Technology options and interoperability for Urban Vehicle Access Regulations (UVARs) schemes

Technical Report

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Directorate-General for Mobility and Transport

2017

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Introduction

Background

Making urban centres as accessible as possible requires local decision makers to prioritise the use of urban space according to local needs and circumstances. Similarly, local competent transport authorities need to decide on how to make the best possible use of the existing expensive transport infrastructure and maximise the accessibility of cities for passengers and freight.

Towns and cities across Europe are considering or have completed the establishment of Urban Access Regulations Schemes in order to improve air quality, urban accessibility and reduce congestion, and/or to foster the development of alternative transport modes and the use of cleaner and more energy-efficient vehicles.

The 2011 Transport White Paper announced the European Commission's intention to tackle this issue by providing an EU-level 'framework for urban road user charging and Access Regulations Schemes and their applications, including a legal and validated operational and technical framework covering vehicle and infrastructure applications'. This framework would seek to address the modalities for the development of Access Regulations Schemes. Authorities at the local level would retain their authority to decide on the appropriateness of an Access Regulations Scheme and to delimit the area under the scheme, to fix the amount of fees levied where a charging scheme is used, etc.[1]

An online public consultation was conducted on "The urban dimension of EU transport policy[2]" from 17 September to 17 December 2012. A vast majority of respondents (71%) think that EU support would contribute to more harmonious development of access regulations and urban pricing schemes at the local level. The most sought-after EU support in relation to access regulations schemes is the development and exchange of information and best practices, development of voluntary guidelines and recommendations, mandatory criteria and interoperability standards for equipment[3].

On 22 September 2014, following the inter-institutional negotiations, the European Parliament and the Council adopted the Directive on the deployment of alternative fuels infrastructure (Directive 2014/94/EU). The cornerstones of the Directive are the following:

- requiring Member States to develop national policy frameworks for the market development of alternative fuels and their infrastructure;
- foreseeing the use of common technical specifications for recharging and refuelling stations;
- paving the way for setting up appropriate consumer information on alternative fuels, including a clear and sound price comparison methodology.

Furthermore, the proposition advanced in the 2013 EC Communication "Together towards competitive and resource-efficient urban mobility[4]" states that smarter urban access regulations and road user charging require "non-binding guidelines" that "would allow cities and Member States to benefit from the experiences elsewhere, and, where appropriate, foster a more common approach to issues such as vehicle categories, road signs, information provision, enforcement, exemptions, and pricing. This would make it easier for

users to understand and comply with schemes, while leaving cities flexibility to adapt to their local circumstances"[5].

Finally, the 2013 Commission Staff Working Document "A call for smarter urban vehicle access regulations", states that "the Expert Group on Urban Mobility should consider access regulations developments and assist with, for example, the elaboration of suitable best practice guides and non-binding guidance to help cities implement access regulations schemes effectively"[6].

In such a context, the European Commission provides indications and guidelines to deal more effectively with the design and implementation of UVARs schemes, in partnership with member States and other relevant stakeholders, in order to avoid fragmentation and ensure a seamless transport system.

International organisations (UNECE) have also contributed to setting the framework towards a common approach, for instance through the Convention on Road Signs and Signals (1968[7]), which set out rules ensuring uniformity of road signs, signals and symbols, necessary in order to facilitate international road traffic and improving safety.

The following table summarises the main steps undertaken at EU/international level, in shaping the policy relevance and the policy framework concerning access regulations strategies and traffic regulation.

UNECE Convention on Road Signs and Signals[8]

The Convention set out in Vienna in 1968, established common rules ensuring uniformity of road signs, signals and symbols, necessary in order to facilitate international road traffic and improving safety. Following the opening for signature of the Vienna Convention on Road Signs and Signals, the Inland Transport Committee (ITC) of the Economic Commission for Europe, considering that it was necessary to achieve greater uniformity in the rules governing road signs and signals in Europe, asked the UNECE Group of Experts on Road Traffic Safety to prepare a draft Agreement supplementing the Vienna Convention. The final text of that Agreement was approved by the Inland Transport Committee on 1 May 1971 (see document E/ECE/812-E/ECE/TRANS/566) and was opened for signature the same day. The Agreement entered into force on 3 August 1979 and on 1 July 2007 it had twenty-nine Contracting Parties. This Agreement was supplemented on 1 March 1973 by a Protocol on Road Markings, which entered into force on 25 April 1985. This Protocol has twenty-four Contracting Parties, at the date of 1 July 2007.

Urban Mobility Package[9]

The section on smarter urban access regulations and road user charging within the Urban Mobility Package describes the role of urban vehicle access regulations in helping optimize urban access, air quality and to contribute to the goal of phasing out conventionally fuelled vehicles in cities by 2050.

In such a context, the European Commission has envisaged the need to exchange information among Member States and experts on urban access regulations across the Union, including practical implementation, conceptual foundations, effectiveness and impacts. This will lead to non-binding guidance to help cities implement access regulation schemes effectively.

Transport White Paper[10]

The 2011 Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system commits in its action 32 – an EU framework for urban road user charging to develop a validated framework for urban road user charging and access regulation

schemes and their applications, including a legal and validated operational and technical framework covering vehicle and infrastructure applications.

Greening Transport Package

The EU has made internalisation of external costs of transport one of its main principles in transport policy. In 2008, the EC Greening Transport Package (COM/2008/0433), included a strategy for the internalisation of external costs (COM/2008/0435). With regards to urban pricing schemes, the latter document refers directly the Action Plan on Urban Mobility (COM/2009/490).

Action Plan on Urban Mobility[11]

The Action Plan on Urban Mobility's (APUM). Action 7- access to Green Zones; Action 12- Study on urban aspects of the internalisation of external costs and Action 13 — Information exchange on urban pricing schemes – relate directly to this measure.

Scope of the study

Against this background, the European Commission – DG MOVE has contracted a study to deliver six non-binding guidance documents (NBGD) on different aspects of access regulations, from design to successful implementation. The goal of the set of NBGDs is to support local authorities planning to introduce an access regulations scheme with practical guidance and recommendations. This is based on previous and current studies[12] and assessments of existing schemes on six aspects of UVARs, from planning to successful implementation:

Topic of the NBGDs	Rationale
1. Information and communication	To inform stakeholders about the scheme's characteristics and functionalities throughout the process of establishing and running a UVAR, and devise and implement effective communication plans, aiming to make users (including foreigners) able to understand the terms and conditions of the scheme, including fines and enforcement options, and establish an interaction with local authorities.
2. Enforcement (including cross-border), vehicle types, their identification and exemptions	To inform stakeholders, using best practices and examples, of the benefits of efficient vehicle identification methods, (including common standards for retrofitted vehicles) exemptions and enforcement rules, also in relation to national legislation. The situation at cross-border points and treatment of foreign vehicles is considered as well.
3. Planning, consultation and design (including definitions and typologies)	To provide information to stakeholders about the UVARs planning, consultation and design cycle. Dialogue with stakeholders, design and inclusions of ancillary transport policies, e.g. parking management and pedestrianisation, are considered.

Topic of the NBGDs	Rationale
4. National legal frameworks	To inform stakeholders about the requirements for an efficient and supportive national framework in relation to national and sub-national legislation for UVARs implementation.
5. Evaluation and assessment	To provide information to stakeholders on state-of-the-art techniques and practices for the evaluation and assessment of UVARs schemes. Information on the range of impacts, techniques, barriers and processes is collected, organised and shared, and is ideally drawn from best practices.
6. Technology options and interoperability	To inform stakeholders of the benefits and shortcomings of the available technology options, and of the potential benefits deriving from interoperability and, in general, from the adoption of common approaches.

While there is obviously no one-size-fits-all approach, commonly applicable solutions to shared challenges and concerns can be found for all of these relevant aspects, which can lead to a European rapprochement of practices for the benefit of cities, citizens and stakeholders across Europe, including business and industry.

The key topics which are presented in the six publications are strongly interrelated and should be seen in their global and dynamic interdependence:

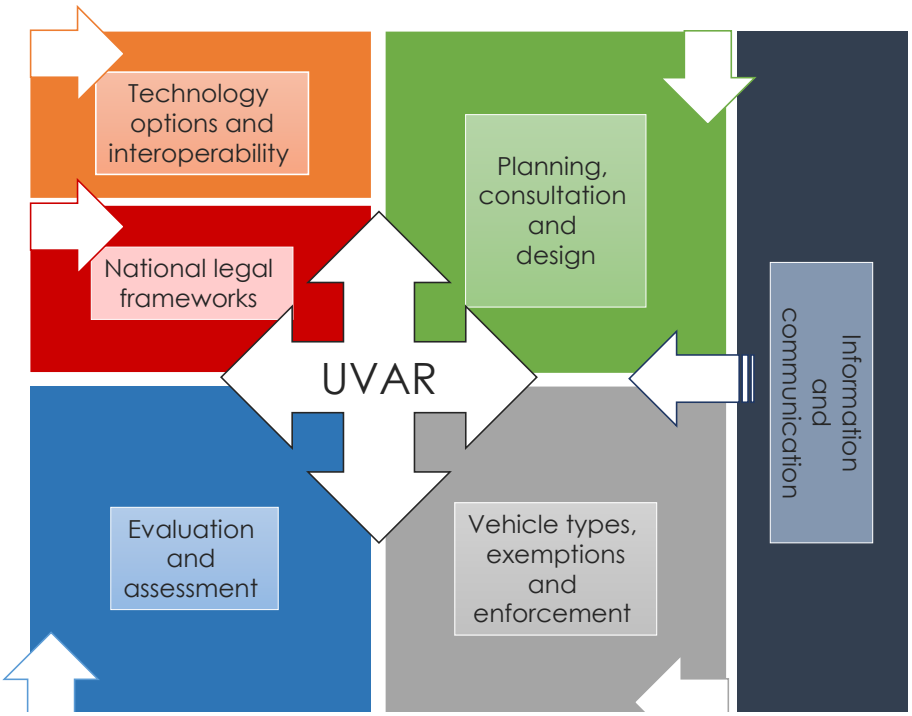

Figure I - The UVAR scheme

This document is primarily intended for use by public authorities, such as municipalities or local agencies, responsible for the management of the traffic, transport and transport infrastructures within urban areas.

All guidance documents will be available online on the European Commission's website once the project will be concluded.

The role of technology and interoperability in UVAR schemes

Most UVARs in operation nowadays need technologies for vehicle detection, charging fines and managing exemptions. In a time of rapid technological developments, the capability to implement complex and most efficient UVARs schemes primarily relies on the application of new technologies.

For example, Cooperative ITS (or C-ITS) technologies, which allow vehicles to become connected to each other, and to the infrastructure and other parts of the transport network, are proving that these systems are able to share information, operate safety functions and at the same time be used for road charging or for access regulation. These technologies can in the future provide technological functionalities, in particular for billing fines, vehicle identification and positioning.

Due to the importance of the technological dimension, the main objective of this NBGD is therefore to review the relevant aspects involved in the selection of the technical solutions while supporting the different options with concrete examples on available options.

The most important technologies are reviewed, i.e. from the Automatic Number Plate Recognition (ANPR), based upon software processing of the plate picture taken by a dedicated, generally digital, TV camera, etc., to technologies based on Dedicated Short Range Communication - DSRC (Frequency already standardize at 5,8 GHz) between an on-board unit and a trans receiver at the access points. Technologies that exhibit an interesting potential on tolled roads, but can be an option also in the urban context, i.e. GPS – GPRS technologies, are considered as well.

The issue of interoperability of UVAR systems, the other component of this NBGD, is relevant at EU level, on the grounds that all citizens should be guaranteed free circulation across the Union. While the problem clearly extends way beyond technological issues, harmonized functionalities of the system could play an important facilitating role.

It is stressed that interoperability may have a technological as well as a spatial/geographical dimension. The technological interoperability of a specific option addresses the capability to adapt to different scheme design and characteristics. For example, in terms of vehicle type detection, payment methods, period of operation, e.g. night or selected day time slot and enlargement of a UVAR area. The spatial/geographical interoperability deals with the capability of the technological options to operate at different scales (urban, regional, national, European). In general, the implementation of UVARs schemes is more concerned with the technological interoperability given the local scale of most UVARs schemes. However, reaching spatial/geographical interoperability may reduce implementation costs and facilitate the movement across borders.

Description of the process

Each of the six identified NBGDs is the result of a participatory process, entailing the following activities:

- Clearly identifying the problem to be solved and the benefits of a more common approach across the EU.
- Defining the scope of the NBGDs and target audiences.
- Bringing together relevant background material (research papers, best practices and experiences).
- Convening a small, balanced group of technical experts to review the available material and prepare drafts of the NBGDs.
- Consulting a broad range of interested stakeholders on the draft NBGDs.
- Presenting the draft NBGDs to interested audiences.
- Revising the NBGDs as appropriate, based on the comments and feedback received.

Up-to-date literature review

A literature review has been carried out in order to set up a knowledge base consisting of research, EU and national guidance, best practices, technical reports, articles and conference proceedings on UVARs. This activity served as a reference to draft the NBGDs.

Sources can be divided into three key categories:

1. *Information at the urban level*. This source accounts for the most significant share of available information. It includes i) the CIVITAS initiative knowledge centre, which reports access regulations feasibility and evaluation cases from the municipalities involved in the CIVITAS projects, ii) databases such as ELTIS, the urban mobility observatory, containing case studies dealing with pricing policies and access regulations measures, iii) academic literature on ex-post assessments of access regulations policies, iv) updates on the implementation of long-standing examples of access regulations policies in European cities, e.g. Milan, Rome, Bologna, London, Stockholm, Trondheim, Gothenburg etc.
2. *Information at the urban and national level*. The key reference for this is the website http://urbanaccessregulations.eu/, which provides an updated overview of the implementation of access regulations policies at the urban and national level (for most of the EU countries). In particular, when appropriate, the national level is addressed through the review of national legislation features, e.g. vehicle identification, enforcement practices, etc.
3. *Information at the EU level*. Academic papers and proceedings from research institutes provide comparisons on UVAR schemes.

The share of sources by key categories is shown in the following graph.

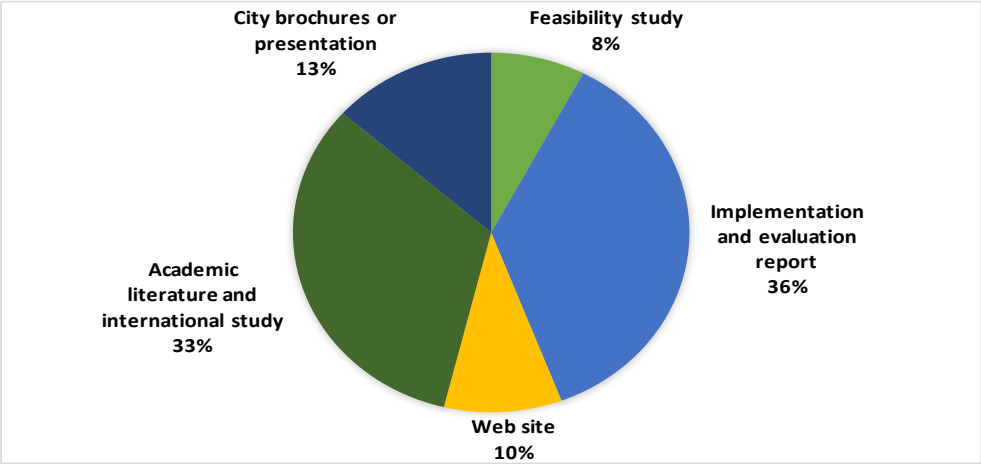

Figure II - - Literature review – type of sources

The methodology for literature review relies on the following assumptions:

- *Time horizon: 2011-2015*. The literature review begins with information from the Study on Urban Access Restrictions (ARS)[13] carried out in 2010, which provides extensive information on access regulations schemes. Building on that, the literature review focuses on publications, reports and studies issued from 2010 onward, trying to offer a complete picture of relevant sources concerning UVAR implementation and design in Europe;
- *Qualitative evaluation*. Each source is graded on a qualitative scale from high to low, indicating the quality of its information on the topic of NBGDs. For each source the title, time horizon, urban area involved, and a brief description of contents and useful notes are provided, e.g. types of reports, feasibility studies, evaluation reports, etc.;
- *Cross-cutting interpretation*. Finally, a cross-cutting interpretation of each topic throughout the available literature has been made to find relevant sections and to address relevant topics.

Concerning technology and interoperability, literature review shows that the comparative assessment of technological options is mainly available from academic literature. The domains addressed basically concern the following topics:

1) Technology integration (software and hardware). For example, in case of GNSS-based technologies applications, their implementation requires more sophisticated map-matching than existing ITS, and further critical trials are required to test system readiness. The integration of the required in-vehicle sensors with external technologies and processes needs development and trials to ensure system reliability.
2) Security and trust issues: system security is also an important issue from the point of view of both users and operators. System security is an important element for operators in preventing fraud but also for user privacy, which is a key element of achieving public acceptability for the proposed system.

3) Cost of transition: cost implications of the various solutions.
4) Policy design, media and political acceptance: towards an understanding about how different social groups (including businesses) would be affected by different pricing scheme designs.
5) Literature from assessment and evaluation reports of cities focuses on specific implementation problems. For example, the implementation of access control systems using automatic control systems through cameras in the city of Ghent raised the issue of data privacy and data protection. A similar problem raised in the city of Rome from camera detection infractions of parking fees.

The complete list of literatures consulted is available in Annex I.

Stakeholder involvement and contributions

The involvement of relevant stakeholders in the discussion and validation of the NBGDs has proved to be of great importance. Each NBGD benefits from two types of stakeholder input:
a) The engagement of a balanced and representative group of experts providing direct contributions to the NBGDs according to their respective areas of expertise;
b) The involvement of a broader group of stakeholders for the circulation and validation of the contents of the NBGDs.

Expert contributions

A special list of experts has been compiled by the authors of this study. This is based on their direct expertise in the design, implementation and operation of access regulations schemes and systems as well as their broad and concrete experience with technologies adopted in the access control systems in a number of deployments across Europe.

The final list of selected experts is as follows:

- Greg Archer: leads the clean vehicles team at Transport & Environment
- Steve Kearns: Engagement Manager at Transport for London
- Mike McDonald: Emeritus Professor of Transport Engineering at the Transport Research Group of Southampton University
- Fabio Nussio: Head of International Cooperation at Roma Servizi per la Mobilità (Mobility Agency of the City of Rome)
- Adriano Trapuzzano: Ex-Solution Manager at BU Electronic Terrestrial Tolling of Kapsch TrafiCom AG
- Terje Tretvik: Senior Scientist at SINTEF Transport and Society, Transport Research

On 13 April 2015, a coordination meeting was held at the ISIS office in Rome, gathering both the experts and the research team, in order to share a common methodology and the main expected output of each NBGD.

The experts' central contribution consisted in providing general feedback on the key challenges and available options identified by the research team on each NBGD topic. Once these were discussed and agreed on, they helped assess the potential impact of a common European

approach and helped identify the key factors leading to the successful implementation of the practices showcased.

In the case of the NBGD on technology and interoperability the allocation has been as follows:

- Adriano Trapuzzano: Chapter IV on Potential impacts from a common European approach
- Fabio Nussio: Chapter V on Barriers and enablers to a common European approach

UVAR stakeholders

At the outset of the study, a list of about 100 key stakeholders was compiled, comprising both cities and other relevant actors such as industry, institutions, economic players, citizen representatives, research institutes, and private consultancies (the list of stakeholders is available in Annex II).

The next figure shows the UVARs stakeholders in detail.

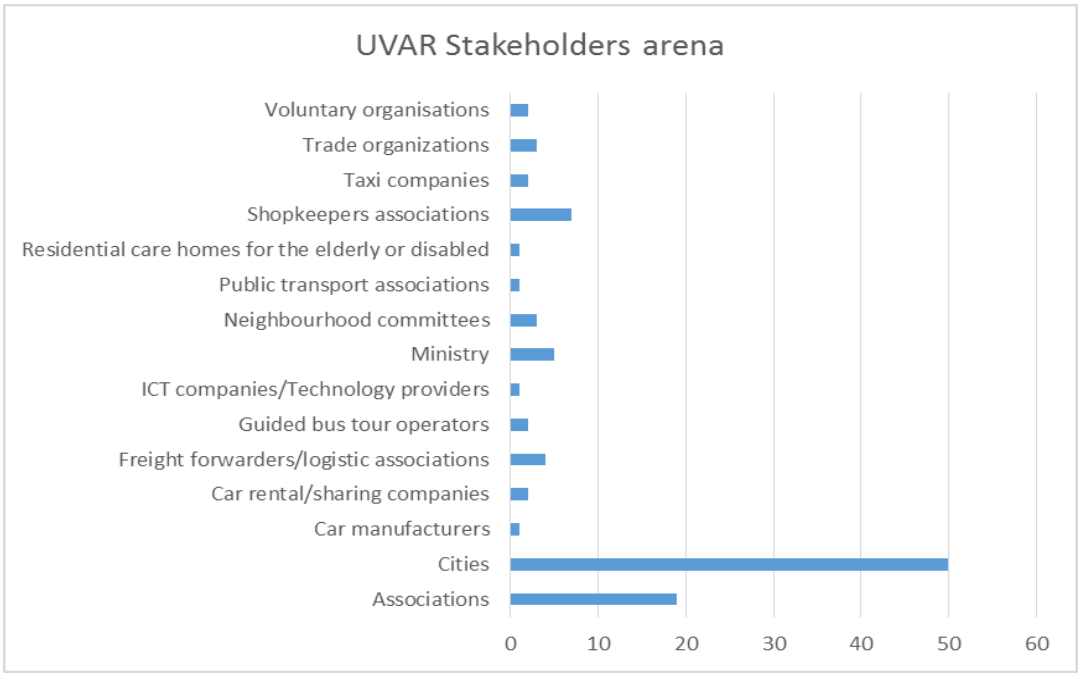

Figure III -- Composition of UVARs Stakeholders

Urban areas and transport associations (from public transport to passengers and freight) account for the biggest shares, followed by shopkeepers' associations and representatives of Member State Ministries.

Furthermore, a key contributor has been the Advisory Group on Access Regulations of the CIVITAS CAPITAL project, which has provided recommendations for the NBGDs.

This UVAR stakeholders' group has been consulted throughout the NBGD drafting process at different stages and in different ways, namely through:

1. The stakeholders' workshop on Monday 19 September 2016 in Brussels
2. An online questionnaire launched in October 2016
3. Continuous consultation via email

Presentation to target audiences and feedback

Stakeholders workshop

The UVAR stakeholders' group was invited to discuss the preliminary results of the fifth and sixth NBGDs – Evaluation and assessment and Technology and interoperability – during a restricted workshop organised with the EC in Brussels on Monday 19 September 2016, at the EC premises DM24, Room 03/47.

Urban associations, policy makers and experts in urban transportation took part in the workshop.

Table 1 - UVARs Workshop - List of participating stakeholders

Name	Organization
Kemal Onel	EC, DG Move
Andrea Ricci	ISINNOVA
Benedicte Tardivo	Ministere Ecologie, Development Durable de l'Energie et du Climat
Enrico Gaspari	PwC
Ian Catlow	London's European Office
Ivo Cré	POLIS- Deputy Director
Julia Levasier	FIA Federation Internationale de l'Automobile/ADAC German member
Lucy Sadler	Sadler Consultants Ltd
Osvaldo Navarro	TPR University of Antwerp
Philip Stein	Expert in Freight transport
Riccardo Enei	ISINNOVA
Vanessa Holve	EUROCITIES

Overall, the discussion was particularly useful in clarifying and/or fine-tuning some of the concepts developed in the draft NBGDs, such as:

- Future technological developments in the field of UVAR technologies. It has been stressed that the NBGD should devote space to future technological developments, opening an informative section on the most promising developments;
- The NBGD should include reference to back office aspects related to the technology options, e.g. costs, how data storage should be carried out, etc. This back-office process has a technological dimension and could be included in the NBGD also with the help of examples.
- Interoperability is an important aspect and more emphasis should be given in the guidance document to the several dimensions.

Stakeholders proved very active in debating and commenting on the topics presented, especially in the closing session, where the audience's involvement in the highlighting of recommendations was particularly relevant.

The stakeholders' point of view was taken into the highest consideration along with their contributions on case studies in the formulation of the NBGDs.

Online questionnaire

In October 2016, an online questionnaire was designed and distributed to the UVAR stakeholders' group. The questionnaire was aimed at collecting feedback on the second draft of the NBGDs 5 and 6, which had incorporated feedback received during the Brussels workshop on 19 September.

The questionnaire was divided into four main sections:

1. Stakeholder details: this section collected information on the respondents, including type of organisation, geographical area, and contact details.
2. Questions on the overall clarity, relevance, effectiveness and usefulness of both the NBGDs as a whole, as well as on their contents.
3. Specific questions on each chapter of the NBGDs.
4. A section for additional remarks and suggestions.

With reference to the Technology and Interoperability NBGD, in total, 3 stakeholders answered the questionnaire, all belonging to government agencies in Denmark, Hungary and Sweden.

In terms of contributions to the NBGDs, the respondents consider the formulation of the recommendations to be on average satisfactory.

Remarks and comments received have been processed and taken into account in the preparation of the final version of the NBGD.

The full list of questions is annexed to this document (Annex IV).

Continuous consultation via email

The research team has kept up a regular dialogue with the UVARs stakeholders' group. Besides the invitation and participation in the workshop and the online consultation, stakeholders have been made aware of all new drafts of the publication produced. These drafts have been shared with all members of the group and accompanied by a call for additional input and comments, to make sure that inputs collected were addressed. A number of individual emails were received that provided either additional open comments or remarks, or directly tracked changes to the text.

Summary conclusions and recommendations

The stakeholders have been active in debating and commenting on the first drafts of the NBGD, helping to make the topics more focused and setting priorities.

The issues raised by the stakeholders, i.e. through feedback provided in the online questionnaire, the discussions held during the September 2016 stakeholder meeting and the various comments on the expert contributions, can be separated into the following topics (from several groups of stakeholders):

Associations:

- Include specific observations about low-tech solutions (stickers, but also streets space redesign and boulders etc.)
- Include some information about technological functionalities (sensing, identification, billing, fines etc.)
- Include some information about future technological outlook (e.g. C-ITS)

In conclusion, the main objective of the NBGD is to review the relevant aspects involved in the selection of the technical solutions for UVAR schemes, while supporting the different options with concrete examples on available options.

[1] MEMO-12-671_EN.
[2] European Commission DG Move: Results of the public consultation 'The urban dimension of the EU transport policy' (page 41).
[3] SWD (2013) 526 final.
[4] Brussels, 17.12.2013 COM (2013) 913 final
[5] Communication from the commission to the European Parliament, the council, the European Economic and Social Committee and the Committee of the Regions: Together towards competitive and resource-efficient urban mobility. Brussels, 17.12.2013 COM (2013) 913 final (page 5-6).
[6] Commission Staff Working Document: A call for smarter urban vehicle access regulations. Brussels, 17.12.2013 SWD (2013) 526 final (page 7).
[7] UNECE Convention on Road Signs and Signals, of 8 November 1968 (ECE/TRANS/196)
[8] UNECE Convention on Road Signs and Signals, of 8 November 1968 (ECE/TRANS/196)
[9] http://ec.europa.eu/transport/themes/urban/urban_mobility/ump_en.htm
[10] WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system /* COM/2011/0144 final */
[11] Action Plan on urban mobility [COM (2009) 490
[12] For a general overview, the analysis done by the ARS study can still be considered a solid reference for facts and trends from which to start. As for the practices of the cities mentioned in the publications, they represent a selection of options currently in operation across Europe.
ARS study - Study on Urban Access Restrictions, Final Report, December 2010 - TREN A4/103-2/2009. http://ec.europa.eu/transport/themes/urban/studies/doc/2010_12_ars_final_report.pdf
[13] ARS Study – TREN/A4/103-2/2009: Study on Urban Access Restrictions - Final Report, December 2010 http://ec.europa.eu/transport/themes/urban/studies/doc/2010_12_ars_final_report.pdf.

ANNEX I - List of information sources

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
1. CIVITAS-ELAN, 2013 "3.2. Study of congestion charging and dialogue on pricing" City of Zagreb	√		√		√		Feasibility study. Presentation made by Marko Slavulj, Ph.D. University of Zagreb Faculty of Transport and Traffic Sciences
2. CIVITAS-MIMOSA, 2013 "Bologna Road Pricing policies" City of Bologna	√√	√√√	√√√		√√√	√√	Measure evaluation report
3. CIVITAS-MODERN, 2013 "Superblocks Concept for Access Restriction" City of Vitoria-Gasteiz	√√	√√√	√√√		√√√	√√√	Measure evaluation report

Title	**NBGD topics**						**Notes & brief description**
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
4. CIVITAS-MIMOSA, 2012 "Flexible access for cleaner freight traffic" City of Utrecht		√√√	√√√	√√	√√√	√√	Measure evaluation report
5. CIVITAS-ARCHIMEDES, 2013 "Access Control Historic Centre" City of Iasi	√√	√√	√√√	√√		√√	Measure evaluation report
6. CIVITAS-ELAN, 2013 "Freight delivery restriction" City of Zagreb	√						Feasibility study. Presentation made by Hrvoje Pilko, B. Eng. University of Zagreb Faculty of Transport and Traffic Sciences
7. CIVITAS-ARCHIMEDES, 2013 "City Centre Access Control" City of Ústí nad Labem		√√√	√√√				Feasibility study

Title	**NBGD topics**						**Notes & brief description**
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
8. CIVITAS-REINASSANCE, 2011 "Upgrading of ZTL scheme" City of Perugia		√√			√		Information from Municipality
9. CIVITAS-2013 "toll - emission zoning of city" City of Brno		√					Information from Municipality
10. CIVITAS-MIMOSA, 2013 "Motorbike Pollution Reduction" City of Bologna	√√	√√		√√√			Feasibility study Measure evaluation report
11. CIVITAS-ELAN, 2011 "Congestion charging scheme for the Ljubljana region" City of Ljubljana	√√						Implementation status report on formal agreement for the congestion charging measure
12. CIVITAS-ELAN, 2012 " Access control system"				√√√	√√√	√√	Implementation status report on access control system (Pilot

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
City of Ghent							project)
13. www.urban accessregula-tions.eu		√√√	√√	√√√	√√√		Web site: overview of EU cities about: Low Emission Zones Urban Road Charging Schemes Urban Access Regulation
14. Clean Air, 2014, "Low Emission Zones"	√√	√√					Aid paper for Municipalities
15. www.eltis.org		√√		√√	√		Web site: Case studies on Low Emission Zones in European cities
16. Frederik Strompen, Todd Litman, Daniel Bongardt, 2012, "Reducing Carbon Emissions through	√√		√√			√√	Overview of TDM measures. Road pricing and congestion charging in London, Singapore and Stockholm

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
Transport Demand Management Strategies" Beijing,							
17. GIZ, 2014, "Vehicle Travel Restriction to Improve Air Quality in Inner Cities"		√√	√√				Low Emission Zones factsheets. London, Berlin
18. GIZ, 2013, "Towards Better Air-Quality in Inner Cities"		√√	√√				Low Emission Zones factsheets. Milan, Berlin
19. Danielis, Romeo, L. R. (2011). An economic, environmental and transport evaluation of the Ecopass scheme in Milan"		√√√	√√√				Analysis and impact assessment of the Milan congestion charging policy
20. Sheffield City Council (2013). "Low Emission Zone (LEZ)	√√√		√√√			√√√	Low Emission Zones feasibility study

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
Feasibility Study" Sheffield City Council							
21. Christiane Malina, Frauke Fischer, 2012, "The impact of low emission zones on PM10 levels in urban areas in Germany"		√√√	√√				Overview on impact and characteristics of LEZ in Germany
22. CIVITAS-MODERN, 2011 "Access restriction policies in Craiova" City of Craiova		√√	√√√			√√	Measure evaluation report
23. CIVITAS-CARAVEL, 2011 "Policy Options for Access Restrictions" City of Stuttgart	√√	√√	√√√		√√	√	Measure evaluation report
24. CIVITAS-SMILE, 2011 "Time control			√√√			√√	Measure evaluation report

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
access restriction" City of Norwich							
25. CIVITAS-MIRACLES, 2011 "Restricting vehicle access al ong La Rambla" City of Barcelona		√	√√√		√√	√	Implementation report, editor Simon Hayes
26. CIVITAS-MIRACLES, 2011 "Multi Initiative for Rationalised Accessibility and Clean Liveable Environments" City of Rome	√	√√√			√√	√	Final Report publishable
27.CIVITAS-MIRACLES, 2011 "Set up of city centre clean zone" City of Cork		√	√√√			√√	Report on evaluation results
28. CIVITAS-CARAVEL, 2011 "Integrated Access Restriction	√√		√√√		√	√√	Measure evaluation report

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
Strategy" City of Burgos							
29. CIVITAS-SUCCESS, 2011 "access control schemes for tourist coaches" City of La Rochelle	√√	√			√	√√	"Design and implementation of access control schemes for tourist coaches" Editors: Breuil, Blackledge
30. CIVITAS-CARAVEL, 2011 "Integrated access control strategy " City of Krakow		√	√√√		√	√√	Measure evaluation report
31. CIVITAS-MOBILIS, 2011 "Access management for the city centre-LTZ buses" City of Venice		√√√	√√√			√√	Final transferability report
32. CIVITAS-33.CARAVEL, 2011 "Clean High Mobility Corridors"	√√√	√√√	√√√	√√	√√√	√√√	Measure evaluation report

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
City of Genoa							
34. CIVITAS-CARAVEL, 2011 "Policy options for access restrictions" City of Stuttgart		√√		√			Travelling towards a new mobility (brochure)
35. CIVITAS-ARCHIMEDES, 2011 "Efficient good distribution" City of Aalborg	√√	√√	√√√	√√	√	√√	Measure evaluation report
36. CIVITAS-RENAISSANCE, 2011 "Testing innovative strategies for clean urban transport for historic European cities" City of Perugia	√				√	√	Innovative cities (brochure)
38. CIVITAS-MODERN, 2011 "Freight distribution"		√√√	√√√		√√	√√	Measure evaluation report

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
City of Brescia							
39. City of Gothenburg website http://www.transportstyrelsen.se/en/road/Congestion-taxes-in-Stockholm-and-Goteborg/	√√	√√√		√√	√	√√	Transport Styrelsen website
40. City of Stockholm website http://foretag.stockholm.se/Tillstand/Trafik/MIljozon1/	√	√√√		√	√	√	Municipality website
41. City of Trondheim "Road tolling in Norway, 2011	√√	√		√√	√	√	Presentation by Norwegian Public Road Administration
42. City of London Website http://www.tfl.gov.uk/modes/driving/congestion-charge	√√	√√√			√√√		Congestion charge website

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
43. City of London LEZ https://consultations.tfl.gov.uk/environment/ultra-low-emission-zone	√√√	√√√			√√√	√√√	Ultra-Low Emission Zone website
44. Transport for London, October 2014, "Ultra Low Emission Zone consultation" Supplementary information			√√√			√√√	Proposal. Summary description of the proposal for addressing road transport emissions in London.
45. 2014, "Low Emission Zone: Lisbon's Experience"	√√	√√	√√				Academic Research. Description of the implementation process of Lisbon's LEZ, the results obtained.
46. UCL, 2014 "Congestion Management for China's Transit		√√√	√√√				Academic research. Overview of charging

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
Metropolis Cities"							schemes in London, Stockholm, Singapore, Edinburgh, Manchester, New York.
47. 2014, "Achieving genuinely dynamic road user charging: issues with a GNSS-based approach"					√√√		Academic research. Critical review of road user charging (RUC) systems through examples from the UK.
48. Transport Research Arena, 2014 "Evaluation of road transport pricing regimes"		√√	√√√				Academic research. London, Stockholm and Milano pricing regimes evaluated through a data envelopment analysis (DEA) comparative efficiency evaluation

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
							scheme.
49. 2013, "Comprehensive Urban Road Toll Evaluation System"		√√√	√√√		√√		Academic research. Comparison of the London, Stockholm and San Diego charging schemes and GNSS city toll systems using the TSES system.
50. Centre for Transport Studies, 2012, "The Stockholm congestion charges – five years on Effects, acceptability and lessons learnt"		√√√	√√√			√√	Working Paper. Effects, acceptability and lessons learnt from the Stockholm congestion charging system experience.
51. Peter Murray, 2012, Public Infrastructure Bulletin: Vol.1, "Congestion pricing for roads:		√√√	√√√				Academic research. Experiences of cordon pricing (London and Singapore),

Title	NBGD topics						Notes & brief description
	1. Information and communication	**2. Vehicle types, identification, exemption and enforcement**	**3. Evaluation and assessment**	**4. National Legal Framework**	**5. Technology options and interoperability**	**6. Planning consultation and design**	
An overview of current best practice, and the economic and transport benefits for government"							corridor pricing (Sydney) and hot lanes (US).
52. Siemens, 2011, "Electronic Toll Solutions "		√√					Leaflet. Major project examples all over the world
53. Satellic, "Urban Tolling and Telematic Solutions"					√√		Leaflet. Overview of city tolling systems
54. http://sootfreecities.eu	√	√	√		√		Website on measures to reduce air pollution in urban areas.
55. Health Effect Study, 2011, "The London Low Emission Zone Baseline Study"			√√√				Study on impact assessment of London LEZ

Quality of information:
√√√ Good
√√ Medium

ANNEX II - List of stakeholders and other contributors

- Associations de commerçants de Paris
- Athens Traders Association
- British Independent Retailers Association
- British Retail Consortium
- car2go Europe GmbH
- City Sightseeing Italy srl
- CIVITAS Initiative
- Concordia France
- Confcommercio
- Confederación Española de Comercio
- Coordinamento dei Comitati Milanesi
- Council of European Municipalities and Regions (CEMR)
- Drivenow
- EEA - European Express Association
- ERTICO ITS Europe
- ETSC - European Transport Safety Council
- EUROCITIES
- Eurocommerce
- European association for forwarding, transport, logistics and customs services (CLECAT)
- European Automobile Manufacturers' Association – ACEA
- European Cyclists' Federation (ECF)
- European Disability Forum
- European Freight & Logistics Leaders Forum
- European Intermodal Association (EIA)
- European Logistics Association (ELA)
- European Passengers Federation (EPF)
- European Passengers Transport Operators (EPTO)
- European Shippers Council (ESC)
- Federación Regional de Asociaciones Vecinales de Madrid
- Federal Ministry of Transport and Digital Infrastructure
- FEDERATION INTERNATIONALE DE L'AUTOMOBILE (FIA)
- Freight and Logistics Leaders Club (FLLC)
- Green Freight Europe (GFE)
- Hailo
- Handelsverband Deutschland (HDE) (German Retail Traders' Association)
- ICLEI - Local Governments for Sustainability
- INEX - ASSOCIATION FOR VOLUNTARY ACTIVITIES
- International Association of Public Transport (UITP)
- International Road Transport Union (IRU)
- Logistics Alliance
- London Road Neighbourhood Association
- Ministerio de Fomento, Dirección General de Transporte Terrestre
- Ministero delle Infrastrutture e Trasporti, Dipartimento Trasporti
- Ministry of National Development - Department for Transport Public Services
- POLIS
- Royal Norwegian Ministry of Transport and Communication – Department of Public Roads and Traffic Safety
- Savez Udruga Malih Trgovaca RH
- Taxi Capital
- The Association of European Vehicle Logistics
- The Original London Sightseeing Tour Limited
- UETR - European Road Haulers Association

- Vereniging Directe Verkoop

Municipalities

- Amsterdam
- Antwerp
- Athens
- Barcelona
- Berlin
- Birmingham
- Bologna
- Bordeaux
- Bratislava
- Brussels
- Bucharest
- Budapest
- Copenhagen
- Dublin
- Düsseldorf
- Eindhoven
- Ghent
- Hamburg
- Krakow
- La Rochelle
- Leeds
- Lisbon
- Ljubljana
- London
- London - Head of Office, London's European Office
- Lucca
- Luxembourg
- Madrid
- Malmo
- Manchester
- Milan
- Munich
- Naples
- Nice
- Oslo
- Paris
- Porto
- Prague
- Riga
- Rome
- Rotterdam
- Seville
- Sofia
- Stockholm
- Tallinn
- Thessaloniki
- Toulouse
- Vilnius
- Warsaw
- Vienna
- Zagreb

ANNEX III - Agenda of stakeholders' workshop

Monday 19 September 2016
10:00 hrs- 13:00 hrs &
14:00 hrs - 17:00 hrs
Rue De Mot 24, Room 3/47
1040 Brussels

AGENDA
10:00 - 10:15 Introduction to the purpose of the workshop and the project
Magda KOPCZYŃSKA, Director DG MOVE C

10:15-11:45

12:00-13:00

13:00-14:00

Update on the external study being conducted, the structure of this workshop and the expected outcomes; Presentation of main issues to be investigated under each topic and first findings
Guided debate on the drafts, following the agenda set for each topic; background information on the drafts by the consultants and suggestions of the participants
Lunch Break

14:00 - 15:30 Discussion on specific issues that have proven particularly difficult to solve and that will be of primary importance to the development of the presented drafts

15:45 - 16:30 Update on the results of the parallel study on the preparation of six non-binding EU guidance documents on urban logistics

16:30 - 16:45 Summary and outlook
Daniela ROSCA, Head of Unit DG MOVE C.I

ANNEX IV – Online questionnaire

Stakeholder information

1. Please indicate the geographical area(s) where your organisation operates (more countries can be selected):

   - ❑ Austria (1)
   - ❑ Belgium (2)
   - ❑ Bulgaria (3)
   - ❑ Croatia (4)
   - ❑ Cyprus (5)
   - ❑ Czech Republic (6)
   - ❑ Denmark (7)
   - ❑ Estonia (8)
   - ❑ Finland (9)
   - ❑ France (10)
   - ❑ Germany (11)
   - ❑ Greece (12)
   - ❑ Hungary (13)
   - ❑ Ireland (14)
   - ❑ Italy (15)
   - ❑ Latvia (16)
   - ❑ Lithuania (17)
   - ❑ Luxembourg (18)
   - ❑ Malta (19)
   - ❑ Netherlands (20)
   - ❑ Poland (21)
   - ❑ Portugal (22)
   - ❑ Romania (23)
   - ❑ Slovakia (24)
   - ❑ Slovenia (25)
   - ❑ Spain (26)
   - ❑ Sweden (27)
   - ❑ United Kingdom (28)

2. Indicate which of the following category(ies) best define your organisation (more categories can be selected). In case your company/organisation may fall under more categories, please mind to ensure that your following responses are coherent with the boxes you select.

   - ❑ Governmental agency (1)
   - ❑ Member of the industry (2)
   - ❑ MS institution (3)
   - ❑ Citizen and citizen representative (4)
   - ❑ Academic and research organisation (5)
   - ❑ Private consultancy (6)
   - ❑ Other (8)

3. Please use this space to further elaborate your previous answer, if deemed necessary

_____ (1)

4. Please fill in with your contact details

   a. Company/organisation (1): _____
   b. Name (2): _____
   c. Surname (3): _____
   d. Position/Role within the organisation (4): _____
   e. City (5): _____
   f. Country (6): _____
   g. Telephone (7): _____
   h. Email address (8): _____

General questions

Clarity

5. Overall, on a scale from one to ten, how would you asses the **clarity (i)**[1] of the NBGD (minimum: 1 – maximum: 10)?

   _____Level (1)

If the score is below 6, the following questions will be shown. Otherwise, question no 7 will appear.

6. Please indicate which section(s) you consider unclear and why. Also, please indicate how the clarity of the mentioned section(s) could be enhanced.

_____ (1)

Relevance

7. Overall, on a scale from one to ten, how would you asses the **relevance/importance (i)**[2] of the contents of the NBGD (minimum: 1 – maximum: 10)?

   _____Level (1)

If the score is below 6, the following questions will be shown. Otherwise, question no 9 will appear.

8. Please indicate which section(s) you consider not-relevant/not-important and why. Also, please indicate – if appropriate – how these sections should be revised to increase their relevance/importance.

_____ (1)

Effectiveness

9. Overall, on a scale from one to ten, how would you asses the **effectiveness (i)**[3] of the NBGD and of the available options presented (minimum: 1 – maximum: 10)?

_____Level (1)

If the score is below 6, the following questions will be shown. Otherwise, question no 11 will appear.

10. Please indicate which section(s) you consider to be non-effective and why. Also, please indicate how these sections should be revised to increase their effectiveness.

_____ (1)

Usefulness

11. Overall, on a scale from one to ten, how would you asses the **usefulness (i)**[4] of the NBGD and of its contents (minimum: 1 – maximum: 10)?

_____ Level (1)

If the score is below 6, the following questions will be shown. Otherwise, question no 13 will appear.

12. Please indicate which section(s) you consider useless and why. Also, please indicate how these sections should be revised to increase their usefulness.

_____ (1)

Section specific questions

13. Are the challenges identified in the NBGD (*Ch. II of the NBGD*) addressed and described in a satisfactory way?

    ❍ Yes (1)
    ❍ No (2)

    If not, how could the challenges be better addressed and described? Please specify (1) _____

14. Are there any additional challenges, which you consider important to mention apart from the three types of challenges presented?

    ❍ Yes (1)
    ❍ No (2)

    If yes, please specify (1) _____

15. Are the available options identified in the NBGD (*Ch. III of the NBGD*) presented and described in a satisfactory way?

    ❍ Yes (1)
    ❍ No (2)

    If not, how could the available options be better presented and described? Please specify (1) _____

16. Are there any additional available options, which you consider important to mention?

    ❍ Yes (1)
    ❍ No (2)

    If yes, please specify (1) _____

17. Are the potential impacts of a common European approach in vehicle types, exemption and enforcement identified in the NBGD (*Ch. IV of the NBGD*) presented and described in a satisfactory way?

    ❍ Yes (1)
    ❍ No (2)

    If not, how could the potential impacts from a common European approach in vehicle types, exemption and enforcement be better presented and described? Please specify (1) _____

18. Are there any additional potential impacts from a common European approach in vehicle types, exemption and enforcement, which you consider important to mention?

    ❍ Yes (1)
    ❍ No (2)

    If yes, please specify (1) _____

19. Are the barriers and enablers to a common approach identified in the NBGD (*Ch. V of the NBGD*) presented and described in a satisfactory way?

    ❍ Yes (1)
    ❍ No (2)

    If not, how this section could improve? Please specify (1) _____

20. Are there any additional barriers and enablers, which you consider important to mention ?

    ❍ Yes (1)
    ❍ No (2)

    If yes, please specify (1) _____

21. Are the recommendations identified in the NBGD (*Ch. VI of the NBGD*) presented and described in a satisfactory way?

    ❍ Yes (1)
    ❍ No (2)

    If not, how could the recommendations be better presented and described? Please specify (1) _____

22. Are there any additional recommendations, which you consider important to mention?

    ❍ Yes (1)
    ❍ No (2)

    If yes, please specify (1) _____

Additional elements

23. Please use the space below to provide your opinion on any additional aspect you may wish to mention

    (please specify) (1)_____

Please note that we may contact you should we have any questions related to the data provided.

[1] In the questionnaire, a text box appears pointing the mouse on the word "clarity" with the following: Clarity in respect to the means and forms used to present the information.
[2] In the questionnaire, a text box appears pointing the mouse on the word "relevance/importance" with the following: Relevance/importance of the contents of the NBGD in respect to the objectives, measures/actions and problems related to UVAR schemes.
[3] In the questionnaire, a text box appears pointing the mouse on the word "effectiveness" with the following: Effectiveness of the contents of the NBGD in respect to the capacity of the NBGD of supporting the achievement of a desired result/expected outcome.
[4] In the questionnaire, a text box appears pointing the mouse on the word "usefulness" with the following: Usefulness of the contents of the NBGD in respect to the objectives, measures/actions and problems related to UVAR schemes.

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