycle lanes, but also starting to collect data that can be expanded to other modes such as taxis, and other shared modes, like motor scooters and things like that.

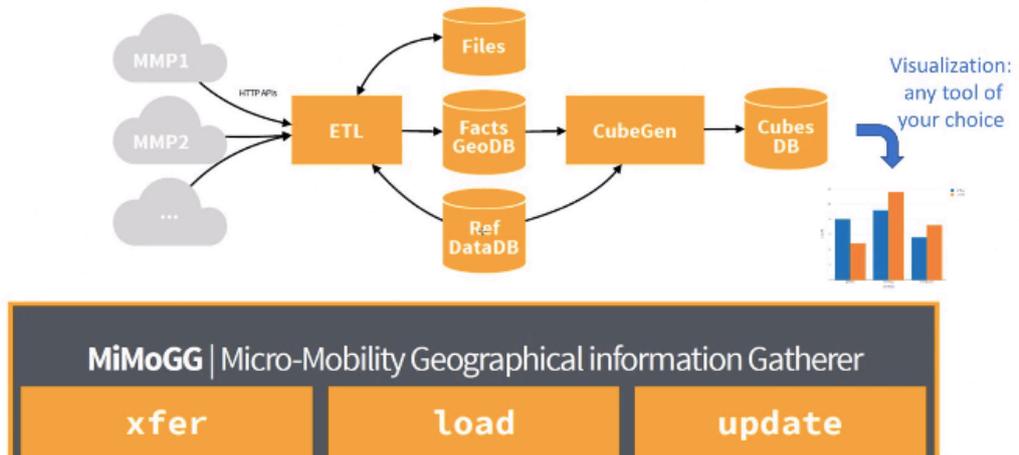
Guusje van der Vossen: But you just mentioned that you're going to publish something on GitHub in December as a Christmas gift. So, I was just wondering what you're specifically planning to publish.

Vasco Mora: Well, I can, if you allow me, I can do something to try to be quick. I will share with you a presentation. Just tell me if you can see my screen.

Guusje van der Vossen: Yes, I can.

The opportunities, bottlenecks and practical possibilities of a European data standard for shared mobility operators

Modular solution: step-by-step



POLIS-EMTA Workshop, Paris
14th-15th October 2019

B	C	D	E	F	G	H	I	J	K	L	M
Date	Maximum Number of Available Vehicles	Maximum of Vehicles Available	Total de Viagens	Total Users Registered	Total Users with Active last 28 days	Total Distance Covered	Total Time (minutes)	Median of Distances per Trip	Average Distance per Trip	Median of Times per Trip	Average Time per Trip
DD/MM/AAAA	nº	nº	nº	nº	nº	km	minuto	km (formato 0,0)	km (formato 0,0)	min (formato 0,0)	min (formato 0,0)
17/07/2020	296	296	178	50	478,29	3560	1,9	2,7	11,5	20,0	
18/07/2020	329	329	335	89	983,02	7370	2,0	2,9	13	22,0	
19/07/2020	328	328	455	121	1 411,87	9555	2,1	3,1	13	21,0	
20/07/2020	323	323	306	85	717,42	5202	1,7	2,3	9	17,0	
21/07/2020	318	318	375	96	1 048,58	6750	1,8	2,8	10	18,0	
22/07/2020	319	319	410	109	1 004,01	7790	1,6	2,4	9	19,0	
23/07/2020	315	315	329	85	833,09	5593	1,7	2,5	9	17,0	
24/07/2020	385	385	376	98	932,74	5640	1,6	2,5	10	15,0	
25/07/2020	385	385	501	125	1 324,24	8517	1,9	2,6	10	17,0	
26/07/2020	374	374	469	124	1 031,89	7594	1,6	2,2	10	16,0	
27/07/2020	365	365	850	154	2 330,40	15300	1,7	2,6	11	18,0	
28/07/2020	369	369	1 072	200	2 894,08	18224	1,7	2,7	10	17,0	
29/07/2020	366	366	1 247	257	3 190,20	19952	1,7	2,6	10	16,0	
30/07/2020	350	350	1 591	305	4 185,76	27047	1,7	2,6	10	17,0	
31/07/2020	330	330	1 616	355	4 302,76	27472	1,8	2,7	11	17,0	
01/08/2020	312	312	1 672	392	4 490,99	30096	1,9	2,7	12	18,0	
02/08/2020	267	267	1 783	456	5 204,93	33877	2,1	2,9	13	19,0	
03/08/2020	215	215	1 312	359	3 813,20	26240	1,9	2,9	12	20,0	
04/08/2020	277	277	1 725	444	4 549,34	29325	1,9	2,6	11	17,0	
05/08/2020	281	281	1 703	463	4 228,55	27248	1,7	2,5	10	16,0	
06/08/2020	280	280	1 741	417	4 628,80	31338	1,9	2,7	11	18,0	
07/08/2020	248	248	1 464	395	4 090,65	30580	1,9	2,8	12	20,0	
08/08/2020	286	286	2 033	529	5 452,71	36594	1,9	2,7	12	18,0	
09/08/2020	245	245	1 552	412	5 036,08	35606	2,2	3,2	13	23,0	
10/08/2020	274	274	1 558	376	4 157,21	28044	1,8	2,7	10	18,0	
11/08/2020	324	324	1 111	311	3 711,20	24300	1,8	2,7	10	18,0	
12/08/2020	347	347	1 111	311	3 711,20	24300	1,8	2,7	9	15,0	
13/08/2020	302	302	1 111	311	3 711,20	24300	1,8	2,7	9	16,0	
14/08/2020	337	337	1 533	365	5 372,00	33500	1,8	2,7	9	16,0	

Vasco Mora: Okay. I think this is it yeah. So okay. I will just jump through the beginning, otherwise we'll lose a little bit of time, but I just presented the why's and what is Lisbon and why we want this. So, we believe that active mobility is a real good compliment for public transport, but we want to facilitate the backbone of the mobility in Lisbon. So we needed micro mobility, and therefore we started the development of a data management in late 2017 when 'Lime'

knocked on our door at the beginning of the mandate. And we developed the solution okay, that is MiMoGG, we call it a micro mobility geo gatherer. So, it's a solution that we build ourselves, so we do not have to listen to all the companies that keep knocking on our doors, about proposals for writing reports, or a lot of guys that knock on our door saying, I am the best solution for you.

Vasco Mora: With MiMoGG I can gather all the operators' data and present you solutions. What we believe is that these companies that came knocking on our door, they wanted more than just selling the solutions. They were willing to gather the information for themselves in a cloud-based system. And that is not necessary, to keep it in the cloud. We are transparent, so we developed something that we could use on our servers without sharing it with anyone, MiMoGG.

Guusje van der Vossen: Alright, and is it a GIS based solution?

Vasco Mora: Yes, so it results from Postgres SQL called GIS, and Quentin, which are all open source solutions. This was a little bit the architecture that we have. It's very simple. So, we get to the micro mobility providers data in the, in the feeds, we haven't extract transform and load solutions that we put in these files. Then we inject them into a database and create cubes, analysis topics.

Vasco Mora: So, as you see in the presentation, we also have a reference database that has all the static data about parking and non-parking areas in the city. These cubes are our analytical cells of analysis. And then we can see these analyses per cube in a visualization. So, the first part is getting the files is the transfer, then putting the data in the geo database, loading it in the cubes, do an analysis and update. And it is so very simple. I was explaining this to two guys from city that were completely non-technical, and they still understood it. So, the only thing we are missing is a standard that could supply the MiMoGG with real-time trip data in a simple, privacy preserving way. This data standard has to be in the same language as MDS and GBFS, otherwise, no one understands each other.

[Further explanation MiMoGG]

Vasco Mora: And this one, the blue spot is an experimental area for a hotspot, and I'll go get there in a second. So, this is a very specific use case. We didn't use the policy API for sharing the non-parking areas. We just send them a file, but we are willing to apply that in the near future because we need then a fairly structured process. So, it's just, we do it sometimes, maybe once in a semester. So, it's very easy to share a file and we ask them to do these in the app. So, these are prints screenshots of the apps we are supposed to where they're identified no parking areas, which is great. Well, some squares for statistical analysis, so we can quantify things on the map.

Vasco Mora: I also love hexagons because the only one that plays board games [inaudible 00:18:12] do a better job filling the map. And this is one of the examples that we have with X accounts. We can see the bubbles with two different KPIs. One of them is the size, so this is

huge here. Okay. The other one is the percentage of enable and disabled. So, we can see on the map where the problems are regarding the provider, but it can be different KPIs. These major dots bubble is a tote park area. Okay? So, this is the the police depot. Where the bikes go when they are parked at the wrong place to rest for the night.

Vasco Mora: The hot spots are a very interesting thing. What we build here... In this specific area of the parties is really in the center of the business district of Lisbon. There was a scattered, a real mess of scooters on the sidewalks. So, what we developed were virtual docks, hotspots, and we put a very large stamp on the maps, and sometimes we will pull a saying in the application, 'please park here'. And there was a huge magnetization to the left. You can see it's the distance to that hotspot. And you can see that the users stopped dropping the scooters everywhere. The street was much tidier. Another benefit is that the users could easily find the scooters, because they were clustered in those positions. And maybe someone else has already a use case which is already important, for the tripdata, as shareable code, we can import it in MiMoGG.

Vasco Mora: So, besides using GBFS, I ask the operators do of deliver the total number of trips and the total number of users that's registered in that day. Okay. I also usually ask for one specific metric, the total number of active users in the last four weeks. So, we know exactly what the ratio is between residents and tourists. We also asks the average traveled kilometres, so I think this a a little bit what you will also request through the CDS-M, but in a more structured way and through an API, which is much better than just compiling spreadsheets of course.

Guusje van der Vossen: Yes. So, MiMoGG is more of a data management model actually, and how to create these dashboards and cubes, which is wonderful. Because you also need that, of course in the backhand, but in the request phase, you're searching for collaboration to make sure that there's one uniform data standard, that also processes trip data, to do that? if I understand you correctly?

Vasco Mora: Right.

Guusje van der Vossen: Okay.

Vasco Mora: Exactly.

Guusje van der Vossen: Well, thank you for showing. It is really nice.

Vasco Mora: We now use the GBFS, but the only thing about GBFS right now that is that we found that we don't have the vehicle type or trip data, and moreover, often providers do not understand what they have to do to comply to the GBFS because sometimes they come from venture capitalists that just puts 200,000 euros in their hands to explore a solution in Lisbon. And they don't have a clue about it. About APIs and about mobility as a whole. They are just managers trying to make sense of it. And we found that very difficult. It was a hard time putting

the providers to provide the correct format according to the published GBFS you will not expecting that.

Guusje van der Vossen: Yeah. That's also what they experience in Paris, Mélanie said that even with SIVU which is quite a simple standard that they still had to put a lot of effort in making sure that the data was qualitative actually. So that is also what I'm kind of curious about, how to make sure that you don't need a data broker to use a data standard. Could you give me a little bit more of context about why you're concerned about using a data broker and a cloud-based solution?

Vasco Mora: Very simply because we found that the Vianova with the right reports and all the other blues systems guys that knocked on our doors, they were too keen on getting the data. They were not keen on serving the municipality. They were not they didn't ask us what we want. They show us what they have, and they come with a lot of policy options and possibilities that we are not looking for, like charging per bike per day, like finding them. We're saying, no, we are just looking at collecting data and have a better understanding of what these new solutions can bring to the city. And we, we found that they have very interesting reporting system and machinery none of them said I can install a solution on premises and not use the cloud solutions. Okay. And that is very strange.

Vasco Mora: So, they are not selling a service. They are selling a solution that leads to them having complete access to the information off of the providers. And a lot of providers would not fancy with that. And found that these data broker companies were a little bit overdoing it and not looking at the city's requests, but just trying to push their solution forward.

Vasco Mora: I can tell you that MiMoGG costs about 750,000 euros. It's running smoothly on our server with a very old sober dual guard wich is not consuming a lot of data or energy. So it's, it was a very nice and cheap options to invite going to the commercial parties which gave us I think a much deeper understanding on what we can do with data, because it would, it would be much easier to spend 20.000 or 30.000 on an annual license just to get access to their platform. But then you have a lock-in effect, and they have access to all the data of the providers. And moreover, we as a city won't learn from the data, we would get beautiful reports, but we would not understand how to use the data of the city, or even be able to describe what is presented. Now we have much better knowledge of what we want to know.

Guusje van der Vossen: Yeah, it's remarkable that you say it is because I just had a conversation with our privacy offer as a municipality. And she also stresses that it's, it's really important to not outsource everything, to also gain knowledge within the municipality, to indeed gain a better understanding of what you could possibly extract from the data, et cetera. And she also mentioned that the, there are a lot of privacy concerns and GDPR issues, but she also stated that the GDPR doesn't prohibit us to use personal data, just if you delete it afterwards really quickly and you minimize the data storage, et cetera. And I also told her about the Vianova platform and told her that they keep the data for two days in the cloud. And then she said, yeah, that is not working by the principle of data minimization. You don't need to store the data for two days in the cloud. You don't even need to store it in the cloud. Exactly what you said.

Vasco Mora: Yeah, exactly. You can just process it and dump it.

Guusje van der Vossen: Yeah

Vasco Mora: But, but one of the things about the GDPR I think it's very simple. If we have a hard regulation in the city to say, this is the way you have to operate, and this is the better you have to share, it's very simple. Or they change the terms and conditions to say to their users that they are going to check with them. And as if they do not share data with the municipality, they cannot operate. The thing that we have in Lisbon is a little bit of a half measure. And because we have a memorandum of understanding and we said that we want MDS but not with a data broker. Some operators said that the trips part of MDS is going to be a little troublesome. So, we are figuring that out now.

Vasco Mora: We are looking at the possibility of doing a hard regulation with two or three, with a cap of two or three operators, something like you mentioned, 8000 scooters. And that will be a contract that will be a little bit different of a memorandum of understanding. And then we can simply say, if you don't want to do to play this game, don't come. But if you want to play by the rules and share the data that we have, and we must develop a process to be confident that we are going to use the data in the right way and discarded it as soon as possible.

Guusje van der Vossen: Okay. Cause I read something about, I don't, I also don't know how to pronounce it. If it's SUMP or S-U-M-P the soft regulation that you're using. Is that what you meant with the memorandum of understanding? Or is it something else?

Vasco Mora: Yes, SUMP is just the gentleman's agreement. Okay.

Guusje van der Vossen: Yeah. Indeed. Okay.

Vasco Mora: We discussed internally what we want. We presented the memorandum understatement with the operators, but if you, if they don't behave according to that, there's no such thing as a contract that you can break, so it's really a gentleman's agreement. So, what we told them is that we are going to tell the vehicles where they can park on the streets or on the pavement, because it was making it impossible for the pedestrians to cross and things like that. And we developed special parking for micro mobility, and we are still developing it for bicycles and scooters. Not for just commercial operations, but for the people's bicycles, also with other people's scooters, if they want to use them.

Vasco Mora: And we are striving that throughout the city. And it was a little bit of a mess in the beginning that we could be able to tidy it up. And to also with the kids, either go to behave or to tell their users to behave. That's a little bit more difficult because they are just not the end users, the population are. But the thing is that we now only have four operations, but we were up to 10. So, we have guys that just have the 100 vehicles and come to Lisbon to explore it. And that was a little bit of a mess, but it was a pilot season. And we had to go through that period, of, of experiencing, to grow through that period. Now, again, we know a little bit what we have, what we want, for instance, I showed you that map.

Vasco Mora: We are looking at use cases where we have KPIs of high density, so meaning the mopeds, bicycles, or scooters in that place, but also low density, meaning I was expecting to have at least five vehicles close to public transport. And I have none. So, we have to balance things like in plus minus balance making sense of that. We don't want overcrowded systems in one place and absent systems in the other. We want to balance the balance distance throughout the city where people can rely on finding easily a shared vehicle to, and soft dementia vehicle for using. So, we are developing also that see the way that we can communicate operators, that they should rebalance things towards those locations.

Guusje van der Vossen: Yep. So, what I'm hearing is that you actually want to search for maybe a more simplistic or clear communication method than MDS or GBFS. But you do want to eventually use an API, a method to collect the trip data and parking data and vehicle data. And that is exactly the part that you want to collaborate on, right. With maybe Paris and us?

Vasco Mora: Yes.

Guusje van der Vossen: Okay. Then that's clear. Perfect. Then I would like to dive into the use cases. You already mentioned the cycling lanes and the high density, low density. Are there any other use cases you foresee?

Vasco Mora: The hotspots that you saw? So, the virtual docs, on the application, preferred parking. That worked really well to clean the public space. And there was another one, but I think it will be more difficult is the low-speed zones. So, places where you cannot go up to the 25 kilometers an hour accepted by the world coat, but you have to stick down to 15 or 20 or whatever. There's also another thing that I think it will be difficult is to grant that the first time you use such vehicles you are not able to ride it's 25 kilometers an hour. So, it would be like a driver license. The first five minutes, you have to ride at 15 kilometers an hour, the next five minutes, you can ride up to 20 and then you can freely ride.

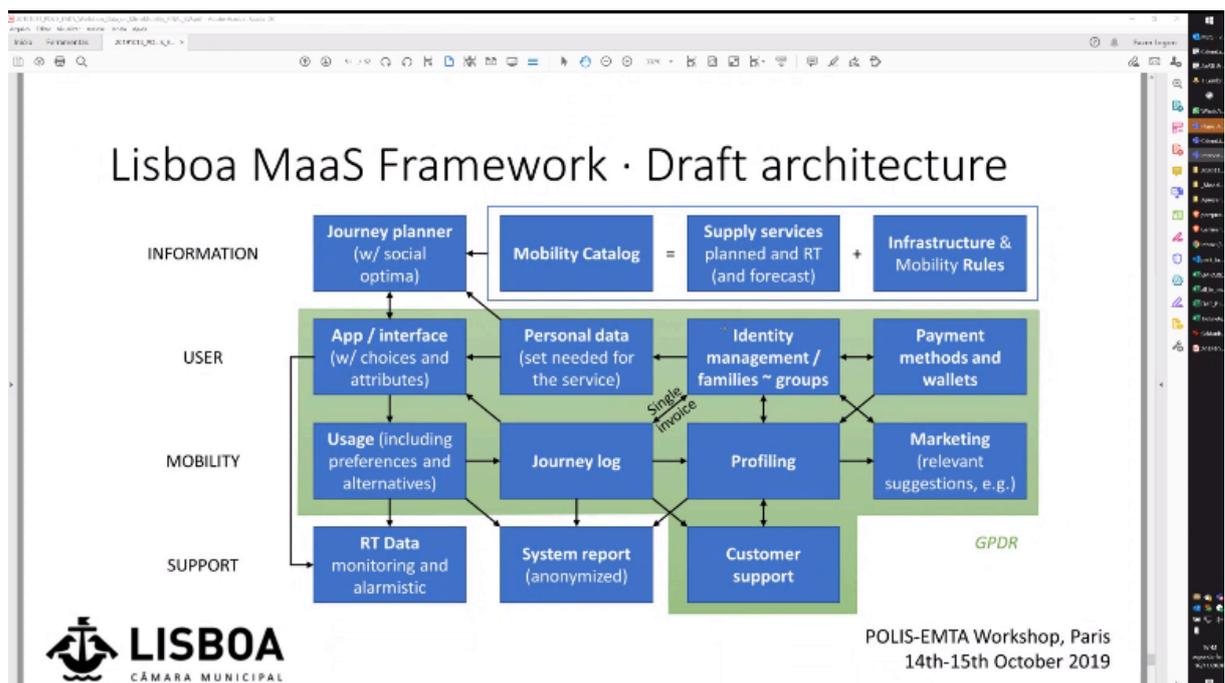
Vasco Mora: And it's very difficult to make this happen throughout all the operators. Therefore we need a clear, standardized method. It's part of the things that we'd like also to promote, and I'm showing my screen again. Okay. So, these identity management part that you see here, it's something that we also launched to develop is the ability to have a single sign-on in the municipality or in the metropolitan area like Facebook or Google, sign-in you just say, "Okay, It's me Asco from Lisbon." That can be used for the operators to sign him, to accept that already has the, all the payment methods, including in a very secure way. So, you don't have to put your credit card again, maybe your friends, you have using PayPal or a pre molded wallet, whatever.

Vasco Mora: And that would be accepted by the operators. Uh, we've one large benefit. These, this, so identity management could be used for ride hailing, micro mobility, taxis, public transport, gas stations for your own vehicle, whatever. And in the end, you should be able to have a single invoice, like what mobility costs this month. So, if I ask you how much do you spend per month on mobility? I think you don't know.

Guusje van der Vossen: No.

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Vasco Mora: Okay. Because you have the insurance of your vehicle, you have the repairmen, you have the fuel, you have the public transport sub-skills subscription do occasional taxes and things like that. Sum it up together. So, the idea towards a very informative way to tell people, you are spending this much on mobility and this like 80% is from your car. And this is a little bit of way to invest on a communication scheme to tell people that showed modes in public transplants are really cheap.



Guusje van der Vossen: Daan, do you want to react on this MaaS framework because that is kind of your field?

Daan van der Tas: Well, I'm very much interested. Do you also have something of a functional description of the different elements in there?

[Explanation MaaS framework]

Daan van der Tas: So, it sounds really appealing what you're telling, yet at the same time, I'm wondering, how will you organize for this? Will you create a kind of central backbone where you communicate from and have your data inputs imputed on, or do you foresee a whole subset of standardized APIs? So what's the idea?

Vasco Mora: API driven completely. I think that independently of the solutions that we have I think the most important part is the connectivity. For me it does not matter, Python or Java or whatever, what matters to me is the outcome, that it is manageable. That we can update and maintain it over time easily. We have had some vendor lock-ins for specific technologies or solutions. We really hate that, and we are trying to avoid that as much as possible, but this is an

API driven approach. So, we develop the catalog, we'd like to broadcast the idea of the catalog with the others. So, they can adopt it.

Vasco Mora: And this would be a new standard. And everything should be structured, in a way that if some aggregator comes into the city, a magical Gator, a Whim, whatever, we don't start the discussion all over again, we give them to them a catalog that has all the end points organized.

Daan van der Tas: Yeah.

Gemma Schepers: Also, I have a question This looks also a little bit like the TOMP API framework that we have designed in the Netherlands. Do you know that, the draft of this blueprint?

Vasco Mora: No, I would love if you could share that with me.

Gemma Schepers: I send it to you.

Vasco Mora: This was completely not on my mind, I have been reading a lot of things, but we are not alone in the universe. So, I'm sure there's a lot of similarities with others. Other solutions have been developed. It would be amazing, again, if we can find commonalities. where we should start, because that's where we have the adventure for adoption and scalability.

Guusje van der Vossen: Yeah. I think we should especially collaborate on collecting all the possible use cases for several European cities and really adjust some standards, maybe MDS or version of it, we're also in close contact with the OMF and we had a talk with them about the metrics API that they are designing. And if we could maybe collaborate on creating a fork of the metrics API that also aligns with the CDS-M. Yeah. However, some doubts are on whether to do that because the membership of private companies cost a lot. And in that sense, not everyone can participate.

Vasco Mora: But for public entities, it's free.

Guusje van der Vossen: Yeah, that is true. But yeah, the rationale to CDM is also to eventually create working groups with market parties and to make sure that they really feel comfor with sharing their data and that they are also aware of how to stand at works. So, you really receive qualitative data at the end and they also kind of feel responsible for the data standard.

Vasco Mora: I talked to them, I talked to Jascha last Friday, I had a meeting with them also.

Guusje van der Vossen: What were the result of that meeting?

Vasco Mora: Yes, I talked to him about Lisbon becoming a member, so I'm already collaborating with them. That's what I told him, but to be an official member, you need to go to the town hall

and then to the municipal assembly. And that's bureaucracy over bureaucracy. That's the engineering thought that is talking. And we have a pipeline of things that we are preparing to join. And OMF is like the fifth. Okay? Because there was a lot of interesting project in Lisbon to participate in some other solutions and other partnerships.

Vasco Mora: And it takes a lot of time just to propose to the city a draft proposal, to say, "We'd like to, to be members of OMF, there is no annual cost. This is what we are expecting. This is the collaboration that we are going to make with trimester meetings and things like that. And we are not focusing on that right now, but that will happen probably in early 2021." Yeah. Otherwise besides that, we are able to share with them to have some meetings and to share with them the use cases and make some suggestions and pool requests on things that we want. I told them that I totally understood what Paris did because they were very fast on doing so, but we are trying to avoid making forks into like different standards.

Vasco Mora: And right now, we are looking at exactly the opposite. I'm trying to foster that we can expand the SIVU with some in the MDS aspects, and map SIVU in the MDS language. So, we can just merge it as you have forks, you have mergers and we can roll back to using the standard solutions instead of popping up new ones. Because I think that's, that's troublesome. That's a problem for everyone. Now, then we don't know where to pick the vendors and we don't have similar metrics to compare cities. I think that's more difficult.

Guusje van der Vossen: Yeah. And the NeTEx is also going to be mapped in MDS. I don't know if you've heard it.

Vasco Mora: Yeah. I'm starting on the 25th at a NeTEx webinar. Cause that's, the European commission is going to promote, I can share the link with you. Um, again, I think that the NeTEx is too complex for most cities to adopt easily. So it's too fast, it's too complex. And we need simple things to start with that we can explain in a one page or not a one-liner, to let people agree on, we want to use this. And if you go to other almighty Datex 2 or almighty Netex, you need a whole meeting just to explain part of it and usually doesn't go well. Okay? So, I think that the smallest beautiful digs can take some place here and breaking things down into modules can be quite effective.

Guusje van der Vossen: Yeah. Well, I think the same about it actually. Ross-Curzon Butlet is a co-creator of CDS-M, he has the same vision as you as I am hearing. He is creating a blueprint and I think it's finished this week or at the end of this week. And he's also planning on sharing it with European cities we've talked to in these interview series.

Vasco Mora: I would rather have a dive in MDS again, because it has evolved since my last deep dive into it. And for instance, if you look at the GBFS+ it also includes vehicle types. Then again, looking at the MDS on what they are doing and what has evolved is important to see, which modules can we pick and use in a simpler standard. To come to a solution that works every day without any hassle. That's what we want.

Vasco Mora: And as we are looking at hard regulation or written regulation, then we can really ask people to give us tripdata. We will still need to work through the privacy part of that. And I think that's, once you get to this point, operators will just give you the data. Yeah.

Guusje van der Vossen: Yeah. I think Brussels is also a great city to take into account. I've talked to them as well, and they are collaborating with the ITF. They're creating this legal framework, I think you already know, but yeah,

Vasco Mora: Yeah. I've been talking to Phillip Christ for quite a while. We are quite aligned with this vision, this overall vision, to align standards and to build some scalable solutions. Yes.

Guusje van der Vossen: Nice, nice. Will, let's see. Time is almost up. Daan and Gemma, do you want to add anything to the conversation or ask anything?

Daan van der Tas: Yeah, I do have a question. Um, it's about the way you look at some of the big techs the big tech companies and how they might well, possibly gain a lot of power in the mobility system and maybe even jeopardizing your data position. So, what are your reflections on to this threat?

Vasco Mora: Well, right. You know, the big techs know more about the city of the mobility in Lisbon that we do that's for sure. You can go two ways. You can go to Google, want to go to Apple, you can go to Tom, Tom in the next here, and they all have more information on, on everyone's mobility. And often they have the profiles of the people, which is even more daunting. If you look at the, the screen I'm still sharing, you looked at we are not fancy of building a journey planner and an app interface, because I think that's not the role of the municipality. I think that should be, we should provide the means to that we have so people can use it in and then innovative solutions can use that. But we also have the mobility layer here and the support.

Vasco Mora: And if you can get real-time data monitoring another mystic from those systems, and if you can get very wide system reports, and for instance, we have these with ways very simplified, where are the pain points in Lisbon in traffic, we collect that every two minutes. Okay? And that was a protocol that we did with ways we gave them the roadworks and we co-developed with them, the roadworks in a, in a way that they could read it. Even if they are open data right now and they are, they still provide us the congestion levels in, in doggy lines, very detailed in the map every two minutes. So, this is the way that I think that we are not, we should be the authorities around the mobility. Authorities should be the one to have the better information, but that's, I think a very long journey.

Vasco Mora: That's a goal, but we have to, to drive the path for that and do way that we believe we can be done is exactly collaborating with the big tech companies, not trying to push them away from the system because we are not strong enough to do so. Uh, let's be honest, but trying to collaborate, I'll give you a little bit of data and you give me some data back, but according to the metrics and to the use cases that we are focused on, because if Google gave me everything they have, I do not know where to start with. So, the thing again, no, this is, this

is true. It's like, even if I had MDS all together, which is quite small standard out, I would probably spend six months just organizing the data to make sense of that. So, I think that what we should look at is use case driven solutions and API driven frameworks.

Vasco Mora: In that way, we are flexible, and we get more quickly the research, the responses to things that we feel are more important in each moment and big tech companies can have a huge part of that. We are working closely with move it, for instance, to give us information about public transport occupancy, that we don't have a way to measure that right now to improve all GTFS feeds, and to improve the work with each one of the operators in the public transport system. So, they can easily provide a better real-time solution for the catalogs for, everyone. So that's a little bit to the way that we try to work with each one of them, their specialties, and trying to make small, but very effective one-to-one deals or pilots, projects, contracts, whatever that can give us some information that we feel is necessary right now.

Vasco Mora: I think the idea is to embrace them, but in a really focused way. And we would love to work with the OEMs, the car manufacturers, because in five- to ten years, the cities will be quite different. We will have autonomous driving and connected vehicles and we don't know how to handle that. To be honest, I can say that we are not prepared. We cannot share with them where the traffic lights are and what is the lights on each one of the traffic lights. We cannot share where the stop signs are. So, it's very simple things that I think that we should work on. Otherwise we will be smashed with someone who will tell us in five years, and we should be able to discuss about these topic in cities and work towards the same goal.

Daan van der Tas: Wow. Yeah. Very interesting. That's great.

Gemma Schepers: How can we organize a follow-up on this discussion? I prefer that Amsterdam organizes a meeting with a few cities to go deeper in this yeah. These kinds of discussions, and then decide together how we bring it to the European level.

Vasco Mora: Yeah. I hope I can push some things in new cities also. So that would be a great stage for getting closer and promote standards in future? Yeah.

Guusje van der Vossen:

Do you prefer Polis, for example EIT or ERTICO, I had a talk with them and they were really welcoming as well. So, there are a lot of different organizations that would also like to help facilitate these discussions.

Vasco Mora:

I think all of them are good stages for that. I'm going to say something very strange. So, don't quote me on this. POLIS has a great city connection, ERTICO it's a different thing. I've worked with ERTICO organizing the ITS European Congress for 2020 that was suspended towards, due in May I think that their goal is to make the bridge between industry and authorities, but they are a little bit closer to the industry. Okay? So, they are a little bit more of the lobbying which is not a problem. It's good that they do. They're an excellent networking, so you can gather all the private sector. Um, but I think that's, again, we should start with to understand what we want as city, instead of being told what we should do by the private sector. The working group on data standard of EUROCITIES could also be a good stage, I would like to facilitate that.

Vasco Mora:

That's always, always my point. I think it'll be amazing for you to present the CDS-M that you have and your vision for them, your goals. Why you invented it, why you asked for it. And maybe we can work from that with other cities. And as I told you, we have the same needs. We'd be likely to adopting yours, once it's a little bit more established and so we don't keep changing scenes overnight. That is the goal to have something and comparable between cities. I think that's the goal for everyone.

Guusje van der Vossen:

Yes, I agree. Well thank you for sharing your views. And then we will keep you up to date on the CDS-M and I am really looking forward to collaborating on these issues.

Vasco Mora:

Likewise, I'm going to ask the deputy mayor, if I can share the MiMoGG with you. If I can do that city to city without putting it live in public, we could start from there. I think that would be faster.

Guusje van der Vossen:

And otherwise it's a nice Christmas gift.

Vasco Mora:

I hope to send a Christmas gift to everyone, haha!

Gemma Schepers:

Yeah. Wonderful. Thank you so much.

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Smart Mobility Team

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Vasco Mora:

Thank you.

Guusje van der Vossen:

And hopefully we will be in contact soon again.

Vasco Mora:

Looking forward. See you soon.

Daan van der Tas:

See you soon. Have a good day.

Guusje van der Vossen:

Bye-bye.

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2.25 – De Roos Advocaten 'Data sharing in Smart Mobility: reflection and solutions of the legal expert', at the MRA-festival

Speakers: Danny Hoekzema and Laura van Gijn

Date: 16th of November

Recommendation: Use a Trusted Third Party for the data processing of shared mobility data.

In the presentation is explained that making 'connected vehicles' data anonymous seems to be very difficult. Patterns can be quickly discovered in mobility data. The government has an important role and responsibility in the safe processing and use of these mobility data.

Two concrete examples are given to show this difficulty to safely manage data from Smart mobility: (1) shared mobility in Amsterdam and (2) 'Turnn'.

1) Partial mobility Amsterdam

In Amsterdam, a supplier of shared cars must have a city-wide car licence stating that they must share data. There are 64,000 shared cars in the Netherlands. The types of data that are required are:

- How many active users
- Purpose of the trip
- Miles travelled
- Most frequently used routes
- Heatmaps

2) 'Turnn'

An application providing information on shared mobility from Drente to Flevoland. 'Turnn' facilitates connectivity and user-friendliness. The collaborating parties of the MaaS pilot also have to deliver the following data to the MaaS learning environment:

- Purpose of the journey
- Type of transport
- Personal identification number
- Start and end of the journey

The government stated that this is made anonymous, to bypass the GDPR. The question is, is this possible, can you make data from connected vehicles anonymous?

“Once a dataset is truly anonymised and individuals are no longer identifiable, European data protection law no longer applies. As a consequence, anonymization, where relevant, may be a good strategy to keep the benefits and to mitigate the risks in relation to connected vehicles.

“much of the data that is generated by a connected vehicle relate to a natural person that is identified or identifiable and thus constitute personal data. For instance, data include directly identifiable data (e.g. the driver’s complete identity), as well as indirectly identifiable data such as the details of journeys made, the vehicle usage data (e.g., data relating to driving style or the distance covered), or the vehicle’s technical data (e.g., data relating to the wear and tear on vehicle parts), which, by cross-referencing with other files and especially the vehicle identification number (VIN), can be related to a natural person. Personal data in connected vehicles can also include metadata, such as vehicle maintenance status”

bron: The European Data Protection Board

The Working Party 29 states that anonymization is not always achieved and heavily depends on the context. The Working Part advises to take into account the ‘reasonable means criterion’ in determining whether anonymization is succeeded. The ‘reasonable means criterion’ maps the concrete means which are needed to re-identify an individual.

These criteria are:

- Time and effort
- Costs
- Resources available
- Publicly accessible data sets
- Development of information and communication technologies

If the means are present and available to re-identify, then the anonymized is still considered as personal data. Trends that enable easier re-identification are; the emerging techniques, open

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data policies of the government, availability of other government data sets and the storage of raw data by the service providers.

In the presentation is concluded that anonymizing data from connected vehicles is problematic. Even anonymized data sets often qualify as personal data, even though people are often unaware of this.

The government has the financial and technical capacity to re-identify the datasets. In addition, the government has many other datasets at its disposal with which the initial anonymized dataset can be combined for re-identification.

An example is given; an anonymous travel movement can quickly be identified as combined with data from traffic cameras. They state that the same applies to pseudonymized data. Open data policies must be taken in account. Any third party can make a request for this data. For this reason, not only available government data must be included in the reasonable means criterion, but also the reasonable means that third parties can deploy.

It is explained that data cannot be anonymous if the raw data has not been deleted by the service provider. Even if a dataset is provided to a third party without indicative data, but the main owner has not deleted the raw data. Does the dataset, received by the third party, still fall under personal data, this is stated in WP 29.

“Wanneer een organisatie bijvoorbeeld gegevens over reizigersbewegingen verzamelt, worden de individuele reispatronen op gebeurtenisniveau nog steeds met persoonsgegevens gelijkgesteld voor elke partij, en wel zolang de voor de verwerking verantwoordelijke (of enige andere partij) toegang heeft tot de oorspronkelijke onbewerkte gegevens, ook al werden de direct identificerende gegevens verwijderd uit de aan derden doorgegeven dataset.”

bron: WP 29

Mobility providers are often unable to remove the raw data at the time they deliver data to the government. This data is still needed for their own services (personalized travel advice, invoices on use). In other words, even anonymized data requests (e.g. by the CDS-M) are still personal data, which makes the GDPR (and AVG) applicable.

The ‘criterion of reasonable means’ has been filled with the interpretation that the government is a large connected body that has access to all data of all the different departments and municipalities and provinces. However, the municipality can also ensure that not every

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department has access to every dataset (this is already the case). This can be done by means of internal technical and organizational measures through which datasets of different departments and projects can be demarcated. If only the resources of one department and its project (e.g. CDS-M) are included in the 'reasonable means criterion', then this is referred to as subjective interpretation of the 'reasonable means criterion'. If you look at it the subjective way, then the anonymized data can be perceived as non-personal data, because there are not enough means available for re-identification.

Measures that are now being taken to make sure that data is demarcated, are:

- Manifesto of TADA
- Use of inter-departmental/project data provision agreements assessing the compatibility of the 'new' purpose with the purpose described in the consent agreement with the mobility provider.
- Conducting data protection impact assessments prior to combining datasets. This identifies all risks to re-identify.
- Checking the lawfulness of data use, this is done by privacy officers, data protection officer, personal data committee.

Through the use of these measures, the municipality advocates ensuring that anonymized data cannot be de-anonymized. De Roos Advocaten has difficulty with this statement. They argue that these measures do not entirely ensure that data remains anonymized, but only that it has been pseudonymized. Which means that the data does lead back one person, only the name, place of residence and other personal information is not clear, and that thus the GDPR has to be taken into account.

"If your organisation holds both the pseudonymised dataset and the cipher or code, your organisation is holding Personal Data as defined in GDPR. Regardless of the 'controls' you have in place, the organisation has access to direct, real-world identifiers. Since data protection is a corporate responsibility, any internal controls are not considered sufficient here and it is not possible to render this data no longer Personal Data. However, pseudonymisation does reduce the risk when processing Personal Data for research, and as such is a safeguard provided in GDPR".

bron: Information Commissioner's Office

Pseudofiction can be turned into re-identification if the measures are undermined by political or social motives, such as the corona crisis, crime or terrorism. When the chips are down, there are political or security reasons for privacy.

Two examples of this re-identification are:

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- Tax and Customs Administration risk profiles for child allowance fraud
- SIRI ethnic profiling

De Roos Advocaten conclude that the 'learning by doing' practice of I&W has resulted in a subjective interpretation of the 'reasonable means criterion'. This is unlawful, because according to De Roos Advocaten this delimitation of data access can always be lifted by political interests. In this case, therefore, the data is not completely anonymous. Therefore, they argue that the GDPR has to be adhered to.

De Roos Advocaten recommend a possible interim solution, namely the Trusted Third Party (TTP). With these parties' contracts could be used, in which is stipulated that these data datasets may not be combined or used for other purposes. And because the data is not public property, there is less chance that political interests will use the data for other purposes. However, this still does not solve the problem that the main owner of the data, the mobility providers, do not remove the raw data. And because of this, the aggregated datasets can never be qualified as totally anonymous, if an objective interpretation of the criterion of reasonableness is assumed.

However, the GDPR does not prohibit the use of personal data. De Roos Advocaten therefore argues that Smart Mobility should not be impeded by this data. However, such data must be treated as personal data. And privacy preserving techniques and measures should be used as much as possible. Such as the use of TTPs and privacy by design.

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2.26 - Focus group Amsterdam x NeTEx

Participants: Fabrizio Areodo, data scientist at Aurige and co-developer of the NeTEx 5 version
Christophe Duquesne, data scientist at Aurige and co-developer of the NeTEx 5 version
Ross Curzon-Butler, Chief technology Officer at Cargoroo and co-developer CDS-M

Date: 18th of November

Preferences: aligning all data standards in the mobility field.

The focus group with the developers of the CEN (European Committee for standardization) NeTEx standard is organized to find out whether CDS-M could be complementary to the fifth multimodal version of NeTEx. The focus group starts with a short introduction of all participants. Thereafter, Ross explains the rationale of the CDS-M and his concerns about the full active version of MDS. In this version the agency API is functional, the API which requests real-time trip data. Ross explains that this API causes reluctance from the shared mobility operators in Amsterdam. He tells that these operators are afraid of data breaches, due to the lack of expertise of the government, and moreover they are concerned about the fact that their business model could be discovered by competitors if the data, even if in an aggregated format, is published as open data. The operators see this data as commercially sensitive. A downside of the MDS for governments is that they then have to use an intermediary, from which they are dependent. Furthermore, he states that in Amsterdam the traffic management and urban planning department do not feel the urgency for real-time trip data, they only use aggregated data and find that sufficient. He does recognize that the question about how aggregated the data should be that it is still useful, and how long should it be stored, these questions have still to be answered. Besides, that DATEX 2 cover roadworks, accidents and traffic management. So, the traffic management is covered, and the regulatory aspect is covered by enforcers on the ground, so in rosses' opinion a standard for shared mobility only has to be useful for urban planners. His aspiration is to make CDS-M applicable for all mobility, in such the urban planners have a larger view on mobility usage in the city. Another aspiration is to align CDS-M with standards that are already out there, such as the NeTEx standard. The CDS-M does not incorporate parking- or availability data so Ross is keen to know whether the NeTEx could be complementary in that aspect.

Christophe asks whether the CDS-M does incorporate passengers' information and whether another standard than NeTEx can be used for availability data now in the Netherlands.

Ross answers that the CDS-M does not include passengers' information. He tells that in the Netherlands the TOMP-API can be used to retrieve availability data from, but it is not designed for that purpose. The TOMP-API is designed for communication between the shared mobility operators and the MaaS platform providers.

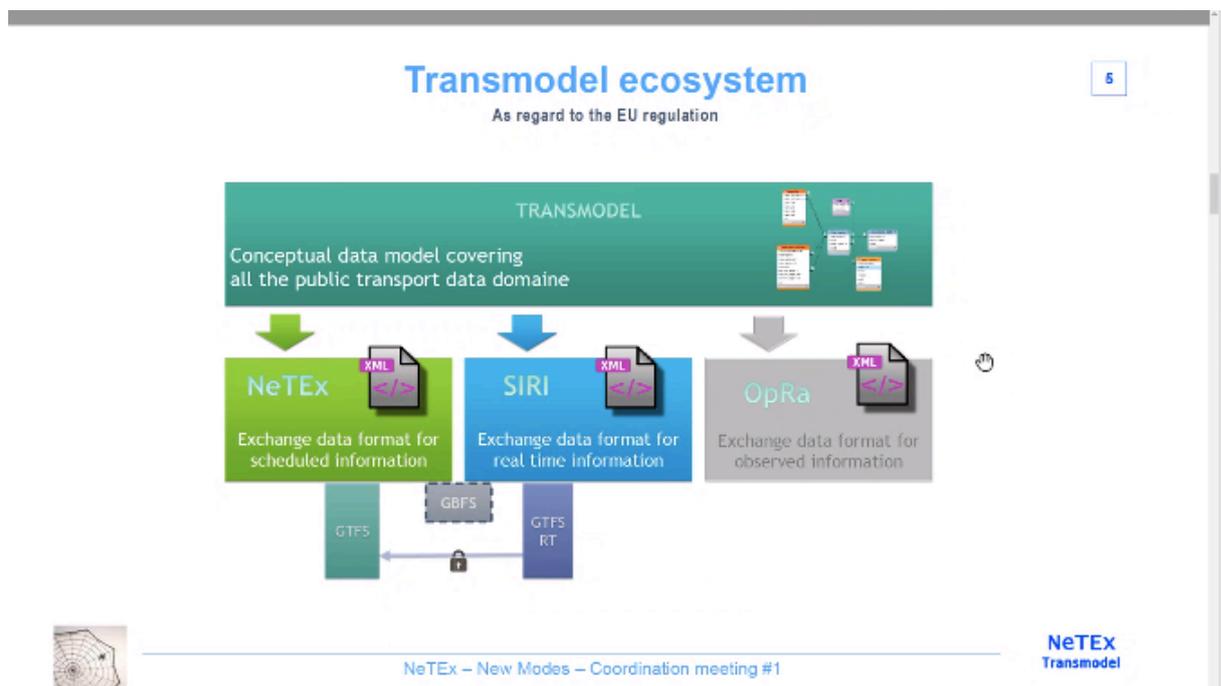
Christophe wonder how to make a journey plan without passenger's information. Ross explains that this is delivered by the shared mobility operators through the TOMP-API towards the platform providers on which customers can book their trip. Ross

That is what the operator delivers through the TOMP, to the platform from which you book your trip.

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[Ross and Christophe discuss definitions such as stop places in NeTEx and CDS-M]

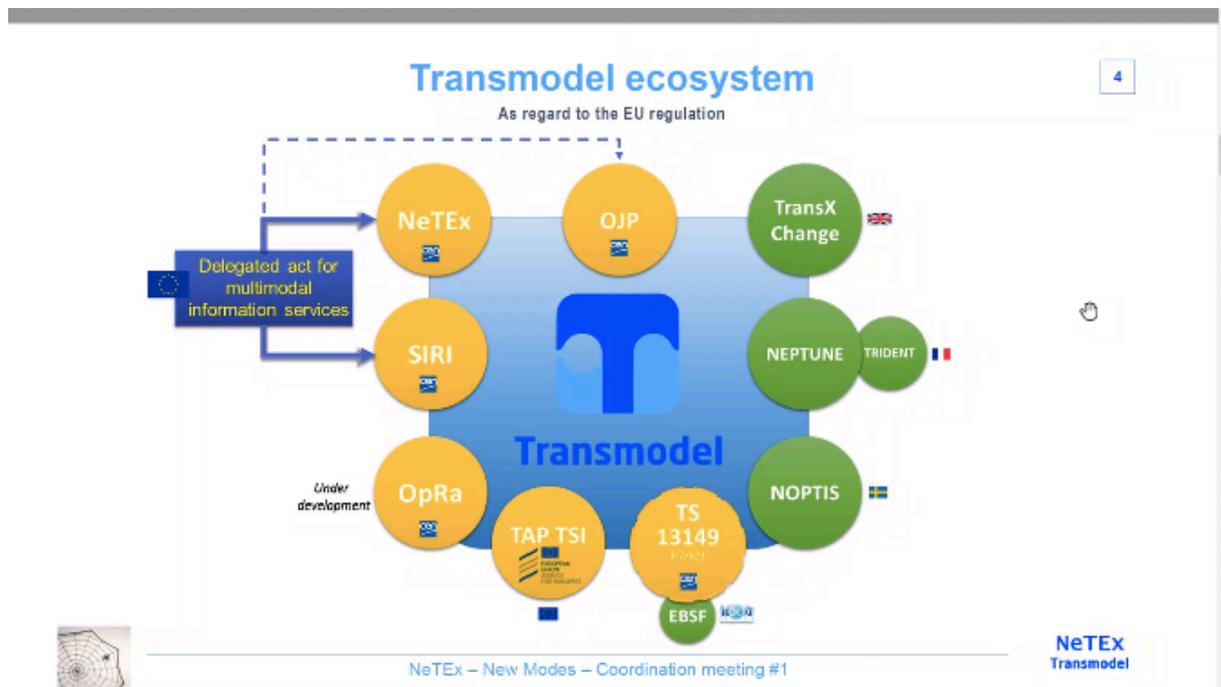
Ross explains the further rationale of the TOMP-API and Christophe explains the trans modal eco-system that they build on behalf of the European commission, which is visible in the figure below.



5

NeTEx – New Modes – Coordination meeting #1

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Christophe mentions that it is the most important that these standards such as SIRI, NeTEx and CDS-M use the same definitions, in such there is interoperability. He explains that the same definitions are used in SIRI, NeTEx and Opra. From his point of view, we can have multiple standards for different uses if we make sure that they communicate in the same way. The NeTEx stand covers the exchange of scheduled information, before the service has been delivered, where SIRI covers the exchange of data in real time, during the service. OpRa covers the exchange of observed information through the Internet of Things, such as roads information, sensors and other curb data. Christophe tells that NeTEx and SIRI work in all code languages and that they are REST APIs. Furthermore, he explains that GTFS is a subset of NeTEx. GTFS only covers the part about the trips, not about the operations. GTFSRT is a subset of SIRI and offers real-time data to complement GTFS.

Ross explains that GBFS is more or less included in TOMP, has parts of the GBFS+. Christophe agrees with Ross that standard with different purposes are very effective, because of their dedicated scope. Christophe tells that they have been developing a translation method, a conversion tool, that translates GBFS and MDS in NeTEx. This is especially relevant for the 5th NeTEx version on new modes that they are now developing.

This specification is about car-sharing, taxis, scooters, mopeds, bicycle, Uber etc. Designed to enable integrated multimodal traveling. And they find it very important that NeTEx is compatible with existing standards in this field, like MDS and GBFS.

Christophe explains that in the regulations of the European Commission is stated that NeTEx needs to be used for the national access point. OpRa, will be finished next year and will then also be used for the national access point. Moreover, he explains that OJP, Open Journal Planner, is also a complement to the NeTEx.

Ross asks if there is a possibility to join the development of these standards. Fabrizio explains that, because they are CEN standards, every country in Europe can be included. The national standardization body can do so. 'Stefan de Koninck is active now', says Christophe. Besides that, parties can join the liaison of NeTEx 5, MDS, GBFS, DATEX 2 and many more are member now. The goal of the liaison is to keep the standards consistent and compatible. Christophe invites Ross to join the liaison.

Christophe asks whether NeTEx could be formally included in CDS-M. Ross answers that we should make that possible. 'We need to create an infrastructure in which these data standards can work together. Especially, for MaaS. Have you heard from the Oslo standard? These standards, as well as TOMP and CDS-M that support and incorporate companies and parties that would not be able to be part of higher excluded standards. They are smaller standards, but they should be included in the MaaS eco-system. The goal is to alter MDS towards a more European focused format now. And if that happens, NeTEx can be mapped in the MDS format as you told before.'

Christophe explains that the European Commission has the same goal, to enable a MaaS ecosystem, with all standards needed. They are working on a directive to harmonize these transmission formats.

Ross explains that the Amsterdam way of reaching an eco-system is cooperating in the development of these standards. He tells that the data standards, such as the TOMP-API, have never been government owned, only government supported. According to him, this created room for government bodies and private parties to co-create the standard. From his point of view, the CEN has a more formalized process, so he thinks that they will probably take a little longer to receive the goal.

And therefore, he stated that Amsterdam has already begun the development of the CDS-M and TOMP, because Amsterdam hopes that some of the developments will be taken up by the EU Commission in the future.

[Ross, Fabrizio and Christophe discuss vehicle identification]

Christophe says that he thinks it would be great if Amsterdam would join the liaison, that it will enable the next step in aligning all standards. Moreover, he invites Ross to join the working group of 4PT, this working group is designed to support data governance of cities. They know about data standard implementation and harmonizing that. He tells that this workshop is also a good place for questions on all topics related data standards.

Ross, agrees that participating in the liaison and the workgroup would be a fantastic start. Ross invites Christophe and Fabrizio to also join the CDS-M meetings after the release of the blueprint and use case overview. These meeting will be bi-weekly or monthly. Ross stresses that aligning standards all comes down to communication. He indicates that all parties have the same goal, ending with one uniform standard. Ross, substantiates that this is the only goals,

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not profit whatsoever. Christophe and Farbrizio accept Ross' offer and are going to join the CDS-M meetings.

3. Appendix - Summary data protection and privacy regulations

The GDPR applies when **personal data** is **processed** by a **data processor** for a purpose, and a method, defined by the **data controller** (Art. 4, GDPR).

The processing of personal data should be processed *lawfully, fairly and transparent* in relation to the data subject. The data should be collected for specified, explicit and legitimate purposes. The purpose must fall under the **processing grounds** mentioned in the GDPR. The data collected has to comply with **the criteria laid down in Article 52(1)** of the Charter of Fundamental Rights, which includes the **requirement of proportionality and necessity**. So, the data collection should comply with the **principle of data minimization**. Inaccurate personal data has to be erased or rectified without delay. Stored data has to be kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed (Art. 5., GDPR).

Personal data may solely be stored for longer periods insofar as the personal data will be processed for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes. However, the stored data has to comply with the **principle of storage limitation**. Moreover, safeguards have to be added to ensure the rights and freedoms of the data subject. Those safeguards have to make sure that further processing of the stored data no longer permits the identification of data subjects. Such as measure could be pseudonymization, provided that the purposes and processing ground for archiving can be fulfilled in that manner (Art. 89., GDPR).

The controller has to ensure **integrity and confidentiality** by providing appropriate security of the personal data, including protection against unauthorized or unlawful processing, and additionally against accidental loss, destruction or damage, by using appropriate technical or organizational measures (Art. 5., GDPR). The obligation of the controller could be assured by **codes of conduct** and **data protection by design**.

All in all, the main principles that should be complied with are **purpose limitation, data minimization, storage limitation, integrity and confidentiality** (Art. 5., GDPR).

The GDPR does not prohibit organizations to process personal data. It merely emphasizes that when personal data is used, the requirements mentioned above must be met. Moreover, the GDPR stimulates the use of data for research and development of technical solutions in the service of the public good. Furthermore, the European Commission encourages Member states to develop Intelligent Transport Systems (ITS) and recognizes mobility data and digital maps as fundamental (Directive 2010/40/EU). In the Commission Delegated Regulation (EU) 2017 substantiates this attitude by enabling the collection of both static and dynamic data, such as individual trips, for this purpose. The 'Open Data Directive' in 2019 deems mobility data as having a 'high value' and encourages the free reuse and open data strategy⁸⁰.

3.1 Definitions and explanations concepts

Personal data is any information relating to identifiable natural person. This natural person could be identified directly or indirectly by identifiers such as a name, an identification number, location data, an online identifier or other factors revealing the physical, psychological, genetic, mental, economic, cultural, or social identity of that natural person.

Data processing is defined as any operation or set of operations which are performed on personal data, such as collection, organization, structuring, storage, adaptation or alternation, retrieval, consultation, use, disclosure by transmission, dissemination, or otherwise making available, alignment, or combination, restriction, erasure or destruction.

The **data processor** is a natural or legal person, public authority, agency or other body which processes personal data on behalf of the controller.

The **data controller** is the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data (Art. 4., GDPR). The controller is responsible for the lawful and GDPR compliant way of processing of personal data. Taking into account the nature, scope, context and purposes of processing as well as the risks of varying likelihood and severity for the rights and freedoms of natural persons, the controller shall implement appropriate technical and organizational measures to ensure and to be able to demonstrate that processing is performed in accordance with this Regulation. Those measures shall be reviewed and updated where necessary. Adherence to approved **codes of conduct** as referred to in Article 40 or approved certification mechanisms as referred to in Article 42 may be used as an element by which to demonstrate compliance with the obligations of the controller. Another way to do so is by assuring **data protection by design** by measures such as pseudonymization, which are designed to implement data-protection principles, such as **data minimization** and **storage limitation**, in an effective manner and to integrate the necessary safeguards into the processing in order to meet the requirements of this Regulation and protect the rights of data subjects (Art. 25., GDPR).

Processing grounds for retrieval and processing of personal data are:

The processing ground does not take effect until the data subject has given consent to the processing of his or her personal data.

- 1) consent of data subject.
- 2) processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract;
- 3) processing is necessary for compliance with a legal obligation to which the controller is subject;
- 4) processing is necessary in order to protect the vital interests of the data subject or of another natural person;

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- 5) processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller;
- 6) processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data, in particular where the data subject is a child.

Point (5) of the first subparagraph shall not apply to processing carried out by public authorities in the performance of their tasks (Art. 6., GDPR).

Data protection is a fundamental right (Art. 8., CHARTER OF FUNDAMENTAL RIGHTS OF THE EUROPEAN UNION). **Necessity** is fundamental principle when assessing a possible limitation of this fundamental right. The limitation, thus the retrieved data, the processing operations and the duration that the data are kept must be strictly necessary. Moreover, it should be the least intrusive way to achieve the purpose. Necessity shall be justified on the basis of objective evidence and is the first step before assessing the proportionality of the limitation ⁸³.

Necessity is one of the aspects that defines the **lawfulness** of the processing of personal data. To be lawful, any limitation on the exercise of the fundamental rights protected by the Charter must comply with the following **criteria, laid down in Article 52(1)** of the Charter: ⁸⁴

- it must be provided for by law,
- it must respect the essence of the rights,
- it must genuinely meet objectives of general interest recognized by the Union or the need to protect the rights and freedoms of others,
- it must be **necessary**,
- it must be **proportional** ⁸⁴.

Thus, to be lawful, the limitation of the fundamental right of protection of personal data must be mentioned in law, must respect the essence of rights, should fall under general interests and must be necessary and proportional. The latter fundamental principles collectively are referred to as the **requirements of necessity and proportionality**.

Proportionality describes the balance between the means used and the intended aim. In the context of fundamental rights, such as the right to the protection of personal data, proportionality is key for any limitation on these rights ⁸³.

More specifically, proportionality requires that advantages due to limiting the right of data protection are not outweighed by the disadvantages experienced by the data subject. In other words, the limitation on the right of data protection must be justified. This could be done by providing safeguards; measures that can support the justification of the limitation.

In addition, when assessing the processing of personal data, proportionality requires that only that personal data which is adequate and relevant for the purposes of the processing is collected and processed, this is called the **principle of data minimization** (Art. 5., GDPR).

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3.2 The Necessity Test

To assess the necessity of measures that limit the fundamental right to the protection of personal data, a necessity test can be used⁸⁴.



The necessity test in steps.

Step 1 - Factual description of measure

- 1) **Describe the measure sufficiently to enable a clear understanding of what exactly is being proposed and for which purpose.**
- 2) **Determine whether the measure implies the use of personal data.**
- 3) **If personal data are processed, describe:**
 - the objective of general interest pursued by the measure;
 - the exact purpose of the processing of personal data, explained in more detail than the objective;
 - the categories of data;
 - the persons whose data are processed (*e.g.* certain categories of persons, users of a service, suspects of a crime, foreigners, nationals, etc.)
 - who is processing and accessing the data (*e.g.* a private company, a public organization);
 - which processing operations are envisaged (*e.g.* collection, storage, access, transfer);
 - For how long the data is retained⁴⁷;
 - The circumstances in which the personal information is used (*e.g.*: on a systematic basis, only in certain cases, during a limited period of time, etc.);

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Step 2 – Identify fundamental rights and freedoms limited by data processing

Identify which fundamental rights and freedoms are limited

- Consider the extent to which the data processing limits the right to respect for private life;
- Identify a potential "difference of treatment" created between individuals which could lead to discrimination;
- Assess the consequences on the possibility of individuals to seek effective, judicial remedies;
- Assess the extent to which freedom of speech, freedom of thought, freedom to receive information; are limited
- Assess whether the essence or basic content of the rights is limited.

Background knowledge:

If the proposed measure involves the processing of personal data, the measure is a limitation on the right to personal data protection under Article 52(1) of the Charter.

Depending on the nature of the data and how it is used, the proposed measure may also limit the right to respect for private life (also called right to privacy) (see Section II.5).

Furthermore, the ECtHR has repeatedly held that the **storing by a public authority of data** relating to the private life of an individual amounts to a limitation on the right to respect for his private life irrespective of the use made of the data.

Distinct processing operations or set of operations (i.e. collection and another operation, such as retention or transfer or access to data) may constitute separate limitations on the right to the protection of personal data and, where applicable, with the right to respect for private life. For instance, the CJEU held that if the measure involves **access of the competent national authorities** to the data processed, such access constitutes a further interference with the fundamental right to respect for private life.

Where a right is affected, the mere fact that a measure limits the exercise of these rights does not mean as such that the measure should not be proposed. However, the measure should comply with the conditions laid down in Article 52(1) of the Charter, including necessity.

If the **essence of the right** is adversely affected by the measure, then the limitation is not lawful, and the measure should be withdrawn or modified before proceeding to the next steps (see Section I.1).

Step 3 – Define objectives of measure

Identify and assess the legitimacy of the aim pursued by the measure:

- Make sure that the problem is sufficiently and clearly described in the measure;
- Integrate sufficient and scientifically verifiable evidence supporting the existence of the problem;
- Define precisely the objective of general interest or **the right of others** which the measure seeks to address;
- Make sure that the purpose of the processing of personal data genuinely aims to achieve an **objective of general interest** recognised by the Union or the need to protect the rights and freedoms of others;
- Explain the importance of the objective to be achieved and how it is critical for the functioning of society.

Background knowledge:

The **rights of others** are in the first place those enshrined in the Charter. The right to the protection of personal data may need to be balanced with other rights, such as the protection of intellectual property rights and the rights to an effective remedy, to freedom of expression and to carry out a business⁵⁰.

Objective of general interest recognised by the Union ⁸⁵:

1. The Union's aim is to promote peace, its values and the well-being of its peoples.
2. The Union shall offer its citizens an area of freedom, security and justice without internal frontiers, in which the free movement of persons is ensured in conjunction with appropriate measures with respect to external border controls, asylum, immigration and the prevention and combating of crime.
3. The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.

It shall combat social exclusion and discrimination, and shall promote social justice and protection, equality between women and men, solidarity between generations and protection of the rights of the child.

It shall promote economic, social and territorial cohesion, and solidarity among Member States.

It shall respect its rich cultural and linguistic diversity and shall ensure that Europe's cultural heritage is safeguarded and enhanced.

4. The Union shall establish an economic and monetary union whose currency is the euro.

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5. In its relations with the wider world, the Union shall uphold and promote its values and interests and contribute to the protection of its citizens. It shall contribute to peace, security, the sustainable development of the Earth, solidarity and mutual respect among peoples, free and fair trade, eradication of poverty and the protection of human rights, in particular the rights of the child, as well as to the strict observance and the development of international law, including respect for the principles of the United Nations Charter.

6. The Union shall pursue its objectives by appropriate means commensurate with the competences which are conferred upon it in the Treaties.

Other objectives that are legitimate:

Article 23 of the General Data Protection Regulation 2016/679 includes a list of aims considered legitimate for limiting the rights of the individual, such as the right to access an individual's personal data, and the obligations of the controller (Art. 23, GDPR).

Such aims respect the essence of the fundamental rights and freedoms and is are necessary and proportionate measures in a democratic society to safeguard:

- a. national security;
- b. defence;
- c. public security;
- d. the prevention, investigation, detection or prosecution of criminal offences or the execution of criminal penalties, including the safeguarding against and the prevention of threats to public security;
- e. other important objectives of general public interest of the Union or of a Member State, in particular an important economic or financial interest of the Union or of a Member State, including monetary, budgetary and taxation a matters, public health and social security;
- f. the protection of judicial independence and judicial proceedings;
- g. the prevention, investigation, detection and prosecution of breaches of ethics for regulated professions;
- h. a monitoring, inspection or regulatory function connected, even occasionally, to the exercise of official authority in the cases referred to in points (a) to (e) and (g);
- i. the protection of the data subject or the rights and freedoms of others;
- j. the enforcement of civil law claims.

Transparency and public control are also legitimate aims (Articles1 and 15(1) TEU) enabling the citizen to participate more closely in the decision-making process⁸⁷.

Step 4 – Choose option that is effective and least intrusive

1) **Describe how and why the measure is essential for satisfying the need to be addressed:**

- Why existing measures are insufficient to address the problem;

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- Why and how the measure can achieve the objective.
- 2) **Consider whether alternative, less intrusive measures could be comparably effective at meeting the objective pursued.**
- Provide scientifically verifiable evidence that can genuinely support the claim that existing measures and less intrusive alternative measures cannot effectively address the problem.

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3) Each particular aspect of the measure is subject to the strict necessity test.

- Thus, the processing of a category of personal data, the categories of persons affected and the duration of the retention of the data. Therefore, when establishing a retention period for the data, the measure should make a distinction between categories of data based on their effective contribution for the purposes pursued and must use objective criteria for the determination of the length of the retention period.

Background knowledge:

The *appropriateness* of a measure is not the same as its *effectiveness*. Even if it is appropriate, the chosen measure should also be effective and less intrusive than other options for achieving the same goal.

An appropriate measure is one capable of attaining the aim pursued:

- There must be a **logical link between the limitation and** the legitimate aims identified.
- The objective pursued must be achieved as a direct consequence of the measure.
- An appropriate measure does not, however, have to address all particular aspects of the problem.

If the proposed measure includes the processing of **sensitive data**, a higher threshold should be applied in the assessment of effectiveness. Mobility data typically contains more sensitive data regarding the location and movements of individuals (CONFIDENTIAL, Bird Company).

3.3 Proportionality test

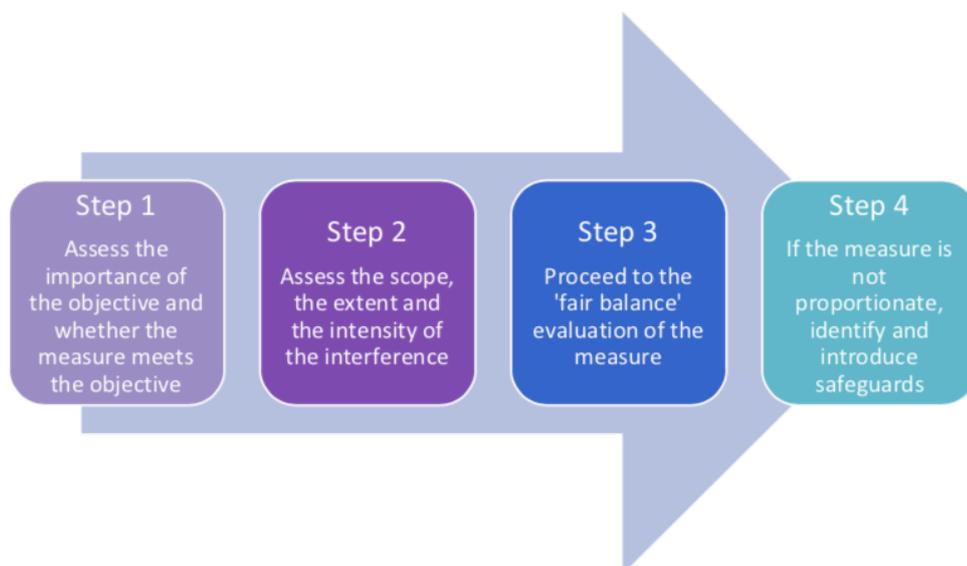


Figure .1 The proportionality test in steps.

Step 1

Define the:

- Needs
- Problem definition
- Concrete purpose
- Level of urgency of public interest
- Importance measure
- Effectiveness and efficiency

Step 2

The impact should be sufficiently described to enable a clear understanding of the scope, extent and intrusiveness level of the interference on the fundamental rights to privacy and to the protection of personal data. It is particularly important to precisely identify **the impact**, taking into account:

- the scope of the measure: is it sufficiently limited? number of people affected; whether it raises 'collateral intrusions', that is interference with the privacy of persons other than the subjects of the measure;
- the extent: how is the right restricted? amount of information collected; for how long; whether the measure under scrutiny requires the collection and processing of special categories of data;
- the level of intrusiveness, taking into account: the nature of the activity subjected to the measure (whether it affects activities covered by duty of confidentiality or not, lawyer-client relationship; medical activity); the context; whether it amounts to profiling of the individuals concerned or not; whether the processing entails the use of (partially or fully) automated decision making system with a 'margin of error'; whether it concerns vulnerable persons or not; whether it also affects other fundamental rights (there could be 'inextricably linked' fundamental right, for instance the right to protection of privacy and the right to freedom of expression, as in the Digital Rights and Tele2 CJEU cases).

Step 3

- First, prior to the balance exercise, verify if there is a situation of information asymmetry: has all relevant information been collected and assessment performed on both the 'benefits' and the 'costs' of the measure?
- Then, compare the constraints on privacy and data protection and the benefits (the balancing exercise): are the measures envisaged to fulfil the objective a proportionate response to the need at the basis of a proposal for legislation, given the limitations to the data protection and privacy rights?

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- After performing the balancing exercise, ensure that adequate evidence is produced and, as the case may be, published, establishing that the analysis has been done (Report on the Proportionality Test, that is, a synthetic analysis of the outcome of the assessment performed).
- Keep (register and store) all relevant documentation obtained or produced while performing the balancing exercise and drafting the Report on the Proportionality Test. Such documentation should be relevant and sufficient to provide justification (or to identify the critical issues) for the measure under scrutiny (target of evaluation), and referred to in an annex to the Report.

Step 4

- Synthetically analyze the outcome of the assessment performed under step 3 as described in the Report on the Proportionality test, highlighting in particular the factors that gave rise to the conclusion of 'non-proportionality' ('negative proportionality test');
- Rework the proposal, drafting if possible one or more corrective options addressing the critical issues (define more narrowly the purpose, the categories and the amount of personal data to be processed, and thus reduce the level of interference of the measure with privacy and data protection);
- Envisage and introduce safeguards reducing the impact of the proposal on the fundamental rights at stake (for example, introduce the need for human verification in case of legislation providing for fully automated measures).
- Provide for re-evaluation and sunset clauses: most probably the situation to be addressed is characterized by a very dynamic environment, from both the technological and societal viewpoint. This uncertainty may have contributed to the assessment of the measure as non-proportionate for 'prudential reasons' (precautionary principle), due to uncertainties on the effective impact of the measure (for example, due to the envisaged technological tools). In this case, in addition to further safeguards, it is advisable to provide for strict re-evaluation (regular checks/evaluation of the impact post factum, also aiming at addressing unexpected effects) and sunset clauses ('unless confirmed or revised, the measure is no longer applicable as from'). Specific oversight mechanism/bodies might also be considered.
- Re-run the assessment of necessity and proportionality (both tests, since the introduced modification may trigger the need to perform again each step of test 1 and 2).

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4. Appendix - Coded Theoretical framework

4.1 Value of a data standard

  Enable two-way communication in machine readable format	FREQUENCY IN PROJECT 1
  Improve urban planning	FREQUENCY IN PROJECT 2
  Regulating shared mobility	FREQUENCY IN PROJECT 2
  Support policy analysis and execution	FREQUENCY IN PROJECT 2

Sub-concepts of the concept 'Value of a data standard'.

Value of a data standard Exemplifications	Quotes	Sub-concepts
Regulate parking zones Regulate driving zones	According to a study from Baltra, G et al. (2020) GBFS queries the location data of parked vehicles, where MDS retrieves real-time GPS trip data. Both standards have a regulatory effect, as they provide insight into parking violations and traffic violations caused by parking and driving outside of a permit area.	Regulating shared mobility
Regulate parking zones Regulate driving zones	Both standards have a regulatory effect, as they provide insight into parking violations and traffic violations caused by parking and driving outside of a permit area.	Regulating shared mobility
Stimulation of shared mobility Traffic management Decreasing air pollution through less private car ownership	From the urban planning point of view, mobility flows visualized by the use of data standard for shared mobility operators could support policy goals such as: the stimulation of shared mobility, enhancement of parking possibilities, regulating the public space, minimization of traffic jams, minimization of rush our peak pressure, the enhancement of road safety by enlarging certain streets and cycling lanes and the enhancement of health by decreasing air pollution through less private car ownership ¹³ .	Support policy analysis and execution
Interoperability and efficiency	In this section the topic of the first sub-question is	Enable two-way communication in

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	<p>nourished with literature findings. Literature on data standards and their value creation for municipalities is addressed. Previous studies show that data standards are often molded into Artificial Programming Interfaces (APIs)^{1'2'3'4'5'6}. According to a recent study of Wulf, J. an Blohm, I. (2020) APIs have currently become a common instrument of digital strategy⁵. This is due to the fact that APIs ensure standardized communication between distinct databases. In the case of a data standard for shared mobility operators, an API offers the possibility for standardized flows of mobility data from the operators' database towards the database of the municipality of Amsterdam. Every kind of database can be connected to an API, because they are made of an interface definition language (IDL). IDL consists of a simple syntax that describes the interface. IDLs provide a general language that every software can understand. IDLs activate language-independent calling⁷.</p> <p>This calling exists of three steps: (1) API provider sends request to endpoints of the server, (2) third party's platform answers request, (3) API provider receives output from server and stores raw data in a database³. According to Bachmann (2020), APIs create interoperability, because the standardized flows of data can be jointly processed and analyzed⁸. From this literature could be derived that APIs serve as the technical design of a data standard and that they play an important role in the digital strategy by enabling data transmission and data as a service⁵.</p>	<p>machine readable format</p>
	<p>On the contrary, Urban Computing Theory and urban planning literature do indicate a possibility for mobility data with the purpose of planning.</p>	<p>Improve urban planning</p>
<p>Road safety Improve Infrastructural planning based on Route Usage/Demand</p>	<p>Urban computing is described as a way of systems thinking within urban planning in which Big Data is used for pursuing Smart City strategies¹⁰. Smart City strategies are focused on achieving a connected, clean, safe and inclusive city by using Big Data and advanced technologies such as the Internet of Things (IoT)^{11'12}.</p>	<p>Improve urban planning, Support policy analysis and execution</p>

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4.2 Opportunities in design

  Co-designing data standard with market parties	FREQUENCY IN PROJECT 3
  Joining European funded projects	FREQUENCY IN PROJECT 1
  Partnerships	FREQUENCY IN PROJECT 1
  Privacy enhancing techniques (PET)	FREQUENCY IN PROJECT 2

Sub-concepts of the concept 'Opportunities in design'.

Opportunities in design Exemplifications	Quotes	Sub-concepts
Upscaling data governance and MaaS	A study from Stockholm by Fenton, P. et al (2020), confirms this point of view and emphasizes as well that municipalities should take an active role in maintaining the collaborations for upscaling the data governance and the MaaS ecosystem 40. Another driver for investing in collaborations is raised by Yanying, Li. And Tom V. (2017).	Co-designing data standard with market parties
Differential privacy	Differential privacy can potentially solve this problem. It is a complex technology which requires a high degree of technological infrastructure and expertise to run properly, the technique operates with a random algorithm which adds noise to the location data which enforces anonymity ¹⁷ .	Privacy enhancing techniques (PET)
Upscaling data governance and MaaS	For a successful employment of MaaS and a achieving a level playing field within the MaaS eco-system, cooperation, pilots and partnerships are essential according to Sochor, J. et al (2015) ³⁷ and Yanying, Li. And Tom V. (2017) ⁴⁰ .	Pilot strategy, Co-designing data standard with market parties, Partnerships
Subsidized European projects	Moreover, it is highlighted that subsidies, pilots or other investments by policy makers could further support this process ^{2'38} .	Pilot strategy, Joining European funded projects

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K-anonymity	PbD could be executed by 'Privacy Enhancing Techniques' (PETs). The commonly used PET for location privacy is k-anonymity, an anonymization theory ¹⁹ . The k-anonymity model uses large pre-aggregated sample sizes of vehicles per area, so that identification is not possible ²⁰ . Yao et al. (2010), recognizes that k-anonymity ensures locational privacy, but at the same time restricts the design of the data standard to aggregated data querying and thereby limits to what extent the data can be used for policy objectives ^{2.1} In the case of a data standard for shared mobility operators it shall thereby limit the regulatory function.	Privacy enhancing techniques (PET)
Qualitative design	Specifically, cooperation on the design of data standards is essential in this aspect. This is supported by the study of Polydoropoulou, A. et al (2020) in which the issue of the lack of compatible data formats and standardized APIs for transport operators is highlighted.	Co-designing data standard with market parties

4.3 Bottlenecks in design

  Discussion on detailedness and purpose of data standard	FREQUENCY IN PROJECT 1
  Privacy discussion	FREQUENCY IN PROJECT 3

Sub-concepts of the concept 'Bottlenecks in design'.

Bottlenecks in design	Quotes	Sub-concepts
Exemplifications		
Auxiliary information	Auxiliary information is often an issue if municipalities acts a data controller, because databases of inhabitants are maintained in many different areas. Auxiliary information decreases the level of k-anonymity, because the possibility of re-identification increases.	Privacy discussion
Regulatory v.s. urban planning	For supporting urban planning policies, the use of historic data sets is sufficient, in comparison to the real-time data which is required for GBFS and MDS and their regulatory functions ¹⁰ . The objective of a data standard, either urban planning or regulating mobility, thus has an influence on the design of a data standard, namely	Discussion on detailedness and purpose of data standard

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	whether it is designed to request real-time or historic data.	
Ethics of privacy	<p>The ethical perspective is emphasized by Roessler (2005), she rates the importance of complete data protection and privacy above that of technological progress. She states that data protection and privacy are a both fundamental aspect of our quality of life and pillars of democracy. Roessler stresses that Big data processing poses a threat to an individual’s informational privacy. In this literature, informational privacy is defined as the ability to control access over what other people know about oneself.</p> <p>According to Roessler and Lever (2015), informational privacy enables autonomy²⁹. Democracy relies upon citizens who value their autonomy and therefore they state that threats to privacy are always threats to democracy²⁸. Furthermore, Roessler and Lever (2015), highlight that the threat to informational privacy is increased in the digital age by data processing. Due to the fact that data is made up of bits, causes data to be replicable, scalable and searchable and can thus it can be easily used in different context leading to identification^{28’30}. The ethical debate about to which extent the government should infiltrate people’s privacy and autonomy could cause possible delays and difficulties in the social adoption of the standard by European cities²⁸.</p>	Privacy discussion
Auxiliary information	<p>There is an exceptional possibility in which this PET does not guarantee privacy completely. This could occur if mobility data is stored for planning purposes without further aggregation beforehand. Then there is a chance of re-identification by juxtaposing historical datasets^{22’23}. Therefore, it could be concluded that if municipalities aspire to use historic data for planning purposes, jointly with real time data for regulation purposes, further data management methods are needed.</p>	Privacy discussion

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4.4 Practical possibilities in design

  GBFS	FREQUENCY IN PROJECT 2
  MDS	FREQUENCY IN PROJECT 2

Sub-concepts of the concept 'Practical possibilities in design'.

Practical possibilities in design - Quotes	Sub-concepts
According to a study from Baltra, G et al. (2020) GBFS queries the location data of parked vehicles, where MDS retrieves real-time GPS trip data. Both standards have a regulatory effect, as they provide insight into parking violations and traffic violations caused by parking and driving outside of a permit area.	MDS, GBFS
Unfortunately, very little scientific literature is available on the two most mature standards in this field, the General Bikeshare Feed Specification (GBFS) and the Mobility Data Specification (MDS).	MDS, GBFS

4.5 Opportunities in implementation

  Demand for a European data standard for shared mobility operators from cities	FREQUENCY IN PROJECT 3
  Joint trust	FREQUENCY IN PROJECT 1
  Pilot strategy	FREQUENCY IN PROJECT 2
  Win-win offer	FREQUENCY IN PROJECT 1

Sub-concepts of the concept 'Opportunities in implementation'.

Opportunities in implementation Exemplifications	Quotes	Sub-concepts
Cities support shared mobility, market parties deliver data	An objective of the MaaS ecosystem is to support shared mobility and thereby potentially enable a paradigm shift towards more sustainable urban mobility ¹⁶ 39. This shift offers benefits to both shared mobility operators as well as European cities.	Win-win offer

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Sufficient cooperation	Concluding from the literature review, the degree of implementation mainly depends on the degree of cooperation, which in turn is dependent on the amount of trust the shared mobility operators have in the municipalities with regard to privacy assurance and the ethical handling of the collected data.	Joint trust
	For a successful employment of MaaS and achieving a level playing field within the MaaS eco-system, cooperation, pilots and partnerships are essential according to Sochor, J. et al (2015) ³⁷ and Yanying, Li. and Tom V. (2017) ⁴⁰ .	Pilot strategy
Increase effectiveness policy execution	In the study is stated that policy makers should establish standards for the data collection, management and sharing. To thereby support the interoperability of data and increase the effectiveness of the collaboration between the municipality and the shared mobility operators.	Demand for a European data standard for shared mobility operators from cities
Need for data standards for MaaS	It is even stressed that there is a need for standardized forms of shared mobility data for the purpose of policy execution.	Demand for a European data standard for shared mobility operators from cities
	Moreover, it is highlighted that subsidies, pilots or other investments by policy makers could further support this process ²³⁸ .	Pilot strategy
Need for data standards for MaaS	The backlog of digital infrastructure could be turned into an advantageous negotiating position in this case. Namely, the backlog creates a shortage of qualitative data and data formats for the realization of a fair Mobility as a Service (MaaS) ecosystem ²³⁶³⁷³⁸ .	Demand for a European data standard for shared mobility operators from cities

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4.6 Bottlenecks in implementation

  Insufficient social adoption by cities due to privacy concerns	FREQUENCY IN PROJECT 1
  Lack of data governance capabilities of cities	FREQUENCY IN PROJECT 1
  Reduced market adoption due to commercially sensitive data	FREQUENCY IN PROJECT 1
  Reduced market adoption due to market monopoly of a Big Tech company	FREQUENCY IN PROJECT 1
  Reduced market adoption due to privacy concerns	FREQUENCY IN PROJECT 1
  Trust issues	FREQUENCY IN PROJECT 1

Sub-concepts of the concept 'Bottlenecks in implementation'.

Bottlenecks in implementation		
Exemplifications	Quotes	Sub-concepts
	A point of critique highlighted in regard to the implementation of a European data standard for shared mobility operators could be the privacy concerns. These privacy concerns can result in insufficient social adoption of European cities of the standard as well as refusal of participation by shared mobility operators ¹⁶ .	Reduced market adoption due to privacy concerns, Insufficient social adoption by cities due to privacy concerns
	The autonomy of service companies, such as shared mobility operators, is limited by data sharing as well. As the 'handbook of privacy' mentions, data is the 'new gold', the service economy consists to a large extent of data trading, in addition to providing service ²⁸ . Moreover, data of shared mobility operators is commercially sensitive. In this respect, the principle of data governance which states that all public data should be 'open source' is in conflict with the interests of market parties ^{13.1} . This conflict of interest jointly with the current backlog of digitalization of data governance in municipalities, could cause resistance ^{32'33} .	Reduced market adoption due to commercially sensitive data

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	They specifically stated that if these conditions are not soon met by municipalities, shared mobility operators will possibly join large tech companies such as Google, due to their luring open data standards that are easy to use. This could result in a market monopoly which hinders the entire MaaS ecosystem and data governance structures ³⁹ .	Reduced market adoption due to market monopoly of a Big Tech company
	This conflict of interest jointly with the current backlog of digitalization of data governance in municipalities, could cause resistance ^{32'33} .	Lack of data governance capabilities of cities
Mistrust market parties in data governance cities	This resistance is partly based on the fact that complex PETs must be in place for data governance, and market parties mistrust the capabilities of the municipalities to properly safeguard privacy ³⁴ .	Trust issues

4.7 Practical possibilities in implementation
Not present

5. Appendix - Discussion Scheme

Legend

✓ = Sub-concept is present

X = Sub-concept is not present

Red = difference

Green = similarity

Yellow = some sort of commonality but not completely similar

X = Complete difference; sub-concept is not present in results literature study and is present in results of the empirical study or vice versa

✓ = Completely similar, sub-concepts and the same associated sub-topics are present in the results from the literature and empirical study

Concept: Value of a data standard	Results literature study (LS)	Results empirical study (ES)	Clarification
Enable two-way communication in machine readable format	✓ Interoperability and efficiency (<i>Bachmann F. et al, 2002</i>)	✓ Most efficient way of policy communication (<i>Philippe Crist, ITF</i>) Publish emergency guidance (<i>Jorge G. Coelho, Faro</i>) Publish no park and no ride zones (<i>Suvi Kajamaa, Espoo</i>) Publish preferred parking zones (<i>Vasco Mora, Lisbon</i>) (<i>Jorge G. Coelho, Faro</i>) Publish slow-speed zones (<i>Vasco Mora, Lisbon</i>)	In both LS and ES the sub-concept 'Enable tow-way communication in machine readable format' is mentioned as a value adding aspect of a data standard. In ES additional, specific, value adding aspects of a data standard tailored to shared mobility operators are present.
Improve urban planning	✓ Road safety (<i>Zueng Y. et al, 2014</i>) Improve Infrastructural planning based on Route Usage/Demand (<i>Zueng Y. et al, 2014</i>)	✓ (<i>Augustin Helmut, Vienna</i>) Improve public space by Right of way Management (<i>Valeria Caiati, TU Eindhoven</i>) (<i>Mélanie Gidel, Paris</i>)	In both LS and ES 'Improve Infrastructural planning based on Route Udage/Demand' is mentioned as a value adding aspect of a data standard.

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		<p>Improve Infrastructural planning based on Route Usage/Demand <i>(Jorge G. Coelho, Faro)</i> <i>(Valeria Caiati, TU Eindhoven)</i> <i>(Mélanie Gidel, Paris)</i> <i>(TfGM, Greater Manchester)</i> <i>(Vasco Mora, Lisbon)</i> <i>(Suvi Kajamaa, Espoo)</i> <i>(Jorge G. Coelho, Faro)</i></p> <p>Remove conflicts with Curb Management <i>(Mélanie Gidel, Paris)</i></p>	<p>In LS the sub-topic 'Road Safety' is discussed as a value adding aspect, however in ES this aspect is not present.</p> <p>A reason for this could be that mobility teams do not see road safety as their objective, or because it is not the main purpose of a data standard for shared mobility.</p> <p>In ES Augustin Helmut mentioned 'Improve urban planning' as a value adding aspect in a general matter.</p> <p>The sub-topics 'Improve public space by Right of way Management' and 'Remove conflict with Curb Management' are solely mentioned in ES.</p>
Monitor shared mobility	✗	<p>✓</p> <p>Travel patterns <i>(Sami Sahala, Helsinki)</i> <i>(Mélanie Gidel, Paris)</i> <i>(Yuki Tol, Amsterdam)</i> <i>(TfGM, Greater Manchester)</i></p> <p>Insight in trip duration <i>(Mélanie Gidel, Paris)</i></p> <p>Insight in trip distance <i>(Mélanie Gidel, Paris)</i></p>	<p>The sub-concept 'Monitor shared mobility' is not present in LS. A potential reason for this could be the infancy state of data standards for shared mobility operators and the lack of</p>

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		<p>Insight in hourly fleet utilization (Valeria Caiati, TU Eindhoven)</p> <p>Availability data (Mélanie Gidel, Paris) (Martin Le Franc, Bruxelles)</p> <p>Status assets (Mélanie Gidel, Paris) (Martin Le Franc, Bruxelles)</p> <p>Parking area performance (Vasco Mora, Lisbon)</p>	scientific literature about this topic.
Regulate shared mobility	<p>✓</p> <p>Regulate parking zones (Baltra, G et al., 2020)</p> <p>Regulate driving zones (Baltra, G et al., 2020)</p>	<p>✓</p> <p>Regulate parking zones (Jorge G. Coelho, Faro) (Martin Le Franc, Bruxelles)</p> <p>Regulate vehicle caps (Suvi Kajamaa, Espoo) (Mélanie Gidel, Paris)</p> <p>Regulate driving zones (Jorge G. Coelho, Faro)</p> <p>Regulate sidewalks (Mélanie Gidel, Paris)</p> <p>Regulate slow speed zones (Jorge G. Coelho, Faro)</p>	<p>In both LS and ES the sub-concept 'Regulate shared mobility' is mentioned as a value adding aspect of a data standard.</p> <p>In both the sub-topics 'Regulate parking zones' and 'Regulate 'Parking driving zones' are discussed.</p> <p>In ES three additional regulatory possibilities are called upon.</p>
Support policy analysis and execution	<p>✓</p> <p>Stimulation of shared mobility</p> <p>Traffic management</p> <p>Decreasing air pollution through less private car ownership (Garau, C., Pavan, V. M., 2013)</p> <p>Inclusivity</p>	<p>✓</p> <p>Blind people use case; polluted sidewalks notification (Sami Sahala, Helsinki)</p> <p>Publish open data for research (Jorge G. Coelho, Faro)</p> <p>Increase equity and public space by distribution requirements</p>	<p>In both LS and ES the sub-concept 'Support policy analysis and execution' is mentioned as a value adding aspect of a data standard.</p> <p>Both LS and ES identify</p>

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	<p>(Sourbati, M. & Behrendt, F., 2020)</p>	<p>(Valeria Caiati, TU Eindhoven) (TfGM, Greater Manchester) Impact on transit analysis (Mélanie Gidel, Paris) Increase personalized travel options (Valeria Caiati, TU Eindhoven) (TfGM, Greater Manchester) Publish open data as incentive (Sami Sahala, Helsinki) Car reduction analysis (Mélanie Gidel, Paris)</p>	<p>inclusivity/equity as policy goal.</p> <p>LS and ES share commonalities, because 'Publish open data as incentive' is a way of 'Stimulation of shared mobility'.</p> <p>Moreover, 'Decreasing air pollution through less private ownership' has commonalities with 'Car reduction analysis'.</p> <p>However, the 'Car reduction analysis' and 'Transit impact analysis', both indicate that in ES, in contrast to LS, the interviewees are not entirely sure whether shared mobility replaces other forms of transport.</p> <p>In ES additional sub-topics are raised concerning specific policies that could be supported by data standards.</p>
Concept: Opportunities in design	Results in literature study	Results in empirical study	Clarification
Clear use case mapping	X	✓ (Helsinki x Amsterdam) (Thierry Vanellander and Elnert)	The sub-concept 'Clear use case mapping' is not present in LS.

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		<p><i>Coenegrachts, University of Antwerp)</i> Target reasoning for clear vision <i>(Ross Curzon-Butler, Amsterdam)</i> <i>(Geert Pater & Peter Jager, RDW)</i> <i>(Martin Le Francq, Bruxelles region)</i> <i>(Philippe Crist, ITF)</i> <i>(Sami Sahala, Helsinki)</i> <i>(Vasco Mora, Lisbon)</i> Processing grounds GDPR <i>(Beryl Dreijer, Amsterdam)</i> <i>(Geert Pater & Peter Jager, RDW)</i> <i>(Karen Cluysen, Polis)</i> <i>(Philippe Crist, ITF)</i></p>	<p>A potential reason for this could be the infancy state of data standards for shared mobility operators and the lack of scientific literature about this topic.</p>
<p>Co-designing a data standard with market parties</p>	<p>✓ Qualitative design <i>(Polydoropoulou, A. et al, 2020)</i> Upscaling data governance and MaaS <i>(Yanying, L., Voegelé, T., 2017) (Fenton, P. et al, 2020)</i></p>	<p>✓ <i>(NeTEx x Amsterdam)</i> Foster relationship cities and market parties <i>(Ross Curzon-Butler)</i> <i>(Mikael Ivari, Gothenborg)</i> <i>(Thierry Vanellander and Elnert)</i> <i>Coenegrachts, University of Antwerp)</i> Qualitative design <i>(Mikael Ivari, Gothenborg)</i></p>	<p>In both LS and ES the sub-concept 'Co-designing a data standard with market parties' is mentioned as an opportunity in design.</p> <p>In both LS and ES the sub-topic 'Qualitative design' is present. Both studies agree that market parties can deliver high quality designs.</p> <p>LS and ES share commonalities in sub-topics, because for the 'Upscaling of data governance and MaaS' strong relationships and</p>

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			cooperation between cities and market parties is needed, 'Foster relationship cities and market parties'.
Collaboration with the Open Mobility Foundation (OMF)	X	✓ (Open Mobility Foundation x Amsterdam) (Vasco Mora, Lisbon)	The sub-concept 'Collaboration with the Open Mobility Foundation' is not present in LS. Potential reasons could be that the OMF is a young organization and moreover data standards are not theoretical subjects, they are computational designs which are often described in reports or websites like GitHub not in scientific literature.
Cooperation with departments in the municipality to map data needs and possibilities	X	✓ (Helsinki x Amsterdam) Foster digitalization throughout the whole organization (Philippe Crist, ITF) (Sami Sahala, Helsinki) Align design to data needs (Philippe Crist, ITF) (Sami Sahala, Helsinki)	The sub-concept 'Cooperation with departments in the municipality to map data needs and possibilities' is not present in LS. This sub-concept is a municipal issue and therefore not visible in the scientific literature.
Cooperation with NeTEx (CEN)	X	✓ (Amsterdam x NeTEx)	'Cooperation with NeTEx' is not present in LS.

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			Data standards are not theoretical subjects, they are computational designs. NeTEx is solely described in reports of CEN and therefore not present in scientific literature.
Cooperation with other European cities on design and use case development	X	<p>✓ (Augustin Helmut, Vienna) (Vasco Mora, Lisbon) Accelerating the digitization process of cities (Benjamin Rabenstein and Frederik Mehler, Berlin) (Geert Pater and Peter Jager, RDW) (Vasco Mora, Lisbon) Increase of adoption by market parties throughout Europe (Geert Pater and Peter Jager, RDW) (Sarah Eskens, UvA)</p>	<p>The sub-concept 'Cooperation with other European cities on design and use case development' is not present in LS.</p> <p>Potential reasons for this could be the specificity or the infancy state of data standards for shared mobility operators and the lack of scientific literature about this topic.</p>
Joining European funded projects	<p>✓ Subsidized European projects (Li, Y. & Voegelé, T., 2017) (Polydoropoulou, A. et al, 2020)</p>	<p>✓ CEN-standard (Amsterdam x NeTEx) Subsidized European projects (Geert Pater and Peter Jager, RDW) (Marin le Francq, Bruxelles region) (Philippe Crist, ITF)</p>	<p>Both in LS and ES the sub-concept 'Joining European funded projects' is mentioned as an opportunity in design.</p> <p>Both LS and ES identify the sub-topic 'Subsidized European projects'.</p> <p>In ES the specific opportunity to collaborate with CEN is raised.</p>

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Partnerships	<p>✓</p> <p>Upscaling data governance and MaaS (Sochor, J. et al, 2015) (Yanying, Li. and Voegel, T., 2017)</p>	<p>✓</p> <p>Collaboration with the Open Mobility Foundation (Open Mobility Foundation X Amsterdam) (Vasco Mora, Lisbon)</p>	<p>Both in LS and ES the sub-concept 'Partnerships' is mentioned as an opportunity in design.</p> <p>LS and ES share commonalities in sub-topics, because for the 'Upscaling of data governance and MaaS', 'Collaboration with the Open Mobility Foundation' could support this development.</p>
Privacy enhancing techniques	<p>✓</p> <p>K-anonymity (Zhang, S. et al, 2019) (Zouinina S. et al, 2020)</p> <p>Differential privacy (Callegati, F. et al, 2015)</p>	X	<p>In ES the sub-concept 'Privacy enhancing techniques' is not seen as an opportunity, it is seen as the norm.</p>
Willingness to align European data standards	X	<p>✓</p> <p>(Amsterdam x NeTEx) (Jorge G. Coelho, Faro) (Philippe Crist, ITF) (Sergio Fernández Balaguer, Madrid) (Vasco Mora, Lisbon) (Gemma Schepers, Amsterdam)</p>	<p>The sub-concept 'Willingness to align European data standards' is not present in LS, because no previous empirical research has been executed on the subject.</p>
Concept: Bottlenecks in design	Results literature study	Results empirical study	Clarification
Discussion on detailedness and purpose of data standard	<p>✓</p> <p>Regulatory v.s. urban planning (Zheng, Y et al, 2014)</p>	<p>✓</p> <p>(Sami Sahala, Helsinki) Aggregated trip data for urban planning (Augustin Helmut, Vienna)</p>	<p>In both LS and ES the sub-concept 'Discussion on detailedness and purpose of data standard' is</p>

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		<p>(Benjamin Rabenstein and Frederik Mehler, Berlin) (Ross Curzon-Butler) (Tijs de Kler, Amsterdam) Detailed trip data for regulating (Open Mobility Foundation) Detailed availability data for regulating (Open Mobility Foundation) Detailed raw data offers flexibility (Ruud Mollema, Ministry of I&W) Detailed trip data for urban planning (Mélanie Gidel, Paris) (Vasco Mora, Lisbon)</p>	<p>mentioned as bottleneck in design.</p> <p>LS and ES share commonalities in sub-topics, because distinct requests for data are necessary for different purposes.</p> <p>Opinions differ on this, as can be seen in the sub-topics of ES which show that some interviewees think aggregated data for urban planning is sufficient, while others demand detailed data too.</p>
Flexibility data standard	X	<p>✓ (Augustin Helmut, Vienna) (Open Mobility Foundation) (Ruud Mollema, Ministry I&W) (Martin le Francq, Bruxelles region) (Sami Sahala, Helsinki) (Yuki Tol, Amsterdam)</p>	<p>The sub-concept 'Flexibility data standard' is not present in LS.</p> <p>A potential reason for this could be the infancy state of data standards for shared mobility operators and the lack of scientific literature about this topic.</p>
Lack of mapping needs and use cases	X	<p>✓ (Karen van Cluysen, Polis) (Philippe Crist) (Jorge G. Coelho)</p>	<p>The sub-concept 'Lack of mapping needs and use cases' is not present in LS.</p> <p>A potential reason for this could be the infancy state of data standards for shared mobility operators</p>

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			and the lack of scientific literature about this topic.
Privacy discussion	<p>✓</p> <p>Ethics of privacy (De Montjoye, Y. A., 2013) (van der Sloot, B. & de Groot, A., 2018) (Roessler, B. & Moore, D., 2020)</p> <p>Auxiliary information (Mohan, P. et al, 2012) (Callegati, F. et al, 2015) (McSherry, F., 2019)</p>	<p>✓</p> <p>(TfGM, Greater Manchester) (De Roos advocaten)</p> <p>MDS is GDPR compliant if clear target reasoning is executed and the principles of GDPR are adhered to (Beryl Dreijer, Amsterdam) (Sarah Eskens, UvA) (Thierry Vanelsander and Elnert Coenegrachts, University of Antwerp) (Philippe Crist, ITF)</p> <p>Not much difference legally in using a third party in terms of privacy (Beryl Dreijer, Amsterdam)</p> <p>Of the conviction that data brokers working with MDS are GDPR compliant (Augustin Helmut, Vienna) (Jorge G. Coelho, Faro) (Martin le Francq, Bruxelles region) (Suvi Kajamaa, Espoo)</p> <p>GDPR is an open standards framework (Beryl Dreijer, Amsterdam) (Yuki Tol, Amsterdam)</p> <p>Subjective interpretation of the 'reasonable means criterium'</p>	<p>In both LS and ES the sub-concept 'Privacy discussion' is mentioned as bottleneck in design.</p> <p>The sub-topic 'Ethics of privacy' was mentioned in both LS and ES. Only Yuki Tol was interviewed as a social scientist, so this sub-topic was mentioned little in the interviews.</p> <p>LS and ES share commonalities in sub-topics, because in the 'Subjective interpretation of the reasonable means criteria', 'Auxiliary information' is seen as non-dangerous, while in the 'Objective interpretation of the reasonable means criteria' it is seen as a dangerous threat to privacy.</p> <p>Additional sub-topics in ES that substantiate the 'Privacy discussion' are either about specific data standards, data management models, the GDPR, or municipal issues,</p>

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		<p><i>(Beryl Dreijer, Amsterdam)</i> <i>(Augustin Helmut, Vienna)</i> <i>(Valeria Caiati, TU Eindhoven)</i></p> <p>Not enough expertise in municipalities to properly manage open data policies <i>(Beryl Dreijer, Amsterdam)</i></p> <p>Using a Trusted Third Party enhances GDPR compliance <i>(Sami Sahala, Helsinki)</i> <i>(Suvi Kajamaa, Espoo)</i></p> <p>Concerns about whether full version of MDS is GDPR compliant <i>(Karen van Cluysen, Polis)</i> <i>(Mélanie Gidel, Paris)</i> <i>(Vasco Mora, Lisbon)</i></p> <p>Target reasoning is needed for GDPR compliance <i>(Beryl Dreijer, Amsterdam)</i> <i>(Karen van Cluysen, Polis)</i> <i>(Geert Pater and Peter Jager, RDW)</i> <i>(Martin le Francq, Bruxelles region)</i> <i>(Philippe Crist, ITF)</i></p> <p>Ethics of privacy <i>(Mikael Ivari, Gothenborg)</i> <i>(Yuki Tol, Amsterdam)</i></p> <p>Objective interpretation of the 'reasonable means criterium' <i>(De Roos advocaten)</i></p>	<p>which are all described in reports, documents or empirical results and thus not present in scientific literature.</p>
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		<p>Anonymized datasets qualify as personal data if the raw data is not deleted <i>(De Roos advocaten)</i> A cloud-based system is not necessary and therefore the use of data brokers is privacy intrusive <i>(Vasco Mora, Lisbon)</i></p>	
Too broad data standard that is difficult to use for cities	X	<p>✓ <i>(OMF x Amsterdam)</i> <i>(Philippe Crist, ITF)</i> <i>(Vasco Mora, Lisbon)</i></p>	<p>The sub-concept 'Too broad data standard that is difficult to use for cities' is not present in LS.</p> <p>This could be due to the cities' perspective of the sub-topic or to the infancy of the subject.</p>
Concept: Practical possibilities in design	Results literature study	Results empirical study	Clarification
CDS-M	X	<p>✓ <i>(Amsterdam)</i></p>	<p>The sub-concept 'CDS-M' is not present in LS, because the CDS-M is still in the research and development phase.</p>
European version of MDS	X	<p>✓ <i>(Jorge G. Coelho)</i> <i>(Amsterdam)</i> <i>(Vasco Mora, Lisbon)</i></p>	<p>The sub-concept 'European version of MDS' is not present in LS, because MDS is a relatively new data standard and therefore there is little scientific</p>

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			literature on this topic.
GBFS	✓ (Baltra, G et al., 2020)	✓ (Vasco Mora, Lisbon) (Mélanie Gidel, Paris) (Ross Curzon-Butler) (Martin le Francq, Bruxelles region)	In both LS and ES the sub-concept 'GBFS' is mentioned as practical possibility is design.
MDS	✓ (Baltra, G et al., 2020)	✓ (Sami Sahala, Helsinki) (Amsterdam x NeTEx) (Philippe Crist, ITF) (Open Mobility Foundation) (Martin le Francq, Bruxelles region) (Vasco Mora, Lisbon) (Mélanie Gidel, Paris) (Jorge G. Coelho, Faro) (Beryl Dreijer, Amsterdam) (Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp) (Karen van Cluysen, Polis) (Augustin Helmut, Vienna)	In both LS and ES the sub-concept 'MDS' is mentioned as practical possibility is design. MDS was the first data standard specifically designed for cities to understand shared mobility.
Metrics API (MDS)	✗	✓ (OMF x Amsterdam)	The sub-concept 'Metrics API' is not present in LS, because MDS is a relatively new data standard and therefore there is little scientific literature on this topic.
NeTEx (CEN)	✗	✓ (Martin le Francq, Bruxelles region) (Sergio Fernández Balaguer, Madrid) (Amsterdam x NeTEx)	The sub-concept 'NeTEx' is not present in LS, because CEN standards are described in reports.

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			In addition, data standards for shared mobility are in its infancy and therefore no analysis have been made in scientific literature on these data standards yet.
Oslo standard	X	✓ (<i>Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp</i>)	The sub-concept 'Oslo standard' is not present in LS. Data standards for shared mobility are in its infancy and therefore no analysis have been made in scientific literature on these data standards yet.
Opra (CEN)	X	✓ (<i>Amsterdam x NeTEx</i>)	The sub-concept 'Opra' is not present in LS, because the standard is still in development.
Shared street MDS	X	✓ (<i>Philippe Crist, ITF</i>)	The sub-concept 'Shared streets' is not present in LS, because MDS is a relatively new data standard and therefore there is little scientific literature on this topic.
SIRI (CEN)	X	✓ (<i>Amsterdam x NeTEx</i>)	The sub-concept 'SIRI' is not present in LS, because CEN standards are described in reports.

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			In addition, data standards for shared mobility are in its infancy and therefore no analysis have been made in scientific literature on these data standards yet.
SIVU	X	✓ (<i>Mélanie Gidel, Paris</i>)	The sub-concept 'SIVU' is not present in LS. Data standards for shared mobility are in its infancy and therefore no analysis have been made in scientific literature on these data standards yet.
TOMP-API	X	✓ (<i>Amsterdam</i>)	The sub-concept 'TOM-API' is not present in LS. Data standards for shared mobility are in its infancy and therefore no analysis have been made in scientific literature on these data standards yet.
Concept: Opportunities in implementation	Results in literature study	Results empirical study	Clarification
Demand for a European standard from cities	✓ Increase effectiveness policy execution (<i>Polydoropoulou, A. et al, 2020</i>) Need for data standards for MaaS (<i>Zheng, Y. et al, 2014</i>)	✓ (<i>Karen van Cluysen, Polis</i>) (<i>Thierry Vanelsander and Elnert Coenegrachts, University of Antwerp</i>) (<i>Sami Sahala, Helsinki</i>)	In both LS and ES the sub-concept 'Demand for a European standard from cities' is mentioned as 'Opportunity in implementation'.

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	<p>(Sochor, J. et al, 2015) (Jittrapirom, P. et al. 2017) (Haveman, S. et al, 2019) (Polydoropoulou, A. et al, 2020)</p>	<p>Need for data standards for MaaS (Mélanie Gidel, Paris) (TfGM, Greater Manchester) Increase effectiveness policy execution (Vasco Mora, Lisbon) (Benjamin Rabenstein and Frederik Mehler, Berlin)</p>	<p>The same sub-topics are raised in LS and ES. Both studies identify 'Increase effectiveness' and 'Need for data standards for MaaS' as the main reasons for the demand for a European standard from cities.</p>
<p>Demand for a European data standard from operators</p>	<p>✗</p>	<p>✓ Convenience (Mélanie Gidel, Paris) (Sami Sahala Helisnki) (Karen van Clusyen, Polis)</p>	<p>The sub-concept 'Demand for a European data standard from operators' is not present in LS.</p> <p>This could be due to the infancy state of data standards for shared mobility operators and the lack of scientific literature about this topic.</p>
<p>Joint trust</p>	<p>✓ Sufficient cooperation (Kuan Cheong, L et al, 2007) (Janssen, M. et al, 2012) (Thompson, N et al, 2015) (Paskaleva, K. et al, 2017) (Yadav, P. et al, 2017)</p>	<p>✓ Sufficient cooperation (Beryl Dreijer, Amsterdam) (Mikael Ivari, Gothenborg) (Helsinki x Amsterdam) (OMF x Amsterdam) (Vasco Mora, Lisbon)</p>	<p>Both in LS and ES the sub-concept 'Joint trust' is mentioned as 'Opportunity in implementation'.</p> <p>Both studies identify 'Sufficient cooperation' as the main driver of building this trust.</p>
<p>Pilot strategy</p>	<p>✓ Increased learning and cooperation (Sochor, J. et al, 2015) (Yanying, L., Voegel, T., 2017)</p>	<p>✓ Increased learning and cooperation (Suvi Kajamaa, Espoo) (Geert Pater and Peter Jager, RDW)</p>	<p>Both in LS and ES the sub-concept 'Pilot strategy' is mentioned as</p>

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		<p>(Martin le Francq, Bruxelles region) (Sami Sahala, Helsinki) (Vasco Mora, Lisbon)</p>	<p>'Opportunity in implementation'. Both studies identify 'Increased learning and cooperation' as the main benefit of the 'Pilot strategy'.</p>
Strong legal framework	X	<p>✓ (Vasco Mora, Lisbon) (Jorge G. Coelho, Faro) (Martin le Francq, Bruxelles region) (Augustin Helmut, Vienna) (Sergio Fernández Balaguer, Madrid) (Philippe Crist, ITF) (Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp) (Karen van Cluysen, Polis) (Mélanie Gidel, Paris)</p>	<p>The sub-concept 'Strong legal framework' is not present in LS. This could be due to the infancy state of data standards for shared mobility operators and the lack of scientific literature about these data standards and their implementation.</p>
Win-win offer	<p>✓ Cities support shared mobility, market parties deliver data (Li, Y., Voegelé, T., 2017) (Cottrill, C. D., 2020)</p>	<p>✓ (Interview Thierry Vanelslander and Elnert Coenegrachts, University of Antwerp) (Vasco Mora, Lisbon) Cities support shared mobility, market parties deliver data (Helsinki x Amsterdam) (Valeria Caiati) (Suvi Kajamaa, Espoo) Better image shared mobility, Market parties deliver data (Helsinki x Amsterdam)</p>	<p>In both LS and ES the sub-concept 'Win-win offer' is mentioned as 'Opportunity in implementation'. Both studies identify 'Cities support shared mobility, market parties deliver data' as a possible win-win offer. In addition, in ES Helsinki raises the win-win offer 'Better image shared mobility,</p>

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Concept: Bottlenecks in implementation	Results literature study	Results empirical study	Market parties deliver data'. Clarification
Difficulties to institutionalize on a European level	✗	<p>✓</p> <p>Long term bureaucratic system <i>(Geert Pater and Peter Jager, RDW)</i> <i>(Ross Curzon-Butler in Amsterdam x Netex)</i></p> <p>Not directly falling within one General Directive <i>(Geert Pater and Peter Jager, RDW)</i></p> <p>The standard must represent a major public task and fall under a European regulation or ISO standard <i>(Geert Pater and Peter Jager, RDW)</i></p> <p>A European project could be subsidized only if the standard is widely adopted in the European Area <i>(Geert Pater and Peter Jager, RDW)</i></p>	<p>The sub-concept 'Difficulties to institutionalize on a European level' is not present in LS.</p> <p>This sub-concept is about governance structures which are rather a practical issue than theoretically proficient.</p>
Discussion implementor	✗	<p>✓</p> <p><i>(Sergio Fernández Balaguer, Madrid)</i></p>	<p>The sub-concept 'Discussion implementor' is not present in LS.</p> <p>This could be due to the infancy of data standards for shared mobility and the lack of literature on these data standards and</p>

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			their implementation.
Discussion role of municipality	✗	<p>✓ (Bruxelles) (Helsinki) (Suvi Kajamaa, Espoo) (Sami Sahala, Helsinki) (Karen van Cluysen)</p> <p>Economically more advantageous to outsource data processing (Sami Sahala, Helsinki) (Augustin Helmut, Vienna)</p> <p>Prevent fender lock-ins and enhance digital expertise of cities, by acting as processor and controller (Vasco Mora, Lisbon) (Suvi Kajamaa, Espoo)</p> <p>Outsourcing data processing speeds up the digitization process (Suvi Kajamaa, Espoo)</p> <p>Act as processor to ensure the privacy of operators (Vasco Mora, Lisbon)</p> <p>Act as processor for upscaling MaaS (Valeria Caiati, TU Endhoven)</p> <p>Outsourcing data processing, in such the communication is B to B which increases the feeling of privacy of operators (Sami Sahala, Helsinki)</p>	<p>The sub-concept 'Discussion role of municipality' is not present in LS.</p> <p>This could be due to the infancy of data standards for shared mobility and the lack of literature on these data standards and their implementation.</p>
Insufficient social adoption of cities due to privacy concerns	✓ (Cottrill, C. D., 2020)	✓ (Mikael Ivari, Gothenborg)	In both LS and ES the sub-concept 'Insufficient social adoption of cities

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			due to privacy concerns' is mentioned as 'Bottleneck in implementation'.
Lack of data governance capabilities of cities	<p>✓ (Kuan Cheong, L. et al, 2007) (Janssen, M et al, 2012)</p>	<p>✓ (Ross Curzon-Butler, Amsterdam) (Karen van Cluysen, Polis) (Mélanie Gidel, Paris) (Sami Sahala, Helsinki) (Benjamin Rabenstein and Frederik Mehler, Berlin) (Sergio Fernández Balaguer, Madrid) (Vasco Mora, Lisbon) (Helsinki) (Mikael Ivari, Gothenburg) (Geert Pater and Peter Jager, RDW) (Beryl Dreijer, Amsterdam) (TfGM, Greater Manchester) (Jorge G. Coelho, Faro)</p>	In both LS and ES the sub-concept 'Lack of data governance capabilities of cities' is mentioned as 'Bottleneck in implementation'.
Lack of regulations	<p>✗</p>	<p>✓ (Sami Sahala, Helsinki) (Benjamin Rabenstein and Frederik Mehler, Berlin) (Sergio Fernández Balaguer, Madrid) (Suvi Kajamaa, Espoo)</p>	<p>The sub-concept 'Lack of regulation' is not present in LS.</p> <p>This could be due to the infancy of data standards for shared mobility and the lack of literature on these data standards and their implementation.</p>
Lack of technical capabilities of shared mobility operators	<p>✗</p>	<p>✓ (Mélanie Gidel, Paris) (Vasco Mora, Lisbon) (OMF x Amsterdam) (Sami Sahala, Helsinki)</p>	The sub-concept 'Lack of technical capabilities of shared mobility

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			operators' is not present in LS. This could be due to the infancy of data standards for shared mobility and the lack of literature on these data standards and their implementation.
No urgency for the use of data standards	✗	✓ (Geert Pater and Peter Jager, RDW) (Suvi Kajamaa, Espoo) Traffic department and urban planners (Amsterdam) (Sami Sahala, Helsinki)	The sub-concept 'No urgency for the use of data standards' is not present in LS. This sub-concept has an empirical character. Since there has not been empirical research on this topic, the sub-concept is not present in LS.
Reduced marked adoption due to commercially sensitive data	✓ (Kuan Cheong, L. et al, 2007) (Janssen, M. et al, 2012) (Paskaleva, K. et al, 2017) (Yadav, P. et al, 2017)	✓ (Beryl Dreijer, Amsterdam) (Thierry Vanellander and Elnert Coenegrachts, University of Antwerp) (OMF x Amsterdam) (Benjamin Rabenstein and Frederik Mehler, Berlin) (Vasco Mora, Lisbon) (Sami Sahara, Helsinki) (Karen van Cluysen, Polis) (Mikael Ivari, Gothenborg) (Jorge G. Coelho, Faro)	In both LS and ES the sub-concept 'Reduced marked adoption due to commercially sensitive data' is mentioned as 'Bottleneck in implementation'.
Reduced market adoption due to the market monopoly of a Big Tech company	✓ (Li, Y., Voegelé, T., 2017)	✓ (Geert Pater and Peter Jager, RDW)	In both ES and LS the sub-concept 'Reduced market

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			adoption due to the market monopoly of a Big Tech company' is mentioned as 'Bottleneck in implementation'.
Reduced market adoption due to lack of target reasoning	✗	✓ (TfGM, Greater Manchester) (Philippe Crist, ITF) (Karen van Cluysen, Polis)	The sub-concept 'Reduced market adoption due to lack of target reasoning' is not present in LS. This could be due to the fact that this sub-concept is rather a practical governance issue, than a theoretical matter.
Reduced market adoption due to privacy concerns	✓ (Cottrill, C. D., 2020)	✓ (Beryl Dreijer, Amsterdam) (Sami Sahala, Helsinki) (Karen van Cluysen, Polis) (Jorge G. Coelho, Faro)	In both LS and ES the sub-concept 'Reduced market adoption due to privacy concerns' is mentioned as 'Bottleneck in implementation'.
Trust issues	✓ Distrust market parties in data governance cities (Thompson, N. et al, 2015)	✓ Distrust cities in market parties in delivering qualitative data (Open Mobility Foundation) Distrust cities in data brokers (Amsterdam) (Vasco Mora, Lisbon) Distrust market parties in data governance cities (Thierry Vanellander and Elnert Coenegrachts, University of Antwerp)	In both LS and ES the sub-concept 'Trust issues' is mentioned as 'Bottleneck in implementation'. Both studies identified the sub-topic 'Distrust market parties in data governance cities' as a form of trust issues. In ES additional sub-topics are raised.

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			The sub-topics 'Distrust cities in market parties in delivering qualitative data' and 'Distrust cities in data brokers'.
Concept: Practical possibilities in implementation	Results literature study	Results empirical study	Clarification
City data management	X	✓ (Vasco Mora, Lisbon) (Beryl Dreijer, Amsterdam) (Jorge G. Coelho, Faro)	The concept 'Practical possibilities in implementation' and all relating sub-
Combination of standards	X	✓ (Philippe Crist, ITF) (Amsterdam x NeTEx) (Sami Sahala, Helsinki)	concepts are not present in LS. This could be due to the infancy of data
MaaS map and toolkit data management	X	✓ (Philippe Crist, ITF) (Sami Sahala, Helsinki) (Jorge G. Coelho, Faro) (Suvi Kajamaa, Espoo) (TfGM, Greater Manchester) (Martin le Francq, Bruxelles region)	standards for shared mobility and the lack of literature on these data standards and their implementation.
Trusted Third Partner	X	✓ (Sami Sahala, Helsinki) (Suvi Kajamaa, Espoo) (Benjamin Rabenstein and Frederik Mehler, Berlin) (Jorge G. Coelho, Faro) (De Roos advocaten) (Sarah Eskens, UvA) (Martin le Francq, Bruxelles region) (Karen van Cluysen, Polis) (Geert Pater and Peter Jager, RDW) (Augustin Helmut, Vienna)	

Municipality of Amsterdam
Smart Mobility Team

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shared mobility operators

		<i>(Helsinki)</i> <i>(Open Mobility Foundation)</i> <i>(Ruud Mollema, Ministry of I&W)</i> <i>Jorge G. Coelho, Faro)</i> <i>(Thierry Vanellander and Elnert Coenegrachts, University of Antwerp)</i>	
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