



UVAR IN SUMP

STRATEGIES & MANAGERIAL APPROACHES FOR IMPROVING LOW-CARBON MOBILITY PLANNING IN FUA

D.T1.1.6 CE SUMP 2.0 topic guide: UVAR in SUMP

Final Version
31 May 2022





Project index number and acronym	CE1671 DYNAXIBILITY4CE4CE
Lead partner	PP1 - Leipzig Transport Company (LVB)
Deliverable number and title	D.T1.1.6 CE SUMP 2.0 topic guide: UVAR in SUMP
Responsible partner(s) (PP name and number)	PP6 - POLIS
Project website	https://www.interreg-central.eu/Content.Node/Dynaxibility4CE4CE.html
Delivery date	05/2022
Status	Final version
Dissemination level	Public

Document history of revisions			
Date	Name	Action	Status
28/01/2022	Laura Babío, POLIS Network	Development of the structure and first draft	Draft
18/07/2022	Laura Babío, Niklas Schmalholz, POLIS Network	Development of case study and best practices	Draft for review
30/07/2022	Ivo Cré, POLIS Network	General Review	Draft
22/08/2022	Laura Babío Somoza, POLIS Network	Addressing comments and finalization	Final document for translation



List of figures and tables

Figure 1 Krakow's functional area. Source: Krakow Transport Authority.....	6
Figure 2 UVAR planning at FUA level: step-by-step process.....	10
Figure 3 Suggested checkpoints with relevant stakeholders during the UVAR planning process.....	18
Figure 4 Proposed LEZ area in Krakow. Source: Krakow Transport Authority.....	22
Table 1 Indicative stakeholder map for UVAR planning. Source: Own elaboration.....	15
Table 2 Stakeholder involvement during Krakow's scenario analysis for UVAR.	21
Table 3 Public consultation activities for the implementation of a LEZ in Krakow	23



Table of Contents

1. Introduction	5
2. Functional Urban Area perspective for Urban Vehicle Access Regulations.....	6
2.1 Introducing the Functional Urban Area (FUA) concept	6
2.1.1 Why consider Functional Urban Areas when planning UVARs?	7
2.2 What to consider when planning UVARs in FUA?.....	7
2.3 How to consider the FUA perspective: a step-by-step process	9
2.3.1 Assessment of the Functional Urban Area	10
2.3.2 Mobility Diagnosis at the FUA level	11
2.3.3 Objectives and long-term vision.....	11
2.3.4 Planning of UVAR and accompanying measures	12
2.3.5 Implementation, monitoring and adjusting	13
2.3.6 Stakeholder and public engagement (at FUA level)	14
3. Dynaxibility4CE case-study: Krakow’s Low Emission Zone	19
4. Best Practices	24
4.1 Milano: Digital integration of UVAR solutions can increase efficiency	24
4.2 Veneto & Baden-Württemberg: Regional UVAR solutions	25
4.3 Ljubljana: UVARs are more than just LEZs.....	26
4.4 Salzburg & Zadar: Parking policy is complementary to a UVAR	26
5. UVAR Operational library	28



1. Introduction

As the fight against climate change intensifies, Urban Vehicle Access Regulations (UVARs) are becoming more popular due to their potential to reduce emissions and improve air quality. In general terms and as defined by the European Commission working document on access regulations (2013), UVARs are ‘measures to regulate vehicular access to urban infrastructure’ - some of these measures are Low Emission Zones (LEZ), Traffic Limited Zones, Pedestrianisations and Parking Regulations.

The rise of UVARs in Europe calls for guidance documents to help policymakers in the successful implementation of these measures, which are often unpopular. A big factor for this perception of UVARs is the broad influence they can have: indeed, these restrictive measures tend to have a significant impact beyond their geographical operational boundaries and in a broad number of matters (accessibility, social inclusion, affordability, spatial distribution of households, etc.).

The UVAR SUMP Topic guide was published in 2019 and, despite its undeniable value, it also requires to be complemented with further guidance on some aspects. The current UVAR flagship document represents an introductory guide to UVAR implementation that features the basics of UVAR planning and their application in the SUMP process, and that briefly touches upon a few specific, but relevant points of attention with regards to UVARs. Topics such as stakeholder acceptance and engagement, complementing measures to UVAR, or information for occasional tourists are briefly discussed, but others, such as enforcement or governance are not included, showing that the document can be further developed.

Dynaxibility4CE, together with other EU-Funded projects ReVeAL, UVAR Box and UVAR Exchange, is working to produce guidance documents and tools to complete the materials circulated in the last 4 years.

This document is an annex to the UVAR SUMP Topic guide and elaborates on how to implement UVARs considering the city and its commuting zone, the so-called Functional Urban Area (FUA). The second section of the present document provides more information on FUAs and how to consider them during the UVAR planning process. Throughout the document, the process is linked to guidance developed by the other EU projects for further topical reading. Moreover, it is illustrated by the process followed by Krakow (Dynaxibility4CE partner) for implementing a LEZ in the city. The general guidance and Krakow case study are complemented with several best practices across Europe that were specifically selected due to their relevance to central European cities - the programme area of our project. Finally, this annex also attempts to harmonise all the guidance produced by the other projects with their compilation in the ultimate UVAR Operational Library, which you can find at the end of this document. This library aims to facilitate access to relevant UVAR guidance for policymakers and urban planners studying to implement UVARs in their region.

This document has been designed following the objective of ensuring overall compatibility and compliance with the most relevant and well-recognized European sustainable mobility planning guidelines and other existing supporting instruments for planning, designing, and implementing sustainable transport measures.



2. Functional Urban Area perspective for Urban Vehicle Access Regulations

2.1 Introducing the Functional Urban Area (FUA) concept

Cities relate to their surroundings by daily flows of people and goods; therefore, mobility planning needs to be done based on the actual flows of people and goods for the whole commuting area. The area that covers the city and its commuting zone is called Functional Urban Area, and it should define the geographical scope of the Sustainable Urban Mobility Plan and, in our case, the UVAR planning.

The definition of Functional Urban Areas as ‘functional economic units’ was given by the OECD, the European Commission’s statistics office (Eurostat) and its Directorate-General for Regional and Urban Policy. A Functional Urban Area consists of one (monocentric) densely inhabited city (or more than one city, polycentric) and a less densely populated commuting zone whose labour market is highly integrated with the city(-ies).¹

The methodology developed by the OECD uses population density to identify urban cores and travel-to-work flows, and it makes it possible to compare FUAs of similar size across countries. The methodology² follows 3 steps:

1. STEP 1. Identification of core municipalities through gridded population data
2. STEP 2. Connecting non-contiguous cores belonging to the same functional urban area
3. STEP 3. The identification of the urban hinterland



Figure 1 Kraków's functional area. Source: Krakow Transport Authority.

¹ Eurostat, 2012: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Functional_urban_area

² OECD, 2012, Redefining urban: a new way to measure metropolitan areas: <https://www.oecd.org/regional/regional-statistics/functional-urban-areas.html>



2.1.1 Why consider Functional Urban Areas when planning UVARs?

Urban Vehicle Access Regulations are usually implemented in the densest, most congested, and most polluted areas in the city - which is often the city centre. However, while the UVAR is usually applied in only a part of the FUA, its impact usually extends far beyond it. Regulating vehicle accessibility in one part of the city can have benefits, such as improved air quality and increased space for walking and cycling, but it can also have negative effects, such as parking pressure or detouring traffic on the edges of the UVAR area - if travel behaviour is maintained and alternatives to the regulated traffic flows are not established or badly promoted.

Implementing UVARs without considering the broader impacts on the FUA can also lead to a decrease in the mobility and accessibility to opportunities for those inhabitants living outside the city's 'hot-spot', as well as to (international) visitors and transporters, that might need new travel alternatives when the UVAR comes in place. The immediate benefits will be mainly experienced in the implementation area, whereas negative ones will burden the neighbouring areas of the restricted zone and can expand well outside the city's territorial boundaries. Planning at FUA level can ensure that a transport system is accessible to everyone and meets the basic mobility needs of all users, as well as the requirements of sustainability and the needs for economic viability, social equity, health, and environmental quality.

Specific guidance on SUMP in metropolitan areas is available, as well as general guidance on FUA planning from the LOW-CARB and SOLEZ Interreg projects. The present document provides specific guidance on how to plan UVARs considering the whole Functional Urban Area.

2.2 What to consider when planning UVARs in FUA?

When planning mobility at the FUA level, certain general aspects are to be considered even before thinking about UVAR planning: elements like the FUA's geographical and administrative boundaries, its planning concentration, existing transport or climate planning frameworks, as well as its socioeconomic characteristics and air quality parameters, and the communication and participation at FUA level, are fundamental assets to successful UVAR/FUA implementations.

Geographical and administrative boundaries

Understanding the administrative boundaries and competencies of a FUA facilitates cooperation amongst institutions. This cooperation calls for four levels of integration:

- (1) alignment of municipal and regional transport objectives with spatial, technological, and ecological developments;
- (2) cooperation of vertical and horizontal policy and governance levels;
- (3) coordination of strategies and decision-making between neighbouring municipalities;
- (4) concertation between different planning disciplines, such as land-use planning, social policies, public health, and economic adjustment policies.

It is crucial to assess the impact of the local and regional frameworks to fully exploit opportunities and avoid conflicts with other competent authorities at a later point; moreover, gaining a clear perspective on how regional and national frameworks influence the SUMP process and design of measures also offers an ideal foundation of work when taking the other elements of UVAR development into account.

When planning for UVAR at FUA level, an essential challenge is that measures that affect the road network, including parking facilities, or that require enhanced public transport provision are likely to be out of the competence of the city authority implementing the UVAR. Establishing cooperation and coordination between different public authorities (municipalities but also transport authorities), especially during the strategy development, is an indispensable prerequisite to a successful UVAR implementation.



Polycentric/monocentric concentration

Identifying the concentration of cities in one FUA is relevant to many parts of the UVAR development process, including delimiting the geographic and administrative boundaries, analysing traffic flows during the mobility study, establishing objectives for the whole FUA, planning for additional mobility services between cities and many more.

Existing transport and climate planning frameworks

Wider existing strategies (SUMP- or climate-focused ones) intrinsically guide the objectives of the UVAR and can facilitate the integration with other mobility measures.

As for existing transport frameworks, there are specific evaluations that need to be done, such as:

- Understanding user needs through an accessibility study that considers trip origins, destinations and purposes, urban development patterns and geographic constraints, as well as showing data as disaggregated, analysable information (available by income, gender, age and other);
- Understanding transport performance through an honest assessment of the availability and usage of mobility services, including the modal split, the level of service integration of the network and the coordination between public and private transport services;
- Understanding both the physical and digital infrastructure of the transport system, including an assessment of the connectivity status, the P+R facilities and the quality of the infrastructure itself.

These evaluations are seminal for, respectively:

- Allowing for future measures that ensure access to better opportunities for everyone, as well as for models of restricted and accessible mobility in different UVAR scenarios that can lead to additional, complementary or exemptional measures for the UVAR;
- Planning for additional mobility services or facilitating the planning of an integrated mobility offer that brings the public out of their cars and encourages the seamless adoption of more sustainable modes;
- Facilitating UVAR monitoring, as well as the provision of UVAR information; planning additional mobility measures and, in particular, strengthening the network connecting intermodal mobility hubs; minimising congestion and promoting the use of public transport.

Socioeconomic characteristics

There are different reasons to use private transport, and in many cases, citizens depend on it for their everyday life and feel that public transport and other more sustainable modes do not cater to their needs. In lower socio-economic backgrounds, there is a higher tendency to own older - and implicitly more polluting - vehicles, which leads to individuals living in such backgrounds being disproportionately affected by UVARs.

To minimize such negative impacts on accessibility, it is important to have a clear overview of the different socio-economic segments and their distribution within a FUA - this allows to not only understand who might be more affected by the UVAR but also to strengthen the alternative mobility options in that area.

Air quality parameters

In the preparation of the UVAR, simulations and air quality/traffic models should forecast impacts beyond the central UVAR zone and for the whole FUA. These models can also help provide an evidence base for determining the size of the zone where the UVAR should apply, as well as its impacts.

Communication and participation at the FUA level

One of the biggest challenges is to ensure citizens' participation outside of the city's territorial boundaries, as well as the coordination amongst all affected stakeholders - section 2.3.6 provides guidance on stakeholder engagement.



After the planning and implementation, communication of the UVAR measures is needed in the whole FUA and special attention needs to be paid to elements such as signage and digital information. The information should be standardised, thus including both static road signage (inside and outside the implementation area) and dynamic information (e.g., digital platforms, Variable Message Signs). On this subject, the [UVAR Exchange project](#) is looking into the harmonisation of road signage, whereas the [UVAR Box project](#) has been looking at the digitalisation of UVARs.

2.3 How to consider the FUA perspective: a step-by-step process

The Interreg funding program has strived to include the FUA perspective in mobility planning in recent years. As part of such effort, the [Interreg project SOLEZ](#) developed guidelines to facilitate the creation of action plans to implement effective strategies and common approaches for mobility planning at the FUA level - guidelines hereby adapted to the specific case of UVARs.

The main steps suggested for the planning of UVARs at the FUA level are:

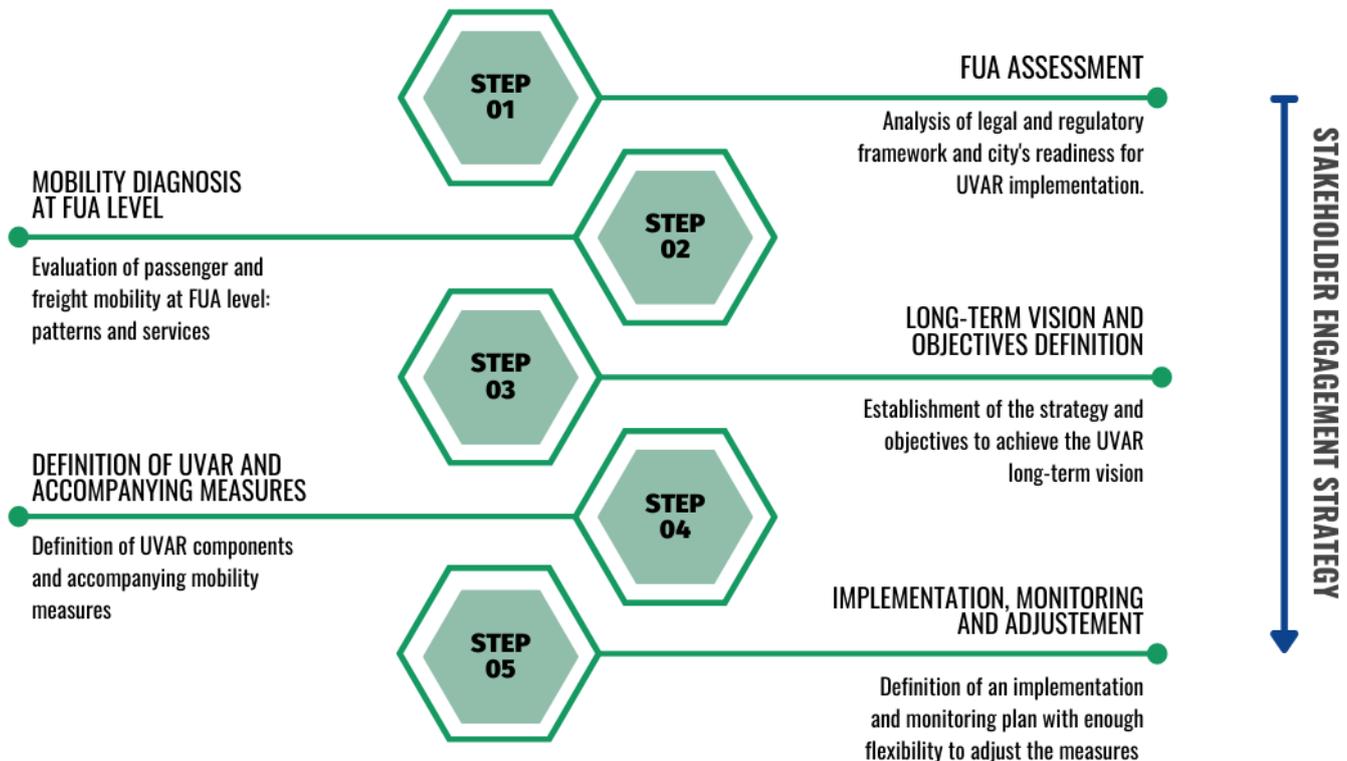
1. **FUA Assessment**
2. **Mobility Diagnosis at the FUA level**
3. **Strategic Planning and Objective Definition**
4. **Planning of UVAR and accompanying measures**
5. **Implementation monitoring and adjusting**

Considering mobility planning often does not follow linear development and different cities across Europe find themselves at different stages, this process is not intended to be followed precisely, but rather to give guidance on the single steps while showing all the elements and factors needed to be considered. During this process, different stakeholders will need to be involved at different stages. Guidance to develop and carry out a stakeholder engagement strategy is provided in 2.3.6.

It is also important to remark that when planning for fairly high-impact or controversial UVARs, it helps to work within the framework of an integrated, long-term plan, such as a SUMP. The integration of SUMP and UVAR ensures that the UVAR is harmonised with the transport system and supported by a comprehensive mobility strategy. Following an existing strategy or framework can also offer a structure of existing stakeholder groups or communication procedures which can support the UVAR development process.



Figure 2 UVAR planning at FUA level: step-by-step process.



2.3.1 Assessment of the Functional Urban Area

The first step for the leading public authority is to perform an assessment of the FUA, including a self-assessment of the leading city. The objective of this first step is two-fold: to define the baseline scenario regarding existing transport and mobility conditions in terms of the **legislative and regulatory framework** and the **transport and mobility planning framework**, and to assess the **readiness for implementation**.

Before defining a common strategy for urban mobility, and more specifically for UVARs (step 3), it is quite important to understand the current **vision** of all the authorities integrating the FUA, as well as what is their overall sustainable mobility framework. Specific focus should be given to municipalities according to population and the existence of transport and mobility attraction points.

It is also key to analyse the **UVAR organisational and decision-making system** at the FUA level. The leading public authority needs to understand all the competencies for not only the planning and implementation of a UVAR, but also its operation and enforcement.

As part of the readiness assessment, it is vital to identify potential **institutional, legal, and financial barriers** that might affect the planning process, as well as drivers that can support the development and implementation of UVARs. There might be national frameworks in place for the implementation and enforcement of selected UVAR measures (e.g., system for identification of complying vehicles or automatic number-plate recognition camera enforcement), as well as for personal data protection, financial management, tendering, and procurement. Since new local regulations might be needed or national legislation altered or created, it is important to start the UVAR planning process with a complete legislative assessment to allow for the new legislation to follow due process.



The current **capacity** of the public authorities is also determinant for a successful UVAR implementation and defines the readiness status. In this case, capacity refers to all available technical solutions and knowledge on UVARs, as well as dedicated staff to the task. This assessment might reveal some gaps that need to be corrected before advancing further in the process.

A common challenge for local administration planners implementing UVARs is to convince decision-makers to move forward with the process and that is why is recommended to identify a **UVAR champion**. In essence, a UVAR champion (whether an individual or a civil society organisation) is necessary to help carry political and public support for the project and should be identified at the beginning of the process.

Finally, the identification of **relevant stakeholders** at the FUA level is also an important part of the assessment and it is further explained in 2.3.6 in the stakeholder engagement section.

2.3.2 Mobility Diagnosis at the FUA level

The second step is to evaluate the passenger and freight mobility landscape, concerning services already in operation, as well as planned for the future.

The mobility diagnosis should be as comprehensive as possible. Considering their available resources and desired timeline, public authorities will need to adapt the level of detail to their budget and time constraints. Ideally, a quantified review of important **mobility and transport indicators** (e.g., traffic congestion, accessibility to services and transport facilities, road safety, air quality parameters) should be carried out in the urban agglomeration of the FUA, as well as in the peri-urban areas.

To understand user needs, the leading public authority should assess the **traffic and mobility patterns** covering the FUA to recognise the current dynamics of movement in the city and surrounding hinterland. Data can be obtained through desk research, field surveys, focus groups, online questionnaires, or statistical analysis of data. By doing both a qualitative and quantitative mobility assessment at the FUA level, public authorities will be able to draw a comprehensive picture of the mobility in the FUA, allowing the identification of bottlenecks and planning needs to be tackled by UVARs and complementing measures.

When developing a UVAR, **involving users** appropriately is a key success factor. Identifying a broad range of users enables one to understand different viewpoints and appropriately design complementary measures. The socio-economic situation of residents and mobility users can range widely, as can their cultural background, gender, and mobility needs (among others)— this diversity is one of the key reasons why UVARs will never become a one-size-fits-all solution.

Lastly, this step is focused on desk research activities aimed at **collecting data** from certified and reliable sources of information. Establishing a good functional partnership with open communication between the different public administrations of the FUA at the beginning of the process will enable better coordination for the data collection.

2.3.3 Objectives and long-term vision

The third step of the process is focused on establishing the UVAR objectives, long-term vision, and strategy to translate the identified mobility bottlenecks and problems at the FUA level into achievable goals.

To set up the UVAR strategy, it is useful to develop a **vision for the city** with different scenarios for UVAR (and accompanying measures), distinguishing between short, medium, and long-term. **UVAR scenarios** should also assess interdependencies between sectoral trends identifying synergies, the potential for integration, as well as the negative effects of sectoral trends. When establishing the vision for a FUA, this should not be exclusively looking at climate neutrality, air quality, but also modal shift, road safety, quality of life, and use of urban space.



Planning from the FUA perspective also means that the **UVAR objectives** should be established locally, regionally, and within a wider sustainable mobility strategy. Above all, these objectives should be achievable and should be gradually implemented to avoid restricting too much too fast, and reduce negative impacts. It is important to make clear the relationship between the measures, the objectives, and the long-term vision. This might be challenging but will be determinant during the UVAR approval process.

2.3.4 Planning of UVAR and accompanying measures

The crucial step of the process is the planning of UVARs and accompanying mobility measures following the objectives and strategy previously defined. The objective of this step is to define all the operational elements related to the UVAR implementation as well as complementary interventions in the transport system, which are necessary to ensure quality and accessible mobility provision.

The objectives set in step 3 should guide the decisions made on the different UVAR components. As mentioned before, there is no one-size-fits-all for UVAR and the final solution could be a combination of different types of UVAR under different scheme designs. [The ReVeAL project](#) has developed a methodology to tackle an integrated implementation where different UVAR measures are defined as **building blocks** and can be combined to make a complete and robust UVAR scheme. Nevertheless, all measures must be integrated and part of a wider strategy (preferably a SUMP) following a common vision.

The operational components of the UVAR(s) that will have to be defined are:³

- Type of access regulation/intervention (e.g., congestion charging, parking charging, Low-Emissions Zone (LEZ), Traffic filter, physical interventions in the public realm...)
- Scheme design (e.g., distance-based (for charging), time-based, point-based, area license/permit-based...)
- Targeted vehicles (e.g., freight and service transport, private car use, type of vehicles - pollutant classes, type of vehicle - dimensions and weight...)
- Technological options for implementation and enforcement - often used in combination (e.g., manual inspection and windscreen stickers, manual toll collection, Automated Number Plate Recognition (ANPR)...))
- Permits and exemptions
- Level of digitalisation and data requirements (e.g., standards for data collection, capacities, necessary tools)

Ideally, the definition of the UVARs should not be done by the leading public authority alone and it should be an **iterative process** that involves all relevant stakeholders at the FUA level. The leading public authority should use this co-creation process to address criticism and foster acceptance, considering different perspectives and using them to strengthen the measures. However, when opposition to UVARs arises, the involvement of the whole FUA should not stop the areas where problems occur to act - it is the responsibility of all involved authorities to cooperate and support each other in finding compromising alternatives.

A **trial period** can help measure the effectiveness and possible impacts of the measure, and it can also help build acceptance for more restrictive UVARs in the future. Different neighbourhoods can be used as testbeds for different UVARs, provided that adequate transport alternatives are in place. It is of utmost importance to plan carefully the trial to avoid any negative impacts, as it can determine the future implementation of larger schemes.

During the design phase, it is also important to play and work on adjusting the different components to satisfy **user needs** - later this can be a determinant factor of a successful UVAR. For instance, permits and exemptions can be used to increase the acceptability and feasibility of a scheme by providing exemptions

³ More information on the [UVAR SUMP Topic guide](#) and the [ReVeAL website](#).



for LEZ to lessen the financial impact on particular groups. However, user needs should not be confused with user desires - the need might be to access an area, while the desire might be to access it by private vehicle. When planning for UVARs, public authorities should prioritize the sustainability and accessibility objectives set in the larger strategy, remembering that a UVAR cannot please everyone.

When planning the UVAR scheme, cities need to decide on how the **enforcement** of the measures is performed. [The ReVeAL project](#) highlights a wide range of factors that need to be considered when it comes to choosing the enforcement mechanism. Some of them include the type of UVAR, the scale, the cultural and political context, the availability of legal frameworks and the resources available. The dissemination of UVAR information is key to preventing impacts (e.g., increased traffic congestion in the surroundings) and ensuring compliance.

Finally, to guarantee that the previous agreements amongst municipalities and stakeholders in the FUA are well-reflected, drafts of the final plan need to be reviewed both internally and by relevant stakeholders in the FUA.

Definition of accompanying mobility measures

Irrespective of its size and type, the implementation of UVAR measures in one area may have an impact on modal split and other relevant transport variables in the whole FUA. The implementation of UVARs should include accompanying measures necessary to fulfil the mobility needs of people, goods, and services in the complete FUA.

Generally, cycling and walking should become an important basic mode on its own and as feeder for public transport in the FUA, and infrastructure should be established accordingly. From the FUA perspective, it is also important to plan multimodal hubs that will allow for efficient interchanges, including new mobility services and tools (such as MaaS) that can enhance public transport and minimize negative impacts on accessibility. With the UVAR in place, it will be vital to also facilitate clear traffic regulations (especially in the area surrounding UVARs) to minimize traffic disruption and ensure road safety.

The ReVeAL project has developed a comprehensive list of complementary measures designed to increase the effectiveness of the UVAR scheme by helping users change their behaviour and therefore limiting the possible negative impacts induced by the UVAR implementation. These measures are:

1. Improvements in public transport
2. Enhancement of cycling and walking
3. Changes in the parking system
4. Enhancement of shared mobility
5. Improvements in urban logistics
6. Zero and low emission vehicles
7. Ticketing and digital support (including for informational purposes, and improved traffic management)

Visit the [ReVeAL guidance documents](#) for additional information.

The Interreg project SOLEZ has also developed [a toolbox](#) to support public authorities, transport providers and business operators in designing and set-up low-carbon mobility services to increase UVAR attractiveness.

2.3.5 Implementation, monitoring and adjusting

The final step in our process is the implementation, monitoring and adjusting of the UVAR and accompanying mobility measures. The objective of this step is two-fold: to monitor the implementation of the UVAR and its generated impacts, and to measure the general progress towards strategic objectives and targets.



The formal adoption of the UVAR will depend on the national/local regulatory framework and administrative procedure. To ensure broad **acceptance and ownership** of UVAR measures it is important to inform and involve relevant stakeholders and the general public throughout the process - they should have the feeling that it is their plan, which aims to improve mobility and air quality for all.

For monitoring and evaluation of integrated FUA measures and their impacts, it can be challenging to find common ground and identify **joint indicators** and **quantified targets**, or to have a joint understanding of how to monitor performance. The [LOW-CARB guidelines for integrated planning at the FUA level](#) provide further guidance on the topic.

It is crucial to understand that the measures should be part of bigger strategies, and the definition of targets and indicators should happen before the implementation phase and should be agreed on by all involved planning institutions at FUA. To evaluate and assess the impacts of UVARs, the ReVeAL project suggests 5 parameters: **economy, energy, environment, society, and transport**.

A systematic, continued, and regular monitoring and consultation of the UVAR, even throughout the implementation phase, will allow adjusting its scope, form, and modalities, should it have disproportionate negative impacts on mobility or the FUA economy.

2.3.6 Stakeholder and public engagement (at FUA level)

To set up a collaborative process to plan UVARs measures at the FUA level, it will be necessary to define a stakeholder engagement strategy that will describe how to engage with stakeholders during the step-by-step process described in the previous section. The strategy presented in this document is based on the [SOLEZ stakeholder engagement guidelines](#), [the GUIDEMAPS guidance documents](#), and the [CIVITAS toolkit for stakeholder involvement](#), adapted to the UVAR implementation process.

An engagement strategy has the following aims:

- To establish early in the project process how stakeholders will be involved in all stages of the decision-making process
- To establish how the involvement of stakeholders might affect the decisions made throughout the project process
- To identify the relationship between stakeholder engagement activities and project decisions
- To clarify the roles and responsibilities of project staff, concerning engagement activities

The stakeholder engagement strategy will define the following aspects:

- Scope and objectives
- Mapping of stakeholders to be involved
- Form of cooperation (vertical, horizontal, cross-sectoral, and spatial)
- Level of engagement of stakeholders (inform, consult, collaborate, empower)
- Timing for stakeholders' involvement
- Engagement methodology
- Resources (skills needed, budget, timeframe)

Scope and objectives

Stakeholder engagement can fulfil different or even multiple goals that must be defined by the leading city. In the case of UVAR, the main objectives of the stakeholder involvement strategy should be to gain acceptability for principally restrictive measures, to improve the design of the scheme(s), and to ensure a smooth implementation.



Concerning engagement evaluation, the goals chosen will determine the kind of indicators required to measure the efficacy of the strategy. For instance, if the goal is to collect feedback to adjust the UVAR, the number of reactions received can be counted. However, if the goal is awareness-raising, it will also require measurement of the level of knowledge gained. To carry out a proper evaluation, it is useful to make the objectives as “SMART” as possible – specific, measurable, attainable, and ambitious, relevant and timely.

Mapping of UVAR stakeholders at the FUA level

Often, the most difficult activity during the engagement planning is identifying who should be involved in the decision-making process for the implementation of UVARs and at what point during the process. A stakeholder can generally be defined as a group, organisation or individual affected by, or who can affect, a project and its implementation, whether directly or indirectly.

The stakeholder constellation at the FUA level is more complex than at the city level and requires engaging a higher number of institutions in the planning process. Planning authorities should establish a full picture of who is affected by and should be involved in the UVAR planning process. These stakeholders should cover - at the FUA level - politicians, technical expertise, transport network competence, and the public, including professionals as well as private road users, alongside those who will benefit from the scheme - even those that may not need to change their behaviour.

To identify stakeholders who should be involved in the UVAR-planning process at the FUA level, the following table provides some guidance on how to structure a stakeholder map for UVARs (non-exhaustive list):

Table 1 Indicative stakeholder map for UVAR planning. Source: Own elaboration.

Institutional Organisations
Local administration (different departments)
Neighbouring local administrations (different departments)
Regional administrations
National and state administration
Transport Authorities
Relevant Associations and Intermediaries
Chamber of commerce
Business and trade associations
NGOs



Representative associations (e.g., disabled citizens, tourism, car drivers...)

Freight associations

Relevant Other Actors

Universities, Research institutes and Consultants

Political framework and parliamentaries

Local and regional media

General Public (at FUA level)

Relevant Private Actors

Once all the stakeholders have been identified, an assessment needs to be performed to determine interests and possible conflicts. To facilitate the analysis, the CIVITAS toolkit for stakeholder engagement proposes these questions:

- What are their objectives (or hidden agendas)?
- What do they have to lose or gain?
- How much influence do they have?
- Are they available to participate?
- Will they be willing to contribute?
- Are they capable of contributing?

During the analysis, it can be useful to identify clusters of stakeholders with similar interests, capacities and/or relevance for the implementation of UVARs - a useful tool for the exercise is the influence-interest matrix that categorises stakeholders according to the mobility topic, as well as their influence (UN Habitat 2001, 24). A good understanding of what stakeholders can get out of their cooperation will help planners convince them of the benefits of the process.

Form of cooperation

Sustainable urban mobility planning is characterised by a high level of cooperation. This includes cooperation with a wide range of departments relevant to mobility, exchange with higher levels of government and coordination with multiple relevant stakeholders.

Institutional cooperation:

For the development of UVARs at the FUA level, it is recommended to implement a combination of:



- Vertical, organisations cooperate with organisations to whom they are accountable in a hierarchical manner e.g., local authority and the local public transport authority)
- Horizontal, cooperation between organizations that are independent and autonomous in relation to one another, without hierarchical links. Such as between local authorities and private operators.
- cross-sectoral cooperation, between organizations or departments with different knowledge and fields of expertise. Such as between different departments of the local authority (e.g., mobility, land use)
- spatial cooperation, between organisations representing different geographical areas and levels. Such as the lead local authority, the neighbouring authorities as well as all other relevant stakeholders included in the functional urban area.

Institutional cooperation comprises collaboration and joint working within and across public organisations (mainly vertically and horizontally) and it is a challenge when developing any mobility plan at FUA level as it requires the sharing of objectives, knowledge, resources, powers, and consent. With a wide variety of institutions, it will be imperative for the leading city to balance the challenges and needs to implement a successful UVAR, just as it will be for the cooperating institutions to align with their own stakeholder ecosystem. There are certain elements that are key to successfully achieving this cooperation: 1. agreeing on responsibilities, 2. aligning on resources, and 3. complying with the legal environment. The CHALLENGE project published a [Manual for Institutional Cooperation](#) for further guidance on the topic.

Level of engagement

The goals of the engagement strategy and the expected contributions from stakeholders will help define the level of engagement for each. Different levels can be categorized as

- Informing the stakeholders so that they better understand the problems and solutions
- Consulting the stakeholders to obtain feedback and collect data
- Engaging with the stakeholders throughout the process to ensure that concerns and expectations are consistently understood and considered
- Collaborate with the stakeholders on several steps of the process
- Empowering the stakeholder to make the final decision

Selecting the right level of engagement for each stakeholder is crucial to the success of the UVAR planning and implementation, and different stakeholders should be involved on different levels. To make the most efficient use of resources and time, and to ensure the best results, it is crucial to select the right level of involvement for each stakeholder. Usually, the implementation of UVAR requires all levels of involvement, but the leading city should be careful not to let external stakeholders dominate the decision-making process.

Steps 1 and 2: consult and engage with stakeholders

Step 3: collaborate with the appropriate stakeholders to define the objectives and the long-term vision

Step 4: collaborate with stakeholders for the co-creation of UVAR and accompanying mobility measures

Step 5: Inform the different stakeholders of the measures and consult them for improvement

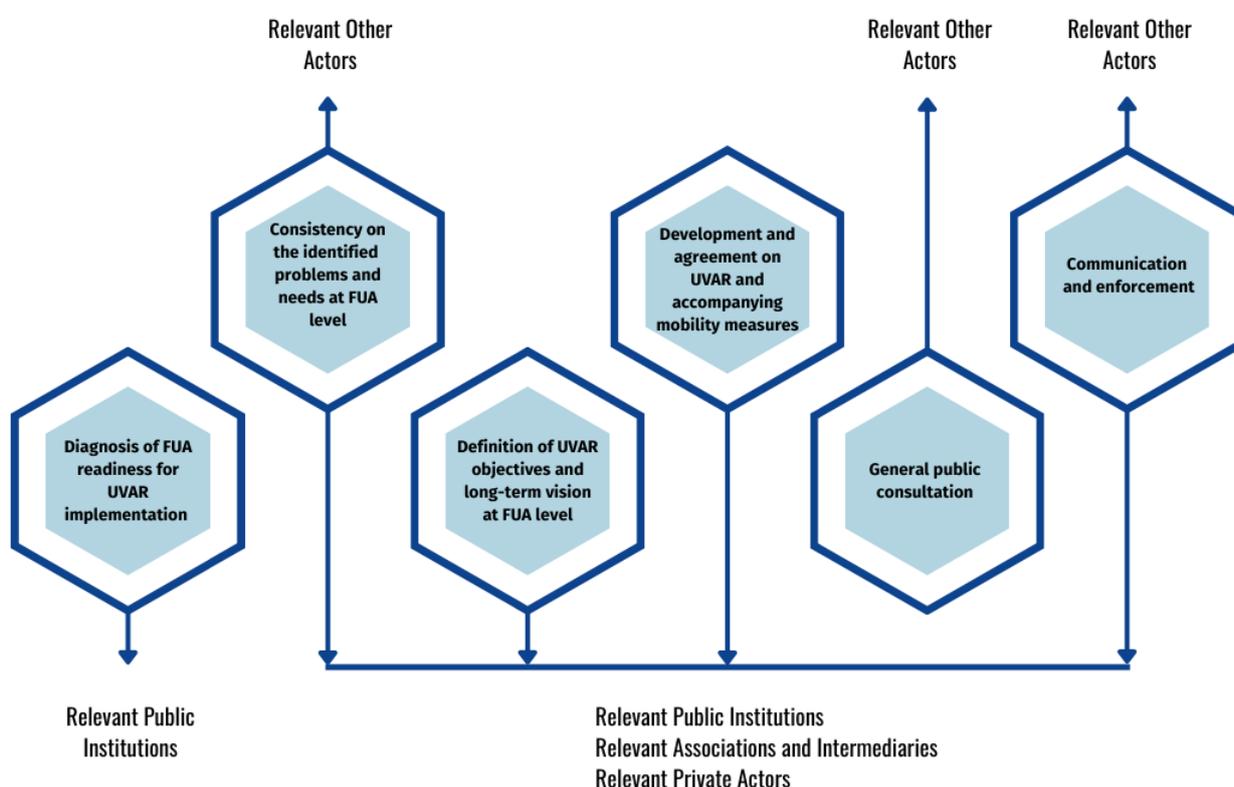
Timing for stakeholder's involvement

Maintaining a good partnership requires planning. Interaction needs to be well structured, with clear and appropriate steps for involvement throughout the decision-making process. Regular communication should be ensured to maintain an effective dialogue between the leading city and the stakeholders, and there

should be an appropriate follow-up to meetings and events. After identifying the main stakeholders to be involved and the goals of the involvement process, the engagement process can be planned on a more operational level.

If stakeholder consultation is not properly organised, stakeholder input will be difficult to collect and use. Based on the step-by-step process and the indicative stakeholder map, this is a proposal of when to approach the different stakeholders:

Figure 3 Suggested checkpoints with relevant stakeholders during the UVAR planning process



Engagement methodology

Many techniques exist to involve different groups of stakeholders at various stages of the project or decision-making process.⁴

It is important to encourage and enable citizens to get engaged and join the debate, especially in the early planning phase when processes are still open and flexible. The leading city should use all possible ways of engagement - from classical face-to-face meetings and surveys to online consultation and co-creation, such as smart city challenges. Cities should not be afraid to adapt and try new methods of communication and engagement, from interactive tools to social media.

The goals, topics, stakeholder analysis and involvement strategy all determine which techniques are most suitable, and without consideration of these elements, an inappropriate engagement activity is more likely to be used.

⁴ Find more information in the CIVITAS toolkit for stakeholder engagement, and the GUIDEMAPS guidance documents.



Resources

A participatory process should not be underestimated as it is not simple and can be time-consuming. The leading city should keep important deadlines in mind, as they can limit the scope of the engagement activities. Taking the timeframe into consideration includes deciding in advance in which phase of policy making (planning, implementation, evaluation) you feel the input of stakeholders is relevant.

The costs of a participatory process depend on the methods used and the chosen target group and should be adjusted to the expected outcomes.

3. Dynaxibility4CE case-study: Krakow's Low Emission Zone

Krakow is located in the northeastern part of the Małopolska Province. Krakow is the capital of the province and the centre of the Krakow Metropolitan Area (KOM), situated at the core of the traffic activity as the main economic and educational hub in the region. The Functional Urban Area in Krakow - an area that covers 326.8 km² with a population of 759 thousand residents - consists of the city of Krakow, as the metropolitan centre, and 14 surrounding communes with intense functional connections with Krakow.

In terms of mobility, Krakow faces similar problems as other EU cities, such as poor air quality, insufficient parking space and increased traffic congestion in the city area. In 2016, Krakow approved the transport policy (a strategy closely related to a SUMP) to reverse the situation and create the conditions for an efficient and safe movement of people and goods while limiting adverse impact on the natural environment and living conditions of residents within the whole FUA.

As part of their work in the Dynaxibility4CE project, the Krakow Municipality (ZTP) has developed an Action Plan to determine a new model for the residents' mobility in all available modes: public transport, walking, cycling, and private car. The document describes the planning process for UVAR as a new innovative low-carbon mobility solution to improve air quality in Krakow's FUA.

UVARs in Krakow: not a new thing

The city of Krakow is not a stranger to the concept of UVAR: the first restrictions on traffic in the city centre were introduced as early as January 1979 when it was decided to restore the original function of the Main Square, which had been degraded by car traffic. The biggest changes in the city happened in 1988 when pedestrian zones were introduced together with limited traffic and parking areas - the first city in Poland to introduce a no-car zone as well as a limited traffic zone. This was also the beginning of a one-way street system that focused on cutting through traffic in the inner city. These policies are still present today.



Although other mobility measures exist to support the access regulations, according to a study prepared on behalf of the Krakow Metropolis Association entitled "Concept of integration of transport systems in the Krakow Functional Area" (2017), 23.5 thousand people (73%) enter Krakow in the morning rush hour in passenger cars, while only almost 7 thousand people use public transport at that time (27%). The result of



such a modal split is, besides congestion on the roads entering the city, longer travel time to the destination and worsening of the air quality in the city of Krakow as well as in neighbouring municipalities.

UVAR planning process Krakow

As previously mentioned, the Dynaxibility4CE step-by-step process is not meant to be a rigid process but mere guidance for a complex planning process. Krakow has been working in their SUMP for some time, and therefore had already performed a mobility analysis and set a long-term strategy before participating in the Dynaxibility4CE project, making that process steps less relevant in their UVAR planning path.

1. FUA Assessment

UVAR readiness in Krakow

As the first step in their UVAR planning, the Krakow transport authority assessed Krakow's UVAR readiness. To do this, the UVAR SUMP Topic guide was translated into Polish and distributed among different departments (Municipal Traffic Engineering, Police, Municipal Police, Road Authority and Municipal Management Department) for an intersectional analysis of the feasibility of implementing the various types of UVAR. The different departments were also asked to make observations regarding the competencies to fully understand the skills and capacities that will be needed alongside the process.

The analysis of different UVARs that can support several city policy objectives and the results of consultations with representatives of municipal units concluded that, given the priority of improving air quality in Krakow, the optimum solution would be the implementation of a Low Emission Zone (LEZ).

Review of binding policies and documents

There were many plans and frameworks that Krakow's city authority had to assess to understand the decision-making process behind UVAR implementation. The following points summarize the legal framework as well as the planning and policy context in Krakow regarding UVAR (and specifically LEZ) implementation.

Several initiatives indicate objectives aimed at improving the air quality of the city and establishing the necessary base to implement vehicle-restrictive measures. The **transport policy of Krakow** indicates the main objectives in the transport sector as well as the means to achieve them, including the consideration of restricting entry to the city for highly pollutant vehicles. The **Adaption Plan to achieve climate change by 2030** identifies the main sectors contributing negatively to climate change, including the transport sector; although the plan does not include UVAR measures, it focuses on the usage of public transport and active mobility, complementary measures to any inclusive UVAR implementation. The **Low-Emission Economy Program (PGN)** identifies the main areas of environmental impact, referencing the negative impact of transport on air quality and indicating necessary actions to be implemented to minimize such impacts - including the implementation of different types of UVAR. At the same time, the PGN highlights the legal and organizational constraints that municipal governments face to implement the recommended actions and it stresses the need to create a legal framework allowing local governments to introduce zones of limited transport emissions.

The most relevant document to support the city's intention to implement a UVAR is the '**Air Protection Program for Małopolska Province**'. This document includes corrective actions to decrease air pollution with an important focus on the transport sector.

As the PGN indicates, to give Krakow the legal basis to implement a LEZ, changes needed to be implemented at the national level. In December 2021, the Act on Electromobility and Alternative Fuels (2018) was amended, according to which, to reduce the negative impact of pollutant emissions from transport on human health and the environment, a Low Emission Zone may be established within the commune, covering roads managed by the commune.

An in-depth analysis was also carried out on reports concerning:

- The number of harmful pollutants (NO_x, CO, PM) emitted by vehicles of different categories (cars, vans, cabs, buses), with different types of fuel and with Euro emission standards



- Evaluation of the effects of improving air quality in Krakow through changes in traffic organization

Understanding stakeholders

To identify the opinion of the residents on the implementation of the LEZ concept, workshops with the residents of Krakow in the form of focus groups were organized. These workshops not only allowed to name the emotions of the residents about the implementation of the LEZ, but also provided valuable conclusions were taken into account when formulating the scope of restrictions, designing an information campaign about the LEZ, forming a message about the objectives and benefits of the implementation of the LEZ, planning the scope of possible assistance measures for the units most affected by the LEZ, the implementation period, the scope of investment and infrastructure measures accompanying/preceding the implementation of the LEZ.

Simultaneously, other activities helpful to the Action Plan development were realised. A survey regarding, inter alia, preferred forms of support to be offered to residents in the future LEZ in Krakow was carried out. Representatives of the Krakow Transport Authority participated in the Clean Air Fund workshops on LEZ, and a series of meetings were organised by various municipality departments regarding the issue.

2. UVAR objectives and scenarios

The review and analysis of the currently binding planning documents addressing the issues of air protection and traffic-calm zones for the Krakow FUA made it possible at a later stage to determine the most important objectives of the UVAR action plan, to define assumptions during the development of scenarios studying the introduction of LEZ and accompanying mobility measures, and to estimate the effects of a potential implementation. These issues are described in the following sections.

The analysis of different scenarios aimed at stimulating the discussion with stakeholders on the rationale for implementing UVAR measures and selecting the most impactful ones. Carrying such work can be effort-consuming for cities, but not only will it help the development process, but it will also increase the sense of social responsibility in acting to minimize the problems affecting the city as well as the social acceptance of UVAR measures. The following table shows the different stages that lead to the development of UVAR scenarios in Krakow:

Table 2 Stakeholder involvement during Krakow’s scenario analysis for UVAR.

Stage		Stakeholders involved
1	Description and analysis of various options for UVAR implementation based on the available SUMP Topic Guide, with a view to possible implementation in Krakow.	Krakow Transport Authority
2	Translating the UVAR SUMP Topic Guide into Polish and forwarding it to the relevant municipal unit for comments, in the context of the possibility of implementing particular types of UVAR in Krakow.	Department of Municipal Traffic Engineer, Police, Municipal Police, Road Authority of Krakow, Public Utilities Department.
3	Organization of qualitative research with the participation of residents - focus groups on impressions regarding the LEZ in Krakow	Residents of Krakow
4	Analysis of available documents concerning air quality and limited traffic zones for the Krakow FUA, i.e., POP, PGN, Transport Policy, Parking Policy	Krakow Transport Authority
5	Analysis of reports on emissions of harmful pollutants from transport in Krakow and focus groups with residents	Public Transport Authority, NGOs active in the field of air quality improvement

6	Determining the most important goals of the Action Plan (considering the needs of residents and city units).	Krakow Transport Authority
7	Defining assumptions for scenario development	Public Transport Authority, NGOs active in the field of air quality improvement
8	Development of scenarios and estimation of the effects of their potential implementation	Krakow Transport Authority

As part of the Dynaxibility4CE project and the UVAR action plan development, workshops were organized with the participation of project partners, representatives of the Krakow Transport Authority and other FUA Municipality units. Such workshops help the city discuss future steps to introduce LEZ in Krakow as well as to identify related challenges and needs. Bringing in experts at the European level is also helpful during the UVAR development process to exchange knowledge and to learn from other initiatives, from both the successes and the shortcomings.

3. LEZ implementation plan definition

The city of Krakow plans to implement their LEZ gradually, increasing with time the severity of the restrictions as well as the size of the implementation area. With each new stage, more vehicles will be banned from entry to the LEZ, which will also increase the effectiveness of the solution to reduce NOx and PM emissions. To facilitate the transition, the effective dates for each new stage to come into force will be consulted with stakeholders in a public consultation process. Parallel to the introduction of LEZ stages, the city is planning to implement other transport and mobility measures to contribute to the achievement of synergy effects in different areas such as spatial planning, environment protection and education.

Krakow is planning to implement complementary mobility packages, targeted at both residents inside LEZ area and outside LEZ area (but inside the FUA area). To provide alternatives to cars, Krakow will increase the development of rail, bus, and tram connections as well as increase the service quality, including the provision of new rolling stock. Other measures for residents inside the LEZ area include free of charge public

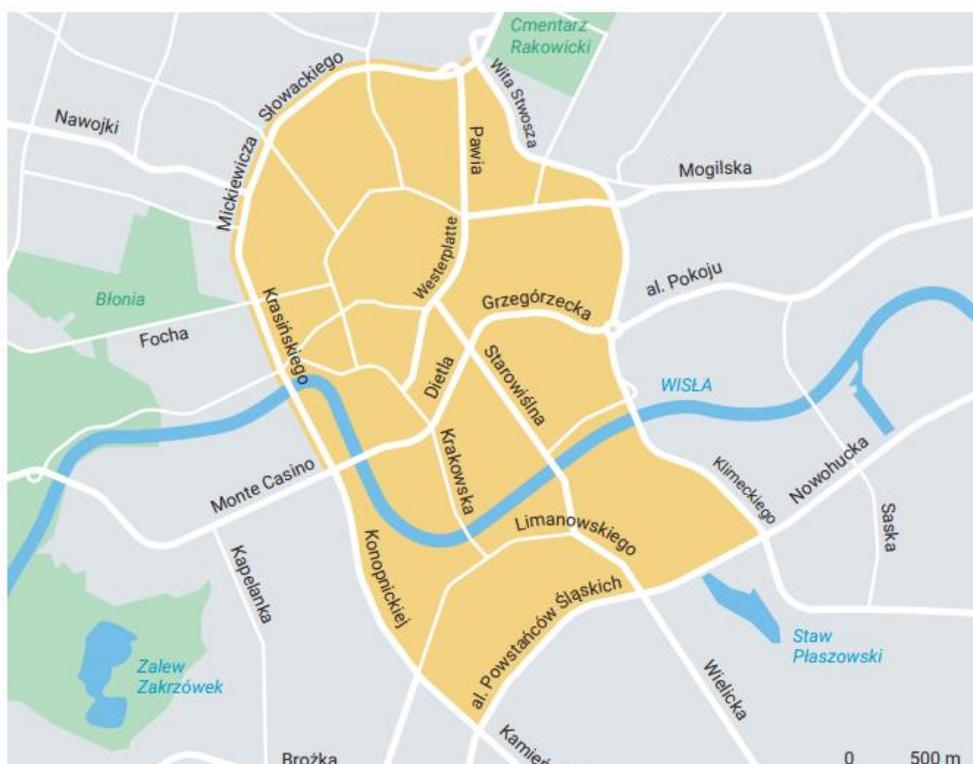


Figure 4 Proposed LEZ area in Krakow. Source: Krakow Transport Authority.



transport tickets during the initial stages and free subscription to long-term rental electric bike systems for 24 months. The action plan also includes measures targeted at entrepreneurs and business owners inside the LEZ, offering a support mechanism that would provide a transitional period for the most restrictive measures as well as different subsidies for the procurement of clean vehicles.

4. Next steps: public consultation and council adoption

To develop a solution that is socially acceptable and effective in the achievement of the air quality objectives, the city of Krakow has prepared a public participation plan to discuss with city residents and other relevant stakeholders the following items:

- LEZ entry requirements
- Date on which these requirements will become effective, and the pace at which they will be raised
- Complete implementation schedule until 2030. This will allow all citizens to have in advance all the information regarding entry requirements for cars to be imposed in the coming years.
- Transitional rules for residents and business owners

The city of Krakow understood that it is key to develop a stakeholder engagement plan that targets various groups of stakeholders through different channels. The following table includes an overview of the public consultation together with the information campaign.

Table 3 Public consultation activities for the implementation of a LEZ in Krakow

Information activity/ form of consultation	Target groups
Announcement of public consultations	All groups of stakeholders
Briefing about public consultations	All groups of stakeholders
Leaflets distributed at main intersections and among residents of the planned LEZ; video about the idea and reasons for introducing LEZ at Krakow.pl and relevant social media	All groups of stakeholders
Livestream with Krakow Mayor and experts	All groups of stakeholders
Information in local media and on social networks about the possibility of submitting comments through a special form and participating in workshops (recruitment for workshops)	All groups of stakeholders
Submission of comments to LEZ scope via a special form (available online and at selected city units)	All groups of stakeholders
Repeated announcements in the media about the workshops	All groups of stakeholders
Introductory meeting for residents	Residents
A series of five workshops for residents	Residents
Information in media about meeting summarizing the workshops outcomes	All groups of stakeholders
Meeting summarizing the workshops outcomes	Residents
A series of three meetings with business owners	Business owners
Expert telephone service	All groups of stakeholders

After the public consultation process is finished and taking into consideration the stakeholders' comments, the city will prepare the project of the resolution on LEZ. The Krakow city council will then work on it and adopt a resolution to establish the LEZ in Krakow. To finalize, the LEZ will be introduced according to the



stages defined during the consultation and approved by the city council (expected to be at the beginning of 2023).

5. Remaining challenges: enforcement

Following what is established in the Act of the electromobility and alternative fuels, Krakow has to follow a sticker-based approach to enforce the LEZ. All cars entering the city will be obliged to mark the vehicle with an appropriate sticker following the formula to be established by the Polish Ministry of Climate and Environment.

The sticker will be issued locally, and the cost of the sticker will remain accessible, considering it will have to be paid for by the citizen. Currently, there are no plans to charge fees on cars for entry, although this might change in the future. The police will lead the enforcement and will impose penalties on drivers who enter the zone with a banned car as well as an unmarked car.

The city of Krakow is aware that this will severely limit the effectiveness of the measure and they envisage equipping the streets with a video-detection system to overcome it. To improve the service and facilitate enforcement, the city is also planning to launch a digital system that would allow drivers to register their vehicle using the online platform or the application and receive the sticker at the indicated address. Such a measure will not only facilitate access to stickers to local citizens but will also enable outsider visitors to comply with the measures.

Finally, the city is also studying the LEZ signage, coordinating with other Polish municipalities and EU entities.

4. Best Practices

UVAR schemes are most common in Western and Northern Europe, but a growing uptake can be seen in the Interreg Central Europe area. Currently, Slovakia and Croatia do not have cities with access regulations, whereas Ljubljana is the only Slovenian city with a significant pedestrian area that limits car access to the historic city centre. In the Czech Republic, significant UVAR schemes for private passenger vehicles are planned but have not yet been implemented.

Besides the Dynaxibility4CE partner city of Krakow, other Polish cities have access regulations for trucks of different sizes. In Germany, a national framework of the 'emission' sticker (Umweltplakette) is in place, which regulates inner city access and facilitates enforcement. After an initial analysis of the existing UVAR schemes in Central Europe, several cities were selected as best practices from the programme area and beyond, which are The Hague & Amsterdam (NL), Milano, the regions of Baden Württemberg (DE) and Veneto (IT), as well as Ljubljana (SI) and Salzburg (AT) and Zadar (HR).

4.1 Milano: Digital integration of UVAR solutions can increase efficiency

The UVAR of Milan, or 'zona a traffico limitato' (ZTL) in Italian, includes three measures, a wider 'Area B' (120km²), a smaller 'Area C' (historic city centre of 2.5 km²), as well as an integrated parking management system. All three solutions, which aim to reduce the negative impacts of the passenger vehicle, as well as the task of enforcement, are managed by Azienda Trasporti Milanese (ATM). Access regulations for both areas apply from 7:30 AM until 7:30 PM.

Area B

The larger 'area B' is regulating the access of all combustion engine vehicles (cars, commercial vehicles, mopeds, and motorcycles), whereas HGVs above twelve meters are not allowed to enter. Enforcement is done through a ring of 188 electronic camera gates. Current access rules, which started in late February 2019 with a minimum for petrol cars (Euro1), diesel cars (Euro4) and mopeds (Euro2), will be tightened in



the following years on 1 October: 2022 (Euro3), 2025 (Euro4) and 2028 (Euro5) and a diesel ban is planned for 2030.

Area C

The inner-city area can only be accessed by purchasing a ticket, which is linked to the license plate and is monitored by 43 electronic gates, equipped with detection cameras. Most polluting vehicles and those longer than 7.5m are not allowed in the area. Residents of 'Area C' need to pay 2€ per access but have an exemption amount of 40 free entries. Vehicles from non-residents that are parked in partner garages and service vehicles need to pay 3€. If this parking offer is not chosen, private car users need to pay 5€ per entry. This offer is possible due to the efficient integration of the UVAR and parking scheme by ATM. Exemptions exist for most hybrids, electric cars, motorcycles, and special vehicles for the security of the population (police, ambulances etc.). The standards of the wider Area B also apply.

Digitisation of parking management

Besides the two above-mentioned UVAR schemes, ATM also manages 25 off-street parking facilities with 20.000 parking spots, over 150.000 on-street spots and around 750.000 permits, which provide certain exemption rights. The essential benefit of UVAR enforcement and parking policy is the fact that administrative synergies allow better integration of payment schemes for Area C access and parking costs, while providing financial benefits to users who enter Area C and choose off-street parking.

Thanks to the integration of the database of the national vehicle register, parking payment and camera registration can take place through a technical data check of the licence plate through gates and scan cars. The organisation of vehicle exemptions for disabled users, residents, and special vehicles (delivery, construction, renovation, media, police etc.) is also centralised. The complete integration of all on- and off-street parking solutions and the high number of daily transactions also attracts payment service providers for in-app purchases, such as Intesa San Paolo Bank and Lisplay (IT), or PayPal (international). In the pre-pandemic year of 2019, already around 30% of payments were made digitally, either through SMS (1%) or app (29%).

Overall, the installation of an integrated digital UVAR and parking system is more efficient, reduces the environmental impact, facilitates access for car users, and the generated data is an available tool for implementing continuous planning choices for transport policy related to passenger vehicles.

4.2 Veneto & Baden-Württemberg: Regional UVAR solutions

Car users, who are regularly visiting different cities, must adapt to local UVAR regulations and need to be aware of different schemes and exemptions. Thus, in the following two examples, the regions of Veneto (IT) and Baden Württemberg (DE) have created a region-wide scheme that creates a common framework of rules, fosters cooperation and facilitates compliance for road users.

Veneto, Italy

As one of 20 Italian regions, Veneto has several significant tourist and commercial centres, such as Venice, Verona, Padua, and Vicenza. Just like most urban areas in Italy, these cities all have low emission zones, which have individual rules, which were set up by the city administration, as no national legal framework exists. This also applies to local permits and exemptions for disabled car users, which were also stored locally. Thus, this lack of exchange of datasets of 115.000 people with a disability pass caused 6000 appeals of fines, of which 75% were won by the vehicle operators. Those wrongful penalties also caused an administrative and financial burden for the city administrations in Veneto, which accumulated to 500.000€ annually. By interconnecting the databases of individual cities, they have reduced wrongful doing, facilitating disabled individuals to enter the restricted area and saving thousands in administrative costs.



Baden-Württemberg, Germany

The German state aimed to reduce the negative externalities of the passenger vehicle with a regional framework for UVARs (low-emission zones, or ‘Umweltzone’ in German). All cities 20 above 100.000 inhabitants have a LEZ.

The legislative framework to create an LEZ was introduced nationwide in 2007. The categorisation depends on the EU-wide vehicle emission standards for vehicles, ranging from EURO 1 (high emission / red sticker) to EURO 6 (low emission / green sticker). These stickers help local authorities to identify cars and enforce the rules, which were tightened in the cities across the state so that almost all cities of Baden-Württemberg allow low-emission cars with a green sticker to enter. Since 2018, additional diesel driving bans were introduced in specific zones or routes, even if these vehicles have a green badge.

Whereas 27 cities in Baden Württemberg breached the air quality standards concerning NO₂ and PM₁₀ in 2016, currently only one specific area is breaching the emission thresholds regularly. The Ministry for Mobility in Baden-Württemberg highlighted that a mere one to two per cent of vehicles does not have a green badge. Thus, the phasing out of old vehicles was successful.

4.3 Ljubljana: UVARs are more than just LEZs

Due to economic growth, more inhabitants could afford a car, which had a significant impact on the modal split, as car use doubled in the first decade of the 21st century. Thanks to the impetus of the first SUMP, which was published in 2012, a gradual pedestrianisation of the inner city took place, which nowadays includes a car-free area of more than 100.000 square meters. This zone can only be accessed by delivery vehicles between 6-10 AM for loading and unloading, or with a specific residence or disabled permit. Residents have 334 dedicated parking spaces in an underground car park in the city centre. Visitors and tourists are recommended to leave the car in six Park&Ride locations were set up on the outskirts of the centre, which have direct tram or bus connections to Ljubljana and only cost 1,3€ per day.

Even though the pedestrianisation efforts took place over several years, they had a significant impact on the accessibility of the inner city, as well as the modal split. Instead of just banning passenger vehicles and trucks from the centre, alternative transport solutions were provided. These include investments in low-emission public transport, such as 32 CNG buses, as well as new dedicated cycling routes, which increased the Ljubljana network to around 220 kilometres. These dedicated spaces are perfect to use the public station-based bike sharing scheme, which includes 36 stations and 360 bikes. The pedestrianisation effects were immediately visible after the start of the transformation with the introduction of the SUMP. Public transport use increased by 18.5% between 2010 and 2014, while the use of city buses rose by 17% between 2013 and 2014 alone.

4.4 Salzburg & Zadar: Parking policy is complementary to a UVAR

Even though the focus of our best practice examples is on UVARs in larger cities, one should point out that complementary measures, such as an integrated parking policy, can have a big impact on the reduction of negative externalities caused by passenger cars. Salzburg (AT) and Zadar (HR) are great examples of efficient parking policies, which are paired with other access regulations. Both cities have around 150.000 inhabitants or less and are both UNESCO World heritage sites and therefore tourist destinations.

Salzburg, Austria

The historic centre of the 4th-largest Austrian city is located between the Salzach river and several hills, which drastically limits the space for residents and tourists. To preserve the historic centre, enhance the



experience for tourists and reduce the impact of cars on residents, access is strictly limited by installing physical barriers with a retractable mechanism. Access is only granted to emergency vehicles, residents with a permit and delivery vehicles (with certain time limitations).

These strict physical measures are embedded in a larger parking strategy, which is enshrined in the overall '[Salzburg.Mobil 2025](#)' plan of 2016, and aims to reduce passenger car impact by creating two different parking zones around the historic centre and investing in P&R facilities. The latter have a combined capacity of more than 4000 parking spots. Additionally, curbside parking was limited in the neighbourhoods around the historic city centre. The maximum parking limit in these areas is three hours. The chargeable parking areas around the historic centre of Salzburg remain relatively inexpensive and during weekends and across most of the city, curbside parking remains free, but the maximum duration of three hours remains.

Overall, the 'short-time parking zones' (German: Kurzparkzone) are a relatively good compromise that allows access to shopping and leisure activity for car users from the rural hinterland of Salzburg. Furthermore, the combination of the retractable barriers, park & ride offers, and curbside parking regulations reduces the burden on tourists and daily commuters, while diverting cars away from the historic city centre.

Zadar, Croatia

The city on the Croatian seaside has made significant efforts to reduce on-street curbside parking in the proximity of its UNESCO World Heritage-projected walls. The municipality transformed around 150 parking places into a beautiful walkway along the stone fortification. This was achieved against the initial opposition of the local shopkeepers and residents, who perceived that parking space was already limited by the time of the proposal. The city was able to convince the residents and local shopkeepers to the changes, thanks to good cooperation and effective communication of the proposed solutions that address the challenge of reduced parking.

Firstly, by providing a few additional parking spaces in other parking lots nearby, as well as by growing the public bike sharing system as an alternative mode. Secondly, by developing and implementing a strategy for deliveries in the city centre, with a traffic regulation and surveillance system for delivery of goods, new loading/unloading bays, and continuous monitoring of their effects. Thirdly, by developing digital solutions to divert traffic and parking seekers to alternative parking lots distant from the old city core.



5. UVAR Operational library

	Name and Project/Organization	Brief Description
1.	UVAR SUMP Topic Guide	This document describes how to relate Urban Vehicle Access Regulations (UVARs) to processes in Sustainable Urban Mobility Plans (SUMPs).
2.	How to regulate vehicle access in urban areas. - ReVeAL	<p>The document provides guidance on a wide variety of aspects affecting UVAR implementation:</p> <ul style="list-style-type: none"> - User needs and public acceptance - Ensuring compliance - Mobility alternatives - Governance and Financing - Exemptions and Permits - and more
3.	UVAR Decision- support Tool - ReVeAL	The tool helps cities identify UVAR measures that may be appropriate for their local context and will then provide guidance on those building blocks and on implementation in general.
4.	UVAR Digitalisation toolbox - UVARBOX	<p>A user-friendly web-based tool, to be used mainly by cities and other UVAR competent authorities as an entry point to provide their UVAR information, in compliance with the SDG Regulation</p> <p>Excel spreadsheets with UVAR data types and attributes</p>
5.	Guidelines for UVARs VMS - UVARExchange	Guidelines for presenting UVAR information through Variable Message Signs
6.	Practical aspects of UVAR information provision through signage - UVARExchange	Guidelines on harmonisation and provision of road signage for UVARs
7.	Recommendations on how to overcome the legal, administrative and technical barriers - UVARExchange	Report on legal, administrative and technical challenges and recommendations on the possible solutions that can help identification of non-compliant vehicles and vehicle owners for enforcing UVARs through data sharing
8.	Support toolbox for the overall design of low-carbon value-added services for freight and people - SOLEZ	Provides an overall description of the most promising, innovative and effective pull measures in terms of low-carbon VA services, covering both passenger and freight transport in FUAs.
9.	Guidelines for integrated low-carbon mobility planning in FUA - LOW-CARB	This document guides how to plan for sustainable mobility on the level of the functional urban area with public transport as a backbone derived from the LOW-CARB project.
10.	Toolkit on stakeholder involvement - CIVITAS	Provides guidelines, tips and checklists to help with the planning and execution of a range of consultation activities.
11.	Guidelines for passengers and freight transport stakeholders'	Guidelines for passenger and freight transport stakeholders' involvement at the FUA level to set up a



	<u>involvement at the FUA level - SOLEZ</u>	collaborative process for the development of action plans.
12.	<u>How-to guide: Zero Emission Zones, POLIS-C40</u>	The guide presents experience and advice on developing a zero-emission zone for freight, from public and private-sector representatives around the wor