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Cleaner and better transport in cities
CAPITAL

CIVITAS INSIGHT

Cities' role in introducing clean vehicles and using alternative fuels

The EU wants to phase out conventionally fuelled vehicles by 2050 and move towards carbon neutral urban logistics by 2030. To achieve this ambitious objective, it developed legislation and provided financial incentives to encourage cities to use alternatively fuelled vehicles and create related infrastructure. This Insight gives an overview of the current situation and future prospects.

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EU framework for alternatively fuelled vehicles and infrastructure

In Europe, the transport sector accounts for a quarter of greenhouse gas (GHG) emissions, with road transport alone contributing to about one-fifth of the EU's total carbon dioxide (CO_2) emissions.[1] Europe's goal is to reduce its dependency on imported oil and lower its global GHG emission footprint. Reaching this goal would mean that Europe spends less on energy and delivers a more sustainable and healthy environment in city centres and surrounding areas. The European Commission (EC) has developed a comprehensive strategy under the 2011 Transport White Paper[2], with a specific set of goals. These are to:

- Halve the use of conventionally fuelled cars in urban transport by 2030, and phase them out by 2050;
- Make city logistics (i.e. the delivery goods) CO_2-free in major urban centres by 2030.

To reach these ambitions, the European institutions have adopted three separate frameworks, which link to clean vehicles and fuels:

- The 2013 Urban Mobility Package – this outlines and details next steps towards the further rollout of Sustainable Urban Mobility Plans (SUMPs). It also offers a range of guidelines on clean city logistics, access regulations, ITS for smart cities, urban safety and SUMP development;
- The 2013 Clean Power for Transport package[3] - this contains the Directive on Alternative Fuels and Infrastructure[4];
- The 2015 Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy combined with the July 2016 Strategy on Low Emission Mobility[5] and the upcoming Effort Sharing Decision.[6] These will further lay out future commitments in terms of reducing CO_2 and other harmful emissions by 2030.

At the national and city level, these regulations translate into two concrete commitments: coping with reducing CO_2 and other harmful emissions[7], and ensuring that passenger and freight transport uses alternative fuels and vehicles.

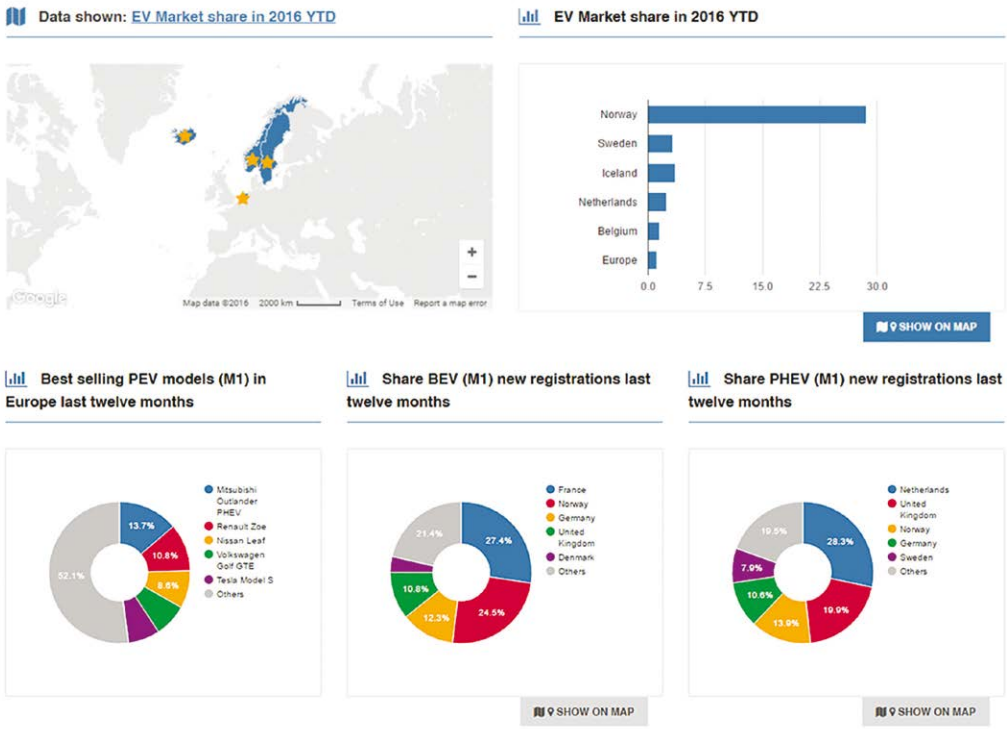
The European Directive on Alternative Fuels and Infrastructure (AFI Directive) details the requirement for Member States to introduce the appropriate charging/refuelling infrastructure for alternatively fuelled vehicles on their national territory by 2020/2025. To implement this directive, Member States have to devise National Policy Frameworks (NPFs) and submit them to the EC by November 2016. These should contain their national plans for introducing charging/refuelling infrastructure.

1 Clean Transport - Support to the Member States for the Implementation of the Directive on the Deployment of Alternative Fuels Infrastructure Good Practice Examples, January 2016, page. 10, http://ec.europa.eu/transport/themes/urban/studies/doc/2016-01-alternative-fuels-implementation-good-practices.pdf
2 Roadmap to a Single European Transport Area – Towards a Competitive and Resource Efficient Transport System", 2011: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144
3 Clean Power for Transport: A European alternative fuels strategy: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013PC0017&from=EN
4 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0094
5 http://ec.europa.eu/transport/themes/strategies/news/doc/2016-07-20-decarbonisation/com(2016)501_en.pdf
6 http://ec.europa.eu/clima/policies/effort/index_en.htm
7 In line with the EU Energy Climate Package, the EU Clean Air Package and the EU Type-approval revision, all of them setting-up not only CO_2 but also NOx and Particulate matters thresholds for regional/local level

The European Alternative Fuels Observatory

To help Member States meet the AFI Directive goals and support the market development of alternative fuels in the EU, the EC established the European Alternative Fuels Observatory (EAFO). The EAFO features a web portal that presents data and information on alternative fuels and clean vehicles in Europe, mapping their actual introduction and use, their infrastructure and the existing incentives across the EU. It supports national and EU legislation, programmes and incentives for alternative fuels. The observatory includes information from EU and EEA Member States, and Turkey. The EAFO targets EU policy-makers, manufacturers of related technology and infrastructure, NGOs and other stakeholders concerned by the topic[8]. The EAFO's primary focus is on electric battery and hybrid vehicles, and those running on fuel cells, and then on natural gas and other alternative fuels.

The website currently presents data on the five countries that sell the most electric vehicles (EVs): Norway, Sweden, Iceland, the Netherlands, and Switzerland. The best performing markets for plug-in electric vehicles (PEVs) are Norway (20 percent of car sales) and the Netherlands (over 5 percent). Together with Sweden, Switzerland is the most promising market, as shown in the graph below.[9]



8 EAFO newsletter – December 2015, https://gallery.mailchimp.com/f4df22d9b3167643f994c601f/files/EAFO_NEWSLETTER_1_2015_FINAL_01.pdf
9 Ibid

Methodology

To assess the current development of the alternative-fuel market at city-level, and to understand local drivers and barriers, the EAFO circulated a questionnaire among a selected group of cities to find out:

- General information on the city, its political strategy and vision to develop and introduce alternative fuels and infrastructure, energy and air quality targets, and links with the local/regional SUMP and building regulations;
- Information on mobility services, clean procurement, fiscal incentives and how the city manages local electric infrastructure;
- Current state-of-play and data related to alternatively fuelled vehicles in public fleets (for example, buses, shared cars, e-bikes, ferries and delivery/service vehicles) and privately owned cars (including taxis and L category vehicles such as powered two- and three-wheelers);
- Data related to existing electric and biogas charging infrastructure, either publicly accessible or privately owned;
- Information concerning the city's involvement in EU/national projects to develop and introduce alternatively fuelled buses.

Alternatively fuelled vehicles in European cities: Outcomes of the EAFO city survey

This section provides some information based on the data collected (September 2016), from eight cities with more detailed results at the end of this Insight.

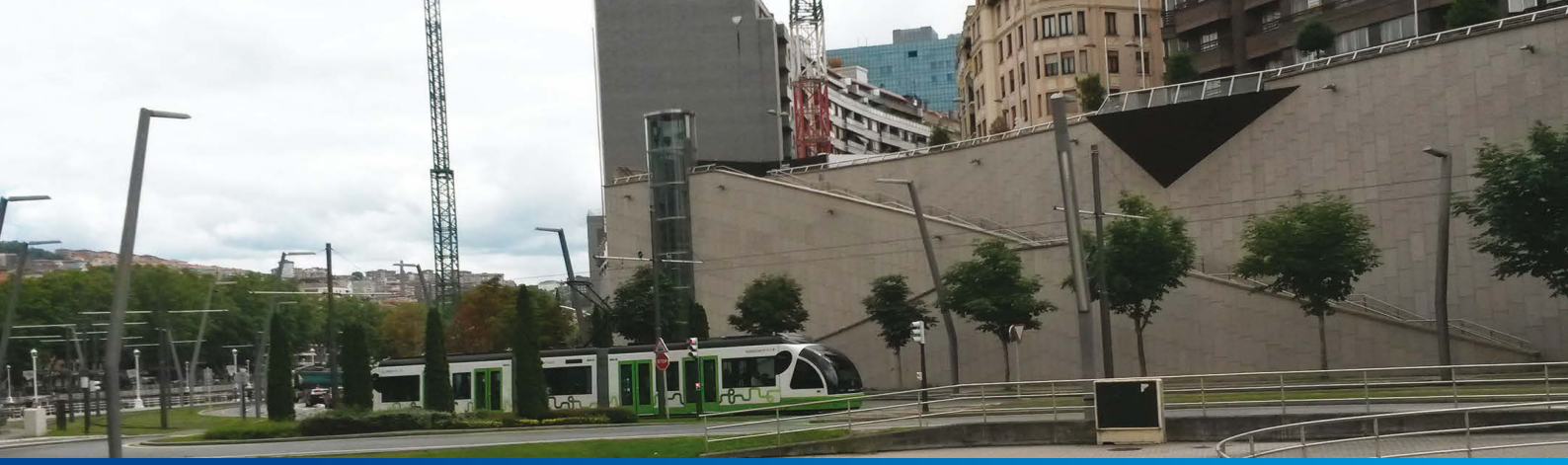
Aachen (Germany)

Aachen covers an area of 160 km² and has 246,000 inhabitants. Aachen's SUMP is part of the Aachen Vision Mobility 2050, which includes the following targets:

- Public transport to operate on alternative fuels (i.e. on electricity entirely based on renewable sources) by 2050;
- Private cars to be emission-free by 2050;
- Reduce carbon dioxide emissions by 40 percent by 2020;
- Reduce energy consumption by 20 percent by 2020.

In 2013, the city introduced a noise action plan[10]. Since February 2016, Aachen introduced new measures such as an environmental zone with restricted access[11] and a clean-air programme[12]. Aachen has 278 battery electric vehicles (BEVs), 17 of which belong to the city's fleet. It has 20 publicly accessible charging points for these vehicles. The city developed the AVV Multiconnect app[13] as part of its involvement in the CIVITAS DYN@MO project (some 100 users are currently testing the software). Aachen's public bus operator, ASEAG, developed the Mobility Broker app[14]. Aachen also promotes car sharing, introducing three conceptually different providers[15], and carpooling[16].

10 Lärmschutz, http://www.aachen.de/DE/stadt_buerger/umwelt/laermschutz/index.html
11 Umweltzone, http://www.aachen.de/DE/stadt_buerger/umwelt/luft-stadtklima/luftreinhalteplan_umweltzone/umweltzone/index.html
12 Luftqualität, http://www.aachen.de/DE/stadt_buerger/umwelt/luft-stadtklima/index.html
13 The AVV Multiconnect app is a travel assistant to suggest alternative routing information and it provides schedules based on real-time information, taking into account current traffic events such as accidents, congestion and other incident, https://www.avvmulticonnect.de/#/start
14 The Mobility broker connects all publicly available mobility offers on a web- and app-based market place, http://mobility-broker.com/
15 Car sharing Aachen, http://www.aachen.de/DE/stadt_buerger/verkehr_strasse/clevermobil/carsharing/index.html
16 Mitfahren und Mitnehmen, http://www.aachen.de/DE/stadt_buerger/verkehr_strasse/clevermobil/mitfahren_und_mitnehm



Copenhagen (Denmark)

Copenhagen spans over 615 km^2 with 590 000 inhabitants, reaching 1.7 million in the region. Copenhagen is the capital of Denmark and is its largest city.

The city has one airport and one port, the Copenhagen-Malmö port. Since the launch of its Climate Action Plan in 2009[17], the city cut its emissions by 24 percent compared to 2005. In 2012, Copenhagen launched a new Climate Action Plan[18] aiming to make the city carbon neutral by 2025. The main area of action is energy consumption, energy production, green mobility and city administration initiatives[19]. Other targets include:

- Reducing total GHG emissions in non-quota regulated sectors (including the transport sector) by 20 percent compared to 2005 levels by 2020;
- Deriving at least 10 percent of the energy needed for transport from renewable sources by 2020;
- Having 20-30 percent of passenger cars, and 30-40 percent of heavy vehicles, use renewable fuels[20] by 2025.

The region has one of the most developed public transport systems in the world and aims at becoming Europe's leading EV region. Copenhagen Electric, a platform that coordinates electromobility in the Capital Region of Denmark[21], is the focal point for all strategic initiatives related to alternative fuels. The Capital Region and Copenhagen are also part of GREAT, a project to create a European area that implements alternative fuel infrastructure and vehicles[22].

Copenhagen installed over 900 EV charging points, five natural gas stations and two hydrogen filling stations. The Capital Region supports DriveNow[23], a city carsharing concept operating in Copenhagen with a fleet of 400 BMW i3 electric cars. GreenMobility[24], a Danish provider of mobility services, plans to introduce 450 EVs in autumn 2016.

Copenhagen, in partnership with Copenhagen Electric, is a Phase 2 city under the FREVUE project, and recently signed the EV4SCC[25] Manifesto in January 2016.

Dundee (United Kingdom)

Dundee is Scotland's fourth largest city. With about 150,000 inhabitants, it covers an area of 67 Km^2. The surrounding region has over 250,000 people with 40,000 commuters driving into the city every week.

Dundee is committed to facing climate change and undertakes a continuous assessment of local air quality[26]. The city and region are currently developing a low-carbon fuel transport strategy, underpinned by the city's overall development plans. Dundee City Council has over 30 EVs available to over 300 employees through an online booking system, 66 EVs in its public fleet and eight shared Ultra-Low Emission light-duty vehicles. Some 13 rapid chargers and 55 standard chargers provide the fuel for the vehicles. The city envisages that taxis and light vehicles and vans belonging to the council will run on electricity by 2020. It is also introducing an additional 40 EVs in the public fleet by the end of 2017, together with a ULEV taxi scheme.

Dundee builds its expertise on previous EU projects such as ENCLOSE[27] for city logistics, and has received national funding in order to become a UK Smart City[28].

17 Copenhagen Climate Plan, https://www.energycommunity.org/documents/copenhagen.pdf
18 Climate strategy for the capital region, https://www.regionh.dk/english/environment/Documents/16582_KLIMA_pixi_2012_engelsk.pdf
19 CHP 2025 Climate Plan http://kk.sites.itera.dk/apps/kk_pub2/pdf/983_jkP0ekKMyD.pdf, page 13
20 COPENHAGEN European Green Capital 2014, Ibid.
21 About Copenhagen Electric https://www.regionh.dk/english/traffic/electric%20cars/Pages/Aboutcopenhagenelectric.aspx
22 GREAT (Green Region for Electrification and Alternatives fuels for Transport), http://www.great-region.org/#four
23 DriveNow, https://be.drive-now.com/en/#!/carsharing/copenhagen
24 Green Mobility, http://greenmobility.com/
25 More information on EV4SCC: http://urbanforesight.org/projects/projectsites/ev4scc/about-ev4scc/
26 2015, Updating and Screening Assessment for Dundee City Council, https://www.dundeecity.gov.uk/sites/default/files/publications/DCC_USA_2015_FINAL_std.pdf
27 http://www.enclose.eu/content.php?p=home
28 http://www.scottishcities.org/smart-cities/

London (United Kingdom)

London consists of a historic core known as 'The City' and two outer rings: Inner London and Outer London. These three large city portions comprise the Greater London Area, which today covers 1,572 km^2, and houses over 8.6 million people. London has a port and six international airports. Some airports are outside London but serve London commuters.

Air quality and sustainable transport are among the highest priorities for the Mayor's Transport Strategy (MTS), a document that the recently appointed new mayor of London is updating. London has a well-developed SUMP, a joint effort of transport operator Transport for London (TfL) and the Economic Development Strategy. The city also has targets to reduce carbon emissions by 60 percent by 2025[29] and for 15 percent of its energy to come from renewable sources by 2020[30].

In 2003, the city adopted a congestion charge to regulate traffic into the city and there are plans to use the Thames River better for public transport (the city already has a River Bus service operating every 20 minutes during peak hours)[31].

London's SUMP consists of three main pillars:

- The Ultra Low Emission Vehicle (ULEV) Delivery Plan for London;

- The Car Club Strategy - which aims to encourage people to use shared vehicles rather than private cars[32]

The electric bus programme - this will introduce 300 zero-emission buses (either electric or hydrogen) and 3,000 double-decker hybrid buses by 2020[33]. It includes a bus-retrofitting programme and hydrogen bus trials[34].

The ULEV is a plan to integrate alternative fuels into London's multimodal transport system and represents a big step towards London's vision of becoming the EV capital of Europe[35]. Some of its targets include:

- Introducing zero-emission taxis and PHVs on London's streets from 2018;

- Increasing the number of ULEVs in freight and fleet organisations;

- Introducing 1,000 ULEVs into the Greater London Authority Group fleet, including 120 in TfL's fleet;

- Working with car sharing initiatives to have 50 percent of their fleets consist of ULEVs by 2025.

Currently, London has more than 6,000 alternatively fuelled vehicles for passenger cars (over 2.6 million cars), 33 alternative fuelled buses (over 9,000) and 31 alternative fuelled HDVs (two-thirds of the total fleet). London has 1,400 EV charging points, and plans to have over 6,000 by 2018; some 150 of these will have rapid-charge technology[36]. London has also four hydrogen filling stations and two natural gas stations.

London is involved in a range of EU-funded projects on the use of alternative fuels such as FREVUE[37], ELIPTIC[38], ZeEUS[39], HyFIVE[40], and CHIC[41].

29 CUTTING CARBON IN LONDON 2015 Update, https://www.london.gov.uk/sites/default/files/london_assembly_environment_committee_-_cutting_carbon_in_london_2015_update_0.pdf
30 The UK's renewable energy target, https://fullfact.org/economy/uks-renewable-energy-target/
31 City of London, http://www.civitas.eu/content/city-london
32 A Car Club Strategy for London Growing car clubs to support London's transport future, p. 4, http://content.tfl.gov.uk/tfl-car-club-strategy.pdf
33 More than 50 all-electric buses to enter service in London, July 2015, https://tfl.gov.uk/info-for/media/press-releases/2015/july/more-than-50-all-electric-buses-to-enter-service-in-london
34 The latter being particularly addressed under the EU Demonstration Project 3EMotion: http://www.fch.europa.eu/project/environmentally-friendly-efficient-electric-motion
35 An Ultra Low Emission Vehicle Delivery Plan for London. Cleaner vehicles for a cleaner city, July 2015, http://content.tfl.gov.uk/ulev-delivery-plan.pdf
36 More information on the website: https://www.zap-map.com/charge-points/public-charging-point-networks/
37 Ibid
38 ELIPTIC, http://www.eliptic-project.eu/
39 ZeEUS, http://zeeus.eu/
40 HyFIVE, http://www.hyfive.eu/
41 CHIC, http://chic-project.eu/

Madrid (Spain)

Madrid has over 3.1 million inhabitants, with some 6 million people living in the metropolitan area. It covers a total area of 604 km^2.

Madrid's underground metro system is one of the largest and fastest growing in the world. At 283 km, is second in Europe only to London[42]. While at the national level, the MOVEA Plan offers funding for the deployment of public and private charging nets, Madrid has developed a comprehensive strategic SUMP, which aims at moving towards low-carbon mobility, and increasing pedestrian mobility and cycling. The city intends to cut 20 percent of its GHG emissions by 2020, and develop an effective infrastructure for alternative fuels and electric transport recharging stations. The city is currently running a certification scheme where residents with zero-emission vehicles can park free in certain zones of the city[43]. The municipality is currently supporting LPG (Liquefied Petroleum Gas), CNG (Compressed Natural Gas), EVs and infrastructure.

There are 1,170 BEVs (there are four in the city fleet) and 65 plug-in hybrid vehicles in the city; 19 of the BEVs are buses and five are taxis. There are 24 EV charging points currently available. Some public parking facilities offer customers charging infrastructure and the city is currently working on a protocol to promote the use of electric cars in "Residential parking facilities" managed by the City Council.

To promote the use of AF vehicles among Car Sharing Operators, the City offers a "Green Car Sharing Operator authorisation" that allows AF car sharing vehicles to park without restriction within the "on street regulated parking area". While each vehicle has to pay an annual fare for the authorisation, car sharing Electric vehicles are exempt from this fare.

The city will reduce the carbon footprint of its municipal fleet by 50 percent, as described in EU and national projects in which Madrid has been involved. These include EVUE[44], MADEV[45], CUTE[46], INVOLVE[47], FREVUE, and the recently started ECCENTRIC project, which is part of the CIVITAS Initiative.

Manchester (United Kingdom)

Greater Manchester covers an area of over 1,270 km^2 and has 2.8 million inhabitants. The Greater Manchester Combined Authority (GMCA), which consists of 10 metropolitan boroughs including the cities of Manchester and Salford, governs the area.

The public transport operator, Transport for Greater Manchester (TfGM), is currently working on a new SUMP, the Greater Manchester Transport Strategy 2040. It will provide more charging points in local centres for zero-emission vehicles[48]. There is also a plan to electrify rail lines to Liverpool, Preston and Leeds, and complete the Northern Hub rail project. TfGM is currently defining specifications for a hydrogen refuelling station. The low-emission strategy and air-quality action plan is a joint effort between TfGM and the GMCA. Together with the Air Quality Action Plan, the purpose is to reduce emissions from road transport and improve air quality[49]. TGFM operates the Greater Manchester Electric Vehicle Scheme, a platform to raise awareness about ultra-low-emission vehicles and to demonstrate that they are a real choice for motorists[50]. The GMCA is considering introducing a Clean Air Zone, with different vehicle restriction scenarios.

42 Madrid CIVITAS, http://www.civitas.eu/content/madrid
43 Ibid
44 EVUE, http://urbact.eu/evue-complete-overview
45 MADEV, http://www.eib.org/attachments/documents/madev_project_factsheet_en.pdf
46 CUTE, http://www.transport-research.info/project/clean-urban-transport-europe
47 INVOLVE, http://www.involve-project.eu/
48 Greater Manchester. Transport strategy 2040 our vision, http://www.tfgm.com/2040/Documents/14-1882%20GM%20Transport%20Vision%202040.pdf, p.36.
49 Greater Manchester Low-emission strategy and air quality action plan, http://www.tfgm.com/GMLES/Pages/default.aspx
50 Electric Vehicle Scheme, http://ev.tfgm.com/

There are 20 BEVs in the city fleet (including three BEV buses) and 325 PHEV buses. TfGM has 320 charging points, 35 LPG stations, and one biodiesel station.

Using apps to promote alternative fuels is still at an early phase, but there are currently studies aiming at creating an open-source community. The city is promoting carsharing companies with two established car clubs and is preparing a tender for a Greater Manchester Ultra Low Emission Vehicle Car Club. TfGM's Travel Choices Department promotes car-pooling via a dedicated website[51].

The European Bus System of the Future 2 project selected TfGM as a "knowledgeable stakeholder"[52]. The project aims to develop a new generation of urban bus systems through new vehicle technologies and infrastructures.

Stockholm (Sweden)

Stockholm covers an area of 187 km^2 and has 930,000 inhabitants. The county spans 6,524 km^2 and has a total population of nearly 2.25 million. Stockholm has four large trading ports, four international ferry ports and three international airports.

Stockholm intends to become a fossil-free city by 2040, and has concrete alternative fuel targets in its overall strategy. It has already taken some key actions. The city has pedestrianised large areas of the city centre, and access restrictions for Heavy-Duty Vehicles have been in place for more than 20 years. Although Swedish law forbids Low Emission Zones (LEZs) for Light-Duty Vehicles, Stockholm has been operating a Congestion Charge zone since 2006. This regulates access to the inner city, and covers a total area of around 40 km^2.[53]

The city is also working on a more efficient and attractive public transport system using intelligent traffic control techniques[54]. City-owned vehicles have been using clean fuels since 2010, taxis since 2013. Buses will run entirely on renewable energy by 2020.

Some 33 of the 6,739 BEVs in Stockholm belong to the city fleet. The city has around 700 charging points, 8 PHEV buses and 60 electric light commercial vehicles. It is to be noted that fiscal incentives for private and/or commercial alternatively fuelled vehicles purchase are forbidden under Swedish law. However, Stockholm uses some specific schemes to promote the use of clean vehicles. For example, delivery zones with extra-long delivery windows are offered for renewably fuelled vehicles. Similarly, Stockholm gives taxis priority according to their emissions and only allows clean vehicles on construction sites.

The upcoming CIVITAS ECCENTRIC project will help Stockholm develop and promote electric charging infrastructure and light vehicles. Pilot projects are ongoing with clean car-pooling and carsharing schemes, specifically under GROWSMARTER[55], while FREVUE[56] currently addresses freight transport. Stockholm is also part of ZeEUS[57], which addresses barriers and challenges for implementing electric buses in cities. Stockholm draws its expertise from previous national and European projects such as Niches[58], Best[59], CIVITAS CATALIST[60], EVUE[61] and Clean Fleets[62].

51 Transport for Greater Manchester, http://www.carsharegm.com/login.aspx?ReturnUrl=%2f
52 European Bus System of the Future 2 (EBSF_2), http://ebsf2.eu/
53 Stockholm to introduce congestion charging, http://www.eltis.org/discover/news/stockholm-introduce-congestion-charging-0
54 Stockholm, http://www.civitas.eu/content/stockholm
55 http://www.grow-smarter.eu/lighthouse-cities/stockholm/
56 http://frevue.eu/
57 ZeEUS, http://zeeus.eu/
58 NICHES, http://ec.europa.eu/research/transport/projects/items/niches_en.htm
59 BEST, http://www.transport-research.info/project/bioethanol-sustainable-transport
60 CIVITAS CATALIST, http://www.transport-research.info/project/sustainable-transport
61 Ibid
62 Clean Fleets, http://www.clean-fleets.eu/

Image: © Portal

Stuttgart (Germany)

Stuttgart covers an area of 207 km² and has over 606,000 inhabitants. It has a cargo port and an international airport.

Stuttgart adopted a mobility development concept for 2030, which contains strategic planning and short-term measures for urban transport[63]. The city aims to reduce energy consumption by 20 percent, and to use renewable energy sources for 20 percent of its overall energy needs by 2020. It has an LEZ where only vehicles with at least Euro 4 emissions standards can enter, and has drafted plans to cut emissions and reduce noise from road traffic. The city is involved in several electromobility initiatives, such as introducing electric taxis (with the goal to replace the entire fleet with EVs), and free parking for EVs and e-bikes[64]. Stuttgart is actively promoting carsharing initiatives such as the fully electric car2go, and Stadtmobil and Flinkster, which have combined electric/non-electric fleets.

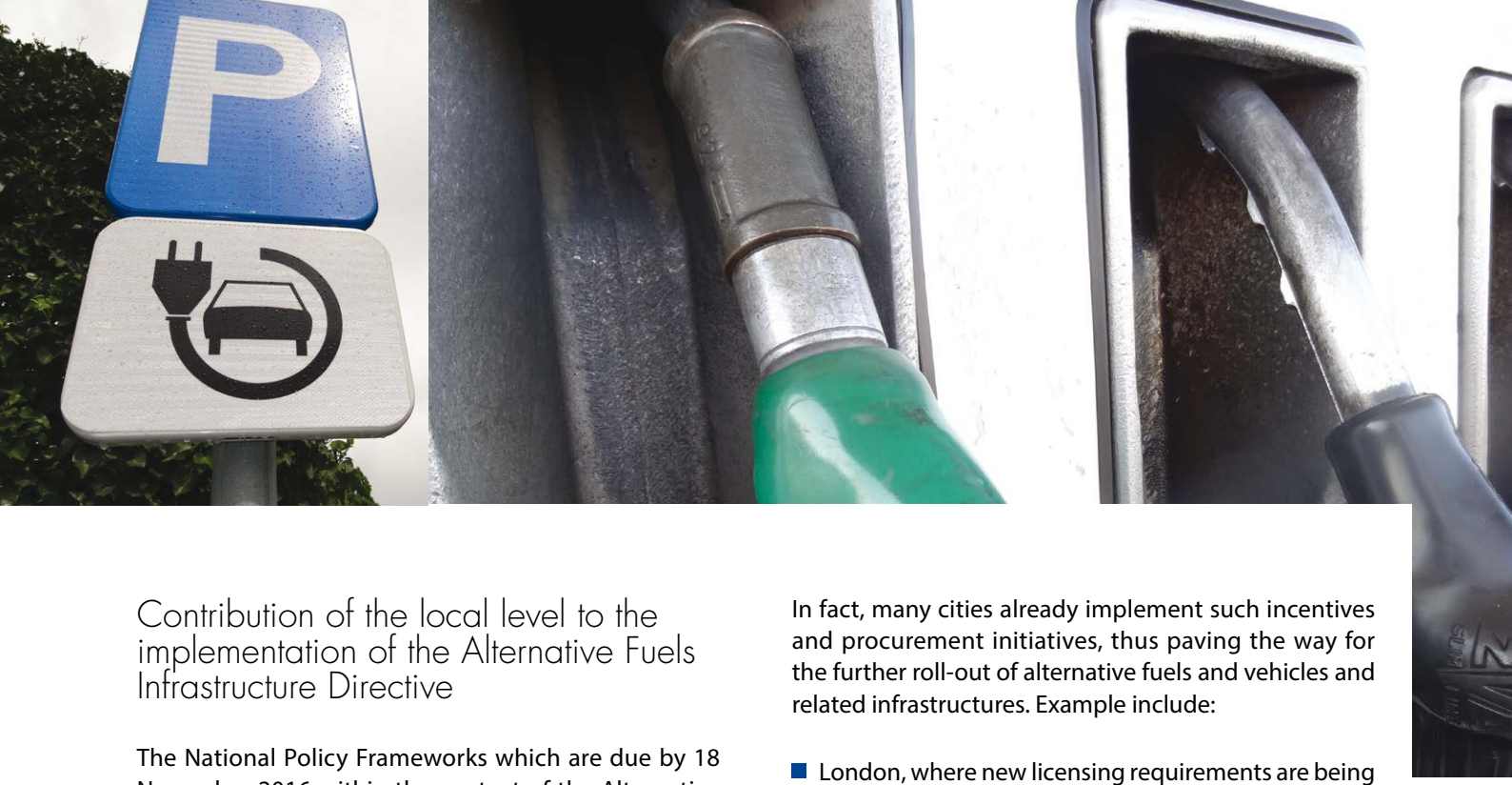
In Stuttgart, there are a total of 937 BEVs and 489 PHEVs. Among these, 11 BEVs and 7 PHEVs belong to the city fleet. There are 320 charging points available in the city. Furthermore, Stuttgart also has 18 PHEV buses. The city offers carpooling through the TwoGo website[65]. In terms of mobility services, Stuttgart is planning its city services within the Polygo project[66], as a follow-up to CIVITAS 2MOVE2[67].

Outlook and recommendations

Clean vehicles and alternative fuels as part of an integrated sustainable urban mobility strategy and system

It is broadly recognized that European cities have a key role to play when it comes to the deployment of clean vehicles and the use of alternative fuels. In order to implement an effective strategy towards a wider uptake of the alternative-fuel market at city-level, an integrated approach to sustainable mobility is needed. The Sustainable Energy Action Plans (SEAPs) and the Sustainable Urban Mobility Plans (SUMPs) are the two major tools that can help cities to achieve an effective clean vehicles strategy. Both SEAP and SUMPs foresee the implementation of key measures to be developed in cooperation with different policy areas and sectors, different levels of and administration and stakeholders.[68] In particular for SUMPs, integrating alternative fuels and clean vehicles should result in a sub-plan or sub-strategy that strengthens the role of these vehicles as part of a multimodal system. When it comes to the introduction of electric vehicles, for example, SEAPs and SUMPs constitute local planning strategies which clearly have some aspects in common. They could address the same schemes and stakeholders or consider the same measures, such as public procurement. Cities therefore need to develop an effective package of measures where clean vehicles are part of a broader mobility system. This is clear in the case of London, where the ULEV integrates the deployment of alternative fuels directly into London's multimodal transport system. But it can also be a complex exercise for local authorities in terms of how to balance the promotion of clean vehicles from the perspective of a collective mode versus private ownership; how to prioritise and fund the infrastructure and the procurement of vehicles; and which accompanying measures (e.g. ICT) to be included in 'the package' to maximize clean vehicles deployment.[69]

63 Das Verkehrsentwicklungskonzept der Landeshauptstadt Stuttgart 2030, http://www.stuttgart.de/img/mdb/item/521819/110256.pdf (in German).
64 Stuttgart electromobility, https://www.stuttgart.de/elektromobilitaet
65 TwoGo, https://www.twogo.com/
66 https://www.mypolygo.de/
67 http://www.civitas.eu/content/2move2
68 http://www.eltis.org/mobility-plans/sump-concept
69 http://www.polisnetwork.eu/uploads/Modules/PublicDocuments/thinking-cities---spring-2015---web.pdf, page 22.



Contribution of the local level to the implementation of the Alternative Fuels Infrastructure Directive

The National Policy Frameworks which are due by 18 November 2016 within the context of the Alternative Fuels Infrastructure Directive represent an important milestone. The EC will liaise with EU Member States regarding these NPFs and will then report on their assessment to the EU Institutions by November 2017. The EC will be in charge of monitoring the implementation of the Directive and suggesting an Action Plan to support Member States at the latest in November 2018. The EC can revise if necessary the AFI Directive by the end of 2020.

To further the uptake of the alternative fuels and vehicles infrastructures, also the local level can adopt a set of policy measures to facilitate the roll-out of clean vehicles and support the implementation of the Directive. Some of the policy measures mentioned in annex 1 of the Directive are within the remit of cities as well:

- Direct incentives for the purchase of means of transport using alternative fuels or for building the infrastructure
- Tax incentives to promote means of transport using alternative fuels and the relevant infrastructure
- Use of public procurement including joint procurement
- Demand-side non-financial incentives such as access to restricted areas, parking policy and dedicated lanes.[70]

In fact, many cities already implement such incentives and procurement initiatives, thus paving the way for the further roll-out of alternative fuels and vehicles and related infrastructures. Example include:

- London, where new licensing requirements are being introduced to reduce emissions from taxi and private hire fleets - the Zero Emission Capable (ZEC) taxi; the Go Ultra Low City Scheme investment (£13m) in a residential charging network; the 50% ULEV target for car club fleets by 2025 which is being supported by the deployment of a car club charging network through London's Go Ultra Low City Scheme project; other smaller schemes available to support delivery vehicles within the Low Emission Neighbourhoods ('Neighbourhoods of the Future'); on top of this, there is the National Infrastructure Plan (£10m) with the development of a rapid charging network. This will address the needs of taxis and private hire vehicles due to changes to their licensing requirements to become zero emission capable vehicles
- Madrid funds up to 1.000 Euro for the purchase of an alternatively fuelled vehicle, which comes on top of national and regional funding programmes covering a large amount of the total cost of the vehicles.
- The Capital Region of Denmark has in 2014, 2015 and 2016 administered part of a national programme offering financial support to companies and public institutions procuring electric vehicles to approximately 6.000 to 7.000 Euro per vehicle.

Preliminary insights from the EAFO city survey

The full results of the EAFO city survey will be available on the EAFO portal from October 2016 onwards. Some key elements already emerged however from the preliminary results of the city survey as well as from ongoing discussions within the CIVITAS Thematic Group on clean vehicles and fuels.

70 AFI Directive, http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32014L0094

Image: © CarlosCorona - communicationpackage.com

First of all, the responses received demonstrate a clear political will on the local level to deploy alternatively fuelled vehicles. At the same time, there are significant contextual differences across cities and their capacity to undertake substantial financial investments to cope with their ambitions to switch from fossil fuel vehicles to hybrids, alternative or electric vehicles can vary substantially as well. This is for example linked to the national frameworks, subsidies or incentives in place. Europe's main capitals have already made good progress and clearly take the lead in clean vehicles deployment, while medium-sized cities are rather looking at such transformations within a 2020-2025 time-horizon.

Cities also express a clear wish to further exchange with their counterparts on how to best developing and tailor their own local policies in such a way that they could boost electromobility both for the freight and the public and/or private passenger segment. Particularly, cities would like to learn about the trajectories and forecasts for decarbonizing transport by sector that are being developed in other member states.

Some concerns and barriers came to the fore as well:

■ **Vehicle data collection** | One major barrier to collecting vehicle data relates to the difficulty for cities of keeping track of private vehicles that are registered in another Member State. While the free movement of goods and workers in the EU constitutes a fundamental principle embedded in the EU Treaty, it also prevents cities from accurately assessing the real number of electric cars circulating within their geographical area. Similarly, cities noted that they still lack a clear picture on the number of private cars operated by taxi fleets. Both elements should be taken into account in all preparatory work at the EU level, for example regarding a pan-European register log for vehicles or by strengthening data communication between the national and the local level. Some cities also face the fact that L1-L5 as well as L6/L7 vehicles do not necessarily need to be registered in their respective Member States, which in turn does not allow for accurate information on this category for vehicle data provision.

■ **Charging infrastructure data collection** | Some cities, such as London, have already privatised their charging network. While this privatisation substantially speeds up the deployment of charging infrastructure, it also changes the way information is shared. In that perspective, precise figures for charging infrastructure coverage are unavailable. Cities are also bound to confidentiality clauses in some of the major projects currently under development. This could hamper data collection at the national level and hence create difficulties in the near future to assess the fulfilment of the EU targets set in terms of charging points per vehicle on the national market. Some additional guidelines in Green Public Procurement and overall within the Clean Vehicle Directive revision should therefore specify a requirement for sharing such information in future tenders or public procurement templates. Additionally, tracking the use of charging points in cities is a challenging issue. Firstly, because some of the city fleets or taxis use rented parking lots, with few data available and therefore only allowing a rough estimation of use of the charging infrastructure rather than exact data. While some local

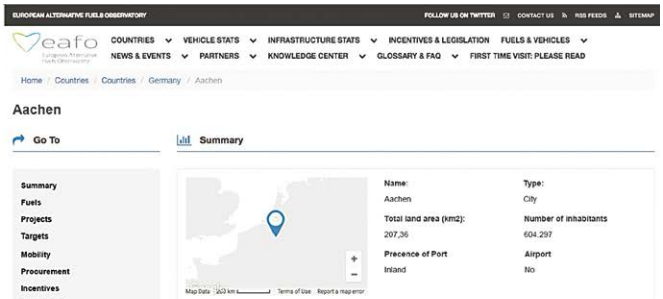
authorities have already set up an interoperable scheme which keeps track of the use of the charging points and also ensures an interoperable billing system when charging points belong to subcontracted third parties (in Stuttgart for example), most cities have not yet deployed a comprehensive system that would allow to measure in real time the use of charging points. The role of the EU would be crucial in this respect, by further supporting research and exchange of good practices while also exploring the possibility of comprehensive yet non-binding guidelines to address this challenge.

■ **Bus and infrastructure data** | Cities express the need for more exchange at the EU level on bus depots and/or maintenance and storage facilities related to electric fleets. This could either take the form of strengthening the current EU project addressing this issue (for example, ZeEUS) or could be explored within the context of new projects. Some elements of concern were also raised regarding charging plugs and en-route recharging systems' standards. Both will be needed in the future to fully deploy electric buses in cities while ensuring at the same time the interoperability of charging systems for domestic or international coaches accessing the urban area or the city centre. This could be solved by accelerating the standardisation process within CEN-CENELEC. Local authorities finally pointed out that more evidence is needed on LNG/CNG and comparisons with different vehicle engine types to economically understand what type could best be deployed locally. This could be supported by creating an EU public/private pool with industrial partners to help with policy setting/investment decisions in this area.

■ **Definition of a clean vehicle and further reliability on Euro standards** | Implementing Low Emission Zones or local air quality targets requires a reliable ranking system for clean vehicles and clean vehicle procurement. Cities raise the issue of the lack of a clear and common definition of a clean vehicle at the European level. Furthermore, recent developments also showed a lack of transparency and reliability of the Euro standards, which constitute the basis for implementing access restrictions and/or Low Emission Zones locally. These issues will be addressed by the European level in the course of 2017 through the revision of the Clean Vehicle Directive[71]. From this perspective, cities pointed out that an understandable, and easy-to-apply-and -communicate common definition of a clean vehicle is needed, based on the combination of harmful emissions (NO_x, $PM_{2,5}$ and PM_{10}) and well-to-wheel CO_2 emissions produced, as well as the energy efficiency of the car. In turn, such definition would allow a global ranking system similar to the one used under the Energy consumption labelling scheme[72] (A to G) and the set-up of EU objectives based on thresholds that would evolve over time. Cities would also welcome a revamped Clean Vehicle Portal in that respect, either as a stand-alone website or by merging it with a one-stop-shop portal such as the EAFO website. On the consumer/user end, cities propose that within the upcoming revision of the EU Directive on the labelling system for CO_2 emissions from cars[73], the European Commission would take the opportunity to also include emissions from the transport sector described under the National Emission Ceiling[74] and the Ambient Air Quality Directives[75] such as NO_x, $PM_{2,5}$ and PM_{10}. It should be noted that these issues are currently under discussion within the Sustainable Transport Forum's City subgroup, a multistakeholder expert group which aims to support the EC with the application of the Clean Power for Transport strategy, to facilitate the implementation of the AF Directive and implement EU activities and programmes aimed at fostering the deployment of AF infrastructure (energy and climate goals). It offers a platform for structural dialogue, exchange of technical knowledge, cooperation and coordination and as such provides advice and technical expertise on the development and implementation of legislation, policies, projects and programmes, delivers opinions, submit reports, and develops and proposes innovative solutions to the EC[76].

71 Revision of the Clean Vehicle Directive, revision of the type-approval for cars and vans, and third Real Driving Emission test package
72 EU Directive 92/75/EC
73 Directive 1999/94/EC
74 Directive 2001/81/EC recently modified in June 2016
75 Directive 2008/50/EC which will be revised in the course of 2017 for a foreseen adoption early 2018.
76 As presented by the City of Stockholm under a report that will be presented in October 2016 to the Sustainable Transport Forum.

AACHEN (GERMANY)



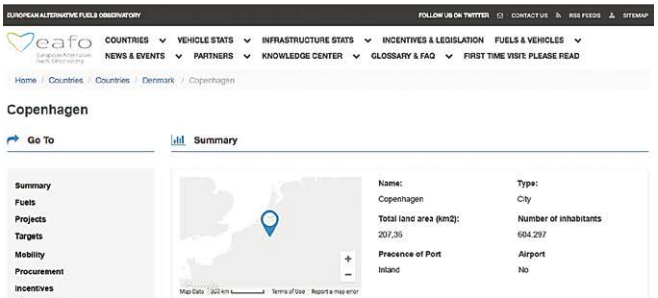
Vehicles data

Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	601	261	340			110.372
Passenger cars	M1 City Fleet	17	17				50
Buses (Public Transport)	M2+M3 City Fleet	2	1	1			344
Light Commercial Vehicles	N1 City Fleet						
Light Commercial Vehicles	N1 Total						213
Heavy Duty Vehicles	N2/N3 City Fleet	3	3				
Light vehicles (quadricycles)	L6/L7						no data available
Light vehicles (two-wheelers)	L1-L5		no data available				9.247
Taxis							no data available
Car-sharing	M1	14	14				156
e-bike or e-motor sharing	L1-L5						32
Ferries							0

Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.6 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All			20						
	Public Parkings	All			36	2	3	2			
	Other	All									
	Any	City fleet or contracted									
	Any	Taxi or Car sharing									
	Any	Restricted (other)	no information available								
Hydrogen filling stations											
Natural Gas filling stations	Any	All									
	Any	City fleet or contracted									
	Any	Restricted (other)									

COPENHAGEN (DENMARK)

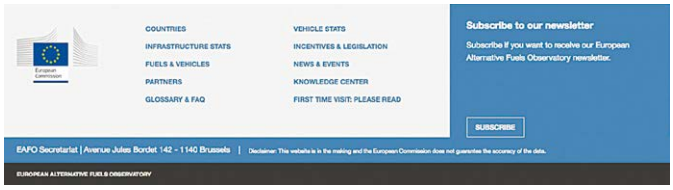


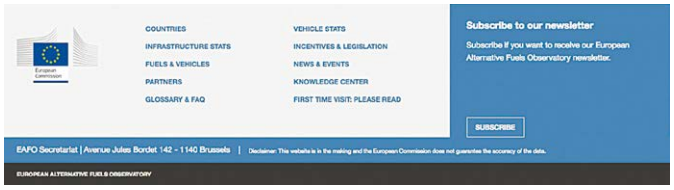
Vehicles data

Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	4.363	4.715	100	26	25	689.718
Passenger cars	M1 City Fleet	419	404	0	15	0	2.103
Buses (Public Transport)	M2+M3 City Fleet	0	0	0	0	0	132
Light Commercial Vehicles	N1 City Fleet	80	79	0	0	1	1.663
Light Commercial Vehicles	N1 Total	424	413	0	1	10	102.186
Heavy Duty Vehicles	N2/N3 City Fleet	8	5	0	0	3	168
Light vehicles (quadricycles)	L6/L7						N/A
Light vehicles (two-wheelers)	L1-L5						N/A
Taxis		1	1	0	0	0	1.900
Car-sharing	M1	820	820				1.100
e-bike or e-motor sharing	L1-L5	1.800	1.800				1.800
Ferries		0	0				10

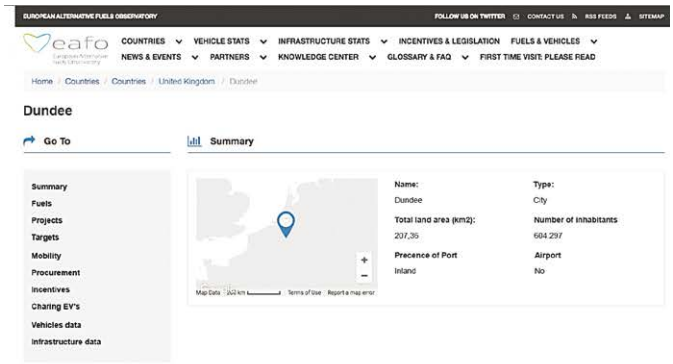
Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.6 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All	N/A	N/A	500	65	65	65	12		
	Public Parkings	All	N/A	N/A	N/A	65	65	65	12		
	Other	All	N/A	N/A	N/A	0	0	0	0		
	Any	City fleet or contracted	4	0	26	0	0	0	0		
	Any	Taxi or Car sharing	N/A	N/A	N/A	0	0	0	0		
	Any	Restricted (other)	N/A	N/A	N/A	0	0	0	0		
Hydrogen filling stations										2	
Natural Gas filling stations	Any	All									5
	Any	City fleet or contracted									0
	Any	Restricted (other)									0





DUNDEE (UNITED KINGDOM)



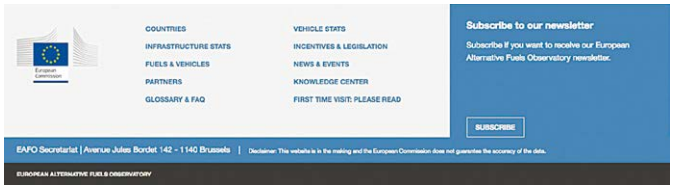
Project name	Yes / no
Targets (long term) on the deployment of Alternative Fuel Vehicles	✓
Zero Emission targets for (specific) vehicle categories or uses, if so which and timing.	✓
Zero/Low/Ultra Low emission zones currently or planned? If so: how large, which type / vehicle restrictions?	
Buildings regulations e.g. mandatory EV chargers installed (in Parkings, new apartment buildings, ...)	✓
Climate Change GHG reductions / Climate Neutral objective	
Renewable Energy targets	✓
Air Quality and Noise	✓
Publications or internet links around targets	

Vehicles data

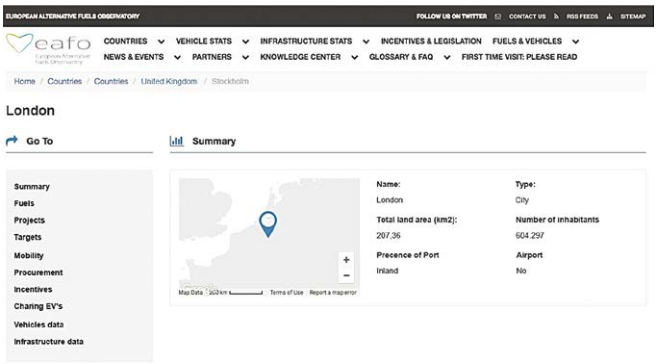
Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	40.000 vehicles weekly commute into Dundee					no data
Passenger cars	M1 City Fleet	53	51	2			455
Buses (Public Transport)	M2+M3 City Fleet	27	27				87
Light Commercial Vehicles	N1 City Fleet	19	19				258
Light Commercial Vehicles	N1 Total						no data
Heavy Duty Vehicles	N2/N3 City Fleet						55
Light vehicles (quadricycles)	L6/L7						N/A
Light vehicles (two-wheelers)	L1-L5						N/A
Taxis		36	36				750
Car-sharing	M1	8	8				16
e-bike or e-motor sharing	L1-L5						
Ferries							

Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.5 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All			6						
	Public Parkings	All				8			4		
	Other	All		27							
	Any	City fleet or contracted		32		2					
	Any	Taxi or Car sharing				5					
	Any	Restricted (other)									
Hydrogen filling stations											
Natural Gas filling stations	Any	All									
	Any	City fleet or contracted									
	Any	Restricted (other)									

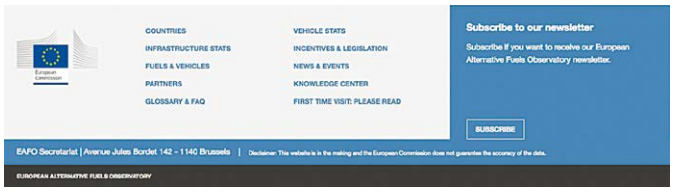


LONDON (UNITED KINGDOM)

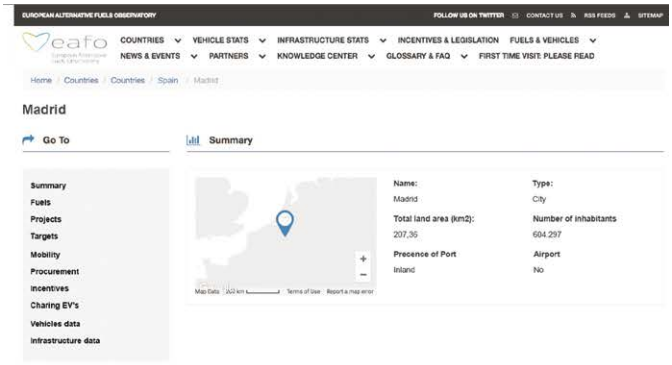


Vehicles data

Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	6.632					2.657.300
Passenger cars	M1 City Fleet	15	6	1	6		407
Buses (Public Transport)	M2+M3 City Fleet	33	22	3	8	0	5.367
Light Commercial Vehicles	N1 City Fleet						612
Light Commercial Vehicles	N1 Total	659					216.600
Heavy Duty Vehicles	N2/N3 City Fleet	31					46
Light vehicles (quadricycles)	L6/L7	204					
Light vehicles (two-wheelers)	L1-L5	300					124.700
Taxis							22.500
Car-sharing	M1						2.800
e-bike or e-motor sharing	L1-L5						
Ferries							4



MADRID (SPAIN)



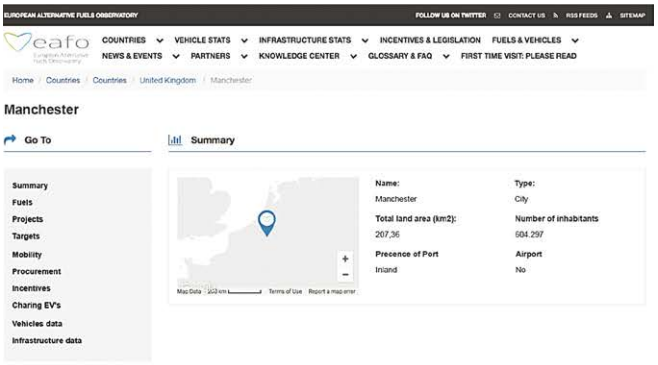
Vehicles data

Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	2.064	1.170	65		31	
Passenger cars	M1 City Fleet	89	4				
Buses (Public Transport)	M2+M3 City Fleet	810	19	13		778	1.915
Light Commercial Vehicles	N1 City Fleet						
Light Commercial Vehicles	N1 Total						
Heavy Duty Vehicles	N2/N3 City Fleet	460		15		445	
Light vehicles (quadricycles)	L5/L7						
Light vehicles (two-wheelers)	L1-L5	5	5				
Taxis		2.069	5			6	15.665
Car-sharing	M1	500	500				
e-bike or e-motor sharing	L1-L5	2.028	2.028				
Ferries							

Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.5 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All	18	6							
	Public Parkings	All	105								
	Other	All				2	3	2			
	Any	City fleet or contracted	17	8	36						
	Any	Taxi or Car sharing									
	Any	Restricted (other)						40			
Hydrogen filling stations											
Natural Gas filling stations	Any	All									14
	Any	City fleet or contracted									8
	Any	Restricted (other)									

MANCHESTER (UNITED KINGDOM)

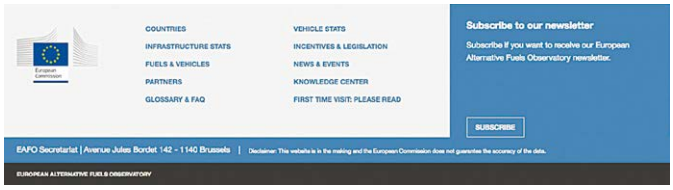


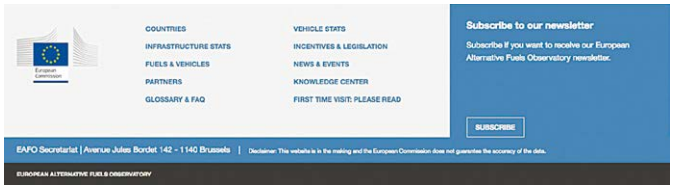
Vehicles data

Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total						
Passenger cars	M1 City Fleet	5	5				20
Buses (Public Transport)	M2+M3 City Fleet	238	3	235			2.367
Light Commercial Vehicles	N1 City Fleet	0					1.099
Light Commercial Vehicles	N1 Total	N/A					
Heavy Duty Vehicles	N2/N3 City Fleet	0					
Light vehicles (quadricycles)	L5/L7	0					
Light vehicles (two-wheelers)	L1-L5	0					
Taxis		0 hackney, N/A PHV					13.577
Car-sharing	M1	5	5				63
e-bike or e-motor sharing	L1-L5	20					20
Ferries		0					

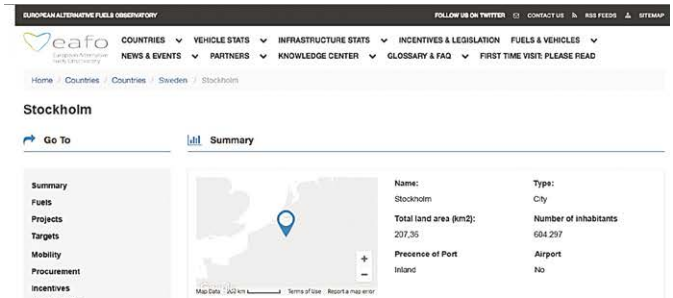
Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.5 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All		320				320			
	Public Parkings	All									
	Other	All									
	Any	City fleet or contracted									
	Any	Taxi or Car sharing									
	Any	Restricted (other)									
Hydrogen filling stations											
Natural Gas filling stations	Any	All									
	Any	City fleet or contracted									
	Any	Restricted (other)									





STOCKHOLM (SWEDEN)



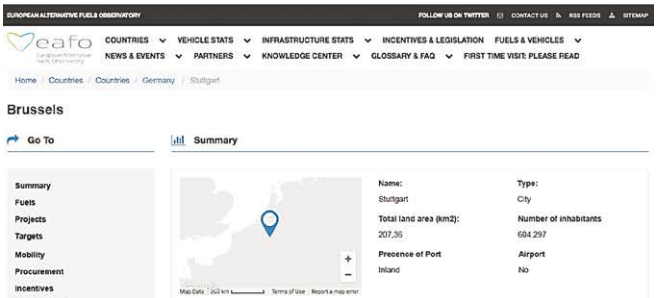
Vehicles data

Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	83.398	6.739	included in BEV	3	13.163	887.057
Passenger cars	M1 City Fleet	337	33	61		92	411
Buses (Public Transport)	M2+M3 City Fleet	1.906		8		338	2.200
Light Commercial Vehicles	N1 City Fleet	365	60			263	425
Light Commercial Vehicles	N1 Total	3.379	362			2.298	11.748
Heavy Duty Vehicles	N2/N3 City Fleet	7				7	15
Heave Duty Vehicles	N2/N3 Total	319				269	12.699
Light vehicles (quadricycles)	L6/L7	0					0
Light vehicles (two-wheelers)	L1-L5	N/A					N/A
Taxis		4.161	54	included in BEV	3	2.980	6.397
Car-sharing	M1	N/A					N/A
e-bike or e-motor sharing	L1-L5	N/A					N/A
Ferries		N/A					N/A

Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.5 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All									
	Public Parkings	All		ca 700		20					
	Other	All									
	Any	City fleet or contracted									
	Any	Taxi or Car sharing									
	Any	Restricted (other)		at least 7.248							
Hydrogen filling stations										1	
Natural Gas filling stations	Any	All									28
	Any	City fleet or contracted									0
	Any	Restricted (other)									e10-15

STUTTGART (GERMANY)

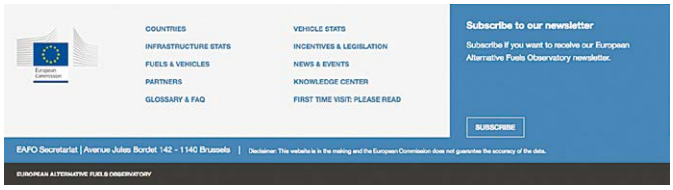


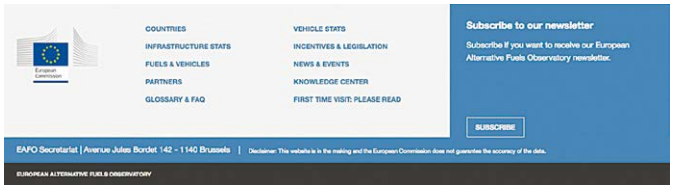
Vehicles data

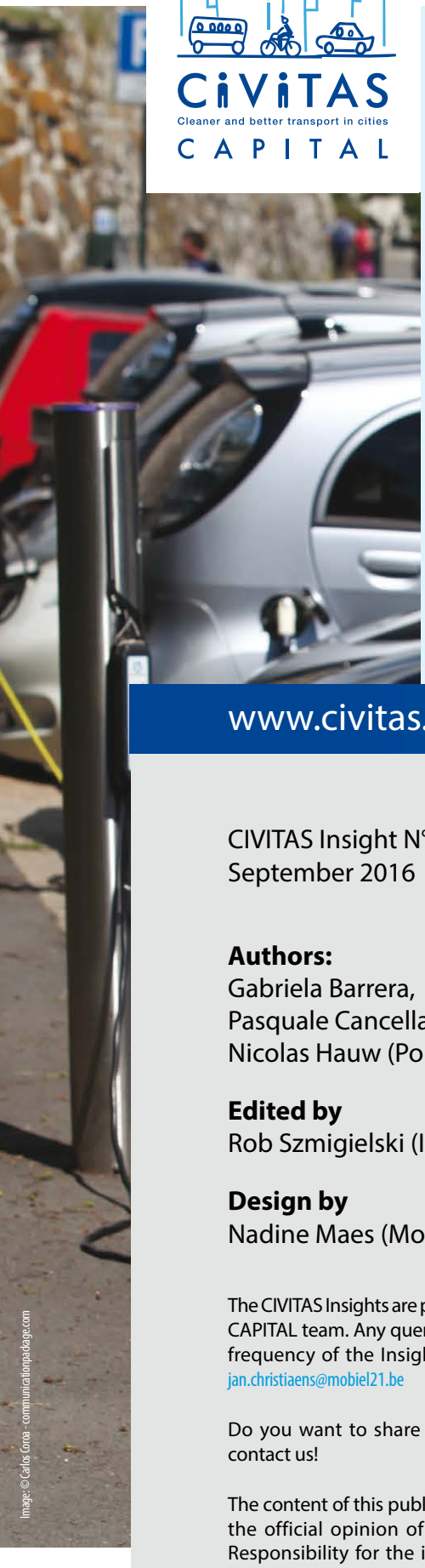
Type of vehicles	Category	Total AF vehicles	BEV	PHEV	FCEV	Natural gas	Total vehicles
Passenger cars	M1 Total	1.763	937	489	35	302	297.198
Passenger cars	M1 City Fleet	36	11	7		18	312
Buses (Public Transport)	M2+M3 City Fleet	18		18			259
Light Commercial Vehicles	N1 City Fleet						
Light Commercial Vehicles	N1 Total						
Heavy Duty Vehicles	N2/N3 City Fleet	4	4				274
Light vehicles (quadricycles)	L6/L7						
Light vehicles (two-wheelers)	L1-L5		18				
Taxis			2	36	0	not available	700
Car-sharing	M1		524				934
e-bike or e-motor sharing	L1-L5		100				400
Ferries			0				5

Infrastructure data

Infrastructure	Place	Accessibility	Normal power			High power > 22 kW				HFS	NGFS
			3.5 kW	7 kW	11 - 22 kW	Combo	ChaDeMo	Type 2 AC	Tesla SC		
EV Charging points	Street	All			320						
	Public Parkings	All									
	Other	All	20		29	6	3				
	Any	City fleet or contracted			20						
	Any	Taxi or Car sharing			6						
	Any	Restricted (other)									
Hydrogen filling stations										3	
Natural Gas filling stations	Any	All									3
	Any	City fleet or contracted									2
	Any	Restricted (other)									







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