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*From H2020 research to political initiatives:
the “factor 100” campaign of the ELIPTIC project*

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Introduction

ELIPTIC is a Horizon 2020 research project on ‘electrification of public transport in cities’ – and one of the very few H2020 projects coordinated by a municipality – the City of Bremen. The “factor 100” campaign compares impacts of e-buses and e-cars - showing that the electrification of an 18m bus for urban operation has impacts that match about 100 e-cars. Whereas there are many funding programmes for electric cars, there was nothing for electric buses equivalent to their impacts. The “factor 100” campaign has been presented at various national events and events of the European Commission. In May 2017, the German Ministers for Environment of all states and the federal level met (“Umweltministerkonferenz”), discussed and adopted a political initiative for a funding programme for electric buses. The successful political initiative was launched by the City of Bremen. In August 2017, the German government announced a €100 million funding programme for electric buses – as part of a strategy to reduce the NO2 problems in German cities.

Keywords: electromobility; environmental impact of transport; electric buses; public transport, political framework; legal framework; emissions; sustainable transport; green transport; CO2 reduction; electric mobility; e-mobility; Horizon 2020; ELIPTIC project; SUMP; urban buses; national funding; TCO

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1. Preliminary remarks

This report is a practitioner's report – presenting a unique result of the Horizon 2020 project ELIPTIC (Electrification of Public Transport in Cities). ELIPTIC is one of the few H2020 transport projects coordinated by a municipality. The work within the project was connected not only to the local implementation of electric buses but to a national initiative entitled “factor 100” – that led to a political initiative of the German states and with some pressure in the national government to a funding programme for e-buses of €100 million annually. This report shows how a European research project can bridge the gap between research and political practice – leading to a concrete long-term effect of the project.

2. Role of public transport in air quality management and Sustainable Urban Mobility Plans (SUMPs)

Many European cities are exceeding the allowed concentration levels of nitro dioxides (NO₂) as a result of local diesel exhaust. Air quality management and mobility management need to go hand in hand in order to reduce both air quality problems and congestion and other transport problems. Sustainable Urban Mobility Plans are a tool for municipalities to develop strategies and implement related measures in an integrated understanding of mobility, transport, urban development and individual behaviour. The sustainable transport modes – walking, cycling and public transport – play a specific role in providing energy efficient, climate friendly and space efficient transport.

Collective (public) transport is an element of sustainable transport in that it uses transport infrastructure efficiently. Whereas larger European cities have rail-bound transport systems (rail, underground, light rail, tram) that usually operate on separated tracks, smaller cities and feeder transport in larger cities depend heavily on buses. Globally, buses are the backbone of collective transport and bus systems account for 80% of all public transport passengers worldwide (UITP, 2010).

As the backbone of public transport, urban buses are a crucial element of sustainable urban transport planning. There are about 77.000 buses in Germany alone (KBA, 2016). The lion's share – an estimated 95% – operates on diesel (UITP 2010). Even more than the facts that diesel is a fossil fuel, the harmful emissions of diesel engines are a problem for the local air quality in many cities world-wide.

3. Strategies of electric mobility

Electrification of transport is a major strategy in many countries world-wide to reduce dependence on fossil fuels. The European Commission has set ambitious targets in that area. The White Paper on transport (“The Transport 2050 roadmap to a Single European Transport Area”) sets the target of having no more conventionally-fuelled cars in cities by 2050. As an interim step, 50% of the cars should use renewable sources by 2030, and there should be “essentially zero-emission” urban logistics. Strangely, there are no targets for public transport, despite it being much more in the influence of the public authorities than the urban logistics sector.

Many European countries and cities have put electric mobility in the focus of sustainable transport strategies. Funding programmes and fiscal/financial support programmes have been created and non-financial user benefits (e.g. use of bus lanes) implemented. Such a car-oriented approach has risks for sustainable transport overall: electric cars start to become the second car in households, increasing the overall space consumption of transport.

The electrification of public transport is a standard for rail-borne modes such as trams and major heavy rail lines. In the field of buses, trolley buses were common in many countries but were taken off the roads in many cities due to their limited flexibility and infrastructure requirements with the overhead wires. Apart from some CNG and some remaining trolleybus operations, diesel-powered buses dominate the urban bus market.

With air quality requirements and the objectives of climate protection – getting away from fossil fuels – the electrification of urban buses has come into the focus of clean vehicle strategies.

4. ELIPTIC analysis led to a comparison of the impacts of electrification between buses and cars and to the “Factor 100” campaign

The ELIPTIC project compared and analysed the barriers to implementing more electric buses. One key obstacle is the higher procurement cost and the low level of public funding. As there are many national incentives for buyers of electric cars, both tax incentives and direct funding (e.g. €6,000 in France or €4,000 in Germany), ELIPTIC compared the impacts of electrification of cars and buses.

One 18m bus in urban operation consumes about 40,000 litres of diesel annually (BSAG, 2014). Looking at the overall impacts, it would take roughly 100 electric cars to achieve the same environmental benefit as can be gained from one (!) 18m electric bus. But there is not yet hundredfold financial support for e-buses and there is not yet an explicit target in European policy papers for the electrification of urban buses.

Today, an 18 m diesel bus is equipped with an engine performing with 200-300 kW and fuel consumption of 50-55 litres diesel/100km. Urban buses are in operation daily for up to 16 hours. A normal private car is in operation statistically less than one hour a day and the cars that are considered most likely to be replaced by electric ones are smaller (i.e. for shorter / urban trips) due to the limited range of most electric cars. As petrol cars account for about half of all new registrations in Germany (Kraftfahrtbundesamt), the share of diesel-powered vehicles is much lower than for buses. As particulates (PM10 and PM2.5) and – even more – NO2 emission is much more related to diesel engines, the impact of diesel engines needs to be taken into account with an additional factor as compared to the pure consumption of fuel and related CO2 emission.

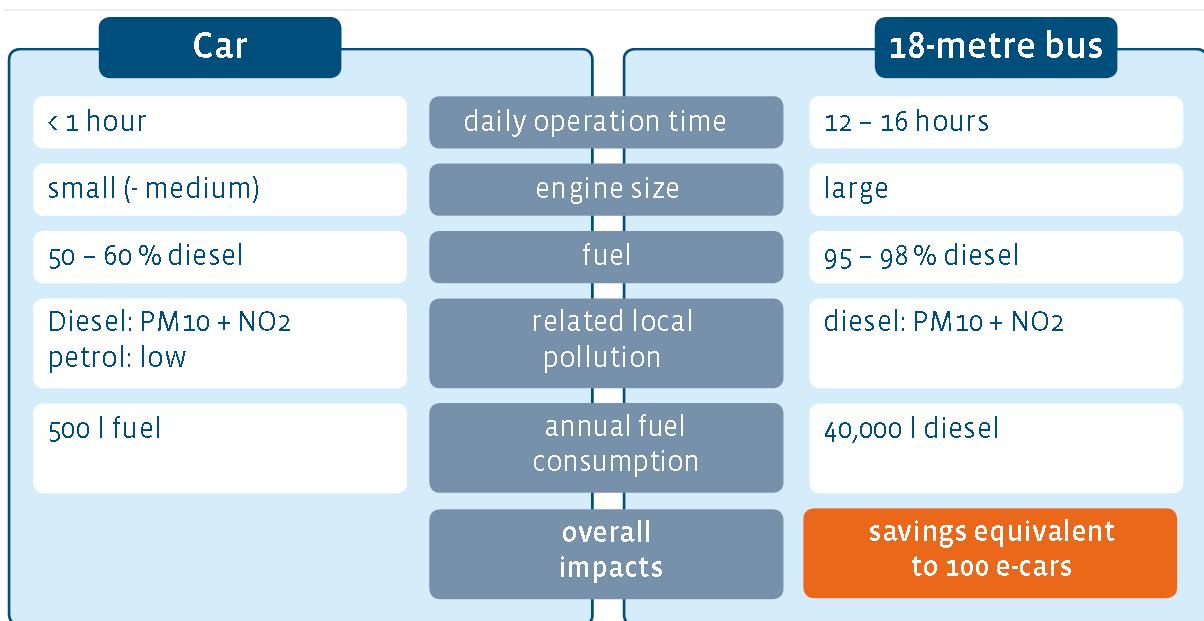


Fig. 1 “factor 100” comparison of e-car and e-bus impacts (ELIPTIC factor 100 leaflet)

Based on pure fuel consumption, an 18 m urban bus emits about 80 times more (CO2) than a car – and it still shows a much better CO2/passenger ratio. Due to the much higher share of diesel-powered vehicles and related harmful NOx and PM emissions, the factor needs to be adapted: factor 100.

We also need to take into account the role of collective transport modes in urban transport. A major role of collective transport is providing space-efficient transport. Urban congestion and parking problems cannot be addressed with electric cars; a comprehensive sustainable urban mobility policy is needed. Collective transport – including urban buses – is a cornerstone of sustainable transport strategies.

5. The ELIPTIC project and increasing awareness for air quality problems

ELIPTIC started in June 2015. In parallel to the project development, the urgency to speed up with the electrification of public transport has become obvious: ongoing air quality problems (especially NO₂ due to increased use of diesel engines and non-conformity with emission standards) and an increase in transport-related CO₂ emission, e.g. Germany was 3.5% above 2015 levels in 2016 (Umweltbundesamt, 2017). Both local air quality problems and global climate protection call for getting fossil fuel burning vehicles off the roads.

ELIPTIC show how costs and energy can be saved by electrifying public transport and optimising the use of existing infrastructure and rolling stock by bringing traditionally separate domains together through innovative use concepts and business cases. ELIPTIC advocates for electric public transport at the political level and helps develop political support for the electrification of public transport across Europe.

ELIPTIC builds on practical experience of 20 use cases carried out by 11 pioneering electric public transport operators and authorities with metro, light rail, tram, and trolleybus systems. They are supported by leading universities, networks and industry sector representatives. With UITP and POLIS, international networks of Public Transport operators and of cities are involved – supplemented by national networks such as vdv (Germany), ASSTRA (Italy) and Low Carbon Vehicle Partnership (UK) to broaden exchange and dissemination. In total, 58 partners from 21 countries are directly involved in the ELIPTIC project.

ELIPTIC's 20 use cases include technical applications and feasibility studies addressing two major barriers of electrifying public transport:

- uncertainty about the most suitable technological path
- lack of business case.

As public transport operators have to operate efficiently, the business case of electric buses needs to be clearly analysed. Besides the vehicle itself and the consumption of fuel/energy, we need to look at availability and maintenance costs. Additionally, infrastructure requirements (including garages and training staff to work with high voltage) need to be analysed.

Additional purchase costs of a battery bus in comparison to a diesel bus are currently 80-100%. Although operating costs of electric bus are expected to drop, there are still uncertainties about the availability and reliability of the current generation of electric buses, which are still pre-serial. In order to accelerate the technical development, a stronger market demand needs to be created.

6. More political and financial support required

Besides the technical and financial analyses of the ELIPTIC use cases, the project partners are working on the political and related financial support. Looking at “factor 100”, the partners call for a stronger commitment by local, national and European authorities. Looking at air quality and noise problems on the local level, electric buses can both reduce local emission problems and support a modal shift from the car to collective transport.

Incentives for electric cars such as the use of bus lanes send the wrong message in the overall transport context. In terms of financial support for research and development at the national and European levels, billions of euros are committed to the electric car. Germany alone spends about €1 billion (KOPA2 and follow-up programmes). At the European level, there is RTD and infrastructure support (e.g. EFRE) but a comparatively small proportion goes into the electrification of public transport, i.e. we are dealing with industry policy as opposed to transport policy.

It is necessary to strengthen the focus on transport policy when developing e-mobility strategies. One element must be the enhanced development of electric buses and their test in real operation. The European targets on sustainable and climate friendly transport should include clear targets for the electrification of public transport: the 2030 targets of the White Paper on Transport should integrate a goal of 80% of urban buses running on

sustainable energy sources. The promotion the electrification of urban public transport must also be enhanced in both European and national RTD programmes.

7. “Factor 100” leads to a €100 million national funding programme for electric buses

Together with standard leaflets and roll-up banners, ELIPTIC also produced something unconventional for a transport research project: “factor 100” coasters. The intention was to reduce the core message to few enough words to fit on a coaster. The message: “Did you know that it takes 100 electric cars to achieve the impacts of one electric bus (18m) (but there is not 100 times the funding for electric buses)”.



Fig. 2 (a) “factor 100” coaster frontside; (b) “factor 100” coaster backside

The “factor 100” campaign was presented at various national events and events of the Commission – including at a workshop with Transport Commissioner Violeta Bulc in October 2016 on procurement of e-buses.



Fig. 3 (a) “factor 100” leaflet; (b) “factor 100” presented at workshop with Commissioner Bulc (Oct 2016). Photo: Glotz-Richter

The city state of Bremen took the ELIPTIC “factor 100” to the Conference of the Ministers for Transport and the Conference of the Ministers for Environment – both representing the 16 states of Germany.

Addressing the diesel-related air quality problems and the increase of transport-related CO₂ emissions, Bremen

started an initiative for appropriate national funding of electric buses. In May 2017, all 16 German State Ministers for Environment agreed on the “factor 100” proposal for a national funding programme, proposing €100 million in annual funding covering 80% of the additional costs for an electric bus. Such a programme could fund 400-500 e-buses annually. In the context of its Diesel Summit on 2 August 2017, the German government announced exactly such a programme with €100 million annual funding for electric buses.

The ELIPTIC project shows how research and technological development can be linked with ongoing political processes. It also underscores the value and relevance of involving municipalities and practitioners directly in European RTD projects.

8. Acknowledgement

The ELIPTIC project runs from June 2015 to May 2018. The final conference will be held on 26-27 April 2018 in Bremen (see www.eliptic-project.eu) .

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Further project information, documents and outputs can be downloaded from: <http://www.eliptic-project.eu/>.

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