ITS4C Congress

Smart Mobility for Climate

17 - 19 September 2019

Decarbonisation Toolbox
WORKSHOP 6

6 Deployment Enablers

The ITS for Climate initiative (ITS4C) was established in 2015 during the ITS world Congress held in Bordeaux, under the leadership of the Nouvelle-Aquitaine Region in France to highlight the potential contribution to the reduction of CO_2 emissions of Intelligent Transportation Systems (ITS) and smart mobility innovations. In 2019, 32 Climate and Mobility experts set out to provide a "Decarbonization Toolbox» for cities, regions, national governments as well as for the ITS community and all stakeholders in the transport & mobility sector. This work was presented during the ITS4Climate Congress in Bordeaux.

www.its4climate.eu

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Highlights

Introduction

This briefing paper addresses the non-technology enablers that can help ensure widespread take-up of ITS and smart mobility tools by stakeholders across Europe.

These are presented in the following sections:

- Policy, Legislation and Regulation;
- Economics and Finance;
- Replication and Planning;
- Changing Behaviour;
- Sharing and Communicating Knowledge.

Policy, Legislation and Regulation

Policy, legislation and regulations set at national and supra-national levels set the framework through which cities and regions deliver their carbon reduction targets. These tools can act as a positive catalyst for change such as through subsidies for electric vehicles or through restrictions imposed, such as low emission zones. They can help accelerate the transition to smart mobility and ITS and hence contribute to carbon reductions overall.

In equal measure, from a public authority perspective, ITS can also be a tool to help implement local policy and further a municipality's transport, health and environmental objectives. For example, in order to make public transport a more attractive option, ITS solutions such as integrated information and payment and bus priority at traffic lights can be implemented.

Global

Paris Climate Agreement

At the COP21 in 2015, the Paris Agreement set international and long-term goals to tackle climate change, namely to limit rises in global temperatures below 2 degrees centigrade with the aim to limit it to 1.5 degree. It foresees increased adaptation and resilience to climate change and the growth of low-carbon and sustainable development. In 2018 countries agreed on the Paris Agreement Rulebook which set out the processes through which these goals can be reached, namely through the Nationally Determined Contributions (national climate action plans). Sixty per cent of countries' NDCs (from a total of 193) include listed measures relating to emissions mitigation although only 10% provide mitigation targets[1].
COP25 takes place in December 2019 in Chile with transport expected to play an ever-growing level of importance being the third largest source of carbon emissions. The Partnership on Sustainable, Low Carbon Transport (SLoCaT) sets out in its Transport and Climate Change Global Status Report 2018 that transport sector CO_2 direct emissions increased 29% (from 5.8 Gt to 7.5 gigatonnes (Gt)) between 2000 and 2016, illustrating how much more progress needs to be made.[2]

Agreements on United Nations Vehicles Regulations.*

The World Harmonized Light-Duty Vehicles Test Procedure) WLTP is a global, harmonized evaluation system for determining the levels of pollutants, CO_2 emissions and fuel consumption of traditional and hybrid cars, as well as the range of fully electric vehicles. This updated procedure was developed by the United Nations Economic Commission for Europe (UNECE) and provides a more reliable and realistic measurement than the former European driving cycle (NEDC) which was agreed to be in need of updating. The European Commission adopted the WLTP in 2017.

European Union

Overview of EU objectives

The EU is a world leader in setting ambitious objectives to enable clean energy transition and the reduction in Greenhouse Gas emissions. It has already set a target of 40% reduction (on 1990 levels) by 2030 and 60% by 2050.

The EU supports the move towards digitalisation, data sharing and interoperable standards in order to engender a more efficient mobility system. It promotes (cooperative) intelligent transport systems, infrastructure for modal shift and adequate road pricing. There are a number of key strategies and EU Directives which seek to enable smart mobility and

[1] - https://www.itf-oecd.org/sites/default/files/docs/transport-co2-paris-climate-agreement-ndcs.pdf p.21
[2] - http://slocat.net/sites/default/files/slocat_transport-and-climate-change-2018-web.pdf
* - http://www.unece.org/fileadmin/DAM/trans/doc/2016/wp29/ECE-TRANS-WP29-2016-069e.pdf

Policy, Legislation and Regulation

ITS, including enhancement of cross border activities.

EU Transport White Paper

In its pursuit of a competitive resource efficient transport system, the roadmap from 2011 sets a goal of no more conventionally fuelled cars in cities by 2050 and to cut carbon emissions in transport by 60% by the same date[3].

European Strategy for Low-Emission Mobility

The Commission's Low-Emission Mobility Strategy sets guiding principles to Member States to prepare for the future[4]. It states that "the delivery of this Strategy will very much depend on cities and local authorities [who are] already at the forefront in the shift to low-emission mobility":

- Increasing the efficiency of the transport system by making the most of digital technologies and smart pricing;
- Speeding up the deployment of low-emission alternative energy for transport, such as advanced biofuels, renewable electricity and removing obstacles to the electrification of transport.

Cities and local authorities are deemed as crucial delivery partners of this strategy and recognised as having already made significant progress in implementing active travel, public transport, shared mobility and low emissions vehicles to reduce congestion and pollution.

Clean Mobility Package

The Package comprises targets to help push the transition from conventional combustion-engine vehicles to low-and zero-emission vehicles. One such domain is on new targets for CO_2 standards:
CO_2 emission performance standards for cars and vans by 2030 will be 37.5% lower for cars and 31% lower for vans compared 2021 levels.

Clean Vehicles Directive

The Clean Vehicles Directive aims to promote clean mobility solutions in public procurement tenders and hence provide a boost in demand and deployment of clean mobility solutions[5].

Renewable Energy Directive

EU countries are required to draft 10-year National Energy & Climate Plans (NECPs) for 2021-2030, outlining how they will meet the new 32% renewable energy target by 2030[6].

Alternative Fuels Infrastructure Directive (& Action Plan)

A review is currently being conducted with Member States reporting back by November 2019 on implementation progress of their National Policy Frameworks (NPFs)[7]. The current assessment of NPFs show there have been shortcomings. The ambition is that all citizens are able to refuel everywhere in a seamless, easy manner across the EU. There is a need for an open market with interoperable services across borders.

ITS Directive

The Directive aims to establish interoperable and seamless ITS services while leaving Member States the freedom to decide which systems to invest in[8]. Digital technologies, especially Cooperative Intelligent Transport Systems (C-ITS),

[3] - https://ec.europa.eu/transport/themes/strategies/2011_white_paper_en
[4] - https://ec.europa.eu/transport/themes/strategies/news/2016-07-20-decarbonisation_en
[5] - https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0033
[6] - https://ec.europa.eu/energy/en/topics/renewable-energy/renewable-energy-directive
[7] - https://ec.europa.eu/transport/themes/urban/cpt_en

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have a huge potential to improve road safety as well as the efficiency and attractiveness of transport. The Commission wishes to stimulate the use of communication technologies which link vehicles together (V2V) and which link vehicles and infrastructure (V2I). Multimodal information specifications (specs A) were recently adopted and Member States must soon have the first phase in place (national access point and some static data). In December 2018, the EC adopted an ITS Directive work programme setting out how particular specifications or other activities (such as a study) are on their agenda up until 2022.

C-ITS Platform

Across 9 working groups, the C-ITS Platform develops policy recommendations and proposals for action for the Commission as well as other relevant actors along the C-ITS value chain. Provide dedicated financial and technical support for local authorities and public transport operators to invest in C-ITS related to local urban transport and mobility schemes influencing the modal split towards more sustainable urban traffic policies and modes[9].

Open Data and PSI Directive

This directive establishes rules relating to data opened up by public bodies. Formerly called the PSI Directive, its name was extended to include open data in its 2018 revision[10]. It proposes to mandate the opening up of certain data sets free of charge, including mobility data, although the latter would have to be instrumented through a specific regulation (implementing or delegated act).

National

Net Zero Carbon 2050

At the national level a number of EU Member States have committed to net zero carbon emissions by 2050. In May 2019 the UK's Committee on Climate Change reported their recommendations for the UK Government (adopted in June 2019) to set this goal which is in line with their commitment under the Paris Agreement. It goes much further than the Climate Change Act which came into law in 2008 binding the UK by law to reduce its carbon account by 80% by 2050 based on 1990 levels.

Alternative fuelled vehicles

Spain has enjoyed a booming hybrid electric vehicle market. HEV sales in Spain increased from 0.7% market share in 2010 to 5.7% by 2018, faster than most other EU nations. This has been driven largely by a series of push and pull regulations and incentives at the national, regional and local levels[11]. These include:

- Environmental car labelling, scrappage schemes, incentive programmes for purchasing low-emission vehicles, priority access to low-emission zones (LEZs), and discounts on parking and road tolls ;
- Substantial tax exemptions have been afforded to the purchaser, such as a one-time bonus on registration of between €2,500 and €6,000 ;

It is interesting that Spanish government has not set a binding CO_2 reduction target for the transport sector to meet EU 2030 goals. Despite this, there are various programmes and strategies defining local, regional, and national policies to reduce GHG emissions from transport. This shows the need for joined up action at all levels.

[8] - https://ec.europa.eu/transport/themes/its/road/action_plan_en
[9] - https://ec.europa.eu/transport/sites/transport/files/2017-09-c-its-platform-final-report.pdf p.61
[10] - https://ec.europa.eu/digital-single-market/en/proposal-revision-public-sector-information-psi-directive
[11] - https://theicct.org/sites/default/files/publications/ICCT_Spain_HEV_market_paper_20190524.1.pdf

Policy, Legislation and Regulation

Ban on Internal Combustion Engine Vehicles

Several countries have announced their intention to ban new internal combustion engine cars and vans from being sold from 2025 (Spain, Portugal, Austria), 2030 (Denmark, Germany, Ireland, Netherlands) and 2040 (France, UK). Thus far there is less evidence of related regulations yet being passed through respective parliaments[12] [13].

Electric and Hydrogen technology

National policy on taxation & incentives of alternative fuel vehicles is an important tool for achieving zero emission vehicle sales. Decarbonising cars, buses and freight vehicles is probably the biggest single measure that can be pursued to help the sector contribute to Paris Agreement targets. As such, EV models such as the 2017 Bus of the Year, Solaris Urbino electric and Hydrogen fuel cell trucks by Hyundai are providing more operational choice to the market[14] [15].

Local

Low Emission Zones

Low Emission Zones provide a framework through which city Mayors can reduce CO_2 and other emissions in urban areas, although the primary motivation is usually to reduce pollutants and keep within legal air quality levels. Access is often controlled through Automated Number Plate Recognition (ANPR) Cameras which helps enforcement and maximises revenue for the city.

A review of air quality improvements before and after the implementation of Lisbon's Low Emission Zone phase 2 showed that - between 2011 and 2013 – there was a reduction in the annual average concentration of PM10 of 23% and of NO_2 annual average concentrations of 12%, compared with the year 2011[16].

In the case of London, Ellison et al., 2013, showed that one impact of the low emission zones was to enhance fleet turnover (the low emission zone implementation 'cleaned' the circulating fleet)[17]. But in terms of impact of concentrations, they found particulate matter falling by approximately 3% in the low emission zone, and no discernible impact on NOx concentrations.

Milan's Ecopass system was introduced in 2008 and reduced CO2 by 9% as well as PM10 by 19%. When the Area C was introduced in 2012 with tougher restrictions, traffic emissions reduced further with CO_2 falling by 22% and PM10 by 18%[18].

In many cases the LEZs were introduced as a city's response to breaching the EU's Air Quality Directive. This is a good example of EU regulation acting as an effective top down approach, promoting action in SUMPs developed at the local level. In fact, CO_2 reduction is usually a welcome side-effect of air quality-driven measures rather than the primary objective. Cities are using sensor-controlled traffic lights to detect traffic levels and adjust the signal timings to manage queues, give buses priority and dynamically alleviate emission hotspots. This shows how ITS can enable a municipality's policies and objectives to fulfil their full potential to help decarbonise cities.

Fiscal Incentives

The UK government offers a tax exemption allowing employers to loan bikes and safety equipment to employees as a tax-free benefit. According to data from the Cycle to Work Alliance, over 550,000 employees used the scheme in its first

[12] - https://www.greentechmedia.com/articles/read/how-internal-combustion-engines-will-die-out-in-eurasia#gs.mhkpp5
[13] - https://qz.com/1341155/nine-countries-say-they-will-ban-internal-combustion-engines-none-have-a-law-to-do-so/
[14] -https://www.solarisbus.com/en/vehicles/zero-emissions/urbino-electric
[15] -https://www.hyundai.news/eu/brand/hyundai-motor-and-h2-energy-to-establish-hyundai-hydrogen-mobility/
[16] - https://www.sciencedirect.com/science/article/pii/S1352231015304064

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5 years (1999-2014). When surveyed 67% of them said they would use their car to commute to work if they did not cycle. As such these commuters stand for emission savings of 112,210 tonnes of CO_2 per year, all thanks to a national level fiscal incentive. For this to succeed, companies are still obliged to opt into the loan scheme, and so through pressure from their staff, or of their own accord, this system (replicated in different ways in many countries) has succeeded from combining a bottom up and top down approach[19].

In Belgium commuters benefit from an obligatory tax-free reimbursement of at least 75% of the costs for public transport if provided by their employer. In the UK, company vehicles are considered as taxable benefit, but with the percentage based upon the CO_2 emissions of that vehicle. This therefore acts as a fiscal incentive for employees to choose lower or zero emissions vehicles[20].

However, there is still a long way to go. The example of Belgium shows that the budgetary impact of fiscal incentives for cycling is very limited compared to the fiscal subsidy for company car: while €70 million are given every year by companies to cyclists in Belgium for their work/home cycling trips, €4 billion are given every year by companies to workers in the form of company cars[21].

Figure 1 - CityMapper Pass : MaaS in London

[17] - https://www.researchgate.net/publication/277441957_Five_years_of_London's_low_emission_zone_Effects_on_vehicle_fleet_composition_and_air_quality
[18] - https://urbanaccessregulations.eu/low-emission-zones-main/impact-of-low-emission-zones#London
[19] - https://ecf.com/sites/ecf.com/files/141117-Commuting-Who-Pays-The-Bill_2.pdf
[20] - https://ecf.com/sites/ecf.com/files/141117-Commuting-Who-Pays-The-Bill_2.pdf
[21] - https://ecf.com/sites/ecf.com/files/141117-Commuting-Who-Pays-The-Bill_2.pdf

Policy, Legislation and Regulation

Open Data

In London, all Transport for London public data is freely released for developers to apply in their own software and services. TfL therefore encourages software developers to present customer travel information in innovative ways – including respective CO_2 emissions – in accordance with transport data terms and conditions. This can help incentivise behaviour change, through varying messages tailored to different users. It is through Open Data that Citymapper is able to offer a user-friendly journey planning service in dozens of cities worldwide. In 2019 the Citymapper Pass was launched in London offering users a real Mobility as a Service function, comprising multiple modes, where public transport is priced cheaper than through the transport operator itself.[22]

According to the Open Data Barometer which covers 115 countries, at a national level there is a significant difference in levels of data which are free, machine readable, and under an open licence[23]. Leading countries include the UK, France, Republic of Korea, Australia, Mexico and Canada.
Regulations pertaining to the sale of public transport tickets by third parties are an important factor when moving towards MaaS systems. In some countries it is not permitted for public transport tickets to be resold by third parties which can be a hurdle. In Sweden, a MaaS pilot led by UbiGo was relaunched only after it was made possible by Stockholm Public Transport (SL) to open up their systems for digital reselling and bundling of services[24].

Multi-sector policy cooperation

Healthy Streets for London, adopted in 2017, sets out 10 performance indicators which help guide the design of public spaces and streets, to make them more geared towards walking, cycling and public transport. It puts health outcomes at the forefront of transport and mobility infrastructure investment decisions. By linking the policy areas of transport, environment and health in this way, as well as the planning system overall, it is anticipated this will unlock more finance and lead to more joined-up and sustained investment in healthy streets[25]. This also provides stronger Cost Benefit Analyses for investing in active travel infrastructure.

[22] - https://citymapper.com/pass
[23] - https://opendatabarometer.org/4thedition/report/
[24] - https://ubigo.me/about-ubigo-english/
[25] - http://content.tfl.gov.uk/healthy-streets-for-london.pdf

Economic and Financial

International Financial Institutions

Project finance is the main mechanism to finance transport projects. In general, debt financing and equity financing are the primary financing methods. Debt and/or equity are paid back from project cash flow. There are numerous initiatives where financing is being used to support Climate Action in Transport.

Project financing can take a number of forms but normally fall within the following categories:

- Debt financing:
    1) Loans:
        - International Financial Institutions (IFIs) :
            European Investment Bank (EIB)
            World Bank Group
            European Bank for Reconstruction and Development (EBRD)
            Asian Development Bank (ADB)
            African Development Bank (AfDB)
            Inter-American Development Bank (IADB/IDB)
            Islamic Development Bank (IsDB)
            New Development Bank (NDB)
            Asian Infrastructure Investment Bank (AIIB)
        - National Promotional Banks and Institutions (NPBIs)/Public Investment Banks
        - Private Banks
    2) Bonds

- Grants

- Equity financing:
    1) Equity funds
    2) Venture capital

- Public Private Partnerships (PPPs)

- Guarantees

For the purposes of this briefing paper we present some of the programmes being run by International Financial Institutions (IFIs) which pursue climate objectives.

EIB - https://www.eib.org/en/products/loans/index.htm
WORLD BANK GROUP - https://www.worldbank.org/
EBRD - https://www.ebrd.com/work-with-us/project-finance.html
ADB - https://www.adb.org/site/public-sector-financing/main
AfDB - https://www.afdb.org/en/projects-and-operations/financial-products
IADB/IDB - https://www.iadb.org/en/about-us/idb-financing/public-sector-financing
IsDB - https://www.isdb.org/
NDB - https://www.ndb.int/
AIIB - https://www.aiib.org/

Economic and Financial

EIB

Financing transport projects contributing to climate action is a key priority of the European Investment Bank. The EIB is committing at least 25% of its investments to climate change mitigation and adaptation, supporting low-carbon and climate-resilient growth. In 2018, the EIB allocated €16.2 billion to the climate action investments, comprising 29% of the Bank's financing. **Transport is the largest sector receiving €6 billion EIB finance.**[26]

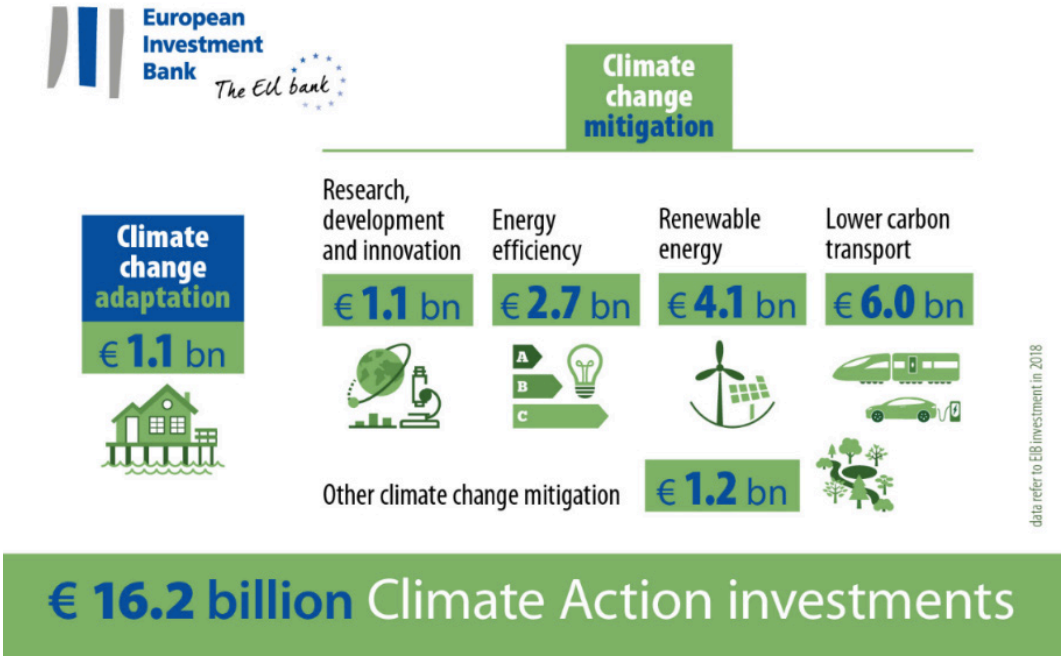

Figure 2 - EIB's Climate Action Investments[27]
Source: www.eib.org/en/projects/priorities/climate-and-environment/climate-action/index.htm

ELENA is a joint initiative of the EIB and the European Commission to provide grants for technical assistance in energy efficient transport and mobility measures in urban areas[28]. Smart mobility projects are eligible for the ELENA grant. The grant is used to finance costs related to feasibility and market studies, programme structuring, business plans, energy audits and financial structuring, as well as to the preparation of tendering procedures, contractual arrangements and project implementation units.

World Bank

The World Bank is to make about $200bn (£157bn) available to fund action on climate change from 2021-25, helping countries adapt to the effects of warming and reduce greenhouse gas emissions. The sum represents a doubling of the five-year investment plan put in place after the landmark Paris Agreement of 2015[29].

[26] - EIB Climate Action Signatures (2018) https://www.eib.org/attachments/registers/92782519.pdf
[27] - https://www.eib.org/en/projects/priorities/climate-and-environment/climate-action/index.htm
[28] - https://www.eib.org/en/products/advising/elena/index.htm
[29] - https://www.theguardian.com/environment/2018/dec/03/world-bank-invest-climate-change

Economic and Financial

EBRD

The EBRD Green Cities is a program helping cities in the EBRD region to cope with the key environmental challenges they are facing[30] [31]. EBRD has committed over €1 billion funds to mobilize green city investments. Low emission transport is one of the priority areas with the Program addressing emissions reduction.

Project Appraisal

Smart mobility projects have the potential to improve transport efficiency – therefore contributing to reducing transport-related emissions. This benefit should be monetized using internationally accepted methods. In order to make sure that the projects that are subject to EIB financing contribute to society, the EIB calculates economic returns. Monetizing wider economic benefits of projects including reduced emissions (in particular, carbon emissions) is an important part of the project appraisal[32].

The Report of the High-Level Commission on Carbon Prices (supported by the French Government and the World Bank Group) explores how countries implement carbon pricing[33]. In order to achieve Paris Agreement temperature targets, the report proposes to use US$40–80/$tCO_2$ by 2020 and US$50–100/$tCO_2$ by 2030 for carbon pricing.

Grants

Through a variety of funding programmes including the European Regional Development Fund[34], Cohesion Fund[35], Horizon 2020[36], Interreg Europe[37] and the Connecting Europe Facility[38], the EU makes funding available for cities to develop, demonstrate and evaluate smart mobility, infrastructure and ITS projects with potential carbon emission reductions often a key performance indicator.

The EU's ELTIS website provides a further overview of Funding and Financing Options for Sustainable Urban Mobility[39].

Business models

The sharing economy can be instrumental in developing sustainable business models in smart mobility. There are some promising models in this regard:

• **EV Car Sharing** schemes offer short-term car rental to people (generally) for short distances. When car sharing schemes are complementary to the public transport services, they can be an effective tool for cities to reach their sustainability goals, particularly in terms of reducing private car ownership and the need for parking spaces, and improving public transport accessibility;

• **Mobility as a Service (MaaS)** offers travellers a single mobility service that can be tailored according to the mobility needs of individuals[40]. It is mainly a digital platform providing mobility options with an integrated payment system;

• **Traffic Management as a Service (TMaaS)** is another emerging business model in smart mobility[41]. It aims at using available traffic information (sensor data, floating car data, social media, etc.) as much as possible in order to provide

[30] - https://www.ebrdgreencities.com/
[31] - https://www.ebrd.com/where-we-are.html
[32] - https://www.eib.org/attachments/thematic/economic_appraisal_of_investment_projects_en.pdf
[33] - https://www.carbonpricingleadership.org/s/CarbonPricing_FullReport.pdf
[34] - https://ec.europa.eu/regional_policy/en/funding/erdf/
[35] - https://ec.europa.eu/regional_policy/en/funding/cohesion-fund/
[36] - https://ec.europa.eu/programmes/horizon2020/en
[37] - https://interreg.eu/about-interreg/
[38] - https://ec.europa.eu/inea/en/connecting-europe-facility

traffic management services to the cities. Currently this concept is tested in the City of Ghent and a number of cities within an EU funded project. See for further information.

The Mayor of London has an ambitious green growth agenda. This involves developing zero-emission taxis and buses and GPS-based geo-fencing to switch hybrid vehicles to zero emissions drive cycles. These measures have economic benefits, with the ultra-low emission vehicle sector in London generating £1.3 billion in sales, supporting nearly 600 companies (across the supply chain) and around 9,000 jobs[42]. Improved air pollution concentrations will also have a significant health benefit. For every 1ug/m3 of air pollutant concentrations that are reduced, there is an estimated 2.5 months gain in life expectancy which itself has an economic impact[43].

Fiscal measures

The world's best-known carbon tax to carry that name began in the European Union in 2005, with the Emissions Trading System. With initial success the price of pollution permits reached more than €20 ($22/£18) for the right to emit a ton of carbon. But heavy lobbying by industry led to a massive oversupply of permits and a price crash to €3 in 2013 – far too low to drive carbon cuts. Reforms have taken the price back above €20 by 2018[44].
Based on the findings of a review of vehicle taxation policy across Europe by Wappelhorst, the International Council on Clean Transportation makes the following recommendations on how governments might encourage the purchase of low-emission passenger cars via taxation policy[45] :

- Create significant tax advantages for low-emission vehicles at the point of purchase;
- Ensure continued tax benefits for low-emission vehicles during their use;
- Account for the emissions of a vehicle as part of the company-car tax system;
- Balance and regularly re-adjust the tax system to be self-sustaining.

Carbon currencies

Community and carbon currencies can help incentivise green behaviour. Carbon currencies can give consumers a real feel of carbon cost and hence drive behaviour change more effectively than through traditional approaches like taxation.

Most citizens agree that climate change is a serious threat and that reducing CO_2 emissions has priority. Nevertheless, they do not always know how to act in a sustainable way. For many, climate change is an abstract concept, and a significant minority even deny its reality. The scale of the problem can be overwhelming, making people passive rather than actively invoking new behaviour. As consumers, people often make choices inconsistent with their role and duty as a citizen.

The Qoin Foundation for example helps to introduce and manage professional community currencies such as the Brixton Pound in London[46] [47]. They can help provide cities, governments and local businesses with ways to systematically reduce carbon emissions by greening their supply chains, circularizing the economy and incentivising behaviour change through shop discounts and donations.

CarbonQoin (working title) is a concept for a Green City Currency. It changes current consumption patterns and daily behaviour in a sustainable way by incentivizing citizens to buy services and products with a lower climate impact and cleaner mobility.

[39] - https://www.eltis.org/sites/default/files/funding_and_financing_options_for_sustainable_urban_mobility.pdf
[40] - https://maas-alliance.eu/
[41] - https://drive.tmaas.eu/
[42] - https://www.c40.org/profiles/2014-london-air
[43] - https://www.c40.org/profiles/2014-london-air
[44] - https://www.theguardian.com/world/2018/dec/04/how-to-make-a-carbon-tax-popular-give-the-profits-to-the-people
[45] - https://theicct.org/sites/default/files/publications/EU_vehicle_taxation_Report_20181214_0.pdf

Economic and Financial

The online platform provides systems such as:

- Green Civic Rewards: Governments, Institutions, & Community Groups reward those who perform desired behaviours with Carbon-Qoin. Examples are cleaner transport (cycling, public transport, e-transport), waste separation and reduction.
- Green Loyalty rewards: the Platform is an innovative demand-generation & payment toolkit that offers customers higher rewards for green purchases. Merchants accept CarbonQoin as payment for (green) products. Examples are green labels & product-groups, circular (second hand, rent, repairs), insulation and water saving, green electricity, and top 20% Energy Label appliances.

In future perhaps, personal carbon budgets might be award to every citizen (covering use of transport, food consumption, energy use at home etc). A market could then establish whereby users would be able to trade deficits or surpluses for their carbon emissions.

[46] - https://www.qoin.foundation/
[47] - http://brixtonpound.org/learn-more

Replication and Planning

A number of frameworks are in place which seek to provide guidelines and support tools to help cities deliver long term sustainable urban mobility policies. The scope to transfer ICT and smart mobility measures from city to city - or continent to continent – is vast. Not just individual tools and technologies, but also broader city-wide sustainable mobility strategies can be replicated, especially if based on an online platform to share data and services.

Sustainable Urban Mobility Plans (SUMPs)

The EU's guide for developing and implementing a **Sustainable Urban Mobility Plan (SUMP)** was published in 2015 and provides urban transport and mobility practitioners and other stakeholders the framework to deliver their SUMPs, meeting needs of citizens and business[48]. The guidelines are under review, with the public draft available online and presented at the SUMP Conference 17-18 June 2019. Further guidance documents are expected with one entitled "**Intelligent Transport Systems (ITS) in sustainable urban mobility planning**" (available since 2 October 2019).

An exercise to evaluate the impact of SUMPs on urban background air quality was performed by Pisoni et al., (2019)[49]. It found SUMPs are an important policy instrument to improve mobility and quality of life at urban level. However, the results from a simulated a scenario, in which 642 urban areas in Europe implement a SUMP, showed only a modest air quality improvement: a decrease in PM2.5 of no more than 2%, and of NO_2 urban background concentration of 4%. There is much more scope for SUMPs to be used to measure and meet targets on CO_2 reduction, in addition to their current focus on pollutant emissions.

Covenant of Mayors and the Sustainable Energy and Climate Action Plans (SECAPs)

In 2008, the EC launched the Covenant of Mayors (CoM) initiative, which was later formally merged with the global Compact of Mayors, creating the Global Covenant of Mayors (GCoM). Today, GCoM includes 9261 cities, 8800 of which are in Europe. It is estimated that the aggregated potential of GCoM could reach annual reductions of 1.4 $GtCO_2$-eq (gigatonnes of equivalent carbon dioxide) in 2030 and 2.8 $GtCO_2$-eq in 2050.

The European Covenant of Mayors movement involves local and regional authorities that voluntarily commit to increase energy efficiency and use of renewable energy sources on their territories[50] [51]. By their commitment, Covenant signatories aim to meet and exceed the European Union 20% CO_2 reduction objective by 2020. Progress on emissions reduction is monitored through the SECAPs, of which transport is a contributing component. In 2017 the EC conducted an assessment of the first 8 years of the Covenant of Mayors. An overall reduction by 23 % in GHG emissions is reported between the baseline and monitoring years of which 7% comes from the transport sector[52].

Green City Action Plans

OECD and global city network ICLEI have developed a methodology on behalf of the European Bank for Reconstruction and Development (EBRD) helping cities to develop their own **Green City Action Plan** (GCAP)[53]. Reducing pollution from urban transport is a key environmental dimension with CO_2 per capita a suggested key performance indicator. Currently, the program is operational in over 20 cities.

World Business Council for Sustainable Development (WBCSD): SiMPlify

SiMPlify is a global city-business collaboration to foster innovation for easy, safe and clean urban mobility systems for all. It is an initiative of WBCSD. SiMPlify's methodology is available for cities to use in developing more effective and inclusive sustainable urban mobility plans.

[48] - https://www.eltis.org/guidelines/second-edition-sump-guidelines
[49] - https://www.sciencedirect.com/science/article/pii/S0301479718311733#bib13
[50] - https://eumayors.eu/
[51] - https://www.covenantofmayors.eu/IMG/pdf/Covenant_ReportingGuidelines.pdf
[52] - https://ec.europa.eu/commission/sites/beta-political/files/covenant-mayors-8-year-assessment_en.pdf

Policy, Legislation and Regulation

SiMPlify has developed a set of sustainable urban mobility indicators that help describe sustainable mobility in cities. They have been endorsed by the European Commission and are both quantitative and qualitative[54]. The online mobility tool supports cities with 200 mobility solutions allowing for the generation of a city mobility plan[55]. The online tool creates a spider chart that provides an overview of strengths and weaknesses of the mobility situation in a city.

The outcome is an integrated solutions portfolio based on global best practice and matching local priorities. The system of indicators and solutions proposed by the SiMPlify mobility tool has been developed via an extensive consultative process with independent experts worldwide[56].

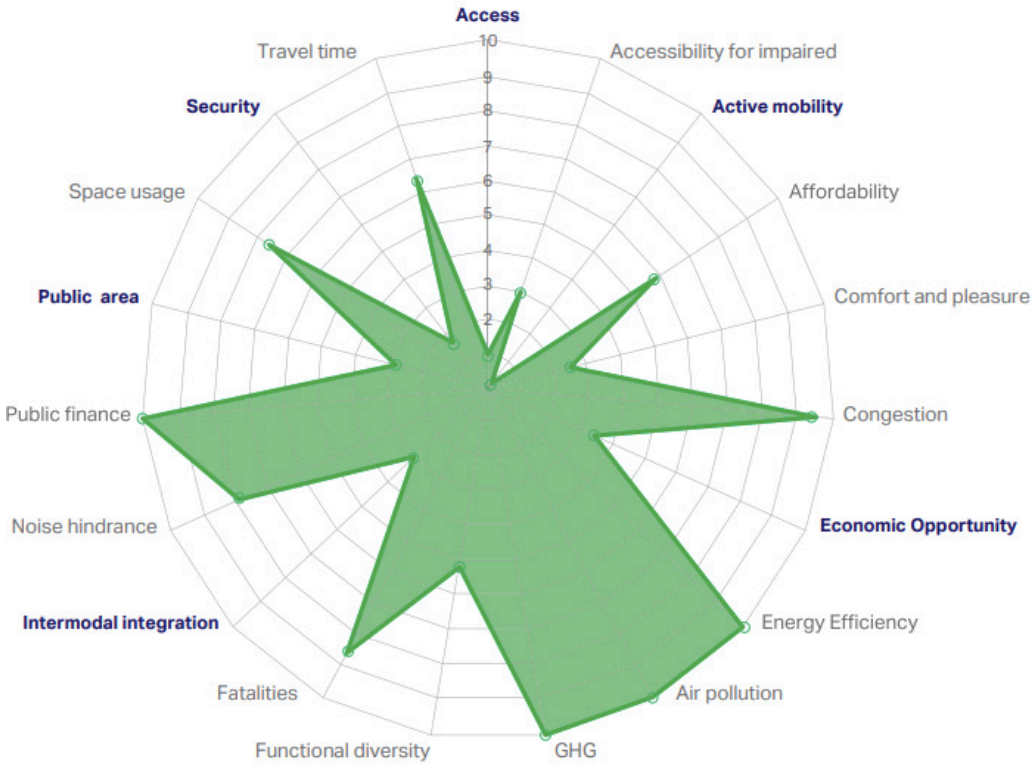

Figure 3 - SiMPlify at work[57]
Source: docs.wbcsd.org/2019/06/WBCSD-Inclusive_Sustainable_Urban_Mobility_Planning.pdf

[53] - www.ebrdgreencities.com/assets/Uploads/PDF/436b87ef46/Green-City-Action-Plan-Methodology-English.pdf
[54] - /www.wbcsd.org/Programs/Cities-and-Mobility/Transforming-Mobility/SiMPlify/News/The-European-Commission-endorses-WBCSD-set-of-indicators-to-help-cities-advance-sustainable-mobility
[55] - www.wbcsdsmp.org
[56] - www.wbcsd.org/Programs/Cities-and-Mobility/Transforming-Mobility/SiMPlify

Policy, Legislation and Regulation

This shows the 19 indicators in the SiMPlify methodology which helped the Brazilian city of Feira to develop an inclusive mobility vision, by enabling stakeholder engagement and citizen participation.

The WBCSD has also developed **the Transport Decarbonization Toolbox** which provides tools to support transport stakeholders to identify measures which can be implemented to contribute to limiting the global warming "well below 2°C" as agreed in the Paris Agreement, whilst aligning with national and sector-specific objectives.[58]

Delivering urban planning under zero-carbon constraints

How new residential developments are designed can help contribute to carbon reduction in surrounding transport and mobility. Mobility hubs are a new innovation comprising smart and zero emission interchanges where users can pick up or switch mode (EV car share, bike share, EV bike share, EV charging points...) as alternatives to using private car.[59] These can be sited in town centres or designed into new developments and there is growing interest from developers, architects, municipalities, transport planning consultancies and service providers to work together, using ITS to give users real time information and payment via apps. Residential deliveries by electric ground drones might also eliminate emissions for last mile logistics.[60]

Figure 4 - Mobility Hub[61]
Source: mobihubs.eu/functions/

[57] - https://docs.wbcsd.org/2019/06/WBCSD-Inclusive_Sustainable_Urban_Mobility_Planning.pdf
[58] - https://www.wbcsd.org/contentwbc/download/6203/86221
[59] - https://northsearegion.eu/share-north/news/new-concept-in-flanders-mobihubs/
[60] - https://www.starship.xyz/

Policy, Legislation and Regulation

Arthur D. Little's Urban Mobility Index 3.0 assesses the mobility maturity, innovation and performance of 100 cities worldwide. With a global average score of 42.3/100, it shows most cities have only deployed half the potential of their urban mobility systems, with much scope to improve[62]. One of the main factors holding back change is that there is "...a lack of integration between transport modes, across different urban policies (environment, land planning, energy, social policy) and across regions, leading to sub-optimal outcome in terms of performance". The report is available from the Future Mobility Lab which also presents the key findings[63].

It is believed that the Internet of Things, designed for the intelligent use of resources, will transform a physical world into an information system world where sensors are linked together and connected over the Internet[64]. This may provide efficient and accurate ways for cities to monitor CO_2 emissions and the resulting impact of chosen policies and infrastructure measures.

National Energy and Climate Plans (NECPs)

EU Member States' National Energy and Climate Plans set out their integrated climate and energy objectives, targets, policies and measures, covering the five dimensions of the Energy Union for the period 2021 to 2030[65] [66]. One of these dimensions 'Climate action - decarbonising the economy' sets out policies to cut emissions to help fulfil the EU's commitments to the Paris Agreement. Within the transport emissions component there is a priority action for cities to increase the efficiency of the transport system by making the most of digital technologies[67]. The final plans from each Member State will be submitted to the EC by December 2019.

National Urban Mobility Plans (NUMP)

Such carbon reduction programmes are not reserved to EU nations. Countries like Brazil, India, Mexico and many others have developed dedicated national urban mobility policies. These provide a clear vision for improvement and development of sustainable urban transport. MobiliseYourCity supports 100 cities and 20 national governments in developing NUMPs through learning, training, building on existing local strategies, to reduce Green House Gas emissions[68]. It is supported by UN HABITAT, the European Commission, ADEME, ARENE, the governments of France and Germany and more.

[61] - https://mobihubs.eu/functions/
[62] - https://www.adlittle.com/en/insights/viewpoints/future-mobility-30
[63] - https://www.adlittle.com/futuremobilitylab/
[64] - https://www.sciencedirect.com/science/article/pii/S0925527314002837
[65] - https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans
[66] - https://ec.europa.eu/commission/priorities/energy-union-and-climate_en
[67] - https://ec.europa.eu/clima/policies/transport_en
[68] - http://mobiliseyourcity.net/

Behaviour Change

Individual behaviour

ITS is giving citizens more choice, often making low emission mobility services more convenient and enabling them to change travel behaviour more easily. In the past, modal choice was based on the time versus cost model. Today, not only are there more modes and operators available, but also users expect to know their real time journey planning options at any given time of day or part of town, they want to be able to easily access multiple modes through a single smart card (e.g. the Dutch OV-chipkaart) or simply tap a contactless bank card, pay by smart phone or through a MaaS application (e.g. Citymapper Pass in London)[69] [70]. They are attracted by demand responsive transport services and seamless public transport interchange.

Users may be drawn to services that give discounts in local shops (Betterpoints), that reward active travel (Free2Cycle), or simply to compete against their peers to walk or cycling the most in any week (Strava)[71] [72] [73]. With ICT opening up the sharing economy, some car owners wish to share petrol costs for their commute (Faxi and Liftshare) or from longer journeys (BlablaCar)[74] [75] [76]. Commuters want to work whilst they travel (ViaVans), reduce their environmental impact (Car2Go) and younger generations may decide to share their ride just to get a chance to meet someone new (Uberpool) or try something new they can upload on social media (Lime eScooter, Lime eBike)[77] [78] [79] [80] [81].

The long-distance carpooling platform BlaBlaCar operates in 22 countries and its community totals 75 million people. It doubles the occupancy rate of cars. In 2018 a total of 1.6 million tonnes of CO_2 were saved by BlaBlaCar carpoolers thanks to the relative efficiency of filled cars versus alternative modes of transport[82].

Anyone using these alternatives may be changing their mobility patterns for economic, health, social or environmental reasons, or simply for convenience. In many of these ICT-enabled modal choices, the potential result can be a smaller carbon footprint, although this depends on the nature of the modes used.
Research in Thailand looked into the factors influencing the intention to use a contactless smartcard called Spider Card. The results revealed that perceived value, performance expectancy and facilitating conditions have a positive influence on passengers' intention to use the card. Perceived value (an integration of perceived convenience and perceived sacrifice) was the main determinant factor influencing behavioural intention[83].

Never before have there been so many and so convenient alternatives to car use in cities, enabled by new technologies. But to ensure this helps drive down carbon emissions, we need to help empower consumers to change travel behaviour in the right way. The focus should be on short car trips that can be made by zero emission alternatives. This will take cross sector cooperation.

It is known that the single most important factor in favour of car use in cities is ample and free (or low-cost) parking[84]. And in virtually all cities a significant portion of trips are relatively short. Precise comparisons are difficult because different countries report trip lengths differently[85] [86] [87] [88]. Bringing these two facts together it is clear that the focus should be on short car trips made by zero emission alternatives and by two-wheel vehicles using human or electric power. This will take courageous parking restraint policies and cross sector cooperation. And those micromobility solutions (shared bikes, shared e-scooters) are also having an important role in providing "last-mile" trips to and from mass transit by people who would otherwise drive to their destination for lack of parking capacity at those mass transit stations[89].

ITS can go beyond changing choice of mode, towards reorganizing our mobility chains. For instance, car-sharing has been shown in several cases[90] [91] to reduce car ownership and the number of trips and kms driven, in association with a reorganization of personal activities. Interesting developments have also emerged in the area of shopping, with many "click-and-collect" systems[92] [93] allowing car commuters to collect their shopping on the way home with little detour,

[69] - www.iamsterdam.com/en/plan-your-trip/getting-around/public-transport/public-transport-chip-card
[70] - https://www4.citymapper.com/pass
[71] - https://www.betterpoints.ltd/
[72] - https://www.free2cycle.com/
[73] - https://www.strava.com/
[74] - https://faxi.co.uk/corp
[75] - https://liftshare.com/uk
[76] - https://www.blablacar.fr/
[77] - https://www.viavan.com/

thus avoiding separate trips to the supermarket or for home delivery of goods ordered online.

Business behaviour

In Milton Park, Oxfordshire, UK, business leaders are supporting measures to encourage their staff to commute by carpool, by bike or at different times of day. Within two years this has already resulted in a modal shift of 6% away from single occupancy vehicles[94].

In the Paris region of Ile de France, the Versement Transport is a tax levied on the employers both private and public organisations as soon as they employ at least 11 employees. The tax is calculated as a percentage of wages and in 2017 contributed 42% of the financing of public transport operators[95].

The workplace parking levy scheme was introduced in Nottingham, UK, in 2012 and applies to large employer's parking at workplaces. It raised £25 million in the first three years of operation, which has funded improvements in the city's transport infrastructure, including a fleet of electric buses. Research indicates that the levy has contributed to a 33% fall in carbon emissions, and a modal shift which has seen public transport use rise to over 40%. Whilst this is a public sector initiative, it was done so through the engagement of local business[96].

According to The Future of Cities report, mobility in cities is one of the sectors that will change most in the future as a result of technological innovation and behaviour change[97]. It states that legislation and appropriate governance measures will be needed to ensure new transport modes complement rather than compete with public transport. In the future, more integrated urban transport solutions will make use of dedicated digital platforms to bring together all available means of transport combining, for example, PT with autonomous electric car sharing and short-term bicycle rental applications to offer Mobility as a Service (MaaS). Detailed evaluation is needed to monitor to what extent MaaS can enable decarbonisation of transport sector.

[78] - https://www.car2go.com
[79] - https://www.uber.com/en-GB/drive/resources/uberpool/
[80] - https://www.li.me/electric-scooter
[81] - https://www.li.me/electric-assist-bike 82 https://www.automotiveworld.com/articles/carpooling-where-business-and-environmental-needs-align/
[83] - https://www.mdpi.com/2076-328X/9/5/46/pdf
[84] - https://www.citylab.com/transportation/2016/02/commuting-driving-work-free-parking-transit-subsidy-benefits-parity-congress/462963/?utm_source=linkedin&utm_content=edit-promo&utm_medium=social&utm_campaign=citylab&utm_term=2019-04-08T14%3A17%3A55%3Futm_source%3Dfbb&fbclid=IwAR031hw0HbocqO6AUqE4cnDFa4lFYe6X741pT7DxWloUwoDh-gz42QKCjvc
[85] - https://www.epa.gov/greenvehicles/what-if-we-kept-our-cars-parked-trips-less-one-mile
[86] - https://www.polisnetwork.eu/publicdocuments/download/2398/document/urban-transport---the-short-trip-is-vital-michael-aherne.pdf
[87] - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/729521/national-travel-survey-2017.pdf p13
[88] - https://www.cerema.fr/fr/centre-ressources/newsletters/transflash/transflash-ndeg-398-juin-2015/chiffre-du-mois-40
[89] - https://www2.deloitte.com/insights/us/en/focus/future-of-mobility/micro-mobility-is-the-future-of-urban-transportation.html
[90] - http://www.urbanecology.org/environmental-benefits-car-sharing-revealed/
[91] - https://www.csmonitor.com/Environment/2016/0720/How-much-does-car-sharing-benefit-the-environment
[92] - https://www.visconlogistics.eu/fully-automated-pick-up-point-for-online-shopping/
[93] - https://www.idealo.co.uk/press/660-5-click-collect-services-that-will-make-your-life-easier-in-2015.html
[94] - https://www.miltonpark.co.uk/travel
[95] - www.eltis.org/sites/default/files/funding_and_financing_options_for_sustainable_urban_mobility.pdf p16
[96] - www.eltis.org/sites/default/files/funding_and_financing_options_for_sustainable_urban_mobility.pdf p15
[97] - https://urban.jrc.ec.europa.eu/thefutureofcities) p40

Sharing Knowledge

In the last two decades, the ambition of many cities goes beyond that of national governments' climate-change targets, while the IPCC Special Report on Global Warming of 1.5°C warns that current nationally-determined contributions for the Paris Agreement are insufficient. The question of how to build effective cooperation and collaboration amongst cities, businesses and solution providers is therefore of vital importance to accelerate innovative approaches to decarbonisation.

According to report The Future of Cities, opportunities, challenges and way forward[98].

• Cities are most effective at taking measures to tackle climate change when aligned with each other and with national- and regional-level actors with whom they can share greater climate ambition and capacity.
• Cities need support from their partners in national and regional governments, the private sector, academia, and civil society to fully meet and exceed these ambitious targets.

There are many existing networks and associations in the ITS/smart mobility arena, and many in the world of sustainability and climate.

There seems to be scope to better share knowledge regarding the impact of various sustainability tools and measures on CO_2 reduction. Our aim is to identify the successful examples of such networks, to help enlarge the impact to a far larger number of cities, businesses and other key stakeholders.

Networks and associations in this field include: ICLEI, POLIS, World Business Council for Sustainable Development, MobiliseYourCity, C40 Cities , SLoCaT, Eltis, CIVITAS, EBRD Green Cities, Open & Agile Smart Cities, Under2 Coalition and many more. Their services and resources include workshops, conferences, study visits, best practice guidebooks and training programmes. Newsletters and mailings are a way of reaching out to a huge number of additional stakeholders, such as the Thinking Cities magazine (by POLIS and H3B Media)[99].
Global Covenant of Mayors for Climate and Energy: Innovate4Cities is a city-focused research and innovation initiative that addresses critical data, innovation and technological gaps to enable cities to take accelerated and more ambitious climate action. Co-developed by cities, city networks, scientists and research institutions, and leading private sector entities, the initiative focuses on the areas most critical to drive climate action in cities*.

[98] - https://urban.jrc.ec.europa.eu/thefutureofcities P84
[99] - https://www.polisnetwork.eu/thinkingcities
* - https://www.globalcovenantofmayors.org/our-initiatives/innovate4cities/

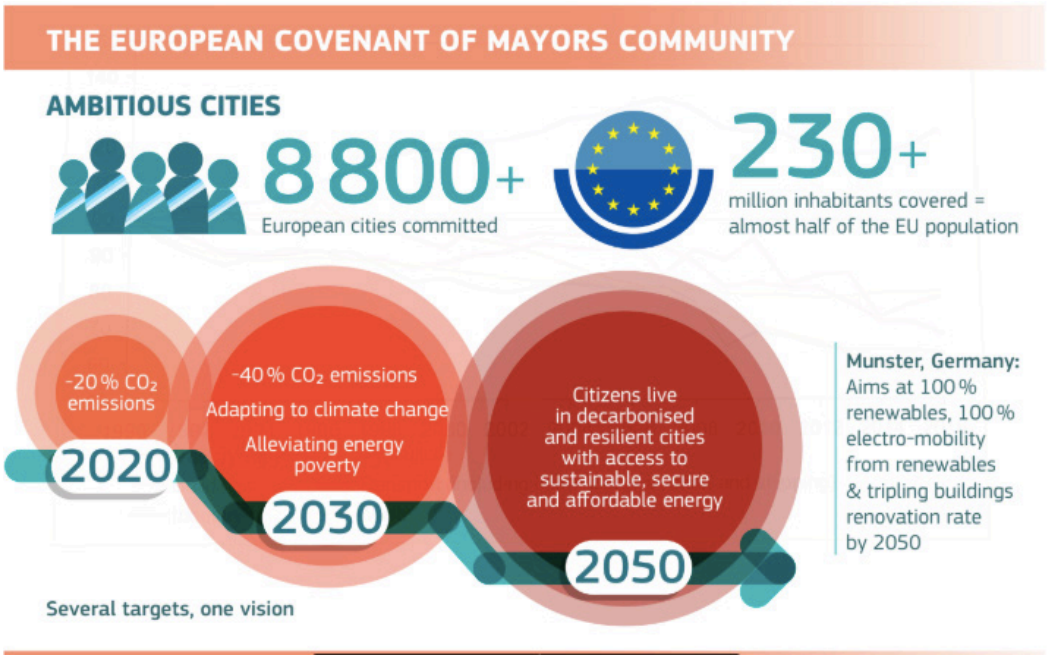

Figure 5 - The European Covenant of Mayors Community: targets and vision.
Source: European Covenant of Mayors, 2018, www.covenantofmayors.eu.

MobiliseYourCity

MobiliseYourCity concludes that the best way of enabling the implementation of SUMPs as a tool to reduce GHG emissions, is through an international network of partners which provide the following services. This followed engagement with 100 cities and 20 national governments[100].

Figure 6 - MobiliseYourCity – enabling SUMPs to reduce GHGs[101]

[100] - http://mobiliseyourcity.net/wp-content/uploads/sites/2/2018/08/MYC_GSR2018_SimplePages_Web.pdf
[101] - http://mobiliseyourcity.net/

Conclusions, recommendations and future discussion

Policy, legislation, regulation

There are many policies and regulations at International, European, National and Local levels which are positively enabling the environment for ITS and smart mobility for carbon reduction. However, there remains scope for better implementation and cross-sector and cross-border cooperation. ITS4Climate can add value here by providing a virtual toolbox communicated via a community of international networks.

Many EU Member States have set out ambitious targets of Net Zero Carbon by 2050, but a common EU-wide pledge has yet to be agreed.

The European Commission is supporting further digitalisation, ITS, road pricing and alternative fuels to engender a more efficient and less polluting mobility system.

Lobbying from the city level (and enforced through city networks) can help put pressure on national governments to be more ambitious with their Nationally Determined Contributions, agreed in 2018, responding to the Paris Agreement.

Despite growing EU sales in 2017, battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV) represent less than 1% respectively of new passenger car registrations in the EU[102]. There is scope therefore for cities (and private sector partners) to enable demand through adequate provision of EV charging points and working with energy stakeholders for smart grid applications to enable Vehicle 2 Grid systems.
Europe needs a common approach to EV infrastructure that avoids unnecessary duplication of charging infrastructure and seamless roaming and payment for drivers[103].

Low Emission Zones and Congestion Charging have proven successful in lowering GHG emissions although there is scope to make greater use of emerging ITS to make clean air zones function more effectively such as via GPS-based geo-fencing.

Open data is facilitating the advance towards Mobility as a Service. But cities should ensure that this does not lead to MaaS silos that offer competing services only available through specific providers. Also, we need more data to establish the potential for MaaS to encourage behavioural change and help decarbonise the mobility sector.

Discussion points

- What policies are in place that allow for CO_2 emission data at local level to be accurately fed up to national, EU and global level? Do these need strengthening.
- Which countries at national level link transport with climate and who is following up on the impact of the policy commitments.
- In the same way as Low Emission Zones, SUMPs or SECAPs, how can we measure the impact of other policies, regulations, governance on reducing CO_2 such that we can give recommendations to others ?
- Can we come up with a carbon quality mark to certain measures / policies indicating potential to reduce CO_2. Do we have data to do this ?
- Does the policy framework currently in place at EU, national, local levels exploit the full potential of ITS and smart mobility to help reduce (and measure) CO_2 ?
- To drive full take-up of EVs fuelled by clean energy, are transport and energy ministries collaborating to ensure sufficient and renewable energy sources are powering charging infrastructure ?

[102] - https://www.eea.europa.eu/themes/transport/term/term-briefing-2018
[103] - https://www.cisl.cam.ac.uk/resources/low-carbon-transformation-publications/electric-avenue-the-future-of-road-transport-in-europe

Conclusions, recommendations and future discussion

Replication and Planning

Assessments that have been conducted on the impact of Sustainable Urban Mobility Plans and Low Emission Zones have shown decreases in $PM_{2.5}$, NO_2 and CO_2 although there is much more potential for significant achievements in this field. Furthermore, there is scope for SUMPs to more explicitly set carbon reduction targets as part of their objectives which could in turn be a useful mechanism to report back to national level targets.
A review of SUMP impacts on emissions in Europe showed only a modest decrease in $PM_{2.5}$ of up to.
The Global Covenant of Mayors (GCoM) which includes 9261 cities estimates an aggregated potential of annual reductions of 1.4 $GtCO_2$-eq (gigatonnes of equivalent carbon dioxide) in 2030.

Off-the-shelf tools such as WBCSD's SiMPlify can help accelerate the speed at which cities can implement successful sustainable urban mobility plans by sharing good practices and building capacity.

Arthur D. Little's Urban Mobility Index 3.0 shows most cities have only deployed half the potential of their urban mobility systems. In order to improve performance there is a need for better integration between transport modes, across different urban policies (environment, land planning, energy, social policy) and across regions.

Discussion points
• There is a cornucopia of EU and global resources, guides and programmes available to cities to help speed up their transition to lower carbon transport sectors. As yet there is no apparent single platform housing all these worldwide tools. Is there a need for an ITS4Climate Decarbonisation Toolbox ?
• The Global Covenant of Mayors is an example where European and global countries are joining forces. However, many cities on the Covenant of Mayors website do not declare air quality or emissions data. Why is this? Do cities need more resources and knowhow in capturing data so it can be reported back to global framework ?

Behaviour Change

ITS can give citizens more choice, often making low emission mobility services more convenient and as such, enabling them to change travel behaviour more easily. This revolution has been seen in cities with the abundance of bike, eBike, DRT, ride hailing and car sharing schemes and emerging micro mobility options such as eScooters.

However, to ensure this helps drive down carbon emissions, we need to help empower consumers to change travel behaviour in the right way. The focus should be on replacing short car trips that can be made by zero emission alternatives with those being introduce in a managed way, and which improves road safety.
Apps can help incentivise or nudge "better" travel behaviour such as discounts in local shops rewarding active travel or through competing to cycle most in any week.

Business travel is equally important. Examples of workplace parking levies have proven to generate significant income for the municipality to invest in public transport enabling modal shift and thereby reducing emissions. Carpooling platforms have increased occupancy rates significantly reducing carbon emissions, as have cycle to work schemes.

Discussion points
• Do we need to look at the way in which behaviour change is monitored and evaluated to capture "real" carbon savings? Taking the topical example of MaaS, the recent Whim impact study has not provided evidence of a sustainable change in travel behaviour among Whim subscribers. But then it compares users with the average Helsinki resident rather than track the behaviour change before and after adopting Whim.
• How do we ensure that new mobility services like eBikes and eScooters are delivered in cities in a way that enhanced connectivity, replacing short car trips and improving road safety.

Conclusions, recommendations and future discussion

Sharing of Knowledge

In the last two decades, city ambition has risen remarkably to often go beyond that of national governments, often driven by air quality concerns. How can cities help to strengthen government ambitions?

Worldwide, there are an increasing number of transnational networks on climate actions driven by cities and local governments, such as the Global Covenant of Mayors for Climate and Energy. How can these international initiatives accelerate the implementation and increase the effectiveness of national and local policies?

Cities are most effective at taking measures to tackle climate change when aligned with each other and with national- and regional-level actors with whom they can share greater climate ambition and capacity. This shows the need for stronger city and regional networks.

The Transport Decarbonisation Alliance (TDA) has set out a manifesto on how to reach net zero emission mobility by 2050 through uniting countries, cities and companies ("the 3Cs")[104]:

- Step 1 : Establish a firm "net zero emission-mobility" target involving all stakeholders in a spirit of irreversible commitment ;
- Step 2 : Develop 3C governance at the different scales to steer and monitor the transformation;
- Step 3 : Spread homogeneous, effective tools to orchestrate the transition at the local, national and international levels;
- Step 4 : Open up pro-business initiatives to foster new services and new products;
- Step 5 : Promote international efforts to speed up the transition globally.

There may be value in greater collaboration between city, regional and multi-sector networks and associations such as POLIS, World Business Council for Sustainable Development, ICLEI, CIVITAS, MobiliseYourCity, C40 Cities, SLoCaT, Eltis, EBRD Green Cities, Open & Agile Smart Cities, Under2 Coalition and others. This could offer a powerhouse of dissemination potential for the ITS4C Decarbonisation Toolbox through existing channels or additional ones such as an online platform.

To help enable ITS Deployment we need to raise awareness of its role in delivering policy and evidence about its impact on emissions reduction. Some cities do not always have the capacity or resources to procure ITS or suffer from vendor lock-in.

Discussion points

- What is the scope for various networks collaborate in dissemination and capacity building activities
- To what extent does the Transport Decarbonisation Alliance manifesto offer a forward path to achieving the commitments of the Paris Agreement, through joint working between countries, cities and companies ? Can ITS4Climate make a valuable contribution ?
- Do cities have the skills and capacity to transfer and deliver smart mobility measures which reduce CO_2 ?
- How do we disseminate most effectively the ITS4C Decarbonisation Toolbox and put this in the hands of users: online platform, interactive, images, attractive, toolset with key recommendations etc. ?
- What scope is there to feed ITS4Climate recommendations into the ITS Committee shaping the priorities of the Horizon Europe 2021-2027 programmes ?
- Do we need to commence with a common definition of smart mobility[105]?

[104] - http://tda-mobility.org/wp-content/uploads/2018/12/EY_TDA-Manifesto.pdf
[105] -https://www.sciencedirect.com/science/article/pii/S096585641731090X

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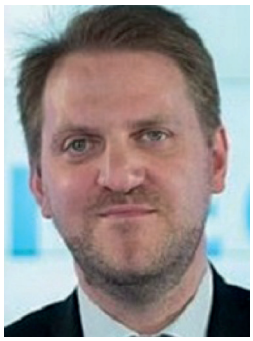
Prior to joining the ITF, José Viegas was Full Professor of Transportation at the University of Lisbon, where he was national Director of the Transport Area of the MIT-Portugal program, Head of Research Unit on Transport Infrastructure, Systems and Policy. He was coordinator of more than a dozen research projects for the European Commission between 1995 and 2010, and a member of the High-Level Advisory Group on Sustainable Mobility appointed by UN Secretary-General Ban-Ki Moon, 2015-2016.
He is currently a managing partner at José M Viegas consultores Lda, advising on Sustainable Mobility and Strategic Change, having been the Methodological Coordinator of the "Sustainable Mobility for All" project (lead organization: World Bank), and Responsible for the Strategic Framework concept of the "Transforming Urban Mobility" project at the WBCSD.



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Francois E. Guichard is the Secretary of the Working Party on Automated/Autonomous and Connected Vehicles. He is supervising the activities on technical regulations related to vehicle automation and vehicle connectivity. He is the Intelligent Transport Systems and Automated Driving focal point of the United Nations Economic Commission for Europe. Previously, he worked as line manager at Daimler AG, he advocated for the introduction of Advance Emergency Braking Systems (AEBS) in the legislation (a relevant contribution for increasing road safety). Before that, he advised a number of Countries on their strategies to tackle environmental issues after having gained experience as a noise / Greenhouse Gas / pollutants emission testing engineer. He started his career as International Management Associate at Mercedes-Benz, gaining experience in Germany, South Africa and in the United States of America.

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Ozhan Yilmaz is a smart transport specialist at the European Investment Bank (EIB), where he undertakes project appraisal and advising activities, as well as coordinating transport activities within the ELENA facility.
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CEO @City Currency Management Group
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* City Currency Fellowship - Cities are supported by auxiliary talent until they are trained, and have opportunities to consult with teams in the future.

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Suzanne HOADLEY,
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Suzanne is Senior Manager at Polis with responsibility for activities related to ITS and network management. She has worked at Polis since 2001. Her main task involves facilitating knowledge transfer and debate among Polis members on topical issues and emerging themes related to ITS and network management, including multi-modal network management, open data, open systems/ interoperability, C-ITS, automation and MaaS. Suzanne has edited policy papers on several of these themes, with the aim of bringing forward the views of Polis member cities and regions to the European institutions and other stakeholders. In addition, Suzanne coodinates Polis' involvement in European projects and represents Polis on various platforms including the EC's Connected, Cooperative and Automated Mobility (CCAM) platform and the Amsterdam Group.

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