



Regulating Vehicle Access
for improved Livability



D2.4 Database of categorized and parameterized option of UVAR measures in three Measure Fields

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Summary sheet

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Project partners

Organisation	Country	Abbreviation
STADT BIELEFELD	Germany	Stadt Bielefeld
COMUNE DI PADOVA	Italy	Padova
UNIVERSITA' DEGLI STUDI DI PADOVA	Italy	UNIPD
GEMEENTE HELMOND	Netherlands	Helm
V-TRON BV	Netherlands	V-TRON BV
MUNICIPALITY OF JERUSALEM	Israel	JERUSALEM
THE MAYOR AND COMMONALTY AND CITIZENS OF THE CITY OF LONDON	United Kingdom	CoL
TRANSPORT FOR LONDON	United Kingdom	TFL
CENTRO DE ESTUDIOS AMBIENTALES	Spain	CEA
SADLER CONSULTANTS EUROPE GMBH	Germany	Sadler
TRT TRANSPORTI E TERRITORIO SRL	Italy	TRT
WSP SVERIGE AB	Sweden	WSP
POLIS – PROMOTION OF OPERATIONAL LINKS WITH INTEGRATED SERVICES, ASSOCIATION INTERNATIONALE	Belgium	Polis
UNIVERSITEIT GENT	Belgium	UGent
RUPPRECHT CONSULT-FORSCHUNG & BERATUNG GMBH	Germany	Rupprecht

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List of acronyms

M1	M1 UNECE class
M2	M2 UNECE class
M3	M3 UNECE class
PTW	Powered two-wheeler
SI	Spatial interventions
PM	Pricing measures
PZEZ/LTZ	Pathways to ZEZ and LTZ
FO	Future options
LTZ	Low Traffic Zone
LEZ	Low Emission Zone
ZEZ	Zero Emission Zone

ReVeAL Overview

Smarter urban vehicle access regulations

Despite urgent calls for “smarter urban vehicle access regulations” in the Urban Mobility Package and other high-level political commitments, very few decision makers are keen on going public with the idea of restricting car access (in time or space) in urban areas. ReVeAL will help to add Urban Vehicle Access Regulations (UVAR) to the standard range of urban mobility transition approaches of cities across Europe. Toward this end, the ReVeAL consortium will combine conceptual work and case study research with hands-on UVAR implementation in six pilot cities and systematic stakeholder interaction and professional communication activities.

The ReVeAL approach works along three different dimensions when considering the implementation of new UVARs:

1. It looks at a range of UVAR measures, grouping them into Measures Fields.
2. It looks at all measures through the lens of four Transition Areas, which need to be taken into account in any local setting (Governance and Financing, Mobility Services and Concepts, System Design and Technology, User Needs and Acceptance)
3. It approaches all of these in the light of the stages of the change process, understanding that cities at different stages are capable of different levels of ambition.

These aspects are crucial to consider for the implementation of any kind of UVAR measure. ReVeAL will open and expand the UVAR toolbox through a dedicated work package (WP2 – UVAR Options and Scenarios), covering both established and cutting-edge approaches. The most important and new ones are Pathways to Zero-Emission Zones and Low Traffic Zones (ZEZ/LTZ) as well as planning and design-related approaches for Spatial Interventions at district level such as superblocks. Also included is the broad array of Pricing Measures (e.g. dynamic road and curb space user charges, congestion charging, paid or regulated parking space) and radically novel approaches such as C-ITS-based strategies to control vehicle access through automated C2I communication or geo-fencing. ReVeAL includes world-leading experts in these four areas who can support the pilot cities during the design and implementation of their UVAR measures. Some of these approaches will be considered in more detail in scenario building activities, which will take place in each of the Pilot Cities.

Overview of D2.4: Database of categorized and parameterized option of UVAR measures in three Measure Fields

This deliverable contains a thorough description of 8 different options of UVAR measures (city case studies) in three measure fields, presented as a relational database. The city case studies of T2.1 (see D2.1) are documented according to the set of categories and parameters developed in T2.2 (see D2.2 and D2.3), which have been revised in T2.3. Additionally, the city case studies have been evaluated to determine how future-proof each of the UVAR measures are in terms of their resilience for future trends and options in services, technology and transition schemes following the methodology developed in T2.6 (see MS11). The description of the measures in this database will feed into WP5 and can be extended to include the “readiness” parameters developed in T5.1. As such, D2.4 serves as a database for the Process Advise Tool, which generates possible measure options for querying cities.

Describing urban vehicle access regulations

ReVeAL gathers and structures existing evidence, current trends and developments in the implementation of various UVAR measures in Europe and around the world. Evidence will be gathered in four ReVeAL Measure Fields, namely:

- Spatial Interventions (SI)
- Pricing Measures (PM)
- Pathways to ZEZ and LTZ (PZEZ/LTZ)
- Future options (FO)

The purpose is to construct a ReVeAL knowledge base that will serve as a basis for building UVAR-related scenarios for the six ReVeAL pilot cities as well as feed into the Process Advisor of the decision support tool for cities post-project (see T5.1).

D2.4 contributes to the ReVeAL knowledge base with a record of best practices as well as experiences of existing UVAR implementations. The data collected relates to three Measure Fields (Spatial Interventions, Pricing Measures and Pathways to ZEZ and LTZ) contextualized in a collection of eight city case studies. The set of eight city case studies presented in this database was defined in T2.1 (see D2.1 – *Short list of UVAR strategies and related city case studies*) and can be found in Table 1.

Table 1. List of city case studies.

Code	Measure field	City case study	Country	UVAR Strategy
C001	SI	Barcelona	Spain	Superblocks
C002	SI	Ghent	Belgium	Traffic circulation plan
C003	SI	Mechelen	Belgium	Cycling zone
C004	PM	Milan	Italy	Congestion charge applied to a perimeter or an area
C005	PM	Greater London	UK	Pollution charge applied to a perimeter or an area
C006	PZEZ/LTZ	La Rochelle	France	Delivery regulations
C007	PZEZ/LTZ	Bologna	Italy	Limited Traffic Zone (LTZ)
C008	PZEZ/LTZ	Amsterdam	Netherlands	Low-/Zero-Emission Zones (LEZ/ZEZ)

A **city case study** is an extensive review of a city where implementation of measures in one or more Measure Fields is taking place (e.g., a ZEZ by design in Amsterdam, a pollution charge in London or the circulation plan in Ghent). The case study looks into the change processes and provides a connected view on UVAR implementations. With two major ReVeAL developments that come together when describing, categorizing, and parameterizing the city case studies; **the UVAR building blocks** and **the set of process evaluation parameters and impact assessment indicators**. (For a description of the methodology for the documentation, categorization and parametrization of the city cases into the database of UVAR options and its relationship with other WP's, we refer to D2.1, D2.2 and D2.3)

A measure in this context is a **building block** (e.g. a parklet, a delivery regulation scheme or dynamic pricing for marking) that moves in the direction of a larger implementation (e.g. a superblock, a zero-emission zone or an integrated parking charge). Such measures may take the form of small or large-scale initiatives, or specific aspects of initiatives ranging across the different ReVeAL Transition Areas. These could include, for example, parklets, urban freight regulation, or successful methods to implement an aspect of a controversial LEZ (e.g. a logistics hub). A first version of the UVAR set of categories or **building blocks** was drafted in D2.2 (T2.2) for four measure fields: Spatial Interventions, Pricing Measures, Pathways to LTZ/ZEZ and Future Options. For the *Database of categorized and parameterized options of UVAR measures*, the building block long list was reviewed and, additionally, complemented. This resulted in an extra category of 'Complementary Measures'. (For a description of the methodology and relations to other WP's, we refer to D2.1, D2.2 and D2.3)

In this report, we refer to two types of UVAR building block documents: the '*Set of categories long list*', which defines the reviewed long list of possible building blocks, indicating their definition and providing various examples, and the '*Case study city building block*' document, which shows the (planned) implemented building blocks for the eight case study cities.

Additionally, in the frame of the *Database of categorized and parameterized options of UVAR measures*, the evaluation of the UVAR process in a city is captured by means of a timeline of relevant UVAR events (UVAR Events Timeline). Such events describe the UVAR life cycle, following the *ReVeAL Transition Framework* (WP1). The **process evaluation parameters and impact assessment indicators** are organized according to thematic clusters as shown in Table 2. The clusters are defined by each of the *UVAR Transition Areas* (Governance and Financing, Mobility Services and Concepts, User Needs and Acceptance, System Design/Technology) and the *General City-ID Card*, and have been developed in the context of the ReVeAL Transition Framework (WP1) and the Evaluation Framework (WP4).

Table 2. Thematic clusters – Process evaluation parameters and indicators.

Governance and Financing	Mobility Services and Concepts	User Needs and Acceptance	System Design/Technology	General City ID-Card
Decision-making context	Improvements in public transport	Inclusion of user needs	Permit system	General information
Legal frameworks	Enhancement of soft mobility (cycling and walking)		Stakeholders	Communication
Political instruments				
Public consultation	Enhancement of shared mobility	General opinion	Enforcement technology	Transport information
Financing	Improvements in urban logistic		Intelligent transport systems (ITS)	Effects on inhabitants
Communications	Changes in parking system	Main arguments		
Planning instruments	Low emission vehicles and ITS developments	User groups identification	Monitoring	General mobility information

Note that the *General City ID-Card* falls in line and synchronizes the work done in ReVeAL with the SUMI Project (2017-2020; MOVE/B4/2017-358) in the understanding that "*The common development and use of a methodologically sound, practically feasible and harmonised indicator set on sustainable urban mobility is fundamental for European urban areas in order to analyse*

progress towards their goals and policy objectives as well as to identify deficiency areas where additional action may be required. Moreover, urban areas need a system of indicators that is widely accepted and used in Europe, irrespective of city size and characteristics of the mobility system."¹ Thus, in congruence with the SUMI Project, the General City ID-Card is based on the data categories described in the *Data Harmonization Guidelines*¹ framed in the SUMI Project. The *Data Harmonization Guidelines* reported in the SUMI Project build heavily on Eurostat (2016) *EU Transport Statistics – Eurostat guidelines* on Passenger Mobility Statistics. This once again highlights the efforts of the European Commission on reaching a regular and harmonised data collection at the European level and the need for ReVeAL to support this effort.

Finally, the database structure allows the user to easily perform for each of the city case studies a Resiliency assessment of each of its UVAR Building blocks. This kind of assessment is of special importance to determine and establish how future-proof each of the UVAR measures presented in the city case studies is with respect to future trends and options in services, technology and transition schemes. For detailed information on the methodology of the Resiliency assessment of the UVAR Building Blocks we refer the reader to T2.6 (MS11).

The description of the measures in this *Database of categorized and parameterized options of UVAR measures* will feed into WP5 and can be extended to include the “readiness” parameters developed in T5.1. As such, D2.4 serves as a database for the Process Advise Tool, which generates possible measure options for querying cities.

The reminder of this report will focus on the structure of the *Database of categorized and parameterized options of UVAR measures* presented by means of its database schema. Followed by a detailed description of the data domains/fields present in each of the data tables contained in the database. These sections provide a wholistic overview of the database and is thus recommended to carefully read these sections before using and/or updating the database.

Database structure

The information gathered is presented as a relational database. This facilitates the visualization, manipulation and querying of the data for further analysis. Thus, allowing for a systematic and unsupervised handling of the data to take place in the operations of the Process Advisor Tool developed in WP5 (see T5.1).

The database corresponds to the accompanying file: “*D2.4_Database_of_UVAR_options.accdb*”. The database contains a total of 14 data tables. Table 3 shows the different data tables present in the database. The schematic representation of the database can be found in the accompanying document “*Database_Schema.pdf*”.

¹ https://ec.europa.eu/transport/sites/transport/files/sumi_wp1_harmonisation_guidelines.pdf

Table 3. Database content – Data tables.

Code	Name	Name in database
C	City case studies	Case_studies
ASC	UVAR set of categories – long list	UVAR_set_of_categories_long_list
CCBB	Case study city – building block	Case_study_city_BB
ETL	UVAR Events Timeline	UVAR_Event_Timeline
TAGF	UVAR Transition Areas – Governance and Financing	Governance_and_financing
TAMSC	UVAR Transition Areas – Mobility services and concepts	Mobility_services_and_concepts
TASDT	UVAR Transition Areas – System design/technology	System_design_technology
TAUSNA	UVAR Transition Areas – User needs and acceptance	User_needs_and_acceptance
CIDCG	General City ID-Card – General information	ID-Card_General
CIDCD	General City ID-Card – Demographic information	ID-Card_Demographic
CIDCM	General City ID-Card – General mobility information	ID-Card_Mobility
CIDCT	General City ID-Card – Transport information	ID-Card_Transport
CIDCE	General City ID-Card – Effects on inhabitants	ID-Card_Effects
RA	Resiliency assessment	Resiliency_assessment

It is important to highlight that the database here presented is by no means finalized by this deliverable report. The data collection activities are to be continued. The categorization and

parameterization of the pilot cities' UVAR measures is to be included in this database in the future. Additionally, new city cases may be included in the future to enrich the knowledge here captured. Therefore, the relational structure of the *Database of categorized and parameterized options of UVAR measures* intends not only to facilitate the fetching and manipulation of the data, but also a future update of the database itself.

Spatial dimension

The spatial dimension is of high importance when comparing city information/statistics. It sets the context to the information that is presented and is thus a crucial factor to increase credibility of city comparative analysis. Therefore, the *Database of categorized and parameterized options of UVAR measures* presents the possibility to capture the spatial dimension associated to the city indicators and parameters. This takes place in the *General City ID-Card*, where an extra field has been added to make evident the scope of the area for which the data is representative.

Following the same principles established for the conception of the *General City ID-Card*. The harmonisation of international data is the cornerstone principle that defines the spatial dimension in the *Database of categorized and parameterized options of UVAR measures*. To find this harmony, we refer to the *Methodological manual on city statistics (2017)*² in combination with the *Nomenclature of territorial units for statistics (NUTS)*³. Table 4 shows the different categories in which the spatial dimension may be represented in the *Database of categorized and parameterized option of UVAR measures*.

Table 4. Area scope types.

Types of Area scope

City

Greater City

Functional urban area

Metro (region)

NUTS 1

NUTS 2

² <https://ec.europa.eu/eurostat/documents/3859598/8012444/KS-GQ-17-006-EN-N.pdf>

³ Regulation (EC) No 1059/2003

For detailed information on the definitions and methodology used to identify the different Area scope types we refer to the *Methodological manual on city statistics (2017)* for the definition and methodologies applied to the types *City*, *Greater City* and *Functional Area*. For the definition and methodology on the identification of *Metro regions* we refer to the paper *Regional typologies: a compilation (2011)*⁴. Note that data sources such as Eurostat⁵ make use of the Area scope types shown in Table 4 and are thus in line with the classification of the spatial dimension of this database.

Data domains/fields

The description of the measures in this *Database of categorized and parameterized options of UVAR measures* will feed into WP5 and can be extended to include the “readiness” parameters developed in T5.1. As such, D2.4 serves as a database for the Process Advise Tool, which generates possible measure options for querying cities. However, this is only possible with a harmonized data set of comparable information. For this purpose, it is recommended to follow the data structure and categories provided in the following sub-sections when updating the database.

Additionally, this section intends to give a detailed overview of each of the different data tables present in the *Database of categorized and parameterized options of UVAR measures*. Presenting the different data fields contained in each of the data tables, as well, as the recommended data types (entry values) to be provided in each of the data fields.

Finally, it is important to highlight that the collection of data fields, and entry values here provided is in a way never final as it undergoes continuous improvements. Future developments in ReVeAL such as the inclusion of new data cases (including the Pilot City Cases), or updates in related WPs (WP1, WP2, WP4, WP5), may lead to new variables (data fields) with new entry values (data types) that would better fit the new findings.

Building blocks

In this report, we refer to two types of UVAR building block tables: the '*UVAR set of categories - long list*', which defines the reviewed long list of possible building blocks, indicating their definition and providing various examples, and the '*Case study city building block*' table, which shows the (planned) implemented building blocks for the eight city case study cities.

⁴ https://ec.europa.eu/regional_policy/en/information/publications/regional-focus/2011/regional-typologies-a-compilation

⁵ <https://ec.europa.eu/eurostat/web/main/home>

The first table for the building blocks is the *UVAR set of categories – long list* table, which contains 72 building block subtypes in 30 UVAR sets of categories. Table 5 shows the different data fields present in the *UVAR Set of categories – long list* data table.

Table 5. Variables: UVAR set of categories – long list

Code	Label	Type	Required?
ASC001	Building block ID	Numerical	Yes
ASC002	UVAR building block	Text	Yes
ASC003	Building block subtype ID	Text	Yes
ASC004	Measure field	Categorical	Yes
ASC005	UVAR building block subtype	Text	Yes
ASC006	Definition	Text	Yes
ASC007	Possible scale – National	Binary	Nice to have
ASC008	Possible scale – Regional	Binary	Nice to have
ASC009	Possible scale – City	Binary	Nice to have
ASC010	Possible scale – Neighborhood/City center	Binary	Nice to have
ASC011	Possible scale – Street	Binary	Nice to have
ASC012	Possible impact – Economy	Binary	Nice to have
ASC013	Possible impact – Energy consumption	Binary	Nice to have
ASC014	Possible impact – Pollution and nuisance	Binary	Nice to have
ASC015	Possible impact – Accessibility	Binary	Nice to have
ASC016	Possible impact – Safety	Binary	Nice to have
ASC017	Possible impact – Equity	Binary	Nice to have

ASC018	Possible impact – Public transport	Binary	Nice to have
ASC019	Possible impact – Sustainable modal split	Binary	Nice to have
ASC020	Possible impact – Public space	Binary	Nice to have
ASC021	Often applied as complementary measure?	Categorical	Nice to have
ASC022	Pop-up opportunity?	Categorical	Nice to Have
ASC023	COVID-19 policy friendly?	Categorical	Nice to have
ASC024	References	Text	Nice to have
ASC025	Comments	Text	No

Table 6 contains the different entry values (categories) associated to the data fields in the *UVAR set of categories – long list* table that require a categorical input. Note that some of the data fields allow for custom entry values (free text); data fields that include entry value “other”. This grants the possibility of updating the entry values categories to adapt to future trends and findings.

Table 6. Entry values for data fields in *UVAR set of categories – long list*

Data field code	Entry value
ASC004	Spatial interventions
	Pricing measures
	PZEZ/LTZ
	Future options – enabler
	Future options – indirect UVAR
	Future options – promote alternatives
	Complementary measures
ASC021	Yes

	Yes, considering...
	No
ASC022	Yes
	Yes, considering...
	No
ASC023	Yes
	Yes, considering...
	No

The second table for the building blocks is the *Case study city – building block* table, which provides information on which building blocks from the *UVAR set of categories – long list* table have already been or are implemented in the city case studies. The information contained in the Case study city – building block table relates to both the UVAR set of categories – long list table, and the UVAR Event timeline table (whenever relevant) by means of the *Building block subtype ID* and the *Event ID* data fields respectively. In addition, the document relates to the information gathered in the CLARS database (<https://urbanaccessregulations.eu>), which already contains information on various UVAR implementations in Europe and is supported by the European Commission. If available, the CLARS information is added to the database by linking to the respective web page. Table 7 shows the different data fields present in the *UVAR Set of categories – long list* data table.

Table 7. Variables: Case study city – building block table

Code	Label	Type	Required?
CCBB001	ID	Numerical	Yes
CCBB002	Building Block ID	Numerical	Yes
CCBB003	Building block subtype ID	Text	Yes
CCBB004	Building block subtype	Text	Yes
CCBB005	Event ID	Numerical	If relevant
CCBB006	City ID	Numerical	Yes
CCBB007	Existing (already present)	Binary	Yes

CCBB008	Existing (part of UVAR strategy)	Binary	Yes
CCBB009	Planned	Binary	Yes
CCBB010	Year of planned introduction	Date - year	If relevant
CCBB011	Adaptation date	Date	If relevant
CCBB012	Considered (but not yet planned)	Binary	Yes
CCBB013	Considered (but rejected)	Binary	Yes
CCBB014	Geographical scope	Text	If relevant
CCBB015	Spatial reference (CLARS)	Text	Nice to have
CCBB016	Temporal reference (CLARS)	Text	Nice to have
CCBB017	Legislation reference (CLARS)	Text	Nice to have
CCBB018	Comments	Text	No

UVAR Events Timeline

For each of the city cases, the evolution of the UVAR process is described by means of a timeline of relevant UVAR events. Such events describe the UVAR life cycle, following the ReVeAL Transition Framework (WP1). The UVAR Events Timeline can be directly related to each of the other tables in the database. And is therefore one of the crucial aspects of the database connecting the categorization of the events by means of the ReVeAL Transition Areas and the UVAR Building Blocks. Table 8 shows the data fields present in the UVAR Events Timeline table.

Table 8. Variables: UVAR Events Timeline.

Code	Label	Type	Required?
ETL001	ID	Numerical	Yes
ETL002	City ID	Numerical	Yes
ETL003	Gate	Categorical	Yes

ETL004	Phase	Categorical	Yes
ETL005	Date	Date	Yes
ETL006	Event	Text	Yes
ETL007	Description	Text	Nice to have
ETL008	Source	Text; Hyperlink	Yes
ETL009	Governance and Financing	Binary	Nice to have
ETL010	User needs and acceptance	Binary	Nice to have
ETL011	Mobility services and concepts	Binary	Nice to have
ETL012	System design/technology	Binary	Nice to have
ETL013	Building block adaptation	Binary	Nice to have

Table 9 contains the different entry values (categories) associated to each of the data fields ETL003 and ETL 004 in the UVAR Events Timeline table. These categories are defined in the frame of WP1 and the ReVeAL Transition Framework and correspond to the different UVAR Phases and UVAR Gates. For detailed information on the ReVeAL Transition framework please refer to WP1 and WP2 (see D2.3).

Table 9. Entry values for data fields in UVAR Events Timeline table.

Data field code	Entry value
ETL003	Decision-making
	Adoption
	Commissioning
ETL004	Ideation
	Design
	Implementation
	Operation

UVAR Transition areas

The **process evaluation parameters and impact assessment indicators** use for the categorization and parameterization of the UVAR measures are organized according to thematic clusters as shown in Table 2. The clusters are defined by each of the *UVAR Transition Areas* (Governance and Financing, Mobility Services and Concepts, User Needs and Acceptance, System Design/Technology) and the *General City-ID Card*, and have been developed in the context of the ReVeAL Transition Framework (WP1) and the Evaluation Framework (WP4). The following subsections present a detailed overview of the data fields present in each of the data tables used for the parameterization of the city cases following the UVAR Transition Areas and the General City ID-Card.

Governance and Financing

The data fields presented in the Governance and Financing table correspond to the seven thematic clusters (Table 2) that define the Governance and Financing transition area. For each UVAR city case, the Governance and Financing table links to its respective UVAR event timeline by means of the *Event ID* (ETL001). Table 10 shows the data fields present in the Governance and Financing table.

Table 10. Variables: UVAR Transition Areas – Governance and Financing.

Code	Label	Type	Required?
TAGF001	Event ID	Numerical	Yes
TAGF002	<i>Decision making context: Who influences/makes decisions?</i>	Categorical	If relevant
TAGF003	<i>Legal Frameworks: National</i>	Categorical	If relevant
TAGF004	<i>Legal Frameworks: Local regulations</i>	Categorical	If relevant
TAGF005	<i>Legal Frameworks: Other actors</i>	Categorical	If relevant
TAGF006	<i>Political instruments: Type</i>	Categorical	If relevant
TAGF007	<i>Political instruments: Relevant policies</i>	Categorical	If relevant
TAGF008	<i>Planning instruments: Type</i>	Categorical	If relevant
TAGF009	<i>Planning instruments: Status</i>	Categorical	If relevant
TAGF010	<i>Financing: Establishment</i>	Categorical	If relevant
TAGF011	<i>Financing: Procurement</i>	Categorical	If relevant

TAGF012	<i>Financing: Revenues</i>	Categorical	If relevant
TAGF013	<i>Communications: Type</i>	Categorical	If relevant
TAGF014	<i>Public consultation: Process</i>	Categorical	If relevant

Table 11 contains the different entry values (categories) associated to each of the data fields TAGF002-TAGF014 in the Governance and Financing table. Note that some of the data fields allow for custom entry values (free text); data fields that include entry value “*other*” (Table 11). This grants the possibility of updating the entry values categories to adapt to future trends and findings.

Table 11. Entry values for data fields in Governance and Financing table

Data field code	Entry value
TAGF002	City council
	Local government
	Regional government
	National government
	Experts commission
	Political party
	Interest groups
	Other
TAGF003	Changes in National Legal Framework
	National frameworks in place for UVAR
	Other
TAGF004	Changes in local regulations
	Local regulations in place for UVAR
	Other
TAGF005	National government
	Regional government

	National police
	Other
TAGF006	Consultation (referendum/participatory process)
	City council resolution
	Municipal decision
	Municipal ordinance
	Mayoral elections
	Monitoring/reporting
	Political party agreement
	Signing of declaration
	Other
TAGF007	Air Quality plan policy
	Sustainable Energy and climate Action Plan
	Public transport policy
	Congestion reduction strategy
	Accessibility policy
	Regional / local economy development plan
	Traffic management policy
	Land use policy
	Sustainability policy
	Innovation policy
	Cycling policy
	Cycle parking strategy
	Urban planning policy

	Parking policy
	Equality
	Economics
	other
TAGF008	Mobility plan
	Research/Study/guidance document
	Other planning instruments
TAGF009	planned
	under development
	open for consultation
	approved
	adopted
	Published
	implemented
	updated
TAGF010	Plan/ study funded [cost/payed by whom]
	Instalment of equipment funded [cost/payed by whom]
	Communication and public involvement funded [cost/payed by whom]
	Enforcement funded [cost/payed by whom]
TAGF011	Ringfencing
	Regional Government
	National Government
	Other
TAGF012	Procurement procedure prepared and planned

	Specifications and standards defined
	Tenders submitted and selected
	Tenders valuated
	Contract implementation and management
	Other
TAGF013	Announcement of proposal
	Briefings & updates
	Other events mentioning UVAR: public speeches...
	Key meetings
	Communication campaigns
	Other
TAGF014	Notification (to publicise the matter to be consulted on)
	Consultation (two-way flow of information and opinion exchange)
	Participation (involving interest groups, stakeholder events)

Mobility services and concepts

The data fields presented in the Mobility Services and Concepts table correspond to the six thematic clusters (Table 2) that define the Mobility Services and Concepts transition area. For each UVAR city case, the Mobility Services and Concepts table links to its respective UVAR event timeline by means of the *Event ID* (ETL001). Table 12 shows the data fields present in the Mobility Services and Concepts table.

Table 12. Variables: UVAR Transition Areas – Mobility Services and Concepts.

Code	Label	Type	Required?
TAMSC001	Event ID	Numerical	Yes
TAMSC002	<i>Improvements in public transport: Fleet renewal to reduce emissions</i>	Categorical	If relevant

TAMSC003	<i>Improvements in public transport:</i> Increase of the service	Categorical	If relevant
TAMSC004	<i>Improvements in public transport:</i> Improvement of the prioritization measures	Categorical	If relevant
TAMSC005	<i>Improvements in public transport:</i> Implementation or improvement of additional complementary services	Categorical	If relevant
TAMSC006	<i>Improvements in public transport:</i> Economic incentives to citizens/companies to enhance PT use	Categorical	If relevant
TAMSC007	<i>Improvements in public transport:</i> Provision of new automated shuttles	Categorical	If relevant
TAMSC008	<i>Enhancement of soft mobility (cycling and walking):</i> Extension of cycle network	Categorical	If relevant
TAMSC009	<i>Enhancement of soft mobility (cycling and walking):</i> Extension of pedestrian network	Categorical	If relevant
TAMSC010	<i>Enhancement of soft mobility (cycling and walking):</i> Improvement of prioritization measures	Categorical	If relevant
TAMSC011	<i>Enhancement of soft mobility (cycling and walking):</i> Provision of bike/pedestrian facilities	Categorical	If relevant
TAMSC012	<i>Enhancement of soft mobility (cycling and walking):</i> Incentives/communication campaigns to increase the share of soft mobility	Categorical	If relevant
TAMSC013	<i>Changes in parking system:</i> Park and ride schemes development	Categorical	If relevant
TAMSC014	<i>Changes in parking system:</i> Park and walk/bike schemes development (parking close to the destination but outside regulated areas)	Categorical	If relevant
TAMSC015	<i>Changes in parking system:</i> Modification of on-street/off-street parking supply	Categorical	If relevant
TAMSC016	<i>Changes in parking system:</i> Improvement of the enforcement capacity	Categorical	If relevant

TAMSC017	<i>Changes in parking system:</i> Introduction of changes in the park pricing system	Categorical	If relevant
TAMSC018	<i>Changes in parking system:</i> Introduction/improvement of dynamic parking guidance	Categorical	If relevant
TAMSC019	<i>Enhancement of shared mobility:</i> Bike sharing system development	Categorical	If relevant
TAMSC020	<i>Enhancement of shared mobility:</i> Car sharing system development	Categorical	If relevant
TAMSC021	<i>Enhancement of shared mobility:</i> Van sharing system development	Categorical	If relevant
TAMSC022	<i>Enhancement of shared mobility:</i> Other sharing system (mopeds, scooters, etc.) development	Categorical	If relevant
TAMSC023	<i>Enhancement of shared mobility:</i> Incentives/campaigns to increase the use of shared mobility	Categorical	If relevant
TAMSC024	<i>Enhancement of shared mobility:</i> Incentives/campaigns to increase the use of electric shared mobility	Categorical	If relevant
TAMSC025	<i>Improvements in urban logistics:</i> Development of new urban logistics platform/hub/infrastructure	Categorical	If relevant
TAMSC026	<i>Improvements in urban logistics:</i> Changes/improvement/new regulations of loading and unloading bays	Categorical	If relevant
TAMSC027	<i>Improvements in urban logistics:</i> Projects to promote cycle/foot/autonomous and improved logistics development	Categorical	If relevant
TAMSC028	<i>Improvements in urban logistics:</i> Covenants/incentives/campaigns to develop cleaner/more sustainable logistic systems/fleets	Categorical	If relevant
TAMSC029	<i>Low emission vehicles and ITS developments:</i> Extension of charging network for e-vehicles	Categorical	If relevant

TAMSC030	<i>Low emission vehicles and ITS developments:</i> Covenants/incentives/campaigns to enhance the shift to cleaner/electric private vehicles	Categorical	If relevant
TAMSC031	<i>Low emission vehicles and ITS developments:</i> C-ITS (Cooperative Intelligent Transport Systems) development	Categorical	If relevant
TAMSC032	<i>Low emission vehicles and ITS developments:</i> Introduction of MaaS (Mobility as a Service) or other platforms to combine multiple mobility modalities	Categorical	If relevant
TAMSC033	<i>Low emission vehicles and ITS developments:</i> Introduction of ride hailing platforms/services	Categorical	If relevant
TAMSC034	<i>Low emission vehicles and ITS developments:</i> Enhancement or promotion of cleaner/electric taxis	Categorical	If relevant
TAMSC035	<i>Low emission vehicles and ITS developments:</i> Enhancement or promotion of cleaner/electric private hire vehicles	Categorical	If relevant

Table 13 contains the different entry values (categories) associated to each of the data fields TAMSC002–TAMSC035 in the Mobility Services and Concepts table. Note that some of the data fields allow for custom entry values (free text); data fields that include entry value “other” (Table 13). This grants the possibility of updating the entry values categories to adapt to future trends and findings.

*Table 13. Entry values for data fields in Mobility Services and Concepts table. *When possible, the status (under consideration, planned, under implementation, operative) should be added to the entry value.*

Data field code	Entry value
TAMSC002	Under consideration
	Planned
	Under implementation
	Operative
TAMSC003*	New PT lines

	Extension of existing lines
	Increased frequencies
	Higher capacity
	Other
TAMSC004*	Dedicated lanes
	Green light for buses/trams
	Other
TAMSC005*	E-ticketing
	Infomobility
	Other
TAMSC006	Under consideration
	Planned
	Under implementation
	Operative
TAMSC007	Under consideration
	Planned
	Under implementation
	Operative
TAMSC008	Under consideration
	Planned
	Under implementation
	Operative
TAMSC009*	Pedestrian paths/streets
	Other

TAMSC010*	Bicycle streets
	Bicycle zones
	30 km/h zones
	Other (traffic calming interventions)
TAMSC011*	Bike parking
	Other
TAMSC012*	Communication campaigns
	Other
TAMSC013	Under consideration
	Planned
	Under implementation
	Operative
TAMSC014*	Parking close to the destination but outside regulated areas
	Bike sharing next to parking areas
	Other
TAMSC015	Under consideration
	Planned
	Under implementation
	Operative
TAMSC016	Under consideration
	Planned
	Under implementation
	Operative
TAMSC017	Under consideration

	Planned
	Under implementation
	Operative
TAMSC018	Under consideration
	Planned
	Under implementation
	Operative
TAMSC019	Under consideration
	Planned
	Under implementation
	Operative
TAMSC020	Under consideration
	Planned
	Under implementation
	Operative
TAMSC021	Under consideration
	Planned
	Under implementation
	Operative
TAMSC022*	Mopeds
	Scooters
	Other
TAMSC023*	Communication campaigns
	Other

TAMSC024*	Communication campaigns
	Other
TAMSC025	Under consideration
	Planned
	Under implementation
	Operative
TAMSC026	Under consideration
	Planned
	Under implementation
	Operative
TAMSC027*	Cargo-bike sharing
	Other
TAMSC028	Under consideration
	Planned
	Under implementation
	Operative
TAMSC029	Under consideration
	Planned
	Under implementation
	Operative
TAMSC030*	Communication campaigns
	Other
TAMSC031*	ISA
	Other

TAMSC032*	MaaS
	Other
TAMSC033*	Other
TAMSC034*	Other
TAMSC035*	Other

User needs and acceptance

The data fields presented in the User Needs and Acceptance table correspond to the five thematic clusters (Table 2) that define the User Needs and Acceptance transition area. For each UVAR city case, the User Needs and Acceptance table links to its respective UVAR event timeline by means of the *Event ID* (ETL001). Table 14 shows the data fields present in the User Needs and Acceptance table.

Table 14. Variables: UVAR Transition Areas – User Needs and Acceptance.

Code	Label	Type	Required?
TAUNA001	Event ID	Numerical	Yes
TAUNA002	<i>User groups identification: Frequent users</i>	Categorical	If relevant
TAUNA003	<i>User groups identification: Non-frequent users</i>	Categorical	If relevant
TAUNA004	<i>User groups identification: Transport mode specific users</i>	Categorical	If relevant
TAUNA005	<i>User groups identification: Goods traffic</i>	Categorical	If relevant
TAUNA006	<i>Inclusion of user needs: Important user needs</i>	Categorical	If relevant
TAUNA007	<i>Inclusion of user needs: Design aspects and adaptations</i>	Categorical	If relevant
TAUNA008	<i>Inclusion of user needs: Engagement methods</i>	Categorical	If relevant
TAUNA009	<i>Stakeholders: Interest groups</i>	Categorical	If relevant
TAUNA010	<i>Stakeholders: Vulnerable groups</i>	Categorical	If relevant

TAUNA011	<i>General opinion: Level of acceptability</i>	Percentage	If relevant
TAUNA012	<i>General opinion: Tone of media coverage</i>	Categorical	If relevant
TAUNA013	<i>Main arguments: For</i>	Categorical	If relevant
TAUNA014	<i>Main arguments: Against</i>	Categorical	If relevant

Table 15 contains the different entry values (categories) associated to each of the data fields TAUNA002-TAUNA010 and TAUNA012-TAUNA014 in the User Needs and Acceptance table. Note that some of the data fields allow for custom entry values (free text); data fields that include entry value “other” (Table 15). This grants the possibility of updating the entry values categories to adapt to future trends and findings.

Table 15. Entry values for data fields in User Needs and Acceptance table.

Data field code	Entry value
TAUNA002; TAUNA003; TAUNA004; TAUNA005	User group type not relevant
	Taken into account in design
	Taken into account in public consultation
	Taken into account in communication
TAUNA006	Active modes improvements
	Affordability of travel
	Ease of understanding the policy
	Local environmental improvements
	Parking availability
	Privacy and anonymous travel
	Public transit improvements
	Quality of urban space
	Travel time improvements

	User friendliness
TAUNA007	Complementary measures
	Discounts
	Enforcement procedures
	Exemptions
	Geographical scope
	Legal framework
	Local policy
	Parking terms and conditions
	Physical design
	Revenue allocation
	Technology
	Time differentiations
	Transportation services
	Vehicle differentiations
TAUNA008	N/A
	Bilateral meetings
	Dissemination
	Interviews, questionnaires and other surveys
	Online consultation
	Public hearing
	Social media engagement and monitoring
	User group meetings
	Written responses and comments

	Other
TAUNA009	Active modes
	Car lobby groups
	Citizen groups
	Different levels of government
	Environmental groups
	Local businesses
	Political parties
	Transit lobby groups
	Other
TAUNA010	Age
	Disability
	Ethnicity
	Gender
	Geographical
	Socio-economic
TAUNA012	N/A
	Strongly positive
	Somewhat positive
	Neutral
	Somewhat negative
	Strongly negative
TAUNA013	Climate impact
	Competitiveness

	Congestion
	Fairness
	Liveability
	Local environmental improvements
	Revenue use
	Other
TAUNA014	Affordability
	Anti-car
	Competitiveness
	Doubt effectiveness of measure
	Fairness
	Measure cost
	Other

System Design/Technology

The data fields presented in the System Design/Technology table correspond to the five thematic clusters (Table 2) that define the System Design/Technology transition area. For each UVAR city case, the System Design/Technology table links to its respective UVAR event timeline by means of the *Event ID* (ETL001). Table 16 shows the data fields present in the System Design/Technology table.

Table 16. Variables: UVAR Transition Areas – System Design/Technology.

Code	Label	Type	Required?
TASDT001	Event ID	Numerical	Yes
TASDT002	<i>Permit system:</i> Payment means	Categorical	If relevant
TASDT003	<i>Permit system:</i> Application means	Categorical	If relevant

TASDT004	<i>Enforcement technology:</i> Manual inspection/windscreen stickers	Categorical	If relevant
TASDT005	<i>Enforcement technology:</i> Manual toll collection		
TASDT006	<i>Enforcement technology:</i> ANPR	Categorical	If relevant
TASDT007	<i>Enforcement technology:</i> RFID	Categorical	If relevant
TASDT008	<i>Enforcement technology:</i> GNSS	Categorical	If relevant
TASDT009	<i>Enforcement technology:</i> (Automatic) bollards	Categorical	If relevant
TASDT010	<i>Enforcement technology:</i> Other	Text	If relevant
TASDT011	<i>Communication:</i> Broadcast online	Categorical	If relevant
TASDT012	<i>Communication:</i> Broadcast traditional media	Categorical	If relevant
TASDT013	<i>Communication:</i> Targeted online	Categorical	If relevant
TASDT014	<i>Communication:</i> Targeted postal	Categorical	If relevant
TASDT015	<i>Communication:</i> Other	Text	If relevant
TASDT016	<i>ITS:</i> Variable-message sign (VMS)	Categorical	If relevant
TASDT017	<i>ITS:</i> Car navigation systems (CarNav)	Categorical	If relevant
TASDT018	<i>ITS:</i> Road surface marking	Categorical	If relevant
TASDT019	<i>ITS:</i> Road signalization	Categorical	If relevant
TASDT020	<i>Monitoring:</i> Traffic and Air Quality	Categorical	If relevant

Table 17 contains the different entry values (categories) associated to each of the data fields TASDT002-TASDT008, TASDT010-TASDT013, TASDT015-TASDT018 and TASDT20 in the System Design/Technology table. Note that some of the data fields allow for custom entry values (free text); data fields labelled “Other” (TASDT009, TASDT014, TASDT019) or that include entry value “other” (Table 17). This grants the possibility of updating the entry values categories to adapt to future trends and findings.

Table 17. Entry values for data fields in System Design/Technology table.

Data field code	Entry value
TASDT002	In person (at the offices of the responsible entity)
	Authorized sellers
	Online (dedicated website)
	Call centre
	ATM
	Parking meter
	Permanent debit
	SMS
	Free
	Mobile app
	Other
TASDT003	In person (at the offices of the responsible entity)
	Online
	Mobile app
	Letter
	Email
	Other
TASDT004; TASDT005; TASDT006; TASDT007; TASDT008; TASDT009	Exploratory (for UVAR, for another UVAR)
	Under consideration (for UVAR, for another UVAR)
	Ruled out (for UVAR, for another UVAR)
	Planned/Approved (for UVAR, for another UVAR)
	Installed (for UVAR, for another UVAR)

	Operational (for UVAR, for another UVAR)
	System integration/extension (under consideration, planned/approved, under implementation, operational)
	System maintenance/update (under consideration, planned/approved, under implementation, operational)
TASDT011	Online advertisements
	Governmental websites
	Dedicated website
	Social media
TASDT012	Press
	Posters/billboards
	Flyers
	TV
	Radio
	On-street campaign
	Letters
TASDT013	Emails (to specific user groups)
	Dedicated mobile apps
	SMS
TASDT014	Letter (to specific user groups)
	Paper documentation/flyers (to specific user groups)
TASDT016	Planned/approved
	Installed
	System updated/extension
TASDT017	Update/engagement third party data provider

	Integrated (with smart routing adaptation system, with ISA system, with geofencing)
	Notifications/alerts
TASDT018	Planned/approved
	Installed
	System updated/extension
TASDT019	Planned/approved
	Installed
	System updated/extension
TASDT020	Air quality sensors
	Traffic counter (sensor, manual counting, license plate survey)
	Other

General City ID-Card

The General City ID-Card consists of five different data tables (Table 18). One data table for each of the five data categories (Table 2) covered by the General City ID-Card and developed to be in line with the *Data Harmonization Guidelines* proposed in the context of the SUMI Project (2017–2020).

Table 18. List of data tables in the General City ID-Card.

General City ID-Card Table	Table Code
General information	CIDCG
Demographic information	CIDCD
General mobility information	CIDCM
Transport information	CIDCT
Effects on inhabitants	CIDCE

The *General City ID-Card* captures basic information regarding the basic qualities of the city at different points throughout the UVAR lifecycle. Parts of this contextual information may be present in the city and may happen and develop indirectly from the UVAR events (e.g. as a result of different and unrelated policy packages). However, in some cases, events can directly trigger changes in the city context that the General City ID-Card intends to capture. For this reason, each of the five General City ID-Card tables contains a data field that aims to log such related events by means of the *Event ID* (ETL001). Tables 19–23 show the data fields present in each of the five General City ID-Card data tables. For more information on the data fields the reader is referred to the *Data Harmonization Guidelines (2020)*⁶ developed in the context of the SUMI Project (2017–2020).

Table 19. Variables: General City ID-Card – General Information.

Code	Label	Type	Required?
CIDCG001	ID	Numerical	Yes
CIDCG002	Event ID	Numerical	If relevant
CIDCG003	City ID	Numerical	Yes
CIDCG004	Year (or period relevant to the data)	Date; Date period	Yes
CIDCG005	Source	Text; Hyperlink	Yes
CIDCG006	Gross Domestic Product (GDP) (€)	Numerical	Nice to have
CIDCG007	Surface (km ²)	Numerical	Nice to have
CIDCG008	Area scope	Categorical (Table 4)	Nice to have
CIDCG009	Direct land use of mobility: Roads (ha)	Numerical	Nice to have
CIDCG010	Direct land use of mobility: Railways (ha)	Numerical	Nice to have

⁶ https://ec.europa.eu/transport/sites/transport/files/sumi_wp1_harmonisation_guidelines.pdf

CIDCG011	Direct land use of mobility: Inland ports and waterways (ha)	Numerical	Nice to have
CIDCG012	Direct land use of mobility: Other direct land use (such as bus lanes, cycle lanes, ...) (ha)	Numerical	Nice to have
CIDCG013	Indirect land use of mobility: Public parking (ha)	Numerical	Nice to have
CIDCG014	Indirect land use of mobility: Private parking (ha)	Numerical	Nice to have
CIDCG015	Indirect land use of mobility: Service areas and petrol stations (ha)	Numerical	Nice to have
CIDCG016	Indirect land use of mobility: Storage and logistic centres (ha)	Numerical	Nice to have
CIDCG017	Indirect land use of mobility: Stations (ha)	Numerical	Nice to have
CIDCG018	Indirect land use of mobility: Other (ha)	Numerical	Nice to have
CIDCG019	Functional activities: Business	Binary	Nice to have
CIDCG020	Functional activities: Energy resources	Binary	Nice to have
CIDCG021	Functional activities: Hospital	Binary	Nice to have
CIDCG022	Functional activities: Services	Binary	Nice to have
CIDCG023	Functional activities: School	Binary	Nice to have
CIDCG024	Functional activities: Commercial	Binary	Nice to have
CIDCG025	Functional activities: Sports recreation	Binary	Nice to have

CIDCG026	Functional activities: Residential	Binary	Nice to have
CIDCG027	Functional activities: Residence elderly	Binary	Nice to have
CIDCG028	Functional activities: Park and green	Binary	Nice to have
CIDCG029	City Mayor	Text	Nice to have

Table 20. Variables: General City ID-Card – Demographic Information.

Code	Label	Type	Required?
CIDCD001	ID	Numerical	Yes
CIDCD002	Event ID	Numerical	If relevant
CIDCD003	City ID	Numerical	Yes
CIDCD004	Year (or period relevant to the data)	Date; Date period	Yes
CIDCD005	Source	Text; Hyperlink	Yes
CIDCD006	Total inhabitants	Numerical	Nice to have
CIDCD007	Area scope	Categorical (see Table 4)	Nice to have
CIDCD008	Ratio Male/female in population	Numerical	Nice to have
CIDCD009	Total inhabitants age distribution; Up to 14	Numerical	Nice to have
CIDCD010	Total inhabitants age distribution; 15-19	Numerical	Nice to have
CIDCD011	Total inhabitants age distribution; 20-24	Numerical	Nice to have

CIDCD012	Total inhabitants age distribution; 25-34	Numerical	Nice to have
CIDCD013	Total inhabitants age distribution; 35-44	Numerical	Nice to have
CIDCD014	Total inhabitants age distribution; 45-54	Numerical	Nice to have
CIDCD015	Total inhabitants age distribution; 55-64	Numerical	Nice to have
CIDCD016	Total inhabitants age distribution; 65-74	Numerical	Nice to have
CIDCD017	Total inhabitants age distribution; 75+	Numerical	Nice to have
CIDCD018	Total inhabitants per employment status: Employed	Numerical	Nice to have
CIDCD019	Total inhabitants per employment status: Unemployed	Numerical	Nice to have
CIDCD020	Total inhabitants per employment status: Student	Numerical	Nice to have
CIDCD021	Total inhabitants per employment status: Retired	Numerical	Nice to have
CIDCD022	Total inhabitants per employment status: Other	Numerical	Nice to have
CIDCD023	Average monthly income of inhabitants per quartile; Q ₁ (€)	Numerical	Nice to have
CIDCD024	Average monthly income of inhabitants per quartile; Q ₂ (€)	Numerical	Nice to have
CIDCD025	Average monthly income of inhabitants per quartile; Q ₃ (€)	Numerical	Nice to have
CIDCD026	Average household size	Numerical	Nice to have

Table 21. Variables: General City ID-Card – General Mobility Information.

Code	Label	Type	Required?
CIDCM001	ID	Numerical	Yes
CIDCM002	Event ID	Numerical	If relevant
CIDCM003	City ID	Numerical	Yes
CIDCM004	Year (or period relevant to the data)	Date; Date period	Yes
CIDCM005	Source	Text; Hyperlink	Yes
CIDCM006	Area scope	Categorical (see Table 4)	Nice to have
CIDCM007	Length of road network in 30 km/h zones (kms)	Numerical	Nice to have
CIDCM008	Length of road with bike lanes and not in a 30 km/h zone (kms)	Numerical	Nice to have
CIDCM009	Length of road network with pavement and not in a pedestrian zone (kms)	Numerical	Nice to have
CIDCM010	Length of pedestrian zones (kms)	Numerical	Nice to have
CIDCM011	Total length of road network excluding motorways (kms)	Numerical	Nice to have
CIDCM012	Total number of passenger trips per year	Numerical	Nice to have
CIDCM013	Total number of passenger trips per year per transport type; Pedestrian	Numerical	Nice to have
CIDCM014	Total number of passenger trips per year per transport type; Bike	Numerical	Nice to have
CIDCM015	Total number of passenger trips per year per transport type; Motorised 2/3 wheelers	Numerical	Nice to have

CIDCM016	Total number of passenger trips per year per transport type; Own car	Numerical	Nice to have
CIDCM017	Total number of passenger trips per year per transport type; Taxi/ride-hailing	Numerical	Nice to have
CIDCM018	Total number of passenger trips per year per transport type; Bus (M2; M3)	Numerical	Nice to have
CIDCM019	Total number of passenger trips per year per transport type; Coach	Numerical	Nice to have
CIDCM020	Total number of passenger trips per year per transport type; Metro	Numerical	Nice to have
CIDCM021	Total number of passenger trips per year per transport type; Tram-light rail	Numerical	Nice to have
CIDCM022	Total number of passenger trips per year per transport type; Train	Numerical	Nice to have
CIDCM023	Total number of passenger trips per year per transport type; LGV	Numerical	Nice to have
CIDCM024	Total number of passenger trips per year per transport type; HGV	Numerical	Nice to have
CIDCM025	Total number of passenger trips per year shared mobility; Car	Numerical	Nice to have
CIDCM026	Total number of passenger trips per year shared mobility; Bike	Numerical	Nice to have
CIDCM027	Total number of passenger trips per year shared mobility; Other	Numerical	Nice to have
CIDCM028	Share of Car (M1) per fuel type; Gasoline	Percentage	Nice to have
CIDCM029	Share of Car (M1) per fuel type; Diesel	Percentage	Nice to have

CIDCM030	Share of Car (M1) per fuel type; CNG	Percentage	Nice to have
CIDCM031	Share of Car (M1) per fuel type; LPG	Percentage	Nice to have
CIDCM032	Share of Car (M1) per fuel type; Ethanol	Percentage	Nice to have
CIDCM033	Share of Car (M1) per fuel type; Bio-Ethanol	Percentage	Nice to have
CIDCM034	Share of Car (M1) per fuel type; Bio-Diesel	Percentage	Nice to have
CIDCM035	Share of Car (M1) per fuel type; Hydrogen	Percentage	Nice to have
CIDCM036	Share of Car (M1) per fuel type; Electricity	Percentage	Nice to have
CIDCM037	Share of Car (M1) per fuel type; Gasoline hybrid	Percentage	Nice to have
CIDCM038	Share of Car (M1) per fuel type; Diesel hybrid	Percentage	Nice to have
CIDCM039	Share of Bus (M2) per fuel type; Gasoline	Percentage	Nice to have
CIDCM040	Share of Bus (M2) per fuel type; Diesel	Percentage	Nice to have
CIDCM041	Share of Bus (M2) per fuel type; CNG	Percentage	Nice to have
CIDCM042	Share of Bus (M2) per fuel type; LPG	Percentage	Nice to have
CIDCM043	Share of Bus (M2) per fuel type; Ethanol	Percentage	Nice to have
CIDCM044	Share of Bus (M2) per fuel type; Bioethanol	Percentage	Nice to have

CIDCM045	Share of Bus (M2) per fuel type; Biodiesel	Percentage	Nice to have
CIDCM046	Share of Bus (M2) per fuel type; Hydrogen	Percentage	Nice to have
CIDCM047	Share of Bus (M2) per fuel type; Electricity	Percentage	Nice to have
CIDCM048	Share of Bus (M2) per fuel type; Gasoline hybrid	Percentage	Nice to have
CIDCM049	Share of Bus (M2) per fuel type; Diesel hybrid	Percentage	Nice to have
CIDCM050	Share of Bus (M3) per fuel type; Gasoline	Percentage	Nice to have
CIDCM051	Share of Bus (M3) per fuel type; Diesel	Percentage	Nice to have
CIDCM052	Share of Bus (M3) per fuel type; CNG	Percentage	Nice to have
CIDCM053	Share of Bus (M3) per fuel type; LPG	Percentage	Nice to have
CIDCM054	Share of Bus (M3) per fuel type; Ethanol	Percentage	Nice to have
CIDCM055	Share of Bus (M3) per fuel type; Bioethanol	Percentage	Nice to have
CIDCM056	Share of Bus (M3) per fuel type; Biodiesel	Percentage	Nice to have
CIDCM057	Share of Bus (M3) per fuel type; Hydrogen	Percentage	Nice to have
CIDCM058	Share of Bus (M3) per fuel type; Electricity	Percentage	Nice to have
CIDCM059	Share of Bus (M3) per fuel type; Gasoline hybrid	Percentage	Nice to have

CIDCM060	Share of Bus (M3) per fuel type; Diesel hybrid	Percentage	Nice to have
CIDCM061	Share of Coach (M2/M3) per fuel type; Gasoline	Percentage	Nice to have
CIDCM062	Share of Coach (M2/M3) per fuel type; Diesel	Percentage	Nice to have
CIDCM063	Share of Coach (M2/M3) per fuel type; CNG	Percentage	Nice to have
CIDCM064	Share of Coach (M2/M3) per fuel type; LPG	Percentage	Nice to have
CIDCM065	Share of Coach (M2/M3) per fuel type; Ethanol	Percentage	Nice to have
CIDCM066	Share of Coach (M2/M3) per fuel type; Bioethanol	Percentage	Nice to have
CIDCM067	Share of Coach (M2/M3) per fuel type; Biodiesel	Percentage	Nice to have
CIDCM068	Share of Coach (M2/M3) per fuel type; Hydrogen	Percentage	Nice to have
CIDCM069	Share of Coach (M2/M3) per fuel type; Electricity	Percentage	Nice to have
CIDCM070	Share of Coach (M2/M3) per fuel type; Gasoline hybrid	Percentage	Nice to have
CIDCM071	Share of Coach (M2/M3) per fuel type; Diesel hybrid	Percentage	Nice to have
CIDCM072	Share of PTW/Motorcycle per fuel type; Gasoline	Percentage	Nice to have
CIDCM073	Share of PTW/Motorcycle per fuel type; Diesel	Percentage	Nice to have
CIDCM074	Share of PTW/Motorcycle per fuel type; CNG	Percentage	Nice to have

CIDCM075	Share of PTW/Motorcycle per fuel type; LPG	Percentage	Nice to have
CIDCM076	Share of PTW/Motorcycle per fuel type; Ethanol	Percentage	Nice to have
CIDCM077	Share of PTW/Motorcycle per fuel type; Bioethanol	Percentage	Nice to have
CIDCM078	Share of PTW/Motorcycle per fuel type; Biodiesel	Percentage	Nice to have
CIDCM079	Share of PTW/Motorcycle per fuel type; Hydrogen	Percentage	Nice to have
CIDCM080	Share of PTW/Motorcycle per fuel type; Electricity	Percentage	Nice to have
CIDCM081	Share of PTW/Motorcycle per fuel type; Gasoline hybrid	Percentage	Nice to have
CIDCM082	Share of PTW/Motorcycle per fuel type; Diesel hybrid	Percentage	Nice to have
CIDCM083	Share of Motorised 3-wheeler per fuel type; Gasoline	Percentage	Nice to have
CIDCM084	Share of Motorised 3-wheeler per fuel type; Diesel	Percentage	Nice to have
CIDCM085	Share of Motorised 3-wheeler per fuel type; CNG	Percentage	Nice to have
CIDCM086	Share of Motorised 3-wheeler per fuel type; LPG	Percentage	Nice to have
CIDCM087	Share of Motorised 3-wheeler per fuel type; Ethanol	Percentage	Nice to have
CIDCM088	Share of Motorised 3-wheeler per fuel type; Bioethanol	Percentage	Nice to have
CIDCM089	Share of Motorised 3-wheeler per fuel type; Biodiesel	Percentage	Nice to have

CIDCM090	Share of Motorised 3-wheeler per fuel type; Hydrogen	Percentage	Nice to have
CIDCM091	Share of Motorised 3-wheeler per fuel type; Electricity	Percentage	Nice to have
CIDCM092	Share of Motorised 3-wheeler per fuel type; Gasoline hybrid	Percentage	Nice to have
CIDCM093	Share of Motorised 3-wheeler per fuel type; Diesel hybrid	Percentage	Nice to have

Table 22. Variables: General City ID-Card – Transport Information.

Code	Label	Type	Required?
CIDCT001	ID	Numerical	Yes
CIDCT002	Event ID	Numerical	If relevant
CIDCT003	City ID	Numerical	Yes
CIDCT004	Year (or period relevant to the data)	Date; Date period	Yes
CIDCT005	Source	Text; Hyperlink	Yes
CIDCT006	Area scope	Categorical (see Table 4)	
CIDCT007	Availability of PT and shared mobility modes; Long-distance bus	Binary	Nice to have
CIDCT008	Availability of PT and shared mobility modes; Railway (all types of services)	Binary	Nice to have
CIDCT009	Availability of PT and shared mobility modes; Metro	Binary	Nice to have
CIDCT010	Availability of PT and shared mobility modes; LRT/Tram	Binary	Nice to have

CIDCT011	Availability of PT and shared mobility modes; Local bus	Binary	Nice to have
CIDCT012	Availability of PT and shared mobility modes; Bicycle (bike sharing station)	Binary	Nice to have
CIDCT013	Availability of PT and shared mobility modes; Car sharing (station or reserved parking place)	Binary	Nice to have
CIDCT014	Availability of PT and shared mobility modes; Bicycle parking facilities	Binary	Nice to have
CIDCT015	Availability of PT and shared mobility modes; Park & Ride	Binary	Nice to have
CIDCT016	Availability of PT and shared mobility modes; Reserved taxi rank	Binary	Nice to have
CIDCT017	Availability of PT and shared mobility modes; Ferry	Binary	Nice to have
CIDCT018	Average monthly ticket price for public transport (€)	Numerical	Nice to have
CIDCT019	Number of ticketing machines and offices; Train	Numerical	Nice to have
CIDCT020	Number of ticketing machines and offices; Bus & trolley	Numerical	Nice to have
CIDCT021	Number of ticketing machines and offices; Tram	Numerical	Nice to have
CIDCT022	Number of ticketing machines and offices; Metro	Numerical	Nice to have
CIDCT023	Number of ticketing machines and offices; Cable car/funicular	Numerical	Nice to have
CIDCT024	Number of ticketing machines and offices; Ferry/river shuttle	Numerical	Nice to have

CIDCT025	Number of vehicles; Train	Numerical	Nice to have
CIDCT026	Number of vehicles; Bus & trolley	Numerical	Nice to have
CIDCT027	Number of vehicles; Tram	Numerical	Nice to have
CIDCT028	Number of vehicles; Metro	Numerical	Nice to have
CIDCT029	Number of vehicles; Cable car/funicular	Numerical	Nice to have
CIDCT030	Number of vehicles; Ferry/river shuttle	Numerical	Nice to have
CIDCT031	Number of stops; Train	Numerical	Nice to have
CIDCT032	Number of stops; Bus & trolley	Numerical	Nice to have
CIDCT033	Number of stops; Tram	Numerical	Nice to have
CIDCT034	Number of stops; Metro	Numerical	Nice to have
CIDCT035	Number of stops; Cable car/funicular	Numerical	Nice to have
CIDCT036	Number of stops; Ferry/river shuttle	Numerical	Nice to have
CIDCT037	Number of people living with no access to public transport	Numerical	Nice to have
CIDCT038	Number of people living with low access to public transport	Numerical	Nice to have
CIDCT039	Number of people living with medium access to public transport	Numerical	Nice to have
CIDCT040	Number of people living with high access to public transport	Numerical	Nice to have
CIDCT041	Number of people living with very high access to public transport	Numerical	Nice to have

CIDCT042	Satisfaction level – Public transport, for example the bus, tram or metro; Very satisfied	Percentage	Nice to have
CIDCT043	Satisfaction level – Public transport, for example the bus, tram or metro; Rather satisfied	Percentage	Nice to have
CIDCT044	Satisfaction level – Public transport, for example the bus, tram or metro; Rather unsatisfied	Percentage	Nice to have
CIDCT045	Satisfaction level – Public transport, for example the bus, tram or metro; Not at all satisfied	Percentage	Nice to have
CIDCT046	Satisfaction level – Public transport, for example the bus, tram or metro; Don't know	Percentage	Nice to have

Table 23. Variables: General City ID-Card – Effects on inhabitants.

Code	Label	Type	Required?
CIDCE001	ID	Numerical	Yes
CIDCE002	Event ID	Numerical	If relevant
CIDCE003	City ID	Numerical	Yes
CIDCE004	Year (or period relevant to the data)	Date; Date period	Yes
CIDCE005	Source	Text; Hyperlink	Yes
CIDCE006	Area scope	Categorical (see Table 4)	Nice to have
CIDCE007	Satisfaction level – The noise level; Very satisfied	Percentage	Nice to have
CIDCE008	Satisfaction level – The noise level; Rather satisfied	Percentage	Nice to have

CIDCE009	Satisfaction level – The noise level; Rather unsatisfied	Percentage	Nice to have
CIDCE010	Satisfaction level – The noise level; Not at all satisfied	Percentage	Nice to have
CIDCE011	Satisfaction level – The noise level; Don't know	Percentage	Nice to have
CIDCE012	Satisfaction level – The quality of the air; Very satisfied	Percentage	Nice to have
CIDCE013	Satisfaction level – The quality of the air; Rather satisfied	Percentage	Nice to have
CIDCE014	Satisfaction level – The quality of the air; Rather unsatisfied	Percentage	Nice to have
CIDCE015	Satisfaction level – The quality of the air; Not at all satisfied	Percentage	Nice to have
CIDCE016	Satisfaction level – The quality of the air; Don't know	Percentage	Nice to have
CIDCE017	Satisfaction level – Public spaces such as markets, squares, pedestrian areas; Very satisfied	Percentage	Nice to have
CIDCE018	Satisfaction level – Public spaces such as markets, squares, pedestrian areas; Rather satisfied	Percentage	Nice to have
CIDCE019	Satisfaction level – Public spaces such as markets, squares, pedestrian areas; Rather unsatisfied	Percentage	Nice to have
CIDCE020	Satisfaction level – Public spaces such as markets, squares, pedestrian areas; Not at all satisfied	Percentage	Nice to have
CIDCE021	Satisfaction level – Public spaces such as markets, squares, pedestrian areas; Don't know	Percentage	Nice to have

CIDCE022	People killed in road accidents per 10000 inhabitants	Numerical	Nice to have
CIDCE023	Survey – Average distance work-home (km)	Numerical	Nice to have
CIDCE024	Survey – Main mode work-home	Listing	Nice to have
CIDCE025	Survey – Average travel time going to work (min)	Numerical	Nice to have
CIDCE026	Survey – Average travel time return (min)	Numerical	Nice to have
CIDCE027	Survey – Number of respondents to survey travel times	Numerical	Nice to have

Resiliency Assessment

The structure of the database allows us to perform for each of the city case studies a resiliency assessment of its UVAR Building blocks. The resiliency assessment is a methodology that allows us to determine and assess the resilience of the UVAR measures in the light of future trends and options in services, technology and transition schemes. For detailed information on the methodology we refer to T2.6 (see MS11). For the resiliency assessment of the UVAR Building Blocks, each city is confronted with the *Assessment Matrix*, main tool in the frame of the methodology for the *General Resiliency Assessment of UVAR Measures* developed in T2.6 (see MS11). Table 24 contains the different data fields present in the *Resiliency Assessment* table found in the database. The context of the *Database of categorized and parameterized options of UVAR measures*, the *Assessment Matrix* (Resiliency assessment table) relates the *Case study city – Building Block* table of each city case study through the *Building Block Subtype ID*.

Table 24. Variables: Resiliency assessment table.

Code	Label	Type	Required?
RA001	ID	Numerical	Yes
RA002	Building Block ID	Numerical	Yes
RA003	Building Block Subtype ID	Text	Yes
RA004	Future Pandemic	Categorical	Nice to have

RA005	The Gig economy	Categorical	Nice to have
RA006	E-commerce	Categorical	Nice to have
RA007	Electric Mobility	Categorical	Nice to have
RA008	Shared Mobility	Categorical	Nice to have
RA009	Autonomous and Connected Vehicles	Categorical	Nice to have
RA010	Ride-hailing	Categorical	Nice to have
RA011	Climate change and natural disasters	Categorical	Nice to have
RA012	Aging population	Categorical	Nice to have
RA013	Work anywhere culture	Categorical	Nice to have
RA014	Internet of things (IoT)	Categorical	Nice to have
RA015	Lower travel demand	Categorical	Nice to have
RA016	Higher travel demand	Categorical	Nice to have

Table 25 contains the different entry values (categories) associated to each of the data fields RA004-RA016 in the Resiliency Assessment matrix.

Table 25. Entry values for data fields in Resiliency Assessment table.

Data field code	Entry value
RA004	Could enable distancing with active modes
	Roadblock could hinder emergency transports
	Avoidance of shared mobility
	May be hinder to safe transport of critical staff
	May be hinder to safe deliveries to risk groups
	May be hinder to safe transport of critical staff or safe deliveries

RA005	Gig economy may make peak times less reliable
	Problem if designed for peak times
	Gig economy may increase need for this
RA006	Regulation may need to be adapted to deliveries
	Could hinder efficient deliveries
	Will probably be needed for e-commerce
	Possibly exclude delivery vehicles from charge?
	E-commerce could increase need for this
	Could have impact on delivery vehicle fleet
	May increase the demand for permits/the number of permits
RA007	Silent cars may increase the need for this (safety)
	Electrification will reduce its impact
	Electrification will reduce its impact (but also make it more possible)
RA008	If micro-mobility is a big part of the shared mobility, it might increase the need for this
	Possible exemptions for high-occupancy shared vehicles
	Shared mobility could increase need for this
	Regulation may need to be adapted to shared mobility
	With shared mobility, regulation and/or enforcement needs to be adapted
	With shared mobility, enforcement needs to be adapted
	Shared mobility could contribute to this
RA009	Automation will enable new enforcement of this
	Automation will enable/need new enforcement of this
	Less need for this with automation

	Automation could increase need for this
	Automation could reduce its impact
	Risk of increased traffic from empty driving if leaving the zone
	This requires connection and in some cases automation
	This requires automation
	Automation may increase need for this
	The non-need for parking of fully autonomous vehicles could limit the effect of this
RA010	Could hinder pick up / drop off
	RH may increase the need for this
	Consider if RH vehicles should be included in priority
	Regulation may need to be adapted to RH
RA011	Changing weather can affect cycling levels
RA012	Make sure infrastructure is suitable for other ability-giving vehicles as well
	Ability-giving vehicles/equipment could increase the need for this
	An aging population may increase the need for this
	Adapt charge for personal accessibility level
	Could hinder service for elderly
	Adapt for service to elderly
	Adapt for personal accessibility level
RA013	Could lead to higher demand for short distance/local traffic
	This may make peak times less reliable but also less extreme
RA014	IoT will enable new enforcement of this
	This will be facilitated by IoT

RA015	Lower travel demand could reduce its impact
	Possible lower occupancy on public transport
	Lower travel demand may decrease income level of city
	Lower travel demand may make measure less efficient
	Lower travel demand could increase need for this
RA016	Higher travel demand could increase need for this
	Possible higher need for bus/tram priority lane
	Higher travel demand may need adjustment of fees
	Higher travel demand may make measure less efficient

Thanks to the simple structure of the *Database of categorized and parameterized options of UVAR measures*, we can perform a resiliency assessment of the UVAR building blocks of any city case in the database. This can be done through a single query that links the *Case study city – Building Block* table with the *Resiliency assessment* table through the Building Block Subtype ID for a given city case. Listing 1 is an example of such query, performed for the City case study of Ghent – Circulation Plan (C002). The query has been written using Access-SQL syntax.

```
SELECT Resiliency_assessment.* INTO Future_trends_Ghent_CP
FROM Resiliency_assessment INNER JOIN Case_study_city_BB
ON Resiliency_assessment.Building_Block_Subtype_ID = Case_study_city_BB.Building_block_subtype_ID
WHERE (((Case_study_city_BB.City_ID)='C002'));
```

Listing 1. Query example for Resiliency Assessment – Access-SQL syntax.

This query example yields a new table *Future_trends_Ghent_CP* which contains the resiliency assessment for the city case *Ghent – Circulation Plan* (C002) allowing us to determine and assess the resilience of the UVAR measures part of this city case in the light of future trends and options in services, technology and transition schemes. The table *Future_trends_Ghent_CP* can be found in the accompanying document “*Future_trends_Ghent.xlsx*”. The analogous for the remainder of the city cases can be found in the accompanying documents “*Future_trends_[city name].xlsx*”.

Listing 1 is just an example of the many other data operations that could be performed. Similar queries could be used for an automatic retrieval of information, the updating of the database, or the addition of new tables. Features that altogether intent to support WP5 in the construction of the

Process Advise Tool and facilitating a smooth updating of the database to keep up with future developments in ReVeAL (WP1, WP2, WP4, WP5), the ReVeAL pilot cities, and UVARs in general.

Annex

Database of categorized and parameterized option of UVAR measures in three Measure Fields

See file "*D2.4_Database_of_UVAR_options.accdb*"

Database of categorized and parameterized option of UVAR measures in three Measure Fields – Database schema

See file "*Database_Schema.pdf*"

Results of the resiliency assessment of city case studies

Table 26 showss the collection of files for each city that contain the results of the resiliency assessment of the city case studies following the approach presented in the query example Listing 1.

Table 26. Resiliency assessment results – file summary.

Code	Measure field	City study	case	Country	File name
D2.4			<i>Database Options</i>	<i>UVAR</i>	Page 64 of 65
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C001	SI	Barcelona	Spain	Future_trends_Barcelona.xlsx
C002	SI	Ghent	Belgium	Future_trends_Ghent.xlsx
C003	SI	Mechelen	Belgium	Future_trends_Mechelen.xlsx
C004	PM	Milan	Italy	Future_trends_Milan.xlsx
C005	PM	Greater London	UK	Future_trends_London.xlsx
C006	PZEZ/LTZ	La Rochelle	France	Future_trends_Rochelle.xlsx
C007	PZEZ/LTZ	Bologna	Italy	Future_trends_Bologna.xlsx
C008	PZEZ/LTZ	Amsterdam	Netherlands	Future_trends_Amsterdam.xlsx