

## User-friendly Information

# Tool on Urban and Regional Access Regulations Schemes

Contract: MOVE/B4/SER/2019-498/SI2.832125

## Deliverable 3.2 – Report on evaluation of end-user information services

Consortium:



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## Administrative section

### Document bios

| Document file name                     | Work package | Tasks |
|----------------------------------------|--------------|-------|
| UVARBox_WP3_Deliverable3.2_09_2022_1.0 | WP3          | 3.2   |

### Version history

| Version | Date       | Description of changes | Author         | Partner     |
|---------|------------|------------------------|----------------|-------------|
| 0.1     | 28.04.2022 | Draft                  | Alex Gstundner | AustriaTech |
| 0.2     | 31.06.2022 | Draft                  | Alex Gstundner | AustriaTech |
| 0.3     | 31.07.2022 | Draft                  | Andreas Höbaus | AustriaTech |
| 0.4     | 31.08.2022 | Draft                  | Alex Gstundner | AustriaTech |
| 0.5     | 05.09.2022 | Review                 | Alex Gstundner | AustriaTech |
| 0.6     | 05.09.2022 | Review                 | Sónia Soares   | ARMIS       |
| 0.7     | 05.09.2022 | Review                 | Nuno Rodrigues | MAPtm       |

### Disclaimer

The views and opinions expressed in this document are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Commission.

## General section

### Summary

This document approaches the UVR data validation process along the UVAR data value chain up to the end-user information services via the UVAR Box Tool with implemented UVAR data throughout the 5 pilot Member States. In collaboration with the Country Coaches and the consortium, UVAR data has been gathered and uploaded to the UVAR Box Tool webserver (hosted by ARMIS during the project) in order to convert the UVAR information into DATEX II version 3.3. Furthermore, the consortium in collaboration with the NAPCORE project explored the status and plans for the compliance assessment process according to the obligations in the DRs (e.g., 886/2013 or 2015/962).

### 1 General description of the deliverable

One of the primary goals of the UVAR Box project is to improve the provision of UVAR information to end users like travellers, fleet planners and citizens, by offering different ways to access the information, and to ensure that access restrictions are accurately and seamlessly reflected in planning and navigation services. In line with this, different dimensions must be considered for this task.

The first step is to enable access to UVAR data, through either the NAPs or other public managed service, that ultimately support any app-based and web-based service of many stakeholders (approached in task 3.1 and described in deliverable 3.1).

The necessary steps of data validation, interpretation, processing and presentation are the main challenges to address in this integration step. The task 3.2 aimed to deliver a process flow describing these integration steps for the provision of UVARs in information services, from where data becomes available to when the end user is able to see UVAR information and act upon it. There are distinct issues to be addressed under this process:

1. Compliance assessment with the obligations for the DRs (e.g., 886/2013 or 2015/962). Propose a process for inspection regarding UVARs based on a closed loop with the responsible actors.
2. UVAR data validation process along the UVAR value data chain:
  - a. Validation using the UVAR Box Tool
  - b. Validation by the NAPs
  - c. Validation from a feedback loop with service providers

The next chapters and respective sections are aligned with the above-mentioned topics.

## 2 Compliance assessment with the obligations for the DRs (e.g., 886/2013 or 2015/962)

Compliance Assessment is a specific task, dedicated according to the Delegated Regulations either to a national body or to a competent authority, nominated by the Member State. The national body/competent authority must carry out random inspections of the compliance of data or service provision with the requirements set out in the Delegated Regulations. In the annex to this regulation, an evidence-based declaration as well as additional information shall be transmitted by the data/service providers to the national body/competent authority.

At the time being, there is no harmonised approach across the Member States on how these random inspections to assess the compliance shall be carried out. Only very few Member States have started to set up processes on this matter. Currently, all Member States have joined their forces in the NAPCORE initiative in order to set up harmonised processes for random inspections and compliance assessment. This is addressed in NAPCORE WG5 "*National Bodies and Compliance Assessment*". By the end of 2022, the first draft proposals for processes and supporting materials for random inspections shall be defined.

The roles of the different parties, concerned by the compliance assessment will be described in this process description as well. From 2023 ongoing, the processes and supporting material shall be used in selected countries for practicability check and improvement. The final recommendation, based on practical evaluation, is expected until the end of 2024.

Moreover, semi-automated tools could support the process of compliance assessment. The NAPCORE WG5 requirements concerning compliance assessment will be collected in 2023 and handed over to the NAPCORE WG4 for evaluation and implementation, if suitable. The definition of requirements taking into account UVAR specific issues could be an additional output integrated in the work of NAPCORE WG5.

## 3 UVAR data validation process along the UVAR value data chain

### 3.1 UVAR data value chain model

The value chain, described and assessed in D2.4 - *Specification of UVAR related data-flows for data generation, collection and data maintenance*, explains how the UVAR data gets from its first source, the competent UVAR authorities, to the end user. The UVAR data is sent from the various authorities (in most cases, the cities) to the NAPs, where the service provider can then collect the reliable UVAR data. After collecting the data, service providers integrate it into their application services and that is where the information gets impact by reaching the end users.



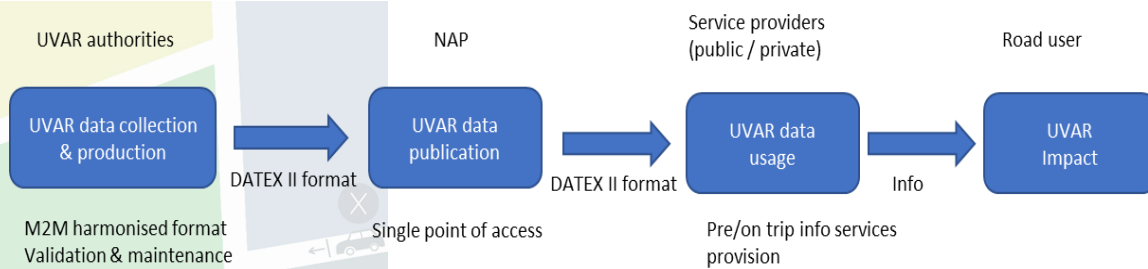


Figure 1 UVAR data value chain model

The next three chapters explore the validation methods that can be comprised along the UVAR value data chain:

- Validation using the UVAR Box Tool
- Validation by the NAPs
- Validation from a feedback loop with service providers

### 3.2 Validation using the UVAR Box Tool

The consortium tested the different input and output methods for the UVAR Box Tool. Moreover, the functionality and usability was also tested, and some recommendations were given to WP2 to consider for the improvement of the UVAR Box Tool.

As the Country Coaches started to gather data samples through the European Union, they were able to acquire a DATEX II version 3.2 data for Low Emission Zones (LEZ), Limited Traffic Zones (LTZ), Pedestrian Zones (PED) and Parking Zones (PARK). This type of data structure is in a machine-readable format (M2M) which will be uploaded and validated against the Traffic Regulation Order (TRO) DATEX II profile and converted by the UVAR Box Tool.

The next step was to validate semi-structured data within the UVAR Box Tool. One of these semi-structured data is data in earlier DATEX II versions, which can be converted into a DATEX II data format version 3.3. This can be done from the DATEX II homepage<sup>1</sup> and the UVAR Box Tool should be able to import and then validate the file.

The last step was to test the manual data input inside the UVAR Box Tool webserver<sup>2</sup>. Therefore, the consortium started by adding a Low Emission Zone (LEZ) from Italy and a Limited Traffic Zone (LTZ) from Amsterdam for testing purposes. The different input methods were tested, including uploading existing shape files.

These three use cases are described in more detail in the following sections:

- Use Case one: Converted DATEX II version 2.3 to 3.3 data
- Use Case two: Semi-Structured data implementation

<sup>1</sup> <https://webtool.datex2.eu/>

<sup>2</sup> <http://uvarbox.armis.pt:2403/uvar/>

- Use Case three: Manual data input

### 3.2.1 Use Case one: Converted DATEX II version 2.3 to 3.3 data

The consortium tested the functionality of the Tool with DATEX II version 3.3 UVARs. The files need to be uploaded in a .zip format to be recognized by the tool. Next, the consortium checked if the given UVAR is displayed on the map on the right spot and if all necessary information is displayed. Afterwards an export of the file must be done from the UVAR Box Tool server. If these steps are all functional as expected, the validation will be completed. In the end, the consortium validated the output data to test them for inconsistencies or errors.

For the first case, we have gathered data from the Tyrol LEZ on the A12 in Austria. Before we could use the data, the consortium and the country coaches converted the given data samples in the DATEX II Wizard<sup>1</sup>, to get a valid template in DATEX II Version 3.3. After selecting the given Location, Network Location and Linear Location, we were able to create a .sel data with the converted information inside the file.

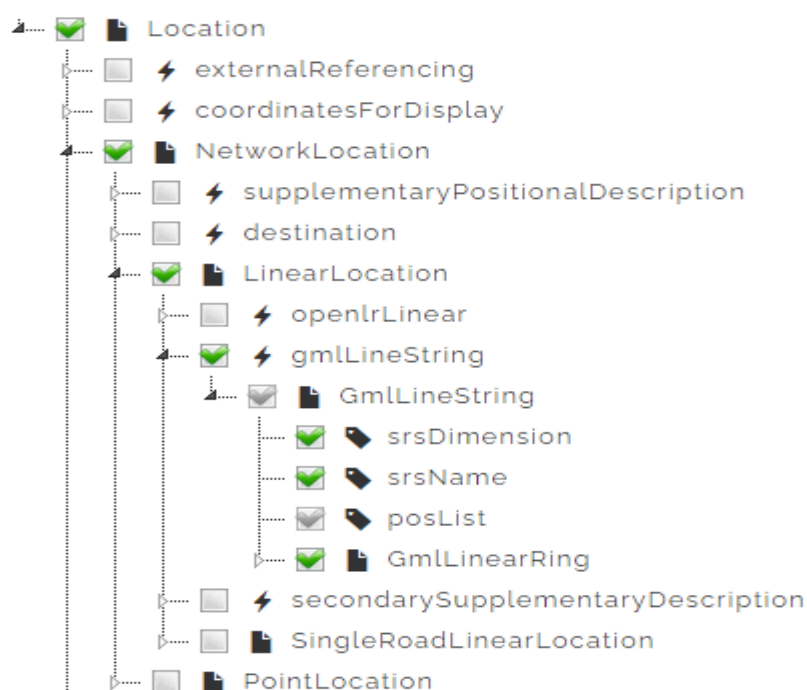


Figure 2 DATEX II Wizard selection

The next step was to upload the .zip file to the UVAR Box Tool webserver. An important note is that the green check needs to be displayed, because otherwise, the data would be corrupt with an error and the import would fail.



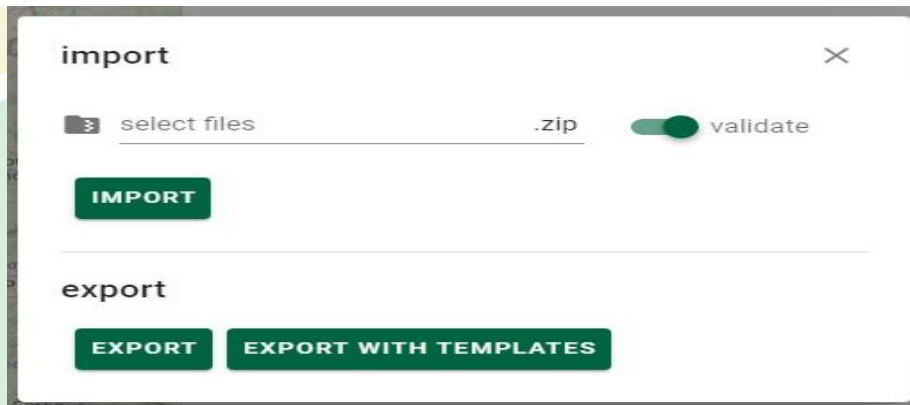


Figure 3 UVAR Box Tool, Import and Export dialog



Figure 4 UVAR Box Tool, individual UVAR

The added zone has been drawn via the tool itself, to test the functionality and the ability to manually draw zones of interest via polygons.

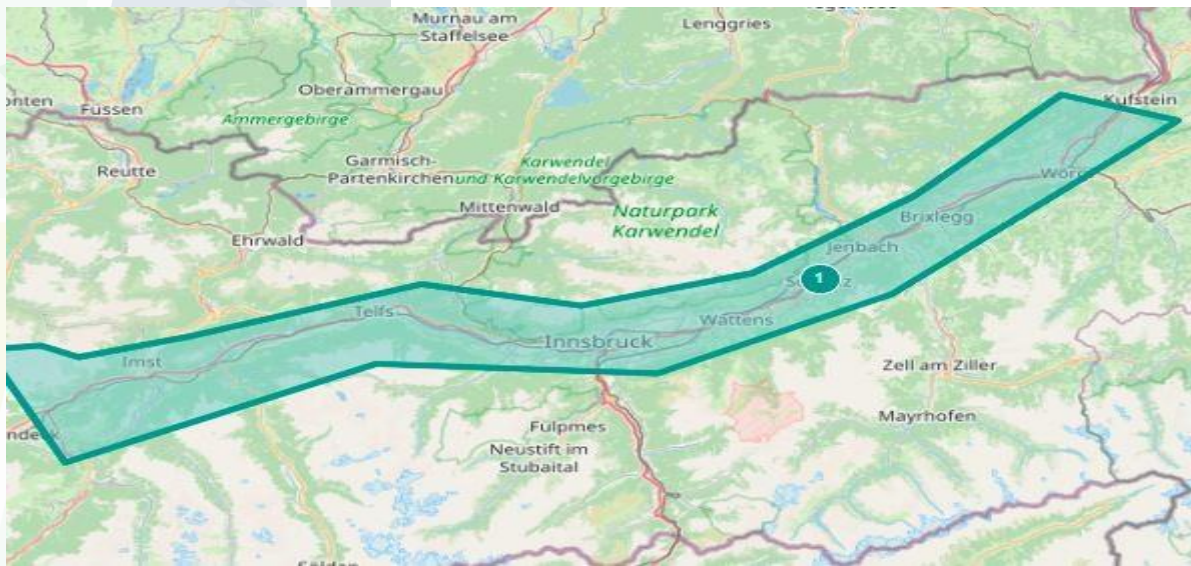


Figure 5 UVAR Box Tool, display of a zone on the map in the tool

In the first Use Case, every step has been confirmed to be functional, as well as the export in DATEX II version 3.3.

### 3.2.2 Use Case two: Semi-Structured data implementation

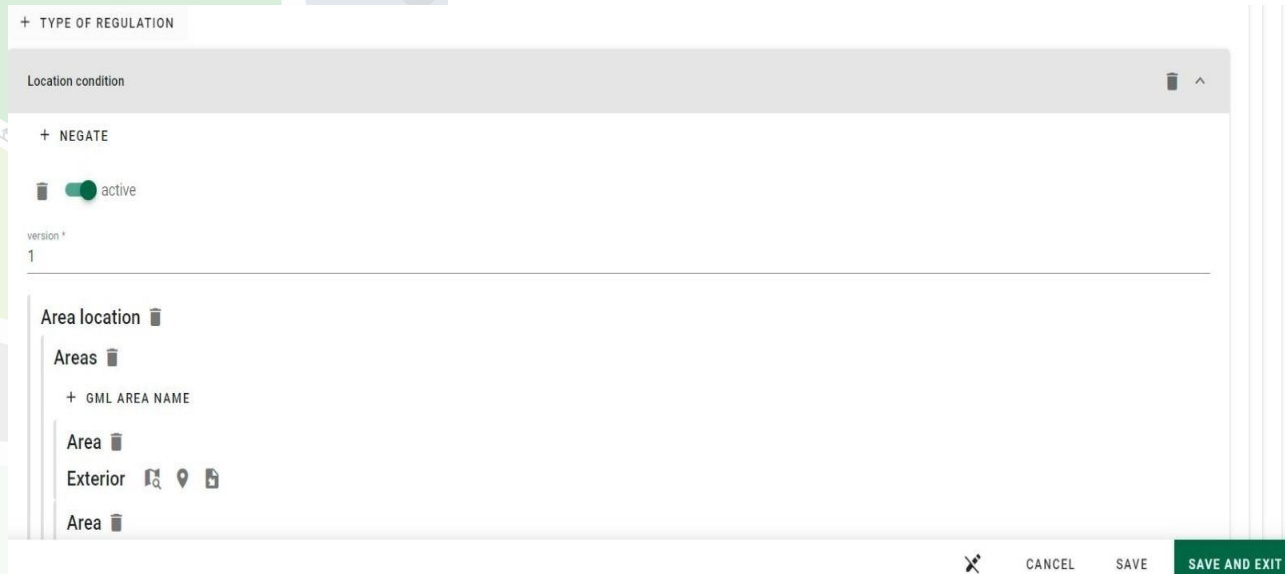
Given the type of data format like shape and .dbf files, the consortium added a pedestrian zone profile from Vienna to the UVAR Box Tool with a shape file attached. Most of the information about the pedestrian zone needed to be added manually in the Tool, because of the missing DATEX II version 3 file. The data concerning Vienna's pedestrian zones was gathered from the government website<sup>3</sup>. While

<sup>3</sup> data.gv.at

it is not possible to import the whole shape file into one profile, the consortium added all the relevant data in the given column by hand.



Figure 6 UVAR Box Tool, edit button



Extended editing mode (1): switch between simplified and extended editing mode. Without pushing the editing mode, it would be not possible to see the Location Condition with the attached area location.

Figure 7 UVAR Box Tool, editing UVAR areas

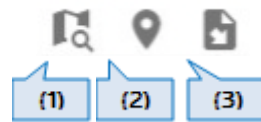


Figure 8 UVAR Box Tool, area functions

- Zoom to geometry (1):  
Zoom the map to the geometry.
- Draw geometry (2): Draw/Edit a geometry:  
The geometry can be manually digitized and edited by the user. To delete a vertex of the geometry the user has to click on the vertex while pressing the Alt-Key.
- Add geometry from file (3):  
Add a geometry from an existing shape file (containing polygons)

Every button has been analysed and was working as intended. Moreover, it was also possible to implement all the different shape files. The only error faced was when the shape file itself was not a perfect polygon. Therefore, the tool can verify if the given shape files have an unintended mistake inside. The next picture describes a polygon error for a given pedestrian zone.

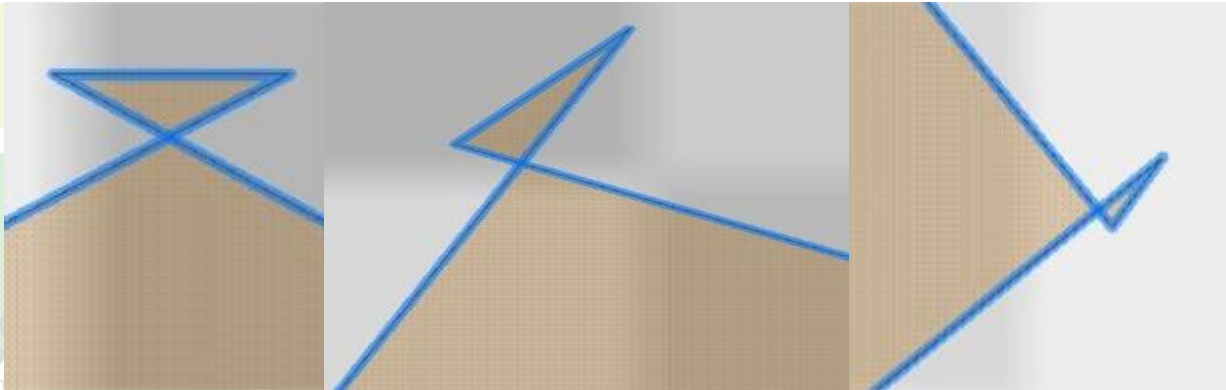


Figure 9 UVAR Box Tool, polygon error

The three pictures show the different polygon errors which were detected by the tool while the Country Coaches wanted to save their input data. To correct the mistake, the given authority needed to update their shape design. From the 259 shape files from the Vienna Pedestrian Zone, the tool was able to identify 11 errors in the polygons, which were forwarded to the Vienna City Council - Municipal Department 46 - Traffic Organization and Technical Traffic Matters as feedback. Having these errors identified, another option is to use a GIS software for correcting the boundaries represented by the corrupt shape file.

### 3.2.3 Use Case three: Manual data input

The consortium added a Low Emission Zone from Italy into the Tool to see if every column was working as intended. After adding all the information and saving the new UVAR, the consortium tested the export feature. Every step was successful concerning the implementation and exportation of the UVAR data.

## 3.3 Validation by the NAP

In the next section, the consortium will display different distribution options and validation strategies to ensure the sustainable usage of UVAR data. This includes the functioning of the NAP and how the UVAR Box Tool could work with it along the UVAR data value chain model.

Below, several options are presented regarding the NAPs functioning and how they operate inside the UVAR data value chain. Moreover, information is given on how and where the UVAR Box Tool could be integrated on different NAP scenarios.

### 3.3.1 UVAR data value chain model NAP datawarehouse / aggregator

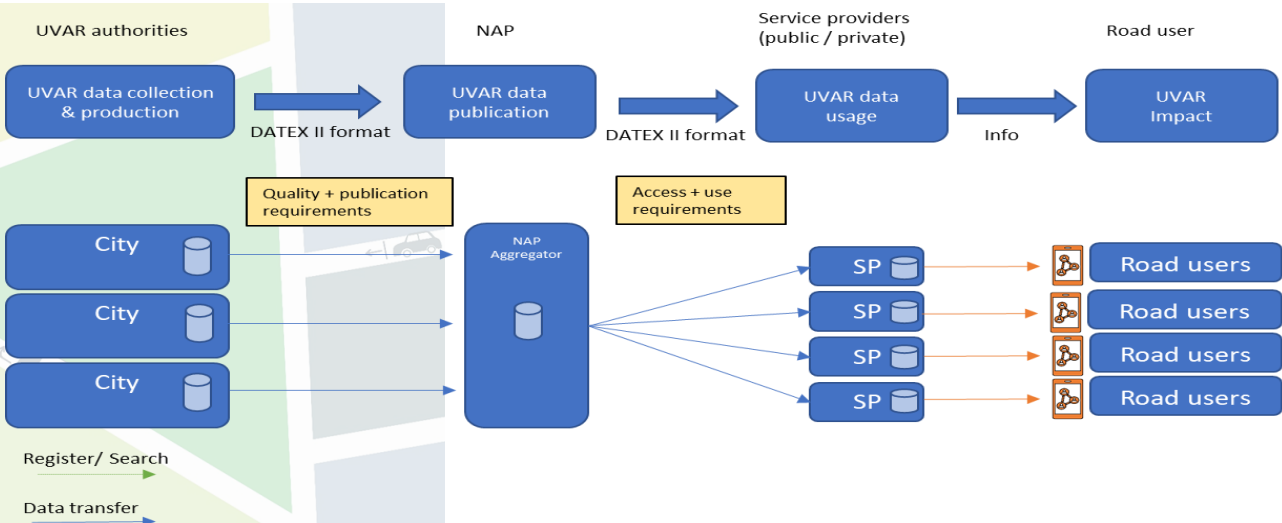


Figure 10 UVAR data value chain model, NAP data warehouse

The municipalities send the UVARs directly to the NAP. The NAP then aggregates the data and makes it available to the service providers. The service providers integrate the data into their services, allowing the end user to use it. For this purpose, the data coming from the municipalities must have a predefined quality.

### 3.3.2 NAP register ("yellow pages")

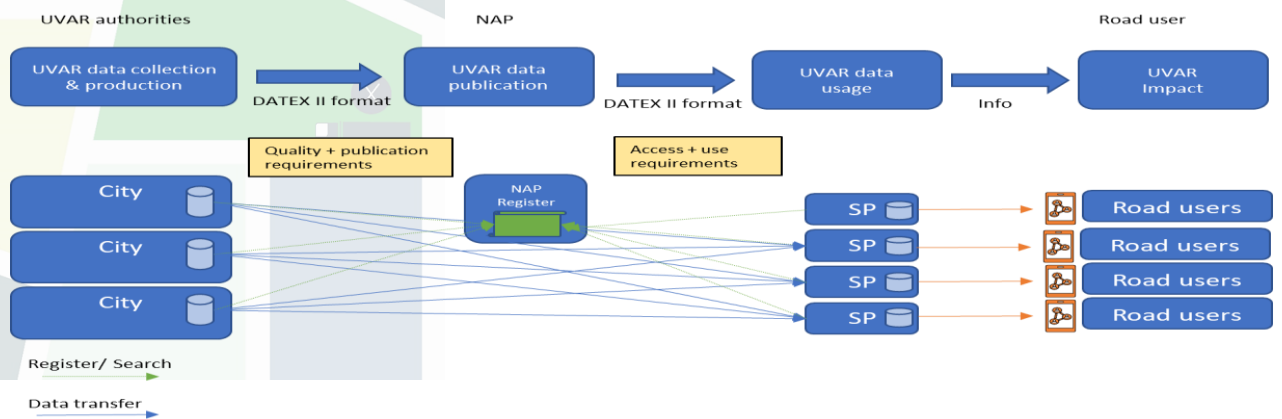


Figure 11 UVAR data value chain model, NAP register

In this case, the UVAR data is exchanged directly between the service providers and the municipalities. The NAP only serves to provide information where the data is available. The service providers must then contact the relevant municipalities as the data is stored locally at their premises.

### 3.3.3 NAP market place/portal (phone book + connection)

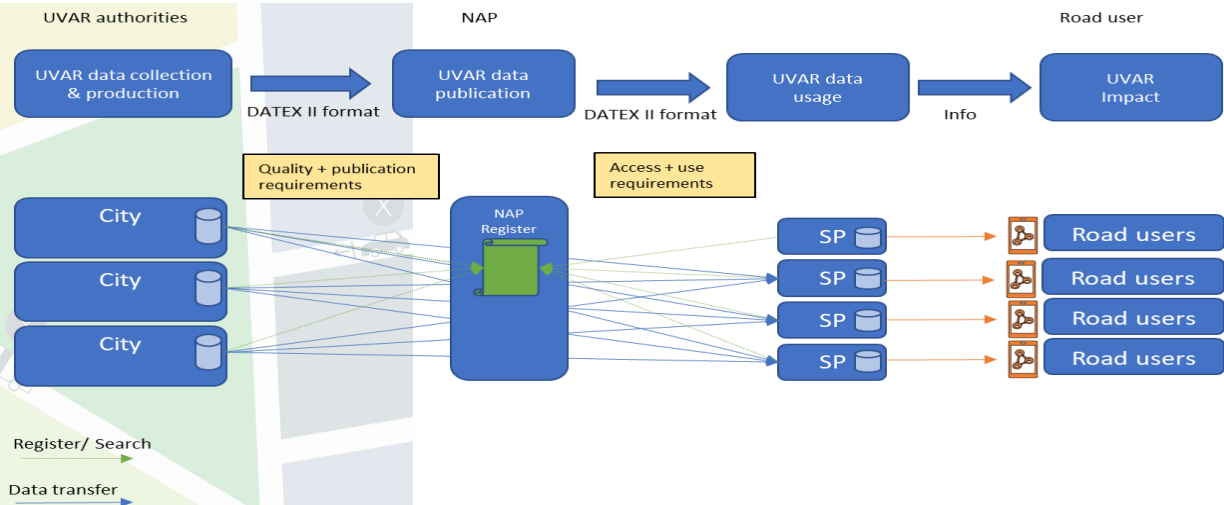


Figure 12 UVAR data value chain model, NAP market place / portal

In this case, the NAP acts as an intermediary between the communities and the service providers. It refers the service providers to the data provider and establishes the necessary connections. The data is stored locally at the municipalities.

### 3.3.4 NAP regional aggregator + portal or register

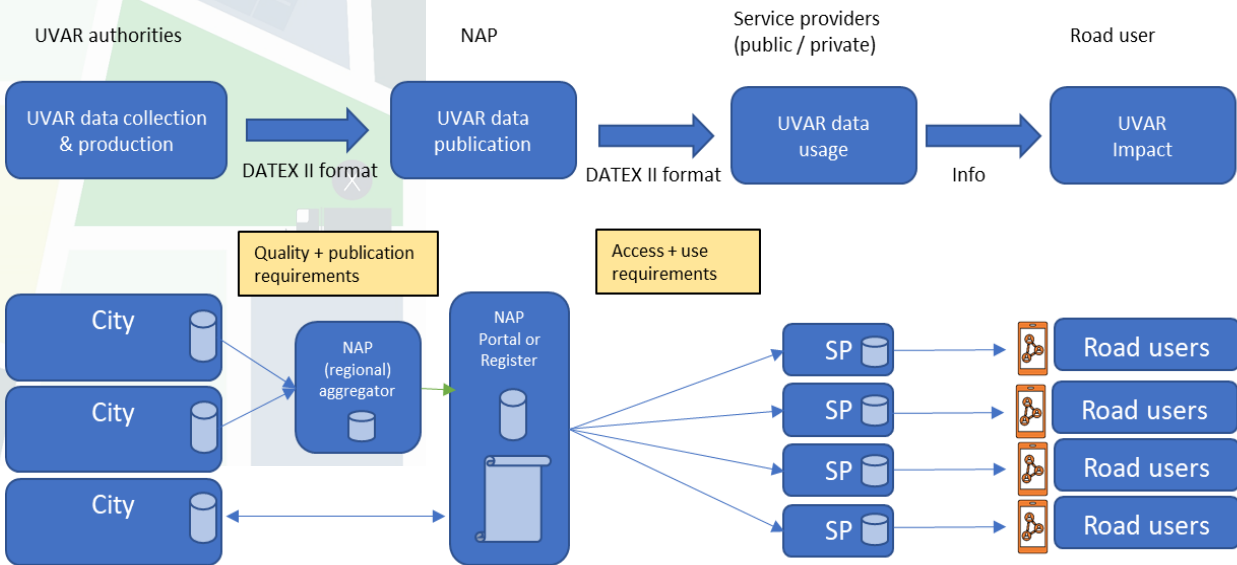


Figure 13 UVAR data value chain model, NAP aggregator and regional NAP

The UVARs are aggregated regionally and then made available on the NAP. In addition, the NAP has a register with the UVARs provided by the municipalities themselves. The service providers then collect the UVARs from the NAP. The data is stored locally at the municipalities or at the NAP aggregator.



### 3.3.5 The UVAR Box Tool on different NAP scenarios

#### Option A

The UVARs are aggregated on the NAP or a reference provided to the municipality data. The data can thus be stored on the NAP or at the municipality itself. The data is managed and created by the UVAR Box Tool.

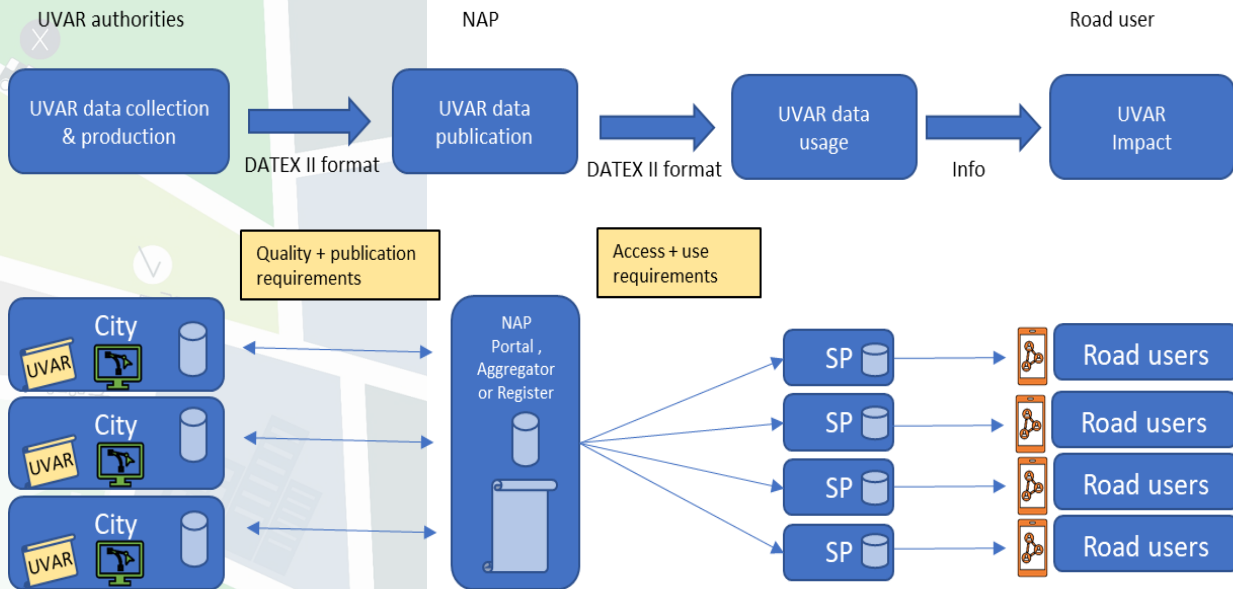


Figure 14 Data value chain model, NAP aggregator with UVAR Box Tool

#### Option B

The UVARs are aggregated regionally and then made available on the NAP. In addition, the NAP has a register with UVARs provided by the municipalities themselves. The service providers then collect the UVARs from the NAP. The data is managed and created by the UVAR Box Tool. The data is stored locally at the municipalities or at the regional aggregators.

The UVARs are aggregated on the NAP or a reference provided to the municipality data. The data can thus be stored on the NAP or at the municipality itself. The data is managed and created by the UVAR Box Tool.



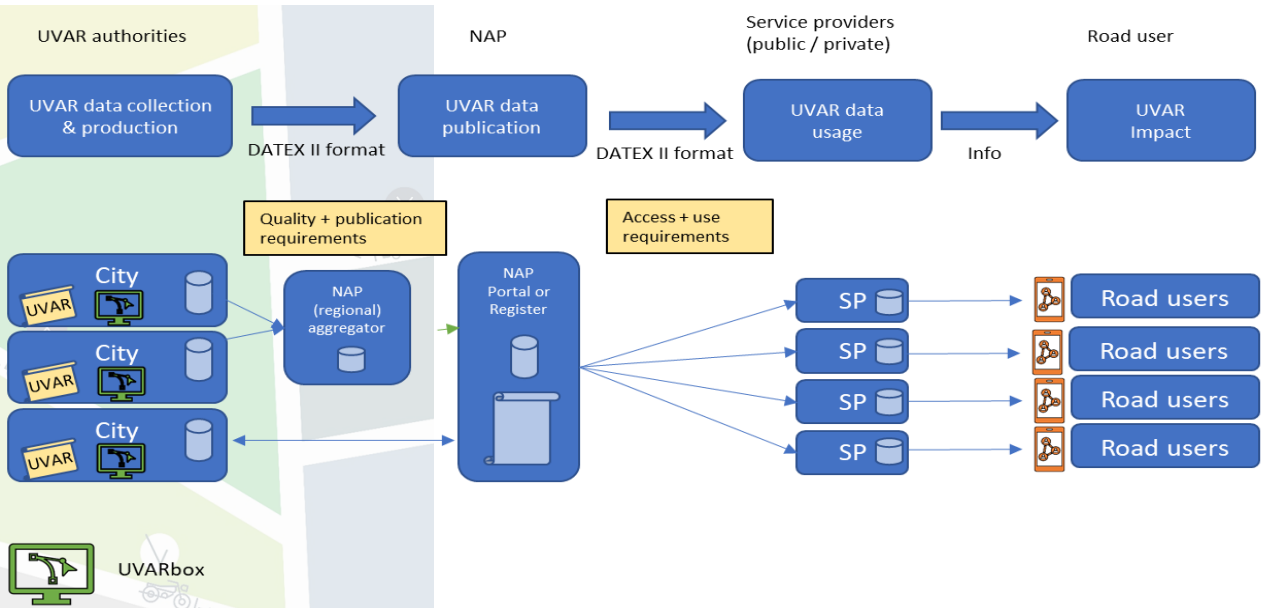


Figure 15 Data value chain model, NAP aggregator and regional NAP with UVAR Box Tool

### Option C

The UVARs are created and processed in the UVAR Box Tool on a national or regional server. The UVARs are then stored locally by the municipalities and made available to the service providers via a NAP register. The UVARs are aggregated regionally and then made available on the NAP. In addition, the NAP has a register with UVARs provided by the municipalities themselves. The service providers then collect the UVARs from the NAP. The data is managed and created by the UVAR Box Tool. The data is stored locally at the municipalities or at the regional aggregators.

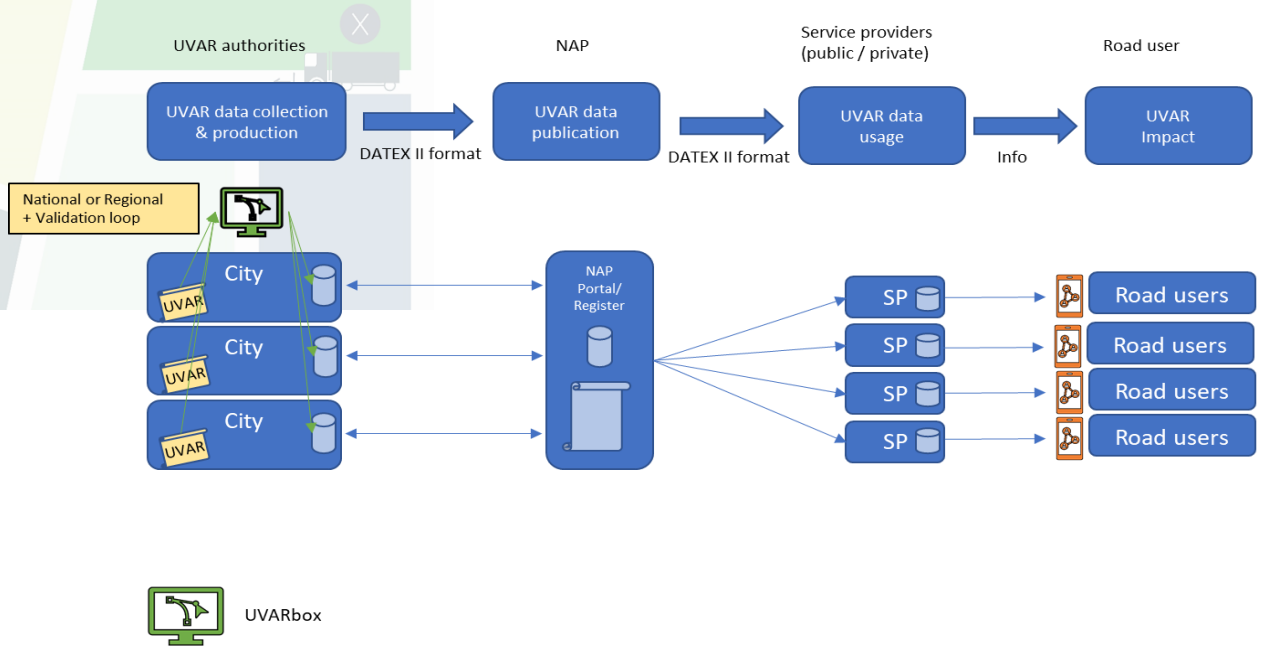


Figure 16 Data value chain model, national and regional UVAR Box Tool server

### Option D

The UVARs are stored and processed by the municipalities on a central UVAR Box server. The database with all the UVARs is then made available to the service providers via the NAP. The data is stored at the (regional) aggregator.

Here, the UVARs are created and processed in the UVAR Box Tool on a national or regional server. The UVARs are then stored locally by the municipalities and made available to the service providers via a NAP register.

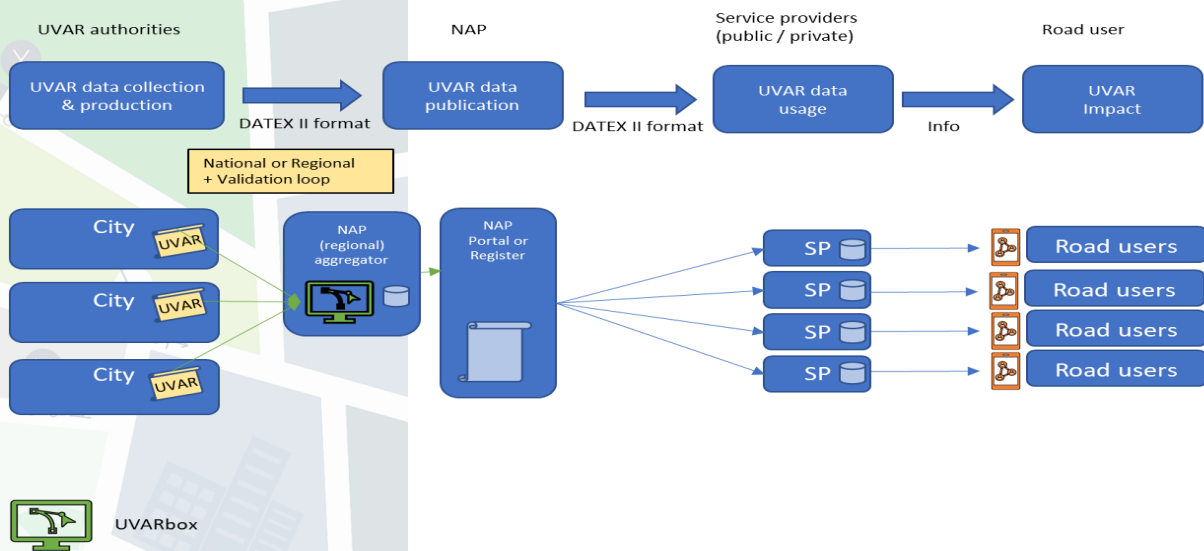


Figure 17 UVAR data value chain model, UVAR Box Tool on NAP

The UVARs are stored and processed by the municipalities on a central UVAR Box server. The database with all the UVARs is then made available to the service providers via the NAP. The data is stored at the (regional) aggregator.

### 3.4 Validation in cooperation with service providers

In order to evaluate the service provider data, a comparison can be made between the data displayed in the service with the UVAR Box Tool entry. As a comparison method, a table is used in which all attributes are listed and it is determined where they occur and in what form. In addition, this is supplemented by a comparison of the geometry by means of image comparison. For now, there are only two service providers that work with the UVAR DATEX II data. Currently, they only have the data from the Netherlands. These providers Flitsmeister and Onderweg are operators of navigation and traffic information apps for iOS and Android. They provide the UVAR data as information about LEZs in the Netherlands. Unfortunately, these apps currently use only a small part of the data provided. Therefore, a more detailed investigation of the use of UVARs by service providers is not possible, as there are still too few examples to make a clear statement. The Figures below show screenshots of both apps.

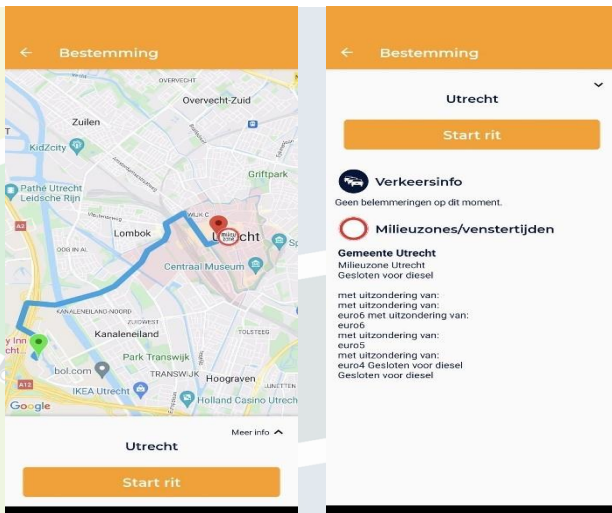


Figure 18 LEZ in Flitsmeister App

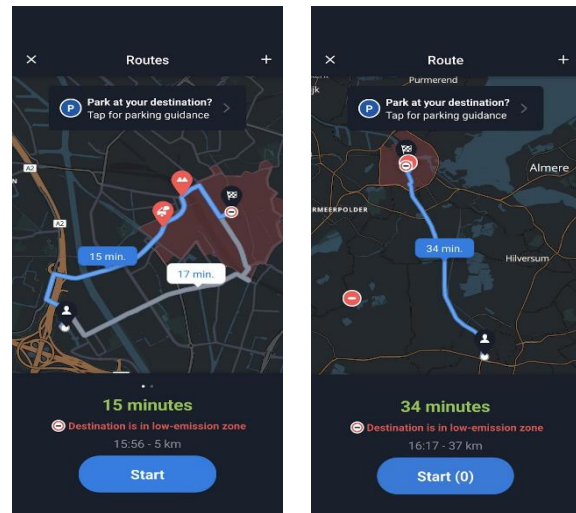


Figure 19 LEZ in Onderweg App

Data processing and delivery by the service provider is an important step in the UVAR Data value chain. The data can be validated in two ways. By the feedback of the service provider, as well as by the comparison of the provided data of the service provider with the created UVARs. This process comprises the stages underlined in the value chain presented below.

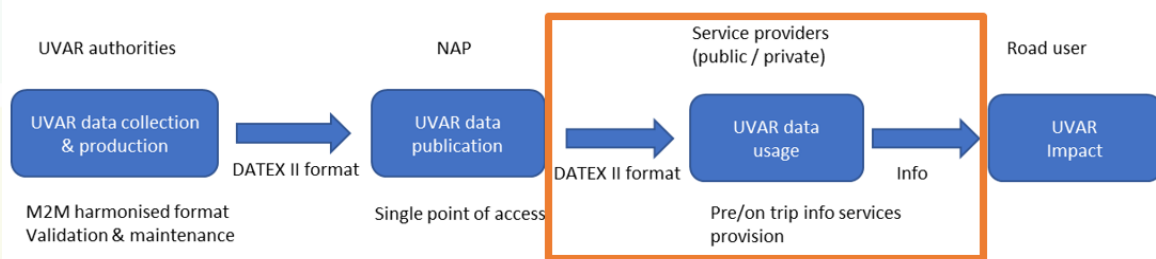


Figure 20 UVAR data value chain

### 3.4.1 Feedback loop between service providers and data providers

In order to be able to integrate the data into their services, service providers must first ensure its veracity. This is an important step for the validation of the UVAR data. In addition, data from different sources can be compared and adjusted once again, independently. Therefore, it is important to define a feedback loop with the service providers and the data providers (or data owners). This helps both the service providers, as they have a well-defined point of contact with the data providers, and the creators of the UVARs, as additional feedback is generated, and errors can be quickly identified.

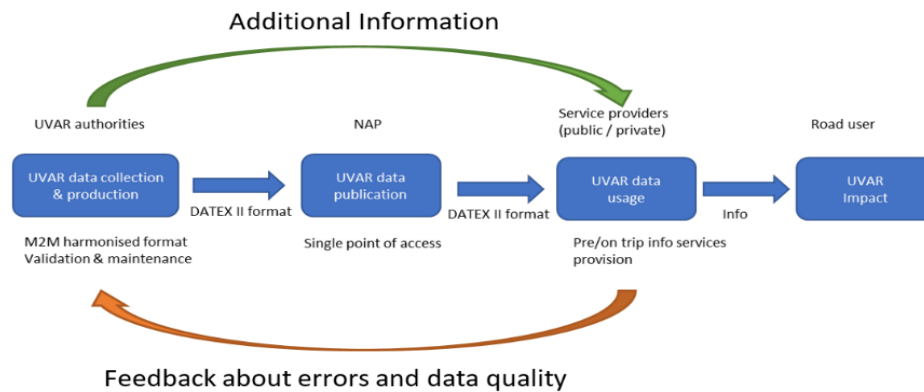


Figure 21 UVAR service provider feedback loop

To guarantee that the feedback loop works, a point of contact must be defined between the service providers and the UVAR creators or the UVAR data providers. This must happen in a specific form, so that the important information can be forwarded quickly and directly to the proper parties to respond quickly to requests and errors.

### 3.4.2 Validation of the Service Provider information

After the UVARs have been created and published in DATEX II format, depending on the structure of the national UVAR data value chain, the service provider can request the UVAR data from the NAP or other sources and integrate them into their services. The data is passed on and the publishers can no longer control how the data is processed. Therefore, it is important to monitor the output of the service provider to the road user. For this purpose, the output data must be checked and then compared with the existing UVARs. This can ensure that the published data has been used correctly. It also provides the opportunity to identify UVAR data that is important to the service provider and data that is not used in the service. It may also be that the service provider adds data that would be useful for the UVAR. It can then be suggested to the UVAR creators to include this data into their dataset.

As a method to validate the end user data, a comparison of the UVAR data from the tool with the data given by the service provider can be performed. To illustrate the approach, the consortium analysed the Amsterdam LEZ by a comparison between the information providers using UVAR DATEX II data from the Netherlands (Onderweg app and Flitsmeister app) and the respective data available at the UVAR Box Tool. This was solved in the form of a table and a comparison of images. It was then determined which data was available, missing, changed or whether there is even more information than in the UVARs itself. In addition, the location of the UVAR in the tool was then compared with that of the service providers.

### 3.4.3 Examples

The Figure below is an example of a comparison of data from the UVAR Box Tool (LEZ Amsterdam) from the two service providers Onderweg and Flitsmeister. It shows which data is available in the UVAR Box Tool and how it is displayed. This is also demonstrated for the two service providers, so the consortium



could check which data is present in each service and how it is represented. It is also possible to find out what data the service providers provide that is not included in the UVAR Box Tool.

|                           | UVAR Box tool                       |                                | Service Provider 1                  |                | Service Provider 2                  |                              |
|---------------------------|-------------------------------------|--------------------------------|-------------------------------------|----------------|-------------------------------------|------------------------------|
|                           | available                           | Attribtue                      | available                           | Attribtue      | avai lable                          | Attribtue                    |
| <b>Name</b>               | <input checked="" type="checkbox"/> | UVAR_20220517_LEZ_NL_Amsterdam | <input checked="" type="checkbox"/> | LEZ Amsterd am | <input checked="" type="checkbox"/> | Amsterd am low traffi c zone |
| <b>Issuing authority</b>  | <input checked="" type="checkbox"/> | municipality of Amsterdam      | <input type="checkbox"/>            |                | <input type="checkbox"/>            |                              |
| <b>Regulation ID</b>      | <input checked="" type="checkbox"/> | SW20-01014                     | <input checked="" type="checkbox"/> | SW20-01014     | <input type="checkbox"/>            |                              |
| <b>Publication time</b>   | <input checked="" type="checkbox"/> | 2020-11-01                     | <input checked="" type="checkbox"/> | 01.11.2020     | <input checked="" type="checkbox"/> | 01.11.2020                   |
| <b>Location condition</b> | <input checked="" type="checkbox"/> | Polygon                        | <input checked="" type="checkbox"/> | Polygon        | <input checked="" type="checkbox"/> | Polygon                      |
| <b>Vehicle condition</b>  | <input checked="" type="checkbox"/> | Diesel, Any vehicle            | <input type="checkbox"/>            |                | <input checked="" type="checkbox"/> | Diesel                       |
| <b>Validity condition</b> | <input checked="" type="checkbox"/> | Starttime 2020-11-01           | <input type="checkbox"/>            |                | <input type="checkbox"/>            |                              |
| <b>Country</b>            | <input type="checkbox"/>            | only of the creator            | <input checked="" type="checkbox"/> | Netherlands    | <input checked="" type="checkbox"/> | NL                           |

Figure 22 Data comparison

Below, it is possible to see how the UVAR boundaries can look be represented. For example, Amsterdam LEZ is shown as a region in the UVAR Box Tool. This is also the case for the display in the Flitsmeister app. With this comparison, it can be determined whether data from service providers are simplified or whether errors have occurred in the presentation.

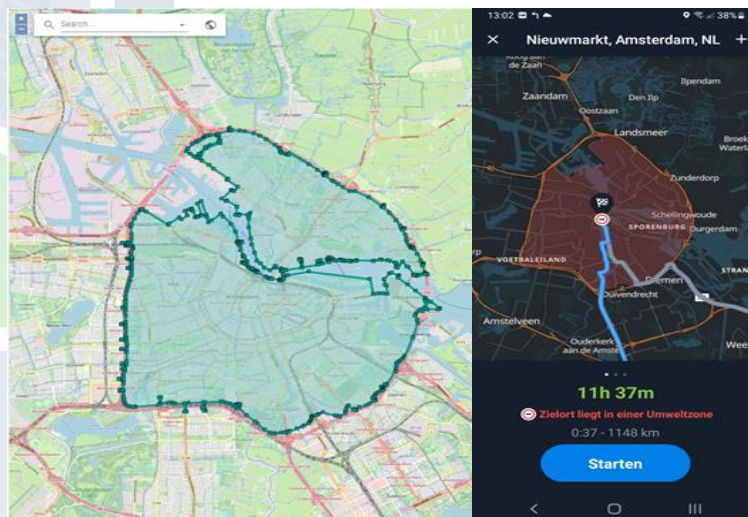


Figure 23 Flitsmeister APP

## 4 Conclusion

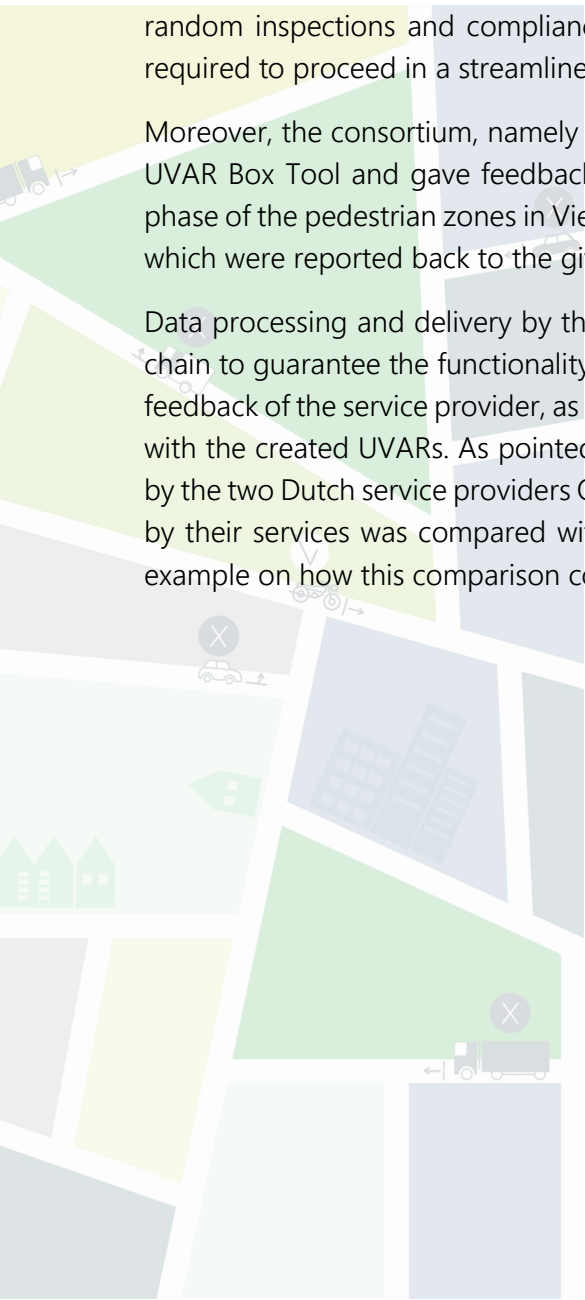
The procedures for the validation of the end user data were described, and when it possible tested, via the UVAR Box Tool, the National Access Points, and via two different service providers Onderweg and Flitsmeister.

When it comes to the compliance assessment with the obligations of the DRs (e.g., 886/2013 or 2015/962), a harmonised approach by NAPCORE is needed to streamline the different NAPs across the Member States. Only very few Member States have started to set up the processes on how to carry out

random inspections and compliance assessment. Therefore, more time and quality management are required to proceed in a streamlined approach to tackle this topic.

Moreover, the consortium, namely the CCs, have tested the different input and output methods for the UVAR Box Tool and gave feedback to improve the early stages of its development. During the input phase of the pedestrian zones in Vienna, the tool was able to identify eleven errors in the polygon design, which were reported back to the given authority.

Data processing and delivery by the service provider is also an important step in the UVAR Data value chain to guarantee the functionality with different systems. The data was validated in two ways: with the feedback of the service provider, as well as by the comparison of the provided data of the service provider with the created UVARs. As pointed out in earlier sections, the generated UVAR DATEX II data is in use by the two Dutch service providers Onderweg and Flitsmeister. The Amsterdam LEZ information provided by their services was compared with the same UVAR scheme generated by the UVAR Box Tool as an example on how this comparison could be made in future applications.





## Glossary

| Term                               | Definition                                                                                                                                                                                                                             | Source of definition                                                                |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| UVAR                               | Urban Vehicle Access Regulation                                                                                                                                                                                                        |                                                                                     |
| UVAR Box                           | Tools enabling the digitisation of UVARs                                                                                                                                                                                               |                                                                                     |
| DATEX II                           | Electronic language used in Europe for the exchange of traffic information and traffic data                                                                                                                                            | <a href="https://www.datex2.eu/datex2/about">https://www.datex2.eu/datex2/about</a> |
| GIS                                | Geographic Information System                                                                                                                                                                                                          | ISO TC211                                                                           |
| ArcGIS                             | Cloud-based GIS mapping software                                                                                                                                                                                                       | Esri.com                                                                            |
| LEZ                                | Low Emission Zone                                                                                                                                                                                                                      | <a href="http://urbanaccessregulations.eu">urbanaccessregulations.eu</a>            |
| LTZ                                | Limited Traffic Zone (ZTLA in Italy)                                                                                                                                                                                                   | <a href="http://urbanaccessregulations.eu">urbanaccessregulations.eu</a>            |
| ITS Directive                      | Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport | <a href="http://eur-lex.europa.eu">Eur-lex.europa.eu</a>                            |
| Single Digital Gateway (SDG)       | European Unique portal to access information, procedures and assistance on EU and national rules and rights related the Single Market                                                                                                  | <a href="http://ec.europa.eu">Ec.europa.eu</a>                                      |
| NAP                                | National Access Point                                                                                                                                                                                                                  |                                                                                     |
| CLARS                              | Charging, Low emission zones, Access Regulation Schemes – most complete platform currently identifying UVARs in Europe                                                                                                                 | <a href="http://urbanaccessregulations.eu">urbanaccessregulations.eu</a>            |
| CS                                 | Congestion charging Scheme                                                                                                                                                                                                             |                                                                                     |
| ZEZ                                | Zero Emission Zone                                                                                                                                                                                                                     |                                                                                     |
| EMERG                              | Emergency scheme                                                                                                                                                                                                                       |                                                                                     |
| PARK                               | Parking Regulation                                                                                                                                                                                                                     |                                                                                     |
| PED                                | Pedestrian Zone                                                                                                                                                                                                                        |                                                                                     |
| ANPR                               | Automatic Number Plate Recognition                                                                                                                                                                                                     |                                                                                     |
| VMS                                | Variable Message Sign(s)                                                                                                                                                                                                               |                                                                                     |
| XML                                | Markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable                                                                                                        | W3C                                                                                 |
| Diesel/Petrol Euro 1/2/3/4/5/6/... | European vehicle's emission standards                                                                                                                                                                                                  |                                                                                     |
| IG-L                               | Austrian Emission Class Ordinance                                                                                                                                                                                                      | CLARS                                                                               |

|         |                                                                                                                           |                         |
|---------|---------------------------------------------------------------------------------------------------------------------------|-------------------------|
| AKKP    | Informationsportal Abgasklassen-Kennzeichnung – Portal to access information on emission stickers in Austria              | Akkp.at                 |
| P+R     | Park and Ride                                                                                                             |                         |
| StVO    | Straßenverkehrsordnung – German translation of traffic regulation                                                         | Ris.bka.gv.at           |
| KFZ     | Kraftfahrgegesetz – Austrian Motor vehicles act                                                                           | Ris.bka.gv.at           |
| VStG    | Verwaltungsstrafgesetz – Austrian Administrative Penal Code                                                               | Ris.bka.gv.at           |
| MA 46   | Vienna Municipal Department: Traffic organization and technical traffic matters                                           |                         |
| GIP     | Graph Integration Platform                                                                                                |                         |
| QGIS    | Free and Open-Source Geographic Information System                                                                        | Qgis.org                |
| RTTI    | Real time traffic information                                                                                             |                         |
| SHPV    | Servicehuis Parkeer- en Verblijfsrechten - Service house for parking and residence rights                                 |                         |
| NPR     | National Parking Register in the Netherlands                                                                              |                         |
| RDW     | Netherlands Vehicle Authority in the mobility chain                                                                       | Rdw.nl                  |
| PMS     | Parking Management System                                                                                                 |                         |
| IenW    | Ministry of Infrastructure and Water Management                                                                           |                         |
| SUMP    | Sustainable Urban Mobility Plan                                                                                           |                         |
| ANWB    | Dutch Royal Touring Club                                                                                                  |                         |
| NRW     | Nordrhein Westfalen region in Germany                                                                                     |                         |
| BImSchV | Bundes-Immissionsschutzverordnung – Federal Emission Control Ordinance                                                    |                         |
| BImSchG | Bundes-Immissionsschutzgesetz – Federal Emission Control Act                                                              |                         |
| RFID    | Radio-Frequency Identification                                                                                            |                         |
| CCISS   | Centro di coordinamento informazioni sulla sicurezza stradale – Italian Road Safety Information Coordination Centre       |                         |
| MIMS    | Ministero delle Infrastrutture e della Mobilità Sostenibili – Italian Ministry of infrastructure and sustainable mobility |                         |
| TIC     | Traffic Information Centre                                                                                                |                         |
| RDS-TMC | Radio Data System - Traffic Message Channel                                                                               | ISO TC204               |
| NeTEx   | General purpose XML format designed for the efficient, updateable exchange of                                             | Netex-cen.eu/ CEN TC278 |

|          |                                                                                                                                                                            |           |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|          | complex transport data among distributed systems                                                                                                                           |           |
| SIRI     | Standard Interface for Real-time Information - XML protocol to allow distributed computers to exchange real-time information about public transport services and vehicles. | CEN TC278 |
| UNECE    | United Nations Economic Commission for Europe                                                                                                                              |           |
| ARPA     | Italian regional environmental agency                                                                                                                                      |           |
| Crit'Air | French stickers indicating vehicle's level of emission                                                                                                                     |           |
| PHEV     | Plug-in Hybrid Electric Vehicle                                                                                                                                            |           |
| HGV      | Heavy Goods Vehicle                                                                                                                                                        |           |
| EV       | Electric Vehicle                                                                                                                                                           |           |
| ZFE-m    | Zone à Faibles Emission mobilité – French translation for LEZ                                                                                                              |           |
| ADEME    | French Agency for ecological transition                                                                                                                                    |           |
| TRO      | Traffic Regulation Order                                                                                                                                                   |           |
| NDW      | Nationaal Dataportaal Wegverkeer                                                                                                                                           |           |
| Dbf file | The .dbf file extension represents the dBase database file. The file type was introduced in 1983 with dBASE II.                                                            |           |

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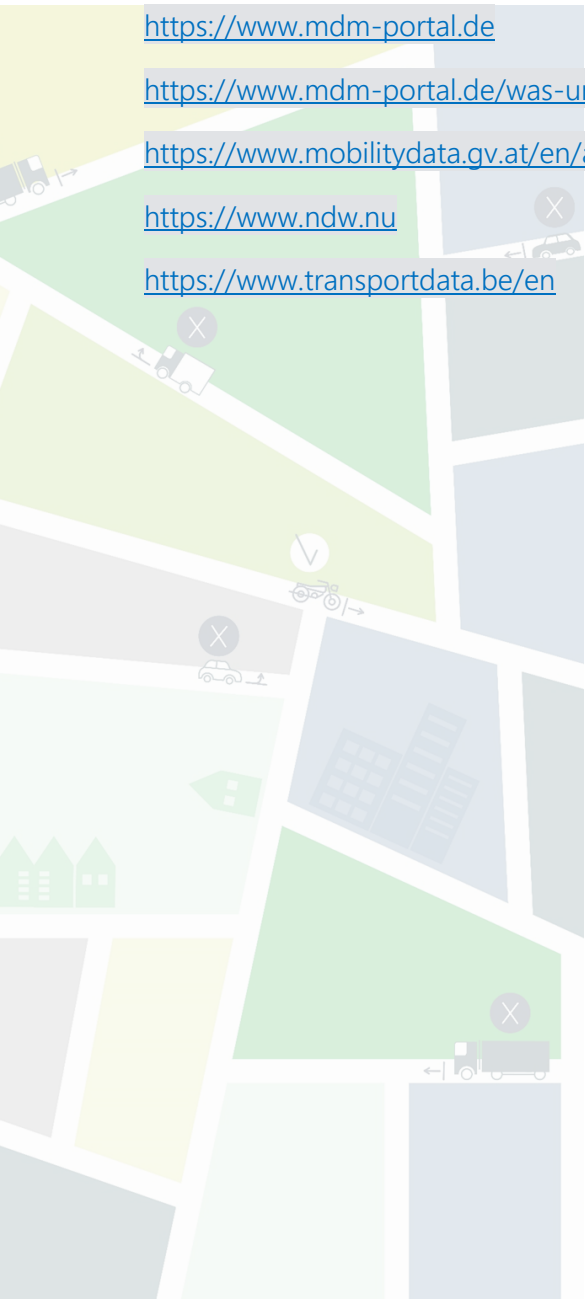
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