URBANIZED

MODULAR AND FLEXIBLE SOLUTIONS FOR URBAN-SIZED ZERO-EMISSIONS LAST-MILE DELIVERY & SERVICES VEHICLES

URBANIZED D8.2: Summary of first observatory insights collected

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Executive summary

The URBANIZED observatory aims to be a resource for logistics operators, suppliers, policymakers, and others interested in urban freight transport to stay up to date with the latest trends and best practices in the field. This deliverable is aimed to gather knowledge on transport-related observatories and strategize the URBANIZED observatory accordingly.

Aiming to understand the structure and added value of existing observatories, we've firstly performed a brief benchmark, presenting the positioning, content and resource strategy behind different transport related observatories analysed. Being our aim to collaborate with them and provide something unique to the community, we have started engaging with the different leads to explore cooperation. Building upon that, we define the strategy proposed for the URBANIZED observatory, both on the quantitative and qualitative insights.

This deliverable represents the launch of our observatory, which will comprise multiple publications over the next two years. In this sense, a tentative schedule of the expected releases is detailed in Table 2, combining purely qualitative insights with quantitative evidence. We finalise this deliverable anticipating the first qualitative insight that will be released by the observatory, ´Fuelling data-driven UFT policies´, focused on the data gap in Urban Freight Transport policies. All knowledge and publications will be disseminated under a dedicated subsection in the official project website, together with promotion via the different URBANIZED accounts.

Table of contents

List of tables

1. About URBANIZED

URBANIZED stands for modUlaR and flexible solutions for urBAN-sIzed Zero-Emissions last-mile Delivery and services vehicles.

URBANIZED aims to prepare urban settings for the future by integrating flexibility and adaptability through modularity in the design of all-electric Light Commercial Vehicles (LCVs), to cover the rapid growth and the changing nature of deliveries and on-demand urban freight transportation (UFT) services while reducing the number of necessary vehicles and dramatically improving last-mile delivery operations.

URBANIZED will work and deliver innovations at 3 levels:

At vehicle systems level: URBANIZED will contribute to solving current automotive manufacturing challenges related to the trade-offs between standardisation and customisation when developing modular vehicle architectures that can serve various user needs by reducing the cost of modularity in each fit-for-purpose application, thus being able to radically reduce production costs for both mainstream and niche applications.

At vehicle level: URBANIZED will contribute to increasing the market offer and uptake of high-performance, urban sized, zero-emission LCVs optimised for urban and suburban operations that will cover present and increasing future demand for these vehicles by offering superior solutions to the alternatives used today for equivalent missions.

At fleet level: URBANIZED will solve the trade-off between 'One size fits all' and 'Design for purpose' approaches when operating mixed fleets of small commercial vehicles thanks to modular vehicle architectures and adaptable energy management systems designed to increase the usability experience while reducing fleet investments and operational costs.

The overarching objective of URBANIZED is to develop and demonstrate a new flexible and modular vehicle platform for small commercial e-vehicles, satisfying design principles of right-sizing vehicles for specific missions in three dimensions: (1) high-performance e-powertrain components and control architectures, through the use of advanced hardware and software co-design approaches; (2) interchangeable, plug & play cargo modules for different use case scenarios and; (3) integrated energy and fleet management strategies using data, connectivity and predictive control algorithms.

The project will produce a comprehensive methodology of the process with its results, challenges and recommendations for solutions to be replicated. Aiming at broadening dissemination and impact, URBANIZED defines an extended partnership, involving 3 satellite cities (Groningen, Madrid and Bergen) committed to CO2-emissions free logistics in their city centres by 2030 and a high-volume OEM highly positioned in the LCV market, all interested in replicability of project results.

2. Introduction

Similar to decision-making in many other fields, Urban Freight Transport (UFT) policy and operations planning is becoming increasingly data-driven, which requires an increased amount of information. To sustain this trend, decision-makers will need to rely on an increased base of up-to-date knowledge. Therefore, it is key to know what trends to prioritize on and receive informative data on emerging trends in the field. Generally, current available data is scattered across stakeholders and often not comprehensive enough for decision-making. The URBANIZED project intends to fill this gap by launching an observatory containing both qualitative as quantitative information on trends and important Key-Performance-Indicators (KPI's) of the UFT ecosystem. Observatories are periodical documents or online platforms, created to better inform or provide tools for decision-makers to master their respective field and the changes/trends occurring within. Consequently, this deliverable has been created to study transport related observatories and strategize the URBANIZED observatory accordingly to maximize its added value.

3. Benchmark

3.1 Included observatories

The included observatories in this benchmark are presented in table 2.1. Since the number of logistics-related observatories is not extensive, a wide scope has been applied to gather more insights. The scope here lies on the observatories that include either transport or logistics elements, since this is the field in which the URBANIZED observatory will operate. An additional requirement is the reporting on upcoming trends or insights into the status of logistic systems. These requirements were considered to guarantee an observatory´s relevance for supporting data-driven decision-making, which is also the goal of the URBANIZED observatory.

Included observatories vary largely, however, they were assessed on the same topics which are discussed in this chapter. The variety of observatories gives an interesting insight into the variety of possibilities for the URBA observatory.

Table 1: Studied observatories

Organisation/Project	Topics
International collaborative observatories[1]	
CityLab	Urban logistics
TInnGO	Gender and mobility issues
UITP	Public transport
Eltis	Urban Mobility
UlaadS	On-demand Urban Freight Transport
ITS observatory consortium	Intelligent Transport Systems
Private / Local observatories[2]	
CIMALSA logistics observatory	Catalan logistic systems
DHL Logistics Trend Radar	Global logistics trends
University Gustave Eiffel	E-commerce

[1] https://www.citylab.soton.ac.uk/deliverables/D2_1.pdf
https://transportgenderobservatory.eu/
https://www.uitp.org/data/
https://www.eltis.org/
https://ulaads.eu/360-observatory/
https://its-observatory.eu/

[2] https://cimalsa.cat/observatori-logistica.php
https://www.dhl.com/global-en/home/insights-and-innovation/insights/logistics-trend-radar.html
https://www.ecommercemobilities.com/

3.2 Content analysis

3.2.1 Positioning-content fit

Among the studied observatories two types of main variants were identified:

- Periodical document (Cimalsa, CityLab)

The presented content is comprehensive, spanning over multiple subjects, combining both qualitative and quantitative information. The three yearly CityLab observatory versions reported on 4 large themes: Urban sprawl, E-commerce, Circular Economy and Service Trips. Cimalsa offers a yearly quantitative report on the following topics: socioeconomics, infrastructure, supply and demand, logistics real estate, efficiency, urban logistics and start-ups. Both observatories are more likely to be used for long-term, strategic decision-making since the data provided does not cater to small-scale policy adjustments.

- Public & ongoing observatory (TinnGO, UITP, Eltis, UlaadS, ITS Observatory, DHL, University Gustave Eiffel)

This observatory type occurred mostly in the benchmark because many observatories of this type exist. The approach varies much with regards to upload frequency, subtopics addressed, user engagement, overall website design and special features. For example, the Eltis and TinnGo observatory can upload frequently because of their large network of content contributors, whereas the e-commerce observatory by the University of Gustave Eiffel relies on the (small) team behind the website. The DHL Logistics Trend Radar, on the other hand, benefits from the company's internal data sources and extensive network in logistics. The observatories described here are more likely to be used for long to medium-term policy creation. Large-scale trends are addressed alongside manifestations and more delineation on those trends.

3.2.2 Resource strategy

In order to provide relevant and regularly updated content, it is key to have a sound resource strategy. The resource strategies for qualitative and quantitative content vary due to the public availability of necessary data.

Qualitative content is mostly time-consuming in desk-research and writing. Either the team behind the observatory dedicates their time on desk research and writing, or content contributors can upload articles (either directly or after a check by the administrator). The Eltis observatory is an example of the latter, with news articles and use cases regularly uploaded by ´Friends of Eltis´.

Regarding quantitative insights, it is most helpful to have partnerships with the parties that gather UFT related data. These parties are typically used by observatories:

- Logistics providers
- Local authorities
- Regional/National statistics bureaus
- Universities
- Market data vendors

The Cimalsa and UITP data observatories are examples of observatories with data partnerships. Cimalsa is long embedded in the Catalan logistic ecosystem and has contacts with authorities and statistics bureaus on different regional levels, as well as partners including ports and train operators. UITP relies on their extensive stakeholder network in the public transport field, which is another form of partnership. They publish datasets on topics like public transport ridership, services provided or the effect of Covid-19 on public transport systems.

3.3 Key learnings

The goal of the observatory should match upload frequency and the presented content. If the goal is to inspire or point decision-makers to relevant trends, a qualitative observatory is enough. If the observatory´s goal is to support long-term decision-making, the upload frequency does not need to be high, whereas short to mid-term decision-making can benefit from frequent updates.

Moreover, the resource strategy and goals of an observatory must be well-aligned to bring the most value. With regards to qualitative and crowd-sourced quantitative sources, high user engagement could help much in sourcing data, compiling and writing. With regards to quantitative content, the crux lies with the resource strategy. Much detailed UFT data lies with logistics operators, who have historically been hesitant to openly share their data due to market competition.

4. The URBANIZED observatory

4.1 Positioning & goal

The URBANIZED observatory's goal is to support fact-based policy decision-making, for stakeholders involved in UFT systems. This entails providing qualitative and quantitative insights into relevant emerging trends. Here, both types of data complement each other. Qualitative insights can provide inspiration and/or focus on emerging topics, whereas quantitative insights can address the scale and trends of such topics.

Moreover, it is recognized that comparable observatories exist. These observatories are either broader (ELTIS), mostly qualitative in nature (ULaaDS), locally relevant (Cimalsa) or mostly relevant for private stakeholders (DHL). The URBANIZED observatory can bring value by offering a mix of quantitative data and qualitative insights related specifically to UFT, that is more easily generalizable to different countries.

We realize that creating a lively external contributor´s community that actively engages in materials is difficult, moreover, other platforms have already taken this space (e.g. ELTIS). Still, engagement from several perspectives can be most beneficial to the relevance of the observatory. Thus, the URBANIZED consortium will be engaged to participate in providing relevant insights and comments on observatory content.

4.2 Presented content

4.2.1 Quantitative stream

The frequency and size of quantitative reports is strongly dependent on the available resources as delineated above. Below, a long-list of KPI categories is presented, as found in academic literature and complemented by bilateral calls with URBANIZED partners. Each of the KPI categories are broad & interpretable by several KPI´s. Over the course of the observatory lifetime, it will become clear for what KPI´s reliable data sources can be found.

Policy-oriented:
Rai et al. (2017) [3] has compiled the following list of KPI categories, which are aimed to provide a comprehensive overview of Urban Freight Transport systems for policymakers. By monitoring these KPI´s, policymakers should be able to create policies that maximize positive impacts and minimize negative externalities.

- Safety (accidents, safety violations)
- Security (transport-related crimes)
- Noise (EU noise standard compliance)
- Freight transport (Vehicle types, modal split, loading rate)
- Infrastructure (travel speeds, parking/unloading, transhipment facilities, congestion)
- Energy consumption (freight vehicle fleet consumption)
- Emissions (emissions standard compliance, GHG emissions)
- Resources (sustainable freight budget, measurement stations)
- Sustainability (SUMP policy compliance, businesses certification, spending on sustainable development)

Business-oriented:
The following KPI categories were formulated by Nguyen (2021)[4] and complemented by input from URBANIZED partners. These KPI´s are aimed at assessing the several aspects of logistic performance of Logistics Service Providers.

- Vehicle attributes (production and user lifetime cost of vehicle, safety scores, weight, volume capacity, vehicle range, charging time)
- Logistics and transport efficiency (goods delivered per delivery point, delivery time per parcel & journey, distance travelled per journey, drivers´ time regulation)
- Operational cost efficiency (salary costs per parcel)

[3] https://www.researchgate.net/publication/319058702_An_indicator_approach_to_sustainable_urban_freight_transport
[4] https://www.researchgate.net/publication/356474816_Evaluating_the_Efficiency_of_Using_Clean_Urban_Freight_Vehicles_in_Urban_Areas

4.2.2 Qualitative stream

Whereas the quantitative resources are mostly intended as taken directly from the data source (I.e. ´raw´), qualitative content is mostly aimed at compiling curated pieces from and concerning the field of UFT. Three category types are to be uploaded: insights, UFT study and tools.

- Insights

Insight articles are meant to provide an insider-view of the UFT system. Typically, these types of content cannot be found in academic journals or government websites. This content is aimed at providing a podium to different standpoints or perspectives on current topics by different stakeholders in UFT. Some examples include interviews, blogs and opinion articles

- UFT study

The study category is aimed at expanding knowledge of interested stakeholders regarding UFT. Content in this category is more neutral and theoretical in character. Some examples include academic reports, regulatory updates and industry (associations) reports.

- Tools

Here, tools are considered as more hands-on content, aimed at easing application of theoretical notions or best practices in one´s own environment. Some examples include case studies, video´s/podcasts and online courses.

4.3 Resource strategy

The resource strategy is different for the quantitative and qualitative streams. However, both (partially) rely on support from partners within the URBANIZED consortium.

4.3.1 Quantitative stream

It is important to match the available quantitative resources to the planned reporting frequency. Therefore, we intend to kick-off the observatory with an ad-hoc approach towards quantitative reporting and striving towards gradually standardizing the reporting activities. Under the ad-hoc approach, the upload frequency is standardized but the presented content is not standardized. If sources prove to be reliable, related respective KPI´s could be reported on more standardized. Possible data source areas are explored in the first months of 2022. The two preferred sources include raw data from project partners (company or research data) and open-source public data (EU, national, regional and city-level). We're currently exploring the feasibility of accessing these sources, but as they have not been secured yet, we will explore alternative pathways too.

With regards to open-source data, six city data platforms have been analysed[5]. Many cities have an open-source platform, where data sets are publicly shared, many of which are licensed under the creative commons' attribution 3.0 or 4.0. Roughly speaking, both licensing agreement types entail data is freely usable and adaptable, if the user properly attributes the source. Open-source data regarding transport and mobility in cities often report on parking, traffic congestion/density, cycling and public transport figures.

4.3.2 Qualitative stream

Like the quantitative stream, Bax & Company will be responsible for publishing qualitative content. Whereas much of the content under the UFT study and tools will be references to third parties, the insight articles will mostly be curated by Bax & Company. The most time will likely be dedicated towards compiling content/interviewing, structuring, and writing for the insight articles. Here, the other members of the URBANIZED consortium will be approached for input and ideas for article topics.

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[5]Examples of open-source data on transport & mobility
Milan: https://dati.comune.milano.it/callgroup/32bbfe8c-ca16-4ec3-bd6f-c12380ca3a11
Toulouse: https://data.toulouse-metropole.fr/explore/?refine.theme=Transport&sort=modified
London: https://data.london.gov.uk/dataset?topics=b35ef9b1-8875-4f7b-8aca-8373cff77d17
Vienna:https://www.data.gv.at/suche/?searchterm=&katFilter%5B%5D=verkehrundtechnik&publisherFilter%5B%5D=Stadt+Wien&publisherFilter_sub%5B%5D=Stadt+Wien#showresults
Amsterdam: https://data.amsterdam.nl/datasets/zoek/?filters=theme%3Btheme%3Averkeer
Barcelona: https://opendata-ajuntament.barcelona.cat/data/en/organization/transport

4.4 Tentative content timeline

Whereas content for the qualitative timeline can quite easily be guaranteed, the quantitative timeline is highly dependent on the availability, update frequency and reliability of sources. The tentative timeline presented under table 2 shows the intended upload frequency for the URBANIZED observatory. The content of each quantitative report will include the most relevant available data at that time in the future.

Table 2: Tentative content timeline

	Qualitative stream			Quantitative stream	
	2021	2022	2023	2022	2023
January					X
February		X	X		
March					
April				X	X
May		X	X		
June					
July				X	X
August		X	X		
September					
November				X	X
December	X	X	X		

4.5 Foreseeable barriers

There is currently a lack of methods and even willingness to share data gathered by Logistics Service Providers. This unwillingness to share could be reduced by ensuring data sharing methods which are low effort, anonymous, secure, with a clear purpose and consider market competition (Laegran, 2021)[6]. Here, the URBANIZED consortium benefits from several logistics stakeholders that may have or could gain access to such data sets. Also, to support data sharing, the URBANIZED consortium will need to establish an agreed upon data sharing method that is feasible under the project cost and budget restraints.

Whereas the URBANIZED consortium does contain a range of scientific and logistics partners, it does not have direct ties with a wide body of public authorities. These authorities, e.g. regional/national statistic bureaus, police have relevant datasets on a share of the abovementioned KPI´s. To some extent, these data sets are published open-source, although other observatories show to retrieve data sets via direct exchange. Retrieving these data sets which fall outside the project consortium might prove time-consuming or complicated. Fortunately, URBANIZED might benefit from the 3 included satellite cities (Bergen, Madrid, Groningen) under other work packages, that have connections to a local network of public authorities.

[6] https://ntnuopen.ntnu.no/ntnu-xmlui/handle/11250/2830172

Acronyms

ANPR	Automatic Number Plate Recognition
BEV	Battery Electric Vehicle
EMS	Energy Management System
HiL	Hardware-in-the-Loop
HoReCa	Hotel/Restaurant/Catering
HV	High Voltage
ITS	Intelligent Transport Systems
ICE	Internal Combustion Engine
KPI	Key Performance Indicator
LCV	Light Commercial Vehicle
LSP	Logistics Service Providers
LV	Low Voltage
MiL	Model-in-the-Loop
OEM	Original Equipment Manufacturer
OBC	On-Board Charger
SiL	Software-in-the-Loop
SotA	State of the Art
SUMP	Sustainable Urban Mobility Plan
SULP	Sustainable Urban Logistics Plan
TRL	Technology Readiness Level
TCO	Total Cost of Ownership

UFT	Urban Freight Transport
URBANIZED	modUlaR and flexible solutions for urBAN-sIzed Zero-Emissions last-mile Delivery and services vehicles
ViL	Vehicle-in-the-Loop
WBG	Wide Band Gap
WBS	Work Breakdown Structure
WP	Work Package
XiL	X-in-the-Loop
ZE(V)	Zero Emission (Vehicle)

The following article is planned to be published as the first qualitative 'insight articles'.

Annex 1 – Insight: Fuelling data-driven UFT policies

1. Introduction

With the rise of urbanization across the globe, increasingly more pressure is put on Urban Freight Transport (UFT) to provide the last-mile delivery of goods. Simultaneously, increased efforts should be and are made towards reducing the impact of UFT on the environment. Namely, UFT accounts for approximately 6% of global GHG emissions (Civitas, 2020). Moreover, global freight demand is expected to triple between 2015 and 2050 (Raj & Vigran, 2020).

Coping with these challenges can be complex for policy decision-makers due to the trade-offs between factors like accessibility for logistics service providers, liveability and provision of goods for citizens, and climate. There is a need for fact-based sustainable planning to deal with this increased complexity. By considering empirical data on Key Performing Indicators (KPI's) of urban logistic systems, policymakers can, in theory, address one issue without worsening another. These are three out of many advantages associated to working with quantitative indicators for policy planning (Rai et al., 2017):

- The ability to capture complex phenomena into manageable and meaningful units
- The ability to facilitate comparison, benchmarking, and communication
- The ability to highlight trends

However, the past two decades have shown a barrier towards the increased demand for fact-based policies: data. In the recently published European Urban Mobility Framework, the need for data in fact-based decision-making is underwritten prominently. Detailed and fresh data streams are needed to fuel data-driven policies. However, gathering data proves to be complex, costly and time-consuming.

2. The data gap

Two types of data problems have surfaced (1) Currently available data sets are not comprehensive or specific enough. (2) Data acquisition is costly and time-consuming.

Currently available data not useful enough

Many urban freight data collections are general, averaged, and therefore unable to address specific urban issues (Rai et al., 2017). Other urban datasets containing macro-indicators (urban sprawl, city size and population density) also do not provide the necessary insights on their own, without

overlaying the necessary freight-related data. Some examples of data gaps include (Allen et al., 2014):

- Activities of Light Goods Vehicles and Heavy Goods Vehicles are often not separated in data collection
- Data about logistics infrastructure from which urban freight deliveries depart is lacking
- The link and relationship between urban freight activity and freight activity further upstream in the supply chain is not well documented

Of the 45 quantitative UFT indicators formulated by Rai et al. (2017), 19 indicators (42%) could not be fulfilled with available data in their case study. This depicts the gap between necessary insights for sustainable UFT planning and the data available.

Current data acquisition is expensive and time-consuming
Today, data collection is done through a variety of collection methods, each with its own purpose, advantages, and disadvantages. These include surveys, interviews, group discussions, traffic counts, written questionnaires, diaries, and on-board technologies (Hadavi, 2018) . These methods are often costly because of the necessary human resources, and none provide a single comprehensive image. Moreover, these data collection methods can be complicated and thus time-consuming. For example, retrieving data from on-board technologies can be problematic since companies are not obliged to share the data.

3. **Bridging the data gap:**

Two directions are mainly explored by academics and EU-funded projects: (1) lowering costs and complexity of data collection through new technologies and (2) leveraging existing data sources through novel data-collection frameworks.

(1) Lower-cost data collection through technology application
Technology application in data collection for UFT planning has not reached the same level as traditional traffic counting and surveys. Technologies that have received most attention so far include loops, Automatic-Number Plate Recognition (ANPR), Bluetooth and floating car data (Hadavi, 2020). Applying such technologies could lower overall costs and be more scalable than manual counting or use of surveys (Raj & Vigran, 2020).
Most of these technologies, however, require an initial investment and require expertise to process and analyse the gathered raw data. Moreover, every technological application has its inherent drawbacks, which means there is no single silver bullet.

ANPR cameras

(2) Novel data-collection frameworks: Centralisation & structuring of available public data
Currently, UFT data is scattered across stakeholders and can take much effort to collect. Stakeholders like logistics service providers (LSP), local statistic bureaus, policy departments and national ministries hold different data sets which can be useful for fact-based decision-making. Examples of solutions and efforts towards this issue include local UFT observatories and development of data collection frameworks projects.

Supported by the Catalan government, the Cimalsa logistics observatory provides yearly updates on several UFT related KPI's in Catalonia. They gather data from a large variety of sources including private stakeholders, data vendors and various public authorities. Although decision-makers might require more frequent updates for certain policy-testing purposes, this type of data can provide information for longer-term developments and decision-making.

In a related field, urban passenger mobility, the URBANITE project is putting effort behind automatic data collection and processing mechanisms. This works shows promising cross fertilization possibilities for UFT data collection, which could bring much value (Rai et al., 2017).

Within UFT, tools like the NOVELOG framework could form a starting point for data collection, as it provides four thematic pillars under which UFT data can be categorized. The framework also differentiates between different stages of data collection and interpretation.

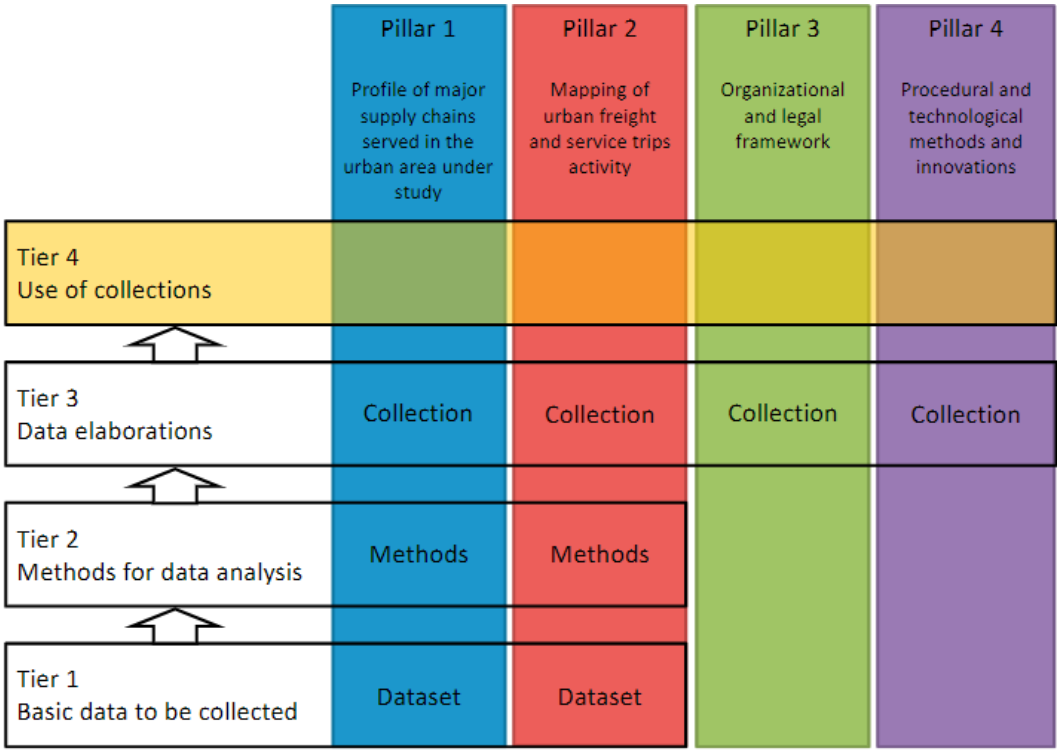

Figure 1: NOVELOG framework

Here, the difficulty of obtaining data from logistics service providers should not be underestimated. Conflicting interests between city planners and LSP have shown to prohibit data flows between the two parties. Research among LSP's by Laegran (2021) shows the following prerequisites they have for sharing data with public authorities:

- Sharing must benefit the carriers, in terms of better planning/facilitating etc.
- The goal of the data collection must be better city logistics, including improved distribution conditions for the carriers.
- Complying with the data sharing terms, ensuring data security.
- Anonymization and on aggregated level, complying with market considerations.
- "All" carriers contributing with data.
- Need to have defined what the data will be used to - a plan and purpose for the data, clear framework, and boundaries for the use.
- The data should be easy to access and extract from the carriers' systems.

Conclusion

All in all, whereas data-based policy planning could have much potential in UFT, its primary resource, data, is still not delivered in full. Data is scattered across stakeholders, not comprehensive enough and costly to acquire. Here, solutions could be stimulated by the focus of the European Commission on data, as described in the recently published European Urban Mobility Framework.