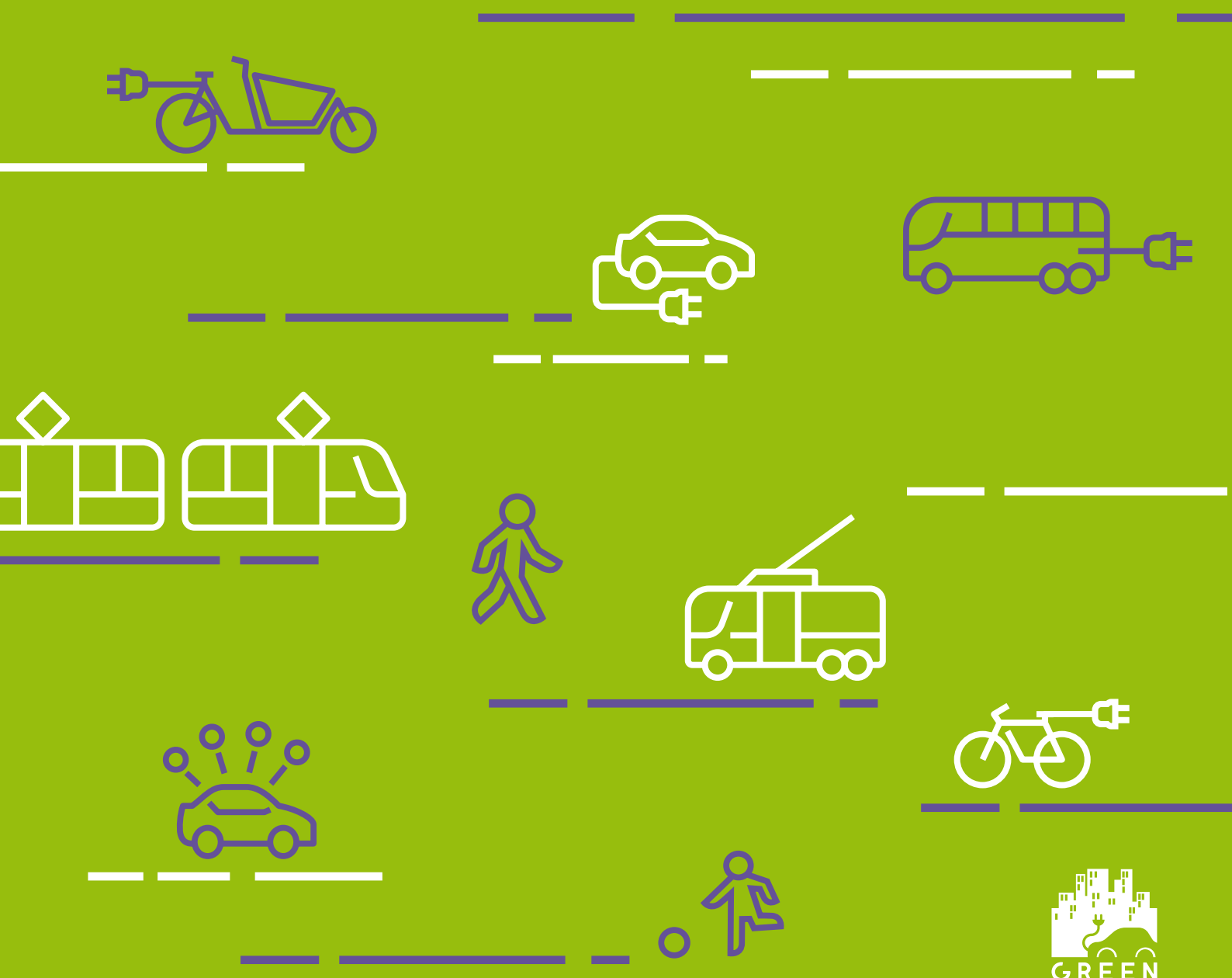
Electric mobility in Sustainable Urban Mobility Planning (SUMP)

New energy for mobility: the GreenCharge approach



This leaflet contains an overview of the e-mobility approach in the GreenCharge project, looking particularly at its relationship with sustainable urban mobility planning.

Sustainable Urban Mobility Plans (SUMP)

Urban mobility planning is challenging and complex. In contrast to traditional transport planning approaches, the new concept not only looks at transport, but also integrates many related sectors (land use, environment, economic development, social policy, health, safety, energy, etc.). Another key requirement is the strong involvement of citizens and stakeholders.

A Sustainable Urban Mobility Plan is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles.

The challenges range from congestion and space consumption to safety, dependence on certain resources and local and global emissions. Understanding that transport can be an emotionally charged topic involving freedom of choice, comfort, status and privilege, sustainable urban mobility planning is a comprehensive planning process that brings citizens and stakeholders on board.

photo: City of Bremen

Active participation: reaching new target groups

screenshot www.bremen-bewegen.de

Online participation as one building block in the planning process

When looking at e-mobility and SUMP, what are the key innovations of SUMPs?

Traditional Transport Planning		Sustainable Urban Mobility Planning
Focus on traffic	→	Focus on people
Primary objectives: Traffic flow capacity and speed	→	Accessibility and quality of life, as well as sustainability, economic viability, social equity, health and environmental quality
Mode focussed	→	Balanced development of all relevant transport modes and shift towards cleaner and more sustainable transport modes
Infrastructure focussed	→	Integrated set of actions to achieve cost-effective solutions

source: the EC's SUMP recommendations (http://www.eltis.org/guidelines/sump-guidelines)

Why are SUMPs important for e-mobility, and vice versa?

SUMPs take the social and environmental aspects of transport into account, meaning that the sustainable modes of walking, cycling and collective transport play a much larger role than in conventional transport plans. The focus has shifted from pure traffic policy to a balanced mix of transport modes that foster accessibility as well as health and environmental quality.

SUMPs are a key component of European transport policy. In its Action Plan on Urban Mobility, the European Commission proposed to accelerate the take-up of Sustainable Urban Mobility Plans in Europe.

GreenCharge contribution to SUMPs

GreenCharge will develop technical solutions and business models that encourage e-mobility, based as far as possible on renewable energy. It will carry out trials at sites in Barcelona, Bremen and Oslo, and use those to evaluate impact using methods promoted by CIVITAS. Details of the three sites are presented on the following pages.

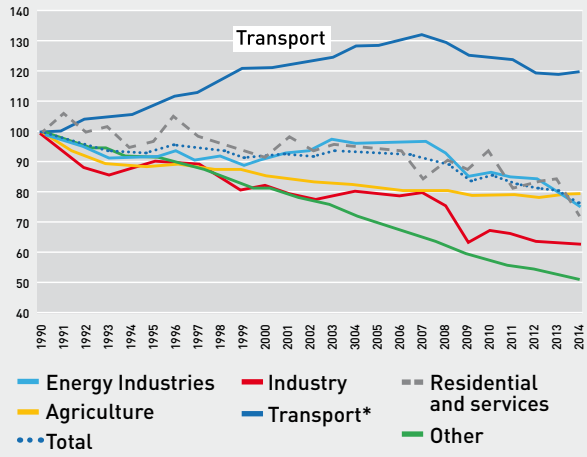
The "lessons learned" in these three cities will be documented in an easily understood format, providing useful inspiration to development of SUMPs in other cities. The project has a dialogue with a wider group of "uptake cities", facilitating refinement of SUMP ideas during the project itself.

SUMPs: e-mobility contributes to pollution reduction

Many European cities suffer from poor air quality. Electric vehicles produce no local emissions from burning fuel. Thus, electrification of transport will be a crucial contribution to improve air quality in cities. In combination with (additional) renewable energy, we can as well reduce the CO_2 footprint.

Industry and households have achieved some clear reductions in greenhouse gas emissions. Transport, on the other hand, remains far behind in meeting the needs of climate protection. Despite a broad agreement on the need to reduce GHG emissions, the European transport sector still emits more than it did in 1990.

EU greenhouse gas emissions from various sectors between 1990 - 2016



* Transport includes international aviation but excludes international maritime; Source: EEA

Considerations for e-mobility and SUMPs

Energy Source

The huge potential of e-mobility to reduce GHG emissions depends crucially on the energy source. It can only be realised if charging is predominantly achieved using renewable energy. For maximum impact on climate protection, this must be part of a wider shift in the energy sector towards renewables and more efficient management of electricity.

But the battery is not the only resource-consuming aspect of a car. Thoughtful construction, use and recycling of all vehicle parts is needed. With this in mind, electric mobility must take into account more than just propulsion technologies.

It is one of the objectives of GreenCharge to develop intelligent charging that also reduces the peak demand for electricity.

Space

All European cities are over-filled with cars. One key aspect of this relates to car parking. On average, private cars in Europe are in use for one hour a day. This means that for 23 hours a day, while the car is parked, the propulsion system is irrelevant - and an electric car consumes as much space as a conventional one. If families choose to add an electric car for short journeys, this could make parking problems even worse.

In Bremen, car sharing already demonstrates the potential to reduce car ownership on a large scale as it is integrated into a wider SUMP approach that sees sustainable modes as an alternative to driving a car and car sharing as an alternative to owning a car. Electric car sharing concepts will be further extended in GreenCharge cities.

The attractiveness of Personal Light Electric Vehicles (PLEV) might become a game changer by shifting to smaller vehicles and offering new sharing options.

Congestion

All cars consume roughly the same space. A simple shift from conventional to electric cars will only give us cleaner congestion. It is a major objective of Sustainable Urban Mobility Plans (SUMPs) to develop holistic concepts to reduce congestion.

GreenCharge pilot cities strongly support this by supporting modal shifts towards walking, cycling and public transport and ride-sharing as key measures to reduce congestion.

Congestion rankings of European cities clearly demonstrate that cycling cities (like Ghent, Groningen, Bremen, Copenhagen etc.) are rather low congestion cities.

photo: Michael Glotz-Richter

Simply electrifying does not end congestion

Safety

There are European, national and local goals to improve road safety, particularly related to fair treatment of vulnerable road users. These require more than just the electrification of cars.

photo: fotolia

Success story: Oslo, Norway

The Norwegian capital of Oslo is well known for its success in electrifying car traffic. This is a result of a combination of local and national measures, as well as both push and pull policies. There were incentives at the local level, such as exemption for e-cars from tolls and parking fees. The policy of opening bus lanes for e-cars is controversial as it has caused disadvantages for users of public transport.

At least as important as these incentives is the national fiscal framework for cars and fuels. Together with the incentives for e-cars, there were disincentives for conventionally fuelled cars in the form of carbon and NO_2 elements in the taxation of conventional cars and higher taxes on fossil fuels.

Price Example

Volkswagen Golf	Volkswagen e-Golf
Import price: **18.914 Euro**	Import price: **27.215 Euro**
CO_2 tax: **3.333**	CO_2 tax: **0**
Nox tax: **237**	Nox tax: **0**
Weight tax: **2.254**	Weight tax: **0**
Scrapping fee: **251**	Scrapping fee: **251**
25% VAT: **251**	VAT: **0**
Retail price: **33.240 Euro**	Retail price: **34.580 Euro**

With a record high of 39% of all new cars being fully electric, Norway now has the highest rate of electric vehicle ownership in the world. In Oslo, 59% of new cars sold in 2018 were either battery electric (42%) or plug-in hybrid (16%). Electric cars make up 23% of total cars in Oslo, with 12% fully electric cars and 11% plug-in hybrids. Norway wants to go even further and is mandating that all new cars sold in the country be fully electric by 2025. Oslo also has significant plans to support the car-free development of its city centre, the role of EVs must support and fit around this.

The municipality of Oslo has an active policy to promote e-mobility. In 2008 the municipality developed a 10-point plan to reduce greenhouse gas emissions. One point was to support deployment and use of EVs through kerbside charging for EVs. The goal of Oslo is to reduce greenhouse gas emissions by 36% by 2020 and 95% by 2030 (compared to 1990). But reducing greenhouse gas emissions has been about more than just EVs. In addition, measures have been implemented to make shared transport solutions more attractive. This includes bus, tram, metro and train. The city has also implemented "green mobility houses", where travelers can find charging opportunities, bicycle parking, car sharing services, electric scooters etc., all in one place. Moving forward, the city administration is pursuing further solutions and technologies enabling zero emission transport. This includes electrification of all vehicles, including buses and taxis, and ensuring zero emission from the maritime sector (including harbour operations).

photo: Paal Mork / City of Oslo

e-cars charging on public streets in residential areas

The GreenCharge trial will contribute to city goals by facilitating charging of electrical vehicles in an apartment block in the Røverkollen neighbourhood, in a technically and financially effective way.

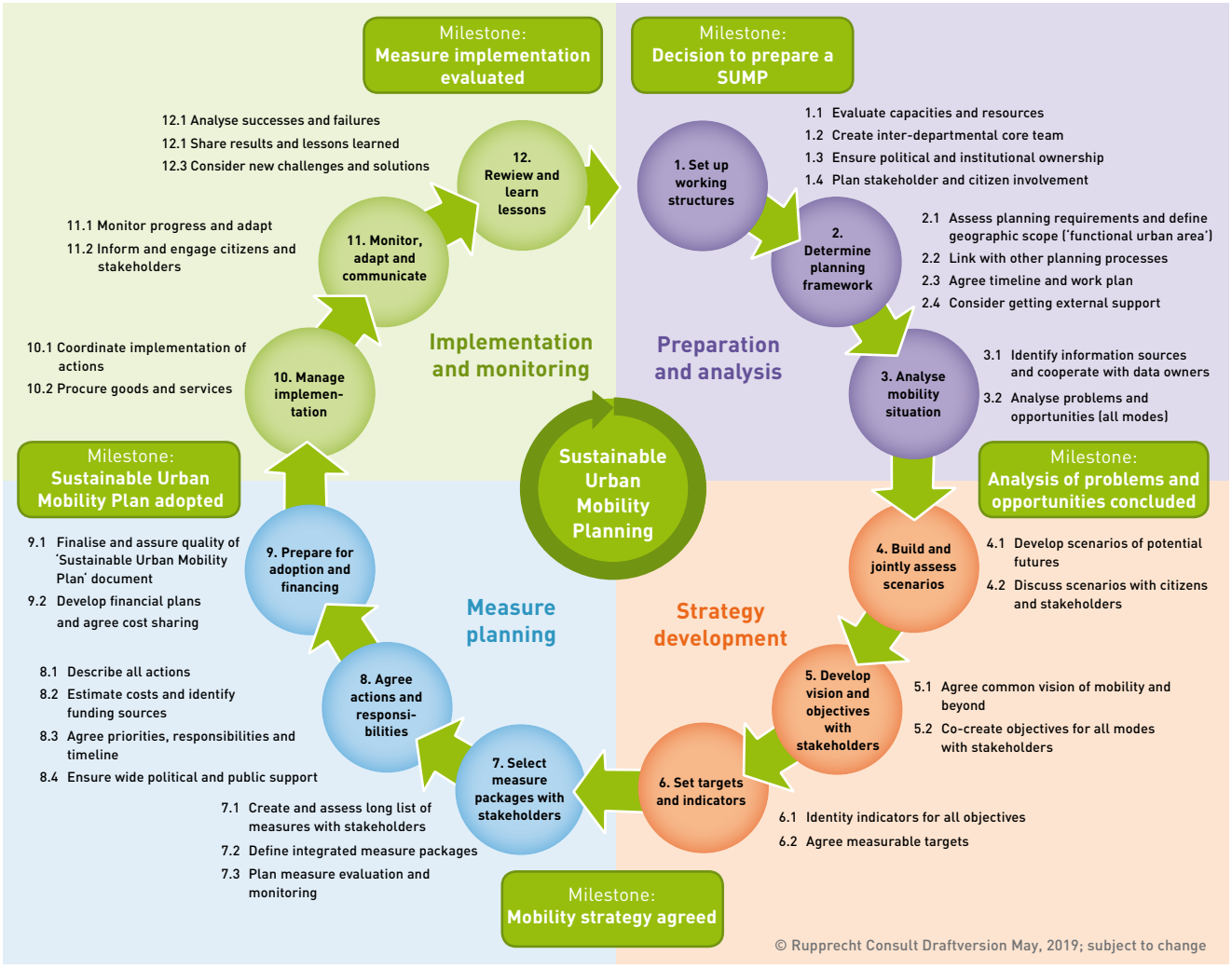
Electric mobility is much more than electric cars

Electric mobility offers huge potential for sustainable urban mobility planning – but only if it is embedded in a wider strategy. Looking at the big picture, it becomes clear that in many cases low-tech solutions – like walking and cycling – are smarter for urban mobility than a pure focus on technology applications.

In terms of space consumed by transport in cities, a range of measures are included in SUMPs, starting with avoiding traffic entirely through spatial planning and organisational changes (e.g. teleworking or corporate mobility management). For workplace mobility management, travel planning, behaviour-related initiatives and ride sharing can be supplemented by charging opportunities and attractive parking spots for EVs.

The modal shift towards walking, cycling and collective transport is another core element of sustainable urban mobility planning – and requires safe, convenient and attractive infrastructure for pedestrians, for cyclists and for the operation of buses, trams and light rail.

The 12 Steps of Sustainable Urban Mobility Planning (SUMP 2.0) – A planner's overwiew.



Electrification can support a shift towards sustainable modes

Without a doubt, European cities need to shift away from single-occupancy cars towards walking, cycling, shared modes and collective transport. Various electric mobility components of SUMP strategies can help lead to such a shift. These include:

a) Electric assistance for bicycles

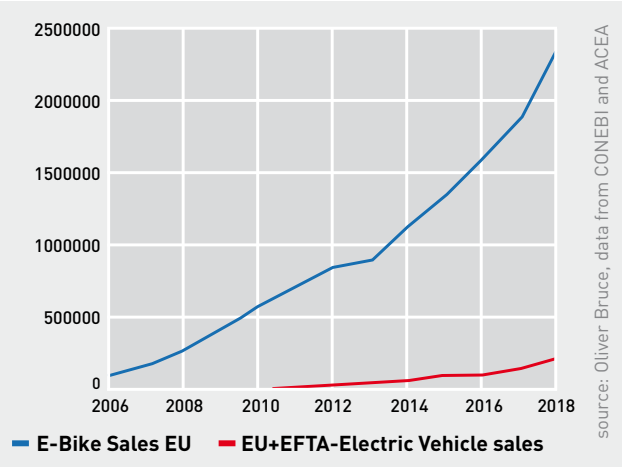
Cycling is a very space-efficient mode of transport. Comparatively little space is needed for parking and little space is needed for travelling. The congestion level in cycling cities is much lower than in most car-friendly cities. You only need to imagine all of the cyclists in Copenhagen or Groningen each sitting alone in a car to understand the value of the space saved in cycling cities. Adding electric assistance makes cycling less strenuous and serves as a range extender for longer distances and as a "gentle push" up hills. Electric support adds huge potential for more cycling in cities across Europe – both for people and for logistics.

As with all bicycles, electrically assisted bikes require convenient and attractive infrastructure. With a growing share of electrically-assisted bicycles in cities (and more bicycles in general), infrastructure will need to be adapted for larger differences in speeds, more overtaking, wider and longer bikes and bikes with trailers. Demand for e-ebikes is also increasing.

photo: Michael Glotz-Richter

Clear priority for cycling

EU Annual E-bikes vs Electric Car sales



Electrification of bicycles by far outnumbers the sale of electric cars

For normal commuting, electrically-assisted bicycles do not need recharging infrastructure en route. The range of e-bikes is sufficient for daily commuting and, as the batteries can easily be taken off the bike, recharging can be done at home or at the workplace. For leisure and tourism, which may involve longer tours, en route recharging may become advantageous.

b) Electrification of buses

Collective transport is another backbone of sustainable mobility strategies. It allows transporting high volumes of passengers – usually based on fixed routes operated according to a timetable.

For many cities and towns, buses play a major role in their public transport system. In Europe, diesel engines propel almost 90% of buses. In 2013, electric buses represented only 1.2% of European buses (UITP, Zeeus report). But whereas private cars are in use for less than one hour a day, public transport vehicles are usually in operation some

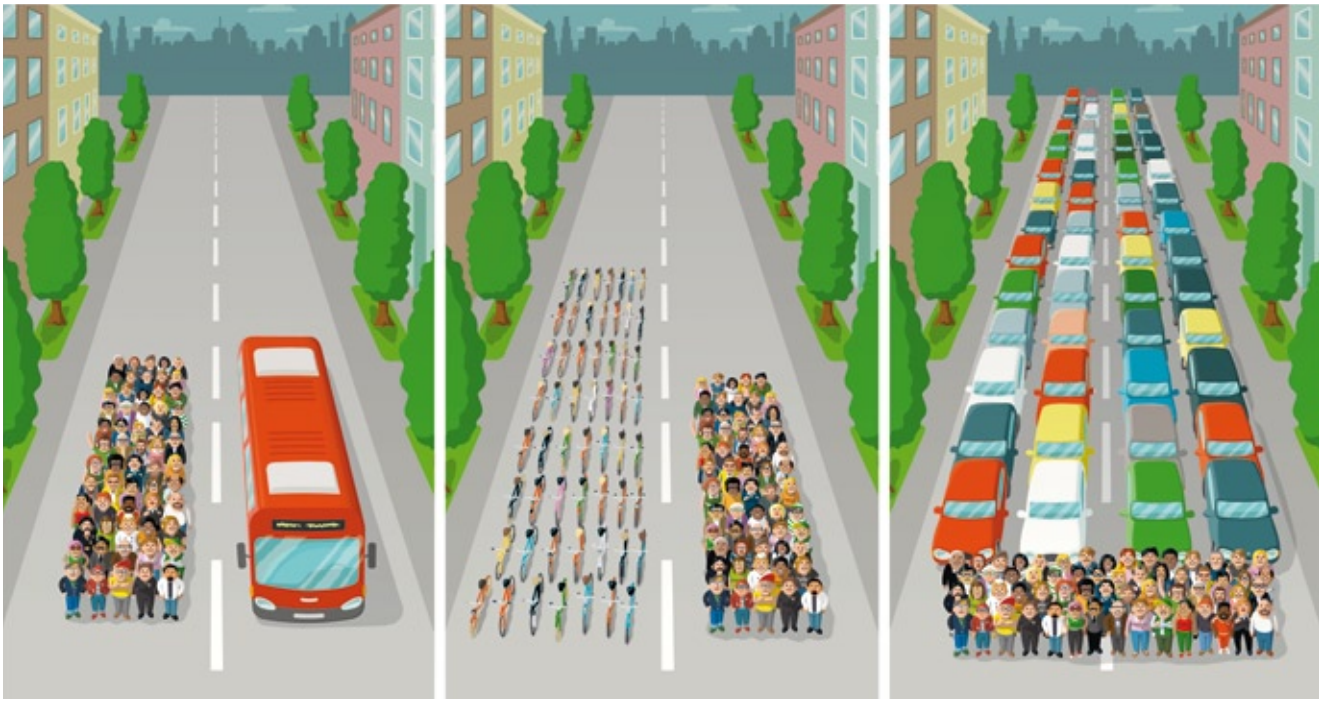


Illustration: Maura Kalusky Inspired by: Cycling promotion foundation

A more efficient use of limited urban street space is a core theme of Sustainable Urban Mobility Planning – public transport and cycling use much less space than private cars.

12-16 hours. When the larger size of the engine is also considered, the impact of electrifying urban buses in comparison to private cars is about 100 to 1.

Cities that exceed EU-mandated NO_2 concentration levels (mainly due to diesel emissions) are particularly interested in changing from diesel to electric buses, but improvements in reliability and performance of battery-electric buses are still needed.

Trolleybuses have already reached a high level of maturity – and can be combined with batteries to allow extended operation without overhead wires.

European regulations require the procurement of a certain share of "clean" buses starting in 2025.

photo: Michael Glotz-Richter

Zero emission – just one goal of public transport: Electric bus in Bremen

Coaster from the "factor 100" campaign of the European H2020 ELIPTIC project.

Barcelona's Electric Mobility Strategy

Barcelona's Electric Mobility Strategy 2018-2024 sets ambitious targets for the development of electric mobility in the city. By 2024, 80% of the municipal fleet should be electric, as should 100 buses and 800 taxis. The strategy also aims to increase the number of electric private cars and motorcycles to a combined total of 24,000.

Barcelona is a large and dense city (population 1.6 million). About 50-75% of public space is currently dedicated to the car, while only 25% of journeys made within the city are done by car. For this reason, Barcelona's Urban Mobility Plan 2013-2018 developed guidelines with a clear focus on sustainable mobility. A key element of Barcelona's SUMP is the development of "superblocks" (a division of the city into 503 large sections), each with a traffic network saturation similar to present levels, but focussed on sustainable modes. Thus, facilities for walking, cycling and collective mobility will be improved (new orthogonal bus and bicycle networks, carpool and pedestrian lanes, etc.), and restrictive measures will be placed on private vehicles, such as an increase in the price of metered parking. The first superblocks were created in 2016. After two years, here the surface area for pedestrians had increased by 80%, the space occupied by private cars was reduced by 48% and the amount of green space had almost doubled. Another impact is revitalisation and more economic activity on the ground floors of buildings.

photo: Michael Glotz-Richter

Barcelona´s bus fleet becoming electric

photo: Michael Glotz-Richter

Converting car lanes and parking space into a bike lane network

photo: Barcelona City Council

Superblock street space

The GreenCharge trial in Barcelona introduces a variety of measures contributing in different ways to the city's SUMP goals. Some of these involve aspects of charging, such as the ability to book, enforcement, and optimisation of energy use and load balancing. Others promote the "mobility as a service" concept, such as promoting parking of e-scooters close to battery hubs and upgrading an e-bike sharing service for commuters in Saint Quirze.

c) As part of new mobility services (e.g. on-demand minibus services)

Mobility as a Service (MaaS) offers new ways to provide collective transport. Widespread digitalisation of public transport will make it smooth and easy to use, thus attracting more users. MaaS provides transport based on personal needs, up-to-date travel information and travel planning as well as convenient access and payment options.

photo: Hendrik Koch

Driverless (electric) mini-buses may create flexible on-demand transport options

d) As part of new sharing concepts

"Use it – don't own it": car sharing, bike sharing and – the latest trend - scooter sharing all complement public transport with more easily accessible forms of individual mobility. Their combined effect encourages people to switch to different transport modes and help reduce car ownership. Rather than owning different vehicles for different transport needs, adopting shared transport saves people time, effort and money yet still provides the customised solutions they need. It also reduces parking pressure on limited street space.

Shared mobility solutions are a powerful catalyst for change offering improved quality of life in urban areas: inclusive mobility for all citizens with significant gains for personal and spatial accessibility. e-mobility solutions can have a role in encouraging shared mode transport, but vehicle charging poses challenges. GreenCharge will contribute to addressing those.

Light e-vehicles are emerging as an exciting new approach within the sharing concept, addressing gaps in the mobility demand.

e) As part of new logistics concepts (micro-hubs to shift to smaller e-powered/ e-supported vehicles like cargo bikes)

For urban deliveries, cargo bikes can play an important role by allowing more efficient and environmentally friendly delivery than conventional vans. Infrastructure - in the form of delivery hubs - is necessary to allow for the loading of cargo bikes for the last mile.

Link to: **http://cyclelogistics.eu/about**

photos: cargo bike in operation; Rytle bike

Micro-delivery logistic

Success story: car sharing Bremen

Bremen is a forerunner in integrating car sharing in a wider urban development and transport strategy. With about 25% of all trips done by bicycle, Bremen is a cycling city. Walking, cycling, and public transport together count for about 2/3 of all trips – making them a good alternative to using a car.

Bremen's strategy goes further and sees car sharing as an alternative to owning a car.

With its network of more than 100 car sharing stations throughout the city and the very reliable concept of station-based car sharing, Bremen's 18,000 car sharers have replaced almost 6,000 private cars with the service of car sharing. This corresponds to roughly 30 kilometres of road space that would otherwise be needed for private car parking. For about 80% of users in Bremen, car sharing replaces the first car in the household. Car sharers use more public transport and cycle more, with car sharing cars just filling in the gaps.

The car sharing fleets in Bremen consist of both conventional and electric cars – allowing users to test and become familiar with electric cars. Nevertheless, the main impact for the City of Bremen remains the shift away from car ownership and the resulting gain in public space.

photo: Michael Glotz-Richter

Very visible: car sharing stations in Bremen (mobil.punkt)

photo: ZET

e-car sharing in a residential neighbourhood

photo: Michael Glotz-Richter

mobil.punkt with e-car (operator ZET)

GreenCharge will contribute to Bremen's SUMP by developing business models, priority charging via photo-voltaic energy, combining electric car sharing with public transport at "mobility points" and enabling electric car sharing in a residential neighbourhood.

The European GreenCharge project is funded by the Horizon 2020 research program and is part of the CIVITAS initiative for clean urban transport.

GreenCharge starts with looking at charging infrastructure as a requirement to promote the electrification of transport. But the focus goes beyond pure technical aspects of charging – rather looking at steps to achieve one of the dreams of modern cities: a zero emission transport system based on electric vehicles running on green energy, with traffic jams and parking problems becoming things of the past. Electric mobility is relevant not only to reducing road transport emissions but also to supporting a modal shift towards less space-consuming modes. Only by creating an appropriate mix supported by well-developed renewable energy systems will mobility become truly sustainable.

www.greencharge2020.eu

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The SUMP guidelines are available for download on the website of ELTIS -the urban mobility observatory **www.eltis.org**

GreenCharge project partners:

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