E-bussED

Interreg Europe

European Union
European Regional
Development Fund

# *Driver & Barriers to e-bus deployment*

Thematic Working Group n. 1

*Mod. 4C-EB-21*

**Final Seminar**
**18-20 May 2022 | Hamburg**

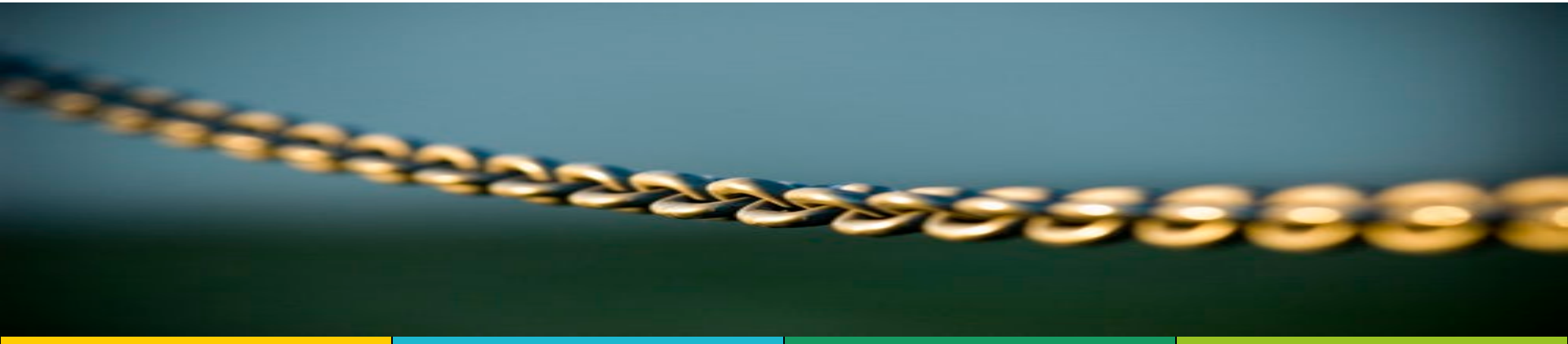
# THE SCOPE OF TWG1

Review possible **drivers** & **barriers** / bottlenecks regarding current governance structure, technological and service management conditions, other regional context factors affecting e-bus development and policy level

E-bussED
Interreg Europe

# CROSS FERTILISATION OF EXPERIENCE

Earmarking the most relevant **Drivers & Barriers** assisted the partners in identifying, documenting and exchanging relevant **experiences** in each region.



# DEFINITIONS

**DRIVER** (also known as **ENABLER**)
*An element (such as a policy or an action) that can help transit agencies and governments initiate, continue, or expand their fleet of e-buses.*

**BARRIER**
*An obstacle or circumstance that can prevent transit agencies and/or governments from initiating, continuing, or expanding their fleet of e-buses.*

*World Resource Institute:*
*"BARRIERS TO ADOPTING ELECTRIC BUSES", 2019*

# DEFINITIONS

The following categories for classifying D&B have been chosen:

- Political
- Social
- Economic
- Technological
- Service Management
- Environmental

# D&B RESULTS – scored list

Doc. 6.4-7H-ib **LIST OF BARRIERS** eBussed Interreg Europe — Partner n. ___ **BARRIER:** An obstacle or circumstance that can prevent transit agencie

| | Political | Social | Economic | Technological | Service management | Environmental |
|---|---|---|---|---|---|---|
| Title | Lack of business case | Consumer education | High cost upfront | Storage of electricity | Limited route flexibility of "opportunity" buses | Source of electrical energy |
| Description | *Lack of experience-based factual information outlining pros and cons to e-bus deployment or other more specific aspects* **3.5** | *In absence of adequate information, the local communities may perceive the ebus introduced as a new mode of transport as a contribution to urban space restriction (issues with installing pantograph chargers at bus stops). Educating local residents on the merits of e-bus adoption and the need for chargers at bus stops should be a first step in overcoming this issue* **2.9** | *Capital cost of e-buses constitutes a large barrier to mass producing the technology, some case studies identifying capital costs as the largest barrier. E-vehicle purchase cost is higher than conventional bus. One way of reducing upfront costs is to take advantage of economies of scale, team up with another city or bus operator and work with the electric bus supplier on a better deal for a bigger contract.* **4.2** | *It refers especially to battery as electricity storage with its limitation vis a vis weight, dimension and protection care (storage in the bus, insulation)* **3.7** | *This limitation becomes evident when compared "opportunity" e-buses with "overnight" buses* **3.6** | *The expected enviromentally positive impact of ebus deployment on the atmospherica conditions in the region can be reduced when the generation modality of electric power is considered (f.i. oil-fuelled electric power plant vis-a-vis wind, solar or other clean energy source)* **3.4** |
| Title | Lack of thorough consideration of infrastructure upgrade implications | Lack of identity to make e-bus more recognizable | New challenging operations | Uncertainty about the most appropriate technological path | Special training of staff required | LCA and battery duration |
| Description | *City officials (including both transit and utility providers) often lack an understanding of the essential infrastructure upgrades needed to implement an e-bus project. Also, lack of thorough consideration and* | *E-bus in some cases may be* | *Demand charges for electricity can be prohibitively costly for early* | *This is caused, among other factors, by a lack of standards and regulations on charging infrastructure.* | | *A battery is typically considered to have reached the end of its life when it has less than 80% of its initial capacity, rather than being completely exhausted, with enviornmental implication for its disposal. However, many battery warranties now define end-of-life to be reached when the battery's capacity falls to between 60-80% of* |

E-bussED
Interreg Europe

# D&B RESULTS – IN A NUTSHELL

| | | GENERAL BARRIERS | | |
|---|---|---|---|---|
| | | Technological | Financial | Institutional |
| E-BUS TRADE SPACE ELEMENTS | Vehicle and batteries | Storage of electricity \|<br>Uncertainty about the most appropriate technological path \|<br>Local supply chain \|<br>Battery LCA and purchase price \|<br>Uncertain reliability and life time of equipment \|<br>Limited route flexibility of "opportunity" buses \|<br>LCA and battery duration \|<br>Climatic conditions \| | High cost upfront | Lack of thorough consideration of infrastructure upgrade implications \|<br>Reluctance of decision makers to adopt/implement ebus policies \|<br>Lack of consistent strategy and implementation \|<br>Lack of institutional authority and control capacity |
| | Agencies and operators | Lack of business case\|<br>Lack or poor quality of products \|<br>Special training of staff required\|<br>Set up of an e-bus system\|<br>Distributed Responsibilities among Asset Owners and Operators \|<br>Attitude of bus operating agencies \|<br>Manufacturers' lack of conviction \|<br>Range of use and range anxiety\|<br>Need of standardization /interoperability \|<br>Data and analysis limited capacity !<br>Added operational complexity | New challenging operations \|<br>New ways to procure needed\|<br>High running costs \|<br>Financial planning | Consumer education\|<br>Lack of identity to make e-bus more recognizable\|<br>Public awareness and curiosity\|<br>Public acceptance to apply for vocational instruments |
| | Grid & charging infra-structure | Infrastructure requirements (grid modification/charging points)\|<br>Lack of adjustment of the European countries \|<br>Lack of standardization\|<br>Source of electrical energy | | Lack of adjustment of laws \|<br>Impact on the street (urban planning)\|<br>Location and acceptance of infrastructures |

# INDICATORS

The development of the e-bus readiness indicators and the analysis of different dimensions of “what makes a region ready for ebusses” were carried out by TWG1.

E-bussED
Interreg Europe

# THE RESULTS – THE READINESS MODEL

| eBUSSED | | | TWG1 | READINESS INDICATORS (template) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | doc. 4C-EB-14 | | | | | | | | |
| Category | Maturity Parameters/ Indicators * | DRIVERS | BARRIERS | Read. Indicator n. | Criteria | Description | | | | When red: not ready yet<br>When yellow or green: provide details to justify | Actors involved |
| 1. Government policies and investment | Regulations | Governance & subsidy strategies | | 1.1 | Government incentivating policies | *(see details by opening the window on the left)* | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | | | 1.1.a | Government incentivating policies | Loans | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | | | 1.1.b | Government incentivating policies | Grants | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | | | 1.1.c | Government incentivating policies | Rebates | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | | | 1.1.d | Government incentivating policies | Others (describe) | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | Government support | Lack of business case | 1.2 | | Past public investment | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | Government support | Lack of business case | 1.3 | | Ongoing public investment | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | Government support | | 1.4 | | R&D support | | | | | Universities, R&D centers |
| 1. Government policies and investment | Regulations | Government support | Lack of adjustment of laws | 1.5 | | Laws and regulations | | | | | Governmental bodies |
| 1. Government policies and investment | Regulations | Access to limited traffic areas for electric vehicles | | 1.6 | | Low-emission zones in urban areas; limited access zones | | | | | Municipal authorities |
| 1. Government policies and investment | Sustainability | Government support | | 1.7 | | Previous positive experience of introducing alternative fuel public transport | | | | | Public/private transport agencies |
| 1. Government policies and investment | Regulations | Government support | Lack of institutional authority and control capacity | 1.8 | | Decision-making process in e-bus deployment | | | | absent, being established, already esta | Public/private transport agencies |
| 2. Charging infrastructure construction and operation | Infrastructure | Potential for grid balancing | | 2.1 | | At design stage | | | | overnight: n., capacity, ... | Energy companies |
| 2. Charging infrastructure construction and operation | Infrastructure | Potential for grid balancing | | 2.2 | | At implementation stage | | | | overnight: n., capacity, ... | Energy companies |
| 2. Charging infrastructure construction and operation | Infrastructure | Potential for grid balancing | | 2.3 | | Already operational | | | | overnight: n., capacity, ... | Energy companies |
| 2. Charging infrastructure construction and operation | Infrastructure | Potential for grid balancing | | 2.1 | | At design stage | | | | opportunity: n., capacity, ... | Energy companies |
| 2. Charging infrastructure construction and operation | Infrastructure | Potential for grid balancing | | 2.2 | | At implementation stage | | | | opportunity: n., capacity, ... | Energy companies |
| 2. Charging infrastructure construction and operation | Infrastructure | Potential for grid balancing | | 2.3 | | Already operational | | | | opportunity: n., capacity, ... | Energy companies |
| 2. Energy production & distribution | Infrastructure | Reinforcing cooperation energy/bus | | 2.4 | | Energy company's experience of installing rapid charging infrastructure | | | | | Energy companies |
| 2. Energy production & distribution | Sustainability | Bus switch in a climate perspective | | 2.5 | | RES | | | | % | Energy observatory |
| 3. Business models and maintenance service system | Infrastructure | | | 3.1 | Operator | *(see details by opening the window on the left)* | | | | | Public transport agencies |
| 3. Business models and maintenance service system | Infrastructure | | | 3.1.a | Operator | Central | | | | You can specify here: public/private/b | Public transport agencies |
| 3. Business models and maintenance service system | Infrastructure | | | 3.1.b | Operator | Regional | | | | You can specify here: public/private/b | Public transport agencies |
| 3. Business models and maintenance service system | Infrastructure | | | 3.1.c | Operator | Provincial/district | | | | You can specify here: public/private/b | Public transport agencies |
| 3. Business models and maintenance service system | Infrastructure | | | 3.1.d | Operator | Municipal | | | | You can specify here: public/private/b | Public transport agencies |
| 3. Business models and maintenance service system | Infrastructure | | | 3.1.e | Operator | (other) - describe | | | | You can specify here: public/private/bo | Public transport agencies |
| 3. Business models and maintenance service system | Infrastructure | x | x | 3.2 | | Fleet age (% over 10 years) | | | | | Public/private transport agencies |
| 3. Business models and maintenance service system | Infrastructure | x | | 3.3 | | Of which electric buses deployed (%) | | | | | Public/private transport agencies |
| 3. Business models and maintenance service system | Economic | Local supply chain in place | Lack of local supply chain | 3.4 | | Local supply chain | | | | | Production/service operators |
| 3. Business models and maintenance service system | Regulations | Access to limited traffic areas for electric vehicles | | 3.5 | | Presence of sensitive areas where e-buses can be introduced | | | | (pedestrian areas, tourist attractions, | Territorial public authorities |
| 4. Consumer and other awareness education | Consumer | Passengers' positive attention to e-bus | | 4.1 | | Educational campaign to advertise e-bus | | | | | Public/private transport agencies |
| 4. Consumer and other awareness education | Consumer | Improved perception of urban centres | | 4.2 | | Congestion charges to limit private traffic | | | | | Municipal authorities |
| 4. Consumer and other awareness education | consumer | Improved overall attractivity/ image of the Public Transport system | | 4.3 | | Successful e-bus trials in the city already carried out | | | | | Public/private transport agencies |
| 5. Operation scope and environmental benefits. Other features | Sustainability | | Climatic conditions | 5.1 | Temperature | *(see details by opening the window on the left)* | | | | | |
| 5. Operation scope and environmental benefits. Other features | Sustainability | | Climatic conditions | 5.1.a | | Temperature in the year below 0 C° | | | | C°degree, month/s, number of days/y | Meteo observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | | Climatic conditions | 5.1.b | | Temperature in the year above 25 C° | | | | C°degree, month/s, number of days/y | Meteo observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Reduced local emissions | | 5.2 | Emissions | *(see details by opening the window on the left)* | | | | | |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Reduced local emissions | | 5.2.a | | Above limit emissions : CO | | | | N° of days in the year | Environmental observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Reduced local emissions | | 5.2.b | | Above limit emissions : NO2 | | | | N° of days in the year | Environmental observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Reduced local emissions | | 5.2.c | | Above limit emissions : PM10 | | | | N° of days in the year | Environmental observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Reduced local emissions | | 5.2.d | | Above limit emissions : NMVOC | | | | N° of days in the year | Environmental observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Reduced noise nuisance | | 5.2.e | | Above limit emissions : noise | | | | N° of days in the year | Environmental observatory |
| 5. Operation scope and environmental benefits. Other features | Sustainability | Topography (geomorphological conditions) | Topography (geomorphological conditions) | 5.6 | | Morphology (flat land) | | | | (% on total regional area) | Survey department |

E-bussED

Interreg Europe

European Union
European Regional
Development Fund

# Thank you