SEEV4-City Policy Recommendations and Roadmap

Authors: Richard Kotter (Northumbria University), Bert Herteleer (Katholiek Universiteit Leuven), Sabina Asanova (POLIS), Robert van den Hoed (Hogeschool van Amsterdam), Jayson Dong (AVERE), Ghanim Putrus and Geoff Obrien (Northumbria University), Bronia Jablonska (Hogeschool van Amsterdam)

Participants: Chris Randall (Leicester City Council), Sture Portvik (Agency for Urban Environment, City of Oslo), Art van Giessen (Amsterdam City Council), Jaap Burger (Amsterdam City Council), Doede Bardok (Amsterdam City Council) and Marco Zilvetti (Northumbria University)

Date: 24 August 2020

Executive Summary

Sustainable Energy Action Planning (SEAP) /Sustainable Energy Climate Action Planning (SECAP) as well as Sustainable Urban Mobility Planning (SUMP) guidance and processes can both be characterised as policy-packages. They should be – but often are so far not as yet - integrated with each other. Increasing decarbonisation of energy production, generation, distribution, supply, and consumption (as well as temporary storage) is required alongside the move towards (ultra-) low carbon transport / mobility. Further integration still needs to be made in coupling the increasing electrification of as part of the move towards a "Smart Grid". The Smart Grid approach also entails an increase in distributed energy sources, and 'prosumers' which both produce and consume electricity, hence Electric Vehicle-for-Energy-Services need also to be considered and integrated in this approach.

In order to achieve a significant decarbonisation of transport, buildings, and electricity supply electricity systems need to be become much less dependent on fossil fuel use. The better integration of renewable energy (e.g. solar, wind, hydro) and electric transport therefore needs to be advanced and supported. The cost of production of renewable energy is increasingly declining and is becoming competitive with fossil fuel energy. In additional energy, autonomy may further reduce the cost of energy if based on locally produced renewable energy, including for transportation use in mobile electric vehicle batteries.

The SEAP and SECAP Covenant of Mayors guidelines and planning processes focus on the key assets of buildings, equipment and facilities – both municipal and third party/ non-council owned – as well as transport. The SUMP guidelines focus on 'functional' municipalities – so beyond their administrative boundaries, due to the traffic flows of both people and goods (including commercial logistics) with a regard to economic, technical, environmental and social sustainability. As they are the responsibility of the same local/regional public authorities, and the underlying logics in principle at least align, there not be conflict here in terms of overall objectives. However, the timelines and length of these plans so far typically differs, and they also often are prepared by different (lead) teams and departments in local and regional authorities.

The SEEV4-City project advocates the further and more holistic integration of these guidelines, planning processes and resultant plans. The aim is to eventually replaces those with ones that work across the transport/mobility and energy sectors, and integrated these into a concept termed Sustainable Urban Mobility and Energy Planning/Plans (SUMEP/s). This report explains the rationale for doing so. Some key public briefings and efforts of SEEV4-City partners on policy learnings are also documented.

This report sets out a number of policy recommendations. They cover the European Union and national levels in the (connected) domains of the regulatory framework, adopting a systems approach, standardisation and communication protocols, communication and awareness raising, user acceptability, business model development, as well as research and exchange of knowledge. Further policy recommendations are made to policy-makers are regional and local levels, in the (connected) domains of strategic planning, capacity-building, and empowering the consumer. Another set of recommendations is aimed at researchers and modelers. The recommendations are rounded off with overarching ones for practitioners on meeting technical requirements on Smart Charging and Vehicle-to-Grid Integration.

Finally, a suggestion for a Roadmap is offered. The precise roadmap depends on the current negotiations over a number of significant issues in the European Union over the next couple of years, including is budgets, plans, investments and programmes but also frameworks, strategies and regulation/legislation relevant to the sectors covered in the report. In addition, similar issues are to e (re-)negotiated over the new couple of years at national levels, including Norway as an EFTA member and also the UK post-Brexit.

Table of Contents

Glossary

AFID	Alternative Fuels Infrastructure Directive
BEI	Baseline CO_2 Emissions Inventory
BESS	Battery Energy Stationary Storage
CHAdeMO	CHArge de MOde: e-mobility collaboration platform around the CHAdeMO DC charging protocol
CoA	Court of Auditors
CPO	Charge Point Operator
CSS	Combined Charging System
CVD	Clean Vehicles Directive
DC	Direct Current
DNO	Distribution Network Operator
DSO	Distribution System Operator
EA	Energy Autonomy
EFTA	European Free Trade Association
ENPI	European Neighbourhood Partnership Instrument
EPR	Extended Producer Responsibility
ERDF	European Regional Development Fund
ETS	Emissions Trading System
EV	Electric Vehicle
GDPR	General Data Protection Regulation
GHG	Greenhouse Gas
ICE	Internal Combustion Engine
ICT	Information and Communications Technology
iEMS	Integrated Management System
KPI	Key Performance Indicator
LRA	Local and Regional Authority
LTP	Local Transport Plan
LV	Low Voltage
MFF	Multiannual Financial Framework
MTCO	Modified Total Cost of Ownership
MTCU	Modified Cost of Use
NGO	Non-Governmental Organisation
OCPP	Open Charge Point Protocol
OEM	Original Equipment Manufacturer
OLEV	Office for Low Emission Vehicles
OSCP	Open Smart Charging Protocol
PAYG	Pay-As-You-Go
PV	Photovoltaic
RES	Renewable Energy Source
RNP	Renewables Networking Platform

SEAP	Sustainable Energy Action Plan/Planning
SECAP	Sustainable Energy and Climate Action Planning/Plan
SUMEP	Sustainable Urban Mobility and Energy Planning/Plan
SUMP	Sustainable Urban Mobility Planning/Plan
TSO	Transmission System Operator
V1G	Grid to Vehicle
V2B	Vehicle to Business
V2G	Vehicle to Grid
V2X	Vehicle to Anything
V4ES	(electric) Vehicle for Energy Service (eV4ES)

1. Introduction

SEEV4-City is an innovative project funded by the EU Interreg North Sea Region (NSR) Programme. Its main objective is to demonstrate smart electric mobility solutions, integrating renewable-energy sources and encouraging take-up in cities through its Operational Pilots, (OPs) but also to go beyond that to analyse the systemic barriers and enablers between these different sectors and policy domains [1].

One of the Objectives and Deliverables (Work Package 5) of the SEEV4-City project is to establish progress towards the integration of Transport/Mobility Plans/Planning and Energy Plans/Planning, focussed in urban areas of different scale and sizes. It is clear from the SEEV4-City OP business models report that synergetic policy integration and enabling frameworks need to be fostered (further) between the domains of transport/mobility, energy (production, distribution and consumption) through not just technology, but also regulatory and policy frameworks and social/organisational innovations to encourage uptake of integrated solutions. Furthermore, the SEEV4-City project objectives also include the Key Performance Indicator (KPI) domains of a) CO_2 emissions reduction from both transport/mobility and its associated infrastructure/appliances as well as energy consumed, b) Energy Autonomy (Self-Consumption of, rather than necessarily Self-Sufficiency by locally generated Renewable Energy [2]), and c) so-called Zero-(tail-pipe) Emissions kms driven with (full) electric mobility. Please see the SEEV4-City OP Business Models, Upscaling and Transnationality, and KPI Methodology reports.

Current policies that are available at a European level, and in different modes encouraged, or even for some European countries mandated, for local and regional public authorities include, but are at national and regional/local level not restricted to or so far expressed necessarily in this exact modality, include planning processes and policy (including actual plans) frameworks, guidance and tools in the domains of transport/mobility as well as energy and climate change mitigation. These have been separately developed over the past couple of decades at European and national levels, and in part also from local level up - in line with Agenda 21 of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, in 1992, with full implementation of Agenda 21, the Programme for Further Implementation of Agenda 21 and the Commitments to the Rio principles strongly reaffirmed at the World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, in 2002 and still referenced in the current UN Sustainable Development Goals Knowledge Platform as relevant [3].

These separate approaches include, at European level but aimed at local and regional public authorities, Sustainable Energy Action Planning/Plans (SEAP/s), and consecutively as an extension SECAP/s, what might be called (as a suggested umbrella term for a range of types of local/regional urban plan and planning formats, often also compelled by the national level) but does not formally exist as a coherent format “Sustainable Urban Energy Planning/Plans” (or “SUEP/s”) as for instance advocated by UN Habitat (the focal point on sustainable urbanization and human settlements in the United Nations system) and ICLEI (a global network of Local Governments for Sustainability), for instance in their *Sustainable Urban Energy Planning: A Handbook for Cities and Towns in Developing Countries* of 2009. [4] Chapter 2 of this handbook provides some detail a step-by-step process to developing and implementing a sustainable energy plan, illustrated by relevant case studies. Furthermore, there has been an evolving planning framework at European level, aimed at local and regional public authorities, in the (largely ground) transport/mobility domain, namely the SUMP/s framework over roughly the same time horizon.

The SEEV4-City project (as well as a number of concluded and ongoing EU projects) has identified the need for a policy process that combines these hitherto largely disconnected planning and policy (including plans) domains across energy and climate change mitigation and transport/mobility. The SEEV4-City project has termed this approach and suggested process and instrument Sustainable Urban Mobility and Energy Planning/Plan (SUMEP).

The SEEV4-City project has, through the Operational Pilot experiences of its local and regional public authorities as full project partners (the cities of Amsterdam, Oslo, Leicester) or hosting an OP pilot (such as the City of Kortrijk), analysis by two (applied) higher education research institutions (Northumbria University and Amsterdam University of Applied Sciences) and two not-for-profit research-based consultancies (Cenex UK and Stichting Cenex Nederland) as well as two key European networks of POLIS and AVERE (as full SEEV4-City partners), worked through the current status of planning framework/guidance and plans to identify progress made and still needed at different levels for the effective integration of the domains of transport/mobility and energy/climate change mitigation.

The SEEV4-City project has accordingly developed, and verified with stakeholders through a Webinar in June 2020, a set of policy recommendations at different levels (European/EU, national, local and regional) and different actors (policy-makers and regulators, implementors, and also applied researchers) set out at the end of this report. This report also suggested a Roadmap towards addressing these Policy Recommendations for progress in the next 2-10 years (see also the SEEV4-City Upscaling and Transnationality report).

In the next chapters this SEEV4-City report provides a short overview of SEAP, SECAP guidance / principles, as well as the newly updated SUMP guidelines, and associated technical documents (topic guides and practitioner briefings).

This report also takes note of the SUMPS-Up (Civitas) and SIMPLA (H2020) project findings concerning the integration of SE(C)APs and SUMPs. Relevant support portals are the urban mobility observatory Eltis [1], and CIVITAS (Cleaner and better transport in cities) [2].

2. Towards integration of transport, urban planning and energy

As noted in the introduction, and in the funded SEEV4-City project application, as well as in the published SEEV4-City Summary and Full State of the Art reviews, there is a clear need to progress towards a further and more holistic integration of transport and energy planning in the context of urban/spatial planning, which encompasses all types of electrified infrastructures and electrical energy demands, production and consumption. This chapter of the report will set out a review of some of the notable current discussions and debates pertaining this, to set the scene for the need for integrated Sustainable Urban Mobility and Energy Planning/Plans. Some city case studies and highlighted projects external to the SEEV4-City project are drawn on here too to illustrated the currency of these discussions, debates and developments.

Chapter 3 of this report follows this with a more in-depth review of the current European guidance frameworks, namely SEAP/s, SECAP/s and also separately for the most part so far SUMP/s.

2.1. Review of current discussions and actions across Europe

As noted by Petersen and Reinert (2018: 475) [5, p. 475], in terms of cars transport and in principle for other vehicular transport, **a range of critical factors are primarily influential for energy consumption and CO2 emissions of transport**:

- The transport activity, that is the amount and length of distances that are / have to covered;
- The choice of transport mode, including the use of cars;
- The technology of the vehicles, in terms of concepts (size, weight etc.) as well as the degree of efficiency of the propulsion systems;
- The fuels or energy sources, where the entire production- and use chain is to be taken into consideration;
- The transport/traffic rules, which may induce or force automotive users (in)to ecologically undesirable driving behaviours;
- The infrastructures, where one has to consider the structure and condition of transport networks, as well as the spatial dimensions of the transport activities.

La Greca and Martinico (2016: 47) [6, p. 47] state that correctly that the **inclusion of energy issues in(to) urban planning has to be not solely considered as an environmental concern but also as a (new) urban policy, with effects on and implications also for public governance approaches and methods**. They further set out that "the implementation of the energy approach in spatial plans requires a complex mix of regulations and market stimulation tools. Many studies are dealing with this issue, which is wider than the sole energy consideration. Impacts of urbanization on urban structures and energy demand have to be considered according to four dimensions: urban production, mobility/ transports, infrastructure/ urban density and private households. The further suggest that "the relationship between spatial planning and energy can include the following categories:

- Operating on urban form and localization of urban functions;
- Introducing planning tools that include energy as a way of governing city and regions;
- Including green energy production in spatial plans."

[1] https://www.eltis.org/

[2] https://civitas.eu/about

Warnecke et al. (2019) [7] argue for an approach to develop an indicator-based approach following design science principles aimed at city administrations and practitioners that would assess public urban mobility initiatives according to their sustainability aspects. Stock (2016, p. 296) [8, p. 296] makes the point that there is a conceptual and definitional difference between mobility – which includes the potential as well as the actual movements and their social and spatial nature – and transport (or even more narrowly, traffic), which only includes the actually undertaken spatial movements/journeys. Wilde and Klinger (2017, p. 7) [9, p. 7] also set out some of the differences between the transport and mobility concepts, as summarised in Table 1.

Table 1: Typical differentiating features of the transport and mobility concepts
(Adapted from Wilde and Klinger (2017, p. 7) [9]

Transport	Mobility
Movement	Motility – the ability to actively move, socially and spatially
Physical	Physical – socially - cultural
Distances and paths as central measurement units	Activities and accessibility as central measurement units
Rather aggregated	Rather individualised
Often construction, infrastructural and planning problem formations/framings	Rather social and psychological problem formations/framings

More widely, Wilde and Klinger (2017) [9] discuss the typical differences between the scientific approaches taken by classic transport research (often economic, engineering or computing based) and social science mobility research, and the standard criticisms of the respective approaches. According to them these differences persist, but need to be discussed and overcome to a considerable degree, which they think is possible towards a necessary integrated mobility and transport research agenda and praxis. One should note that social science-based mobility research, notwithstanding the above diagnosed tendency to use aggregate data less, does often (for instance in sociological or human geography mobility and transport research) construct typologies of users or segmented categories and groups, such as is the case for Hille (2017) [10] in her research on e-carsharing users to derive action motives of users. Riedel and Schwedes (2017) [11] set out the results of two social-science based applied and demand-focussed research projects on EV charging infrastructure in **Berlin** ('**City2.e**' and '**CCS**'). They come to the conclusion that potential users of electric vehicles (cars) always make mobility (and thus also transport mode) decisions with reference to their own every-day mobility. In addition, the realised mobility and transport behaviour is shaped by routines and also biographical predispositions. However, new mobility opportunities, such as e-mobility, can create situations which can put into question the 'normal' mobility routines or reshape those. For both the automotive and the digital economy players, e-carsharing offers a field of experimentation in currently still niche areas (Bauriedl, 2020) [12].

Stock (2016) [8] also critiques (theoretically, and empirically in a German context) the so-called "electro-mobilists" as an active community and who are (unlike all EV drivers or users in her distinction) ('ideologically') frame and understand electro-mobility as a technical and environmental innovation leading through automotive daily mobility praxis to resource conservation, but not as a (partial or even predominant) move away from auto-mobility. Similarly, Manderscheid (2020) [13] critically discussed the discourses present around e-mobility in industry, policy and governments, where some are dominated by and focussed on automotive drivetrains (only), and others more broadly (and helpfully) on transport and even mobility (paradigm) shifts. This is relevant in terms of the transport mode hierarchy expressed in the SUMP principles (covered in more detail in a later chapter in this report), as well as wider energy consumption (reduction) principles.

An increasing number of cities have experimented and implemented spatial zoning where car-based, or indeed automotive-based transport entirely is excluded for traffic-reduction, urban air- and noise pollution as well as energy reasons. Karle (2020) [14] offers a brief overview of them, ranging from e-carsharing to electric buses and (city) logistics, as do most modern textbooks of electro-mobility. Please also see the SEEV4-City Business Model and also State-of-the -Art reports, as well as contributions to the edited volumes by Leal Filho and Kotter (2015) [15], Hülsmann and Fornahl (2014) [16], Fornahl and Hülsmann (2016) [17] and Brunnengräber (2020) [18].

A range of European projects, such as the **URBACT "EVUE"** (electric vehicles in Urban Europe) project [19], have reported on advances through pilots, solutions and business model development principles for those. For instance, the now concluding Baltic Sea Region EU Interreg Project **"BSR Electric"** has published checklists for a range of application use cases of electro-mobility in different contexts, ranging from urban logistics, e-logistics, e-buses, e-bikes for commuters, e-bikes for families, e-scooters and e-ferries [20].

The BSR Electric project [21] has also produced a comprehensive stakeholder analysis which summarizes the status quo of e-mobility within their partner countries (some of which overlap with the SEEV4-City ones), as well as a database and map showcasing e-mobility solutions across the Baltic Sea Region. Based upon findings

and results of piloting activities, the BSR Electric project partners have developed and published a set of theme-specific checklists guiding the target group in decision-making:

- E-Vans and e-Logistics - Action Checklist for Municipalities, local and national Politicians
- E-Buses - Action Checklist for Municipalities and Public Transport Providers
- E-Bikes - Action Checklist for Municipalities and Companies
- E-Scooters - Action Checklist for Municipalities and Organizations
- E-Ferries - Action Checklist for Municipalities.

The EU Interreg project "**CleanMobilEnergy"**, which runs until the end of 2021 and includes the SEEV4-City partner POLIS, is developing and testing one generic transnational intelligent Energy Management System (iEMS) which will be adapted to their 4 pilot cities/towns across North West Europe. These pilots range from small towns to large cities and cover different types of renewable energy, storage and electric vehicles. [22]

The EU Interreg **"EV Energy" project**, running until the end of June 2021, has collated and published a range of good practice case studies across different transport modes for the introduction and expansion of electro-mobility. The EV Energy project aims to analyse, initiate and implement policies favouring sustainable energy and electric mobility systems in urban areas [23].

Jegu and Dubois (2017) [24] explain how the **city of Dijon** in Burgundy, France, moved to transform the modal transport use in the core of the city, due to its characteristics as a heritage/tourism and economically growing, yet somewhat peripheral, city. Two new electrified trams were seen as a game changer, but electro-mobility on e-bikes/ pedelecs in the outer (hilly) fringe also found to be popular. Pedestrianisation and car-free squares in the city centre, but some of the dis-connected city quarters were now served by a hybrid electro-mobility bus but individual car transport remained popular. E-car sharing has a role to play in the region and Dijon, as do electric road vehicles (Aixam, Microcar, Nuon etc) which do not require a driving licence.

As part of the Spanish/ Basque **city of Vitoria-Gasteiz**'s Sustainable Urban Mobility Plan, the city developed an approach for redesigning neighbourhoods in line with the 'superblock' concept. A superblock reorganises urban space to support low-carbon mobility practices. In Vitoria-Gasteiz, private cars and various forms of public transportation are kept out of these blocks, and inner streets are redesigned to be pedestrian- and bike-friendly. The city of Vitoria-Gasteiz recently shared its successful use of superblocks [25] with other European cities as part of the **SMARTEES** project [26], a Horizon 2020 EU research project that aims to support cities' energy transitions and improve policy design by examining five types of energy- and mobility-related local social innovations. The superblock concept is also being explored in **Barcelona**, Catalonia/ Spain [27]. The SMARTEES project also includes a focus on 'holistic, shared and persistent mobility plans': "A defining feature of this social innovation is the participatory development and adoption of a holistic and persistent mobility plan, in which all city development and planning follows a coordinated approach focussed on making the city mobility efficient and sustainable. Reference cases analysed within the scope of SMARTEES are **Zurich** (Switzerland) **and Groningen** (the Netherlands).

Cities such as **Turin** (Italy) have generally placed much more faith and predominance on public transport, and have used shared mobility and electro-mobility – with the two also overlapping – as part of a transformation of mobility in the city, alongside a major push for active travelling (cycling and walking). [28].

Shared mobility has been the focus of the EU Interreg project **"ShareNorth**", in which the concept of "mobility points" were developed where multimodal solutions (such as walking, cycling and public transport) meet (first implemented in **Bremen**, Germany), and now this has been connected with an electric carsharing system and the availability of charging points (for instance by the city of **Bergen** in Norway). [29]

The EU CIVITAS **"SUITS"** project goes into a similar direction, with a focus on "developing and making available to local authorities of small and medium sized cities and to other stakeholders a set of tools that are enhancing their capacity to design and implement sustainable transport measures." [30]. SUITS is one of three **CIVITAS SUMPs-related projects**, alongside **CIVITAS PROSPERITY** [31] and **CIVITAS SUMPs-UP** [32]. The three projects bring together more than 80 actors working towards a common goal: to support cities across Europe to develop and implement Sustainable Urban Mobility Plans.

Please also see **SEEV4-City Webinar contribution** by Richard Kotter, "From Operation Pilot Insights to SUMEPS – Why and How Do We Need Integration of Mobility, Energy and Grid Planning?", on the 20th of May 2020 for further details [33].

Urban Vehicle Access Regulation (UVARs) schemes, with restrictions to more polluting vehicles have been worked on for private automotive vehicles, as well as commercial ones. This has now also become part of the toolbox of SUMP measures, with exemptions and advantages given to ULEVs such as fully electric vehicles in the context of paying congesting charges and other road charging schemes, or free parking for instance for electric freight vehicles (Mourey and Backhaus, 2019 [34]; Tomassini et al, 2017 [35]).

It is worth noting here that similar principles apply to more **rural and sub-urban** (commuting hinterland) areas. Mobility in these areas typically entails longer distances, and typically has a less dense and frequent public transport network. Accordingly, electric road transport for individual mobility is of heightened importance here (Fitte et al, 2019 [36]; Fornahl and Wernern, 2015 [37]). Electro-mobility and car-sharing may also be a system building block for a rural mobility change (Baasch, 2020 [38]). Innovative social and organisational set-up such as co-housing and EV sharing may also be sub-urban to rural, and not just urban/metropolitan. Sub-urban to rural areas around medium-sized cities (or 'regio-poles') need adjusted concepts for electric mobility as part of new mobility opportunities (Radtke and Daub, 2020 [39]; Bergmann and Daub, 2016 [40]).

2.2. Current developments: a case study of the city of Birmingham (England, UK)

The English/British city of **Birmingham** has developed, as part of a CIVITAS EU-project called SUMP-UP, the concept of Green Travel Districts (GTDs, for instance in its city centre, with the vision of Birmingham City Council that "a Green Travel District is one that consists of a concentration of people, living, and working in an environment in which people are put before cars and in which residents, workers, and visitors can safely walk, cycle, or take public transport. The city centre is one of eleven GTDs identified in Birmingham.

The city centre is one of the most active GTD locations and has been the focus of Clean Air Zone (CAZ) proposals that seek to address the air quality challenges faced by the city. It has been decided that **a Clean Air Zone will be introduced in in the city centre in the summer of 2020. With the Clean Air Zone, the most polluting vehicles that drive into the city centre will be charged. This measure will be supported by additional measures to manage parking demand and improve the sustainable transport network**."

The following **principles** are **behind Birmingham's GTDs**:

- Walkable & Cycle Friendly–where non-motorised transport modes are prioritised;
- Permeable & Connected–a network of connected streets for non-motorised transport;
- **Sustainable Transit Led & Low Carbon–where there is access to high quality public transport**;
- **Mixed use and compact–a plan for multi-modal, shorter commutes has been developed.**" [41]

The City of Birmingham had been given a "final warning the UK / English central government over its urban air quality, after the UK central government itself had been given such as warming by the European Commission.

Birmingham City Councils' Sustainable Energy Action Plan from 2010/11, valid until 2020 [42], was described by the council thus at the time:

> The SEAP points to a general direction rather than a prescriptive set of programmes and in this sense is not Birmingham's energy strategy –it provides a guide and some general boundaries for a more detailed look at implementation. This will be developed by Birmingham City Council and partners during 2011 ... those involved in the SEAP can be held accountable by those who represent the people of Birmingham. The City Council has a strategic role to play in orchestrating the opportunities and partners involved in delivery and the recently formed Cabinet Committee, Climate Change and Sustainability will provide scrutiny and challenge. A steering group that includes those who manage and operate the energy networks and supplies to Birmingham as well as representatives of the main sectors – communities, commercial and industrial organisations, transport agencies, strategic planners, waste and energy managers and universities providing novel solutions will be in place by Summer 2011. This group will provide a dynamic overview of a great many and varied programmes to deliver the SEAP with the best outcome. In so doing, Birmingham can not only become more self-reliant with a local energy scheme, backed by a greener national supply, but also enjoy economic growth founded on sustainable energy.

It is interesting to see that **Birmingham City Council's new Draft Transport Plan**, **published in January 2020** [43] and with wide-consultation and central government scrutiny ongoing/to come, **to last until 2031** (from 2020), **does reference key SUMP principles, as well as energy (SEAP / SECAP) ones**:

> The plan contains a set of principles that will guide investment in transport so that it is able to serve a future Birmingham that is home to more people and that is a better environment in which to live and work for everyone irrespective of age, disability or income. These measures are designed to:
>
> - Reduce transport's damaging impact on the environment, supporting Birmingham's commitment to becoming a carbon neutral city by 2030;
> - Eliminate road danger particularly in residential areas;
> - Connect people with new job and training opportunities;
> - Reconnect communities by prioritising people over cars;

- Revitalise the city centre and local centres. [43]

On renewable energy in particular in connection with transport, **Birmingham City Council's Draft Transport Plan 2031** states that:

> Road transport accounts for 80% of NO2 emissions and a third of CO2 emissions in Birmingham. Alternative cleaner fuels will become the norm to support air quality and climate change [action]. Future programmes will support the introduction and supply of cleaner fuels contributing to air quality improvement. These developments include Tyseley Energy Park [44], a state-of-the-art refuelling hub providing facilities for hydrogen, compressed natural gas (CNG) and electric vehicles.
>
> Birmingham City Council will support trials with a new generation of electrically powered scooters designed to carry one or two people for sort distances within built-up areas. These types of micro-mobility vehicles are becoming common in cities across Europe and the USA but are yet to make a UK impact. [43, p. 22]

Birmingham City Council's new Draft Transport Plan 2031 [43, p. 32) refers to urban parking in the following way: The framework for future decision-making on urban parking provision needs to take into account the differing needs of users – for example motorists with disabilities – as well as characteristics that vary by location. However, guiding principles will include:

- Commuter car parking will be limited in areas which are well served by public transport – for example the city centre.
- On-street parking space will be prioritised for users with disabilities, cyclists, **car clubs and other sustainable modes**.
- Public transport and cycling provision will be prioritised over car parking provision.
- Parking will be restricted outside schools for air quality and safety measures.

2.3. Integration of Mobility Systems

The **SEEV4-City project considers the integration of electric vehicles (such as cars and vans, as well as e-bikes** (buses would also be applicable but are outside the scope of the project itself), **the local and central electricity grid, and renewable energy.** To this end, it does also need to concern itself with organisational as well as technological innovation, human-technology interfacing as relevant to usability, communication / message framing and social acceptance and uptake of new solutions and ways of operating. It therefore also needs to consider investment and business cases, from the perspectives of different stakeholders which need to come together. For electric vehicles, for instance, the project and future policy should not simply consider electric vehicles as electrified means of road transport (with the promise of, per vehicle if substituting an Internal Combustion Engine (ICE) vehicles, reduced Carbon-Dioxide emissions and also urban air pollution.

It is assumed here that the **Transport Mode Hierarchy** is followed; in other words, active travel to be prioritised first (walking and cycling), then pubic transport (trams, buses etc.), then shared transport in road vehicles (travel-to-work plans, car sharing, and then individualised vehicles (including taxis and min-cabs), and there now with a focus on ultra-low carbon ones (which can be fuelled by a number of means, including by electricity). Similar principles would apply for freight and urban logistics transport. In practice, there may be an identifiable trend in cities for now of electric vehicles being an additional household vehicle, with thus at best only a part-substitution of ICEs. Whilst the central or local grid stakeholders may still be at times cautious about the stress electric vehicles in large numbers may place on the grid, potentially requiring grid reinforcements, they also now begin to see the value of vehicle-for-energy-services (V4ES) where electric vehicles – when not in transportation use mode – can balance the grid. The **UK**'s **energy regulator**, **Ofgem**, has announced that they will "develop a regulatory strategy on electric vehicles to support roll out and maximise the benefits to consumers." [45]

A fresh report providing insight into the experience of New Mobility Services in Europe has been published by the **Partnership for Urban Mobility** (PUM) [46], drawing on examples from cities across Europe. The report explores the policy tools used by PUM partner cities, regions, umbrella organisations such as **EUROCITIES** (the network of major European cities) and the **Council of European Municipalities and Regions** (CEMR), as well as stakeholders such as **POLIS** (the network of network of European cities and regions cooperating for innovative transport solutions), the **International Association of Public Transport** (UITT), the **European Cycling Federation** (ECF) and **Walk 21** (the international charity dedicated to ensuring the right to walk and opportunity to enjoy it, and national and European authorities to integrate and govern (with regulatory frameworks) new mobility services, as well as how they intend to achieve their wider policy goals of the effective integration of new mobility services in the transport offer of cities from a needs and expectations perspective. The participants were asked about traffic in their city/ region, such as modal share, SUMP, demographics, measurements regarding congestion, the average length of trips, the role of commuting, air quality and future plans for mobility. In order to contextualise this information, the survey also asked about data protocols, and the availability of services such as car-sharing, ride hailing, bike sharing and e-scooters.

Electric vehicles (full battery EVs, as well as those hybrid ones with large EV batteries) **can store electricity from the grid at times of oversupply in them, especially from intermittent renewable energy sources**. At peak demand for electricity in the grid electric vehicles can supply electricity to the grid (Vehicle-to-Grid) [47].These electric Vehicle-for-Energy Services (eV4ES) may need an aggregator, as well as ICT and software support functions, which opens up commercial opportunities for energy services companies, with the proviso that there needs to be a sufficient net revenue for electric vehicle owners to compensate them (beyond the supplier/ manufacturer's warranties) for electric vehicle battery degradation and inconveniences.

Furthermore, electric vehicles – when not in transportation use mode – can provide smart energy management functions as part of a Vehicle-to-Building set-up, leading to greater efficiency of use of self-produced renewable energy (solar in particular, but also micro-wind etc.) as well as emergency back-up power. A combination with a stationary battery may make sense, depending on the circumstances. This battery can also then provide grid services. Please see the SEEV4-City State-of-the-Art, OP Business Models as well as the Upscaling and Transnationality reports [3].

National, regional and local statistics indicate that the transportation use of individualised road transport vehicles is only about 20% of the time typically even on working days, hardly during the late evening and night, and even less so on weekends. Even many commercial and logistics vehicles have significant downtimes from transportation use, especially overnight and on Sundays.

Urban parking is also becoming increasing a discussion in European cities. In 2019, the **Park4SUMP** Horizon 2020 EU project produced a **SUMP practitioner briefing on parking and sustainable urban mobility planning** [48]. A very recent **joint POLIS and EPA Discussion Paper on Urban Parking** [49] by a POLIS – EPA parking working group noted that over the past two years their dedicated attention to the digitalisation of local parking management for the future (with digital parking tools in urban mobility policies). This should also be seen, it states, in a wider context vis-à-vis reaching wider mobility and transport policy goals, embedded in a global spatial, economic and social vision respective cities. The recent POLIS-EPA joint discussion paper states that:

> Within the working group, the overall conviction grew that the discussion on the digital future of parking is very important, but does not address the fundamental issue of undesigning European cities from the surplus of privately owned and used vehicles. **The POLIS members [that is, local government institutional members] also see parking technology to become more useful when it has the ability to inform decision makers about mobility and urban planning**. The current mobility context in larger cities, for the first time in decades, presents a real alternative for private vehicle ownership. Cities can finally move away from a mobility system depending on large numbers of stationary cars. This new context sees a shift from motorized vehicles to active travel modes (walking and cycling) and from private ownership to shared, collective of temporary use of vehicles (with proven and new public transport concepts, shared mobility, and new mobility services – ride hailing, micro-mobility). Changes of modal shift in favour of active travel and new mobility services and replacing private car ownership might currently be confined to specific cities and specific city districts. However, they start to have impact on local parking strategies, use of parking infrastructures, and revenue generated by parking management infrastructures. [49]

Recently parking issues have risen to the EU and the international policy agenda. The EU institutions discussed parking standards and Electric Vehicle amenities in view of the revision of the Energy Efficiency Performance of Buildings Directive. The **European Cyclists' Federation** (ECF) brought forward a comprehensive study presenting the current status with regards to bicycle parking standards across EU members states and regions. In addition (in 2015, together with the **International Energy Agency**, the **International Transport Forum** and the **Nuclear Energy Agency**), **the OECD** [50] published a **paper highlighting the potential of advanced parking policies in view of environmental and energy policies of its member states**.

The cities engaging in the **POLIS-EPA working group** activities agreed that decisions about the built environment need to be taken now to avoid a legacy that hampers further evolution, sinks public and private budgets in infrastructures that might be underused and deliver bad to negative return on investment.

The ECF contribution to the POLIS discussion paper [49] includes

> the **strong case for establishing, implementing and enforcing bicycle standards in buildings**. Next to recommending the actual availability of bicycle parking, the ECF also provides qualitative requirements for bicycle parking. 'In order to encourage regular cycle use, access to bicycle parking most of all has to be easy and convenient. It should be as barrier-free as possible, weather-protected, theft-secured and provided in sufficient numbers in or near the entrance to buildings, taking bicycle ownership as well as (projected) daily/regular use into account. Facilities to accommodate the increasing diversity of bicycles, such as tricycles, cargo bikes and bike trailers should also be provided. Existing developments without bicycle parking should

[3] https://www.seev4-city.eu/publications/

be retro-fitted, either by converting car parking spaces into bicycle parking or by providing parking facilities near/adjacent to buildings. **An adequate number of power sockets should be installed for recharging e-bikes.'**

In the **POLIS-EPA discussion paper** [49], "a simple solutions framework is provided, starting from the following principles:

1. Build less parking and optimize the use of existing offer;
2. Reduce the spatial impact of parking infrastructures;
3. Reconvert parking infrastructure for new forms of use."

Overall, researchers commissioned by complement and evaluate the various national programmes to establish, demonstrate and promote electric road mobility have noted four pillars of motives of cities for the introduction of e-mobility: environmental, transport/mobility, economic and image, as summarised by Table 2.

Table 2: Motives of cities for introducing electric mobility (translated and adapted from Ernst et al, 2013, p. 354) [51]

Environment	Transport/Mobility	Economy	Image
Reduction of emissions and pollution (harmful gases, substances, participle)	Electro-mobility as a building block of systemic transport concepts	Support for new markets and technologies	The city as a fore-/front-runner
Resource-efficient solutions	Mobility increasingly thought as decoupled from a vehicle	Raising the attractiveness as an economic location	Competition between cities to attract both residents and companies

The **new SUMP topic guide on electrification in sustainable urban mobility planning** [34] advises that "categorizing users according to their need opens the door for future e-mobility needs (that may not yet exist) to also be incorporated into charging infrastructure development. It presents an example on of users' categorisation" (please see also the SEEV4-City business models report), see Table 3.

Table 3: Example of users' categorisation (source: Mourey and Backaus, 2019: 17) [34]

User Groups	User group description	User group objective
A Commercial fleets	Taxis, logistics, & company or municipal vehicles are used by different drivers for business & private purposes. They operate in FUAs primarily in dense cores often for first & last mile mobility of workers, tourists, & freight delivery. They have short but irregular driving profiles & thus require both options of fast charging & slower overnight home charging.	*Ensure widespread availability & improved utilisation of fast-charging during operating hours & convenient solutions for overnight charging at home*
B Users of shared e-mobility services	eMaaS vehicle use is characterized by shared or multimodal trips of different electric vehicles. eMaaS users need multiple charging options that is widely and quickly available, similarly to fleet users. As a last-mile solution, charging facilities close to public transport nodes are likely prevalent. The demands on charging convenience are high because the user is often not a regular driver. Pricing transparency and payment convenience is important.	*Develop easy-to-use & highly-integrated payment & reservation systems incl. transparent pricing schemes reflecting users' specific preferences*
C Urban residents without own parking	Urban residents particularly in dense cores of FUAs, who live in multi-storey buildings rely on a combination of parking & charging facilities. Charging sessions can be longer (overnight or over the day at the work place). Personal preferences (e.g. renewable energy sources/ attractiveness of the charging location) are more important to residents than other user groups. Both professional & leisure trips need to be provided for.	*Provide convenient charging possibilities at non-residential points; slow overnight public charging and models that optimize scarce space in dense-urban areas*
D Long-range commuters	This group requires interoperable charging infrastructure & payment schemes that are available & accessible along TEN-T networks & at borders of urban cores where transition to public transport can occur. Reliability & prediction of availability, & range after charging are important to users. Time spent at gas stations should be comparable to charging times to match the user's experience of total journey times.	*Ensure wide availability of rapid chargers interoperable between national and EU regions to allow users to quickly top up their EVs.*

2.4. Review of EU policies for smart economy/infrastructure

The **European Green Deal** includes a target to reduce transport-related greenhouse gas emissions by 90% (compared to 1990) by 2050. The **European Commission** intends to adopt a comprehensive strategy, by the end of 2020 in consultation with the **Council of Ministers** and the **European Parliament,** to meet this target and ensure that the EU transport sector is fit for a clean, digital and modern economy. The European Commission's stated objectives include:

- increasing the uptake of zero-emission vehicles;
- making sustainable alternative solutions available to the public & businesses;
- supporting digitalisation & automation;
- improving connectivity & access.

The roadmap for the **EU's Strategy for a Sustainable and Smart Mobility** has been closed for feedback on August 10th 2020, and a public consultation is ongoing until the 23rd of September 2020. [52]

Eurelectric, the 'union' of the European electricity industry, in July 2020 welcomed the European Union's Strategy for a Sustainable and Smart Mobility in preparation. "The European power sector endorses the proposed targets in the transport sector, as part of the European Green Deal, for advancing towards a green, digital and competitive modern economy." [53]

In 2019, Eurelectric had presented their *Decarbonisation Pathways* [54]. Their study includes a range of electrifications scenarios to 2050 against a 2015 baseline, see Figure 1.

Figure 1: Electrifications scenarios to 2050, against a 2015 baseline (source: Eurelectric, 2019) [54]

The Eurelectric report also includes a carbon abatement (i.e. CO2 emission reduction) target by 2045, see Figure 2.

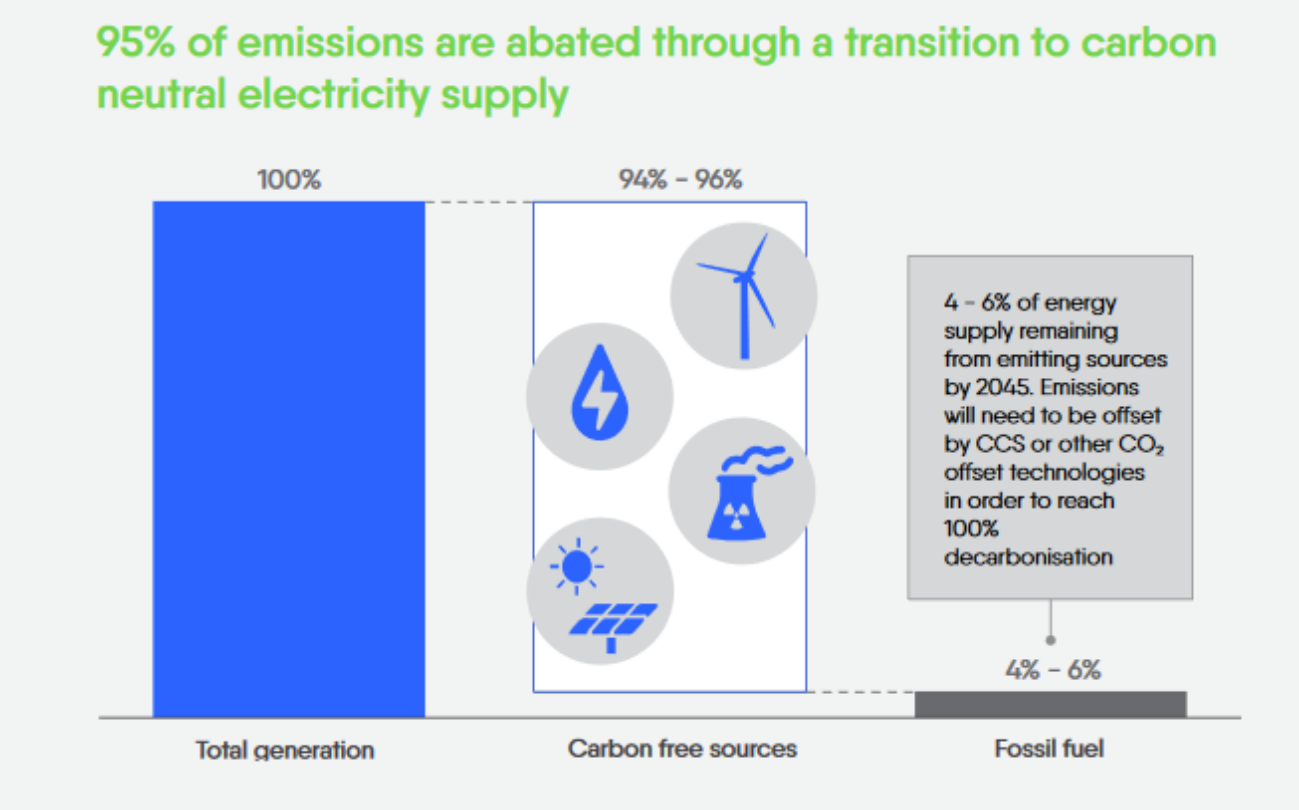


Figure 2: Carbon abatement target by 2045 (source: Eurelectric, 2019) [54]

Furthermore, the Euroelectric report includes a "least-cost" scenario for a carbon-neutral energy system, see Figure 3.

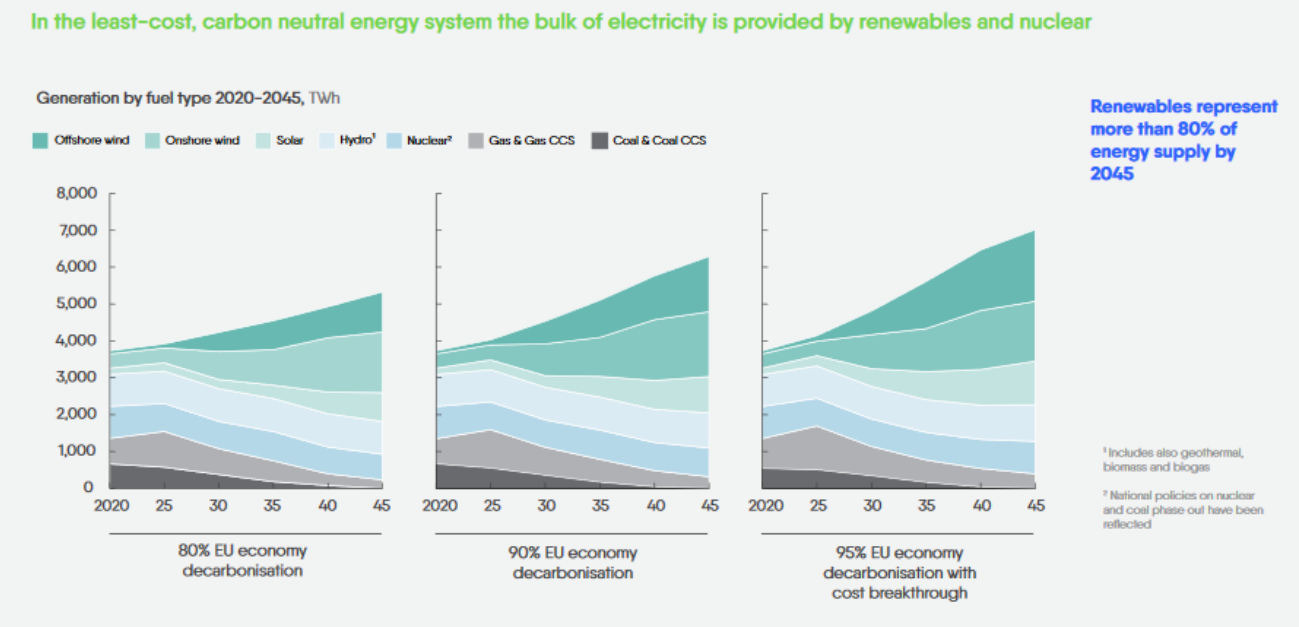


Figure 3: 'Least-cost' scenario for a carbon-neutral energy system (source: Eurelectric, 2019) [54]

A recent white paper entitled "Intelligent Mobility for Energy Transition: Accelerating towards more sustainable societies" [55] developed by the **Intelligent Mobility for Energy Transition (IMET) initiative** [4] is of key interest

[4] Lead author: Andrew Price of Nissan Europe, with Diego Carretero Lopez coordinated research and content collection from key contributors with guidance from Anna Domenech, leader of the IMET initiative), with key contributions from EURELECTRIC, Innoenergy, European Distribution System Operators (E.DSO), Platform for Electro Mobility, Asociación Española de Fabricantes de Automóviles y Camiones (ANFAC), Smart En, PricewaterhouseCoopers, NHP ESCo, Evectra,

here. The initiative is driven by Nissan Europe, sitting within the **Sustainable Urban Mobility Action Cluster of the European Innovation Partnership on Smart Cities and Communities** (EIP-SCC) established by the European Commission. The paper [55] states that:

> It is no surprise a significant blocker to the clean energy transition is that much of industry, especially heavy industry and transportation remains too dependent on fossil fuels. While the political will to change this is not in short supply even the more innovative policy ideas come up against entrenched regulations and frameworks that are not fit for purpose today and hamper the transition. This paper shows that how with a new way of approaching policy the progress already made can be further exploited to accelerate the transition. The paper gives primary focus to the still untapped full potential of new electrified technologies, what the paper refers to as intelligent mobility technologies which include: electric vehicles, energy storage, smart charging and vehicle-to-grid. It will be illustrated how when fully exploited and complemented by the right supporting frameworks Europe can leap frog its efforts to achieving the clean energy transition.

See also the SEEV4-City Stakeholder validation Webinar on the 24th of June 2020 by Anna Domenech Abella of Nissan Europe and the "Intelligent Mobility for Energy Transition" initiative within the EIP Smart Cities [5].

The IMET white paper [55] references some key EU policies:

> **The European Framework 2030:** commits to reducing greenhouse gas emissions by at least 40% by 2030 compared to 1990. In addition, it commits to delivering an energy transition ensuring renewable energy represents at least 32% of energy production and targets at least a 32.5% improvement in energy efficiency.
>
> **The Climate Neutral Strategy 2050, 'A Clean Planet for All':** a roadmap to show how Europe can lead the way to climate neutrality by investing in realistic technological solutions, empowering citizens, and aligning action in key areas such as industrial policy, finance, or research.
>
> By setting this direction Europe was making a clear statement, namely that the clean energy transition is the holy grail. These critical frameworks were to be **complemented by Member States' National Energy & Climate Plans (NECP)** outlining how governments would meetthe2030 targets. Following suit, **regions and municipalities across Europe have set out decarbonisation strategies and Sustainable Urban Mobility Plans (SUMP) to address climate change**. [55]

The 'Intelligent Mobility for Energy Transition' **IMET white paper** [55] has a decidedly urban focus:

> Against a backdrop in which 70% of Europeans live in cities and generate 75% of EU emissions, cities and municipalities bear a great deal of responsibility for climate change. At the same time, they offer a great deal of potential in terms of solutions, operating as test beds and then supporting more rapid adoption.
>
> Urban areas can help catapult the clean energy transition by rethinking how mobility and energy policies are developed in the first instance and to do so **it is critical to join up urban mobility and energy generation policy development to maximise the decarbonisation benefits**.
>
> Electric vehicles will be a decisive tool to both decarbonise transport and help achieve this transition. Electric vehicles can replace using petrol or diesel vehicles and their related technologies including recycled or second life batteries for energy storage extend the sustainability offering of this solution. That the battery in an electric vehicle has a life beyond the life of the vehicle presents a great opportunity to rethink how we manage and store energy. Vehicle-to-grid technology also offers a solution that can support more decentralised and renewable energy generation. [55]

Some projections for some countries suggest that the future increase in renewable energy availability will be insufficient to meet the increased demand by EVs. For instance, stability problems are envisaged within electric grids due to the occurrence of high load spikes. Therefore, meeting the increased energy demand will likely pose serious challenges to electricity companies who might be compelled to seek alternative renewable energy solutions, including expanding existing ones. [56]

Smart charging and bi-directional charging could significantly reduce these issues according to many experimental and simulation studies and future energy systems scenarios (such as the July 2019 *Future Energy Systems* study by the **UK's National Grid** [57] and also offer new 'vehicle for energy services'.

Also, there is an expanding field of static energy storage (including second-life automotive batteries- in the industry taken to mean once reduced to below about 80% of their original power capacity) which can perform grid balancing and energy services for the grid. If these static storage modules are only there because of peak

---

NaviParking, GRUPOETRA,The Institute for Energy Diversification and Saving (IDEA), La Asociación de Empresas de Energía Eléctrica (AELEC), and (Asociación Empresarial para el Desarrollo e Impulso del Vehículo Eléctrico) AEDIVE.

[5] http://event.seev4-city.eu/

shaving electricity demand from the grid by EV charging installations, say in fully or partly EV parking garages, this may be called transport (infrastructure) for energy services.

The **IMET white paper** [55] argues that it is important to go beyond 'simply' to electrify road transport, and advocates an 'intelligent mobility' agenda:

> Intelligent Mobility refers to the interaction of electric vehicles, which have increasingly autonomous driving capabilities with the surrounding infrastructure including energy systems. It represents a transformation in the way vehicles are driven, integrated into society and powered. Electric vehicles are a significant factor in moving towards low carbon societies, with electrified vehicles such as plug in hybrid playing an important transitionary role. Additional technologies supporting the transition to low carbon include smart charging, battery storage and vehicle-to-grid. Combined these represent a powerful solution to achieving a clean energy transition and […] increasing their adoption must be a priority for governments."

The **IMET white paper** [55] argues that:

> Supporting electro-mobility will bolster efforts to achieve a clean energy transition. Policy making between mobility and energy must no longer be dealt with separately or in isolation. Specifically, an integrated policy approach would seek to maximise the synergies between:
>
> - Energy storage and energy efficiency technologies such as vehicle-to-grid services which support grid stabilisation and self-consumption;
> - Energy infrastructure and smart electric vehicle charging infrastructure.

Further policy recommendations from the IMET white paper [55], publicly endorsed inter-alia by POLIS, are for governments and other key actors to:

> Promote decentralised energy storage and distribution:
>
> - Provide an incentive structure that encourages decentralised energy generation, storage and consumption;
> - Remove barriers including legislative, taxation and regulatory that prevent the economic case for consumers to adopt innovative solutions and sustainable energy practices such as vehicle-to-grid services.
>
> Specific ways in which renewable energy technologies can be incentivised for consumers, business, utility companies and commercial developers include:
>
> - Purchase subsidies aligned with the positive environmental potential of the technology (smart meters, vehicle-to-grid systems, solar panels, energy storage systems) for sales, installation, maintenance and repair;
> - Tax incentives. Fixed tax deduction in alignment with environmental impact; variable tax incentives based on amount of energy sent back to grid;
> - For commercial developers, building codes should mandate or incentivise the installation of renewable and energy efficiency technologies as well as smart charging points in new commercial buildings;
> - Use public authority buildings as demonstrations of how smart technology can be used to drive down electricity costs and decentralise energy usage.
>
> Whilst consumer demand for electric vehicles has increased over time, it is clear that the greater the rate of uptake, the faster the transition can be fully realised. In order to achieve this, public authorities should seek to utilise both financial and non-financial incentives to drive change:
>
> - Target mid-range electric vehicle models for financial incentives to drive uptake in mass-market segments;
> - Tax-based incentives applied both to electric vehicle purchase and charging infrastructure development have the benefit of helping to alter consumer behaviour without being dependent on available public funds. Strong consideration should be given to introducing fiscally-neutral "Bonus Malus" schemes by which buyers of electric or low emission vehicles receive an attractive rebate (bonus) which is paid for by taxes (malus) levied on the purchase of gasoline and diesel cars with CO2 emission values exceeding a set limit;
> - Utilise low emissions zones within urban areas to drive behaviour change. In particular, public authorities should make very clear the exclusion of electric vehicles from any financial costs of entering such areas, thereby putting electric vehicle ownership as a clear advantage to those in such areas;

- To lead by example public authorities should drive change in their workforce and increase the number of electrified vehicles in public fleets, including buses and taxis.

Prioritise smart charging architecture across Europe. By mandating the installation of smart charging, the impact of electric vehicles on the electricity system will be reduced and better managed while the use of clean, renewable electricity can be maximised. To accomplish this, Member States and municipalities must:

- Provide support and simplify procedures for smart charging installation and keep the pace on installing charging infrastructure;
- Promote the interoperability between charging networks to enable chargers to be controlled by approved third parties (such as DSOs and aggregators) that can gather data that is used to support smart energy management;
- Develop robust cyber security standards to mitigate the risk that smart charging presents to the stability of the grid, in addition to protecting individual consumers. As electric vehicle uptake and smart charging increases, the risks will evolve in parallel;
- Existing standards must be extended to cover vehicle integration with smart grid and home energy management systems.

Communication campaigns and initiatives should focus on:

- Illustrating the role of a decentralised energy system and how consumers can play a part in it.
- Explaining the financial benefits available through integrating electric vehicle ownership with home energy usage. In particular, the total cost of ownership and maintenance of owning an electric vehicle over a vehicle powered by diesel or petrol and how combined with solar panels and home energy storage there is the potential to lower energy bills and achieve energy positive housing.
- Celebrate success across borders: encourage cross-border initiatives to promote successful projects. Several cities and communities have launched successful initiatives as part of their Sustainable Urban Mobility Plans to raise awareness and motivate consumers into becoming active energy system participants. Sharing, replicating and encouraging further ambition on these successes via city networks and regional forums can be an incredibly effective way to catalyse and sustain momentum across borders. [55]

A recent **white paper** by **Robb / EATON on stadia and arenas** from 2018 [58] concludes that:

> Demand has to be monitored before it can be controlled. Utilities will be able to provide their commercial and industrial electricity customers with data about how much energy they use and when demand peaks occur. Energy storage systems designed for the primary function of peak shaving need to be sized according to key criteria such as demand and consumption requirements. This means the batteries are sized to address the maximum demand (MW) and also sufficient storage capacity (MWh). Owners and operators of stadiums and arenas should also consider future energy requirements as well as any potential opportunities for revenue generation. Batteries are modular, and a system that is supplied to be scalable to meet future demand and energy needs should be considered, taking advantage of lower cost lithium-ion batteries. Selecting the right energy storage partner provider is key. Stadiums and arena owners and operators should work with a company that provides turnkey energy storage systems and engineering support, through the design, installation, commissioning and operational phases of the system." The Eaton white paper also references that "commercial premises and venues with carparks, such as shopping centres, supermarkets, leisure centres, stations, airports, not to mention stadiums and arenas, have an opportunity to provide charging infrastructure for their customers. As well as providing stadium with a new revenue opportunity, installing EV charging infrastructure also improves the fan experience. In future, carparks could also be fitted with smart charging equipment, to encourage local residents to park their cars overnight or for longer periods to take advantage of off-peak times. (Robb /EATON, 2018: 4) [58].

No one single policy in any of these domains of transport/ mobility, energy/ climate change and smart grid policy alone will be fully effective; rather, "a host of measures will have to be implemented for policy action to bring about desired change and to be successfully implemented." (Givoni, 2014: 1) [59].

Givoni's Editorial of a special issue of the journal *Transportation Research Part A* (Vol. 60, pp. 1-8) from 2014 on "Policy-Packaging" (in the field of transport) suggests that policy-packaging (of measures and interventions) is needed yet (then) in its infancy, and distinguishes it from "just a list of policies".

It is suggested that:

> To increase the probability of policy 'success' a range of policy options (measures) should be explored and implemented. The way that these many policy measures are considered and implemented must be carefully considered, to utilise synergies between measures and to avoid potential contradictions between them when

> it comes to one or more policy objectives." By 'Policy-Packaging' Givoni and the special issue contributors refer to "the approach of strategically considering a wide range of policy measures to address a policy problem and implementing them in coordination. (Givoni, 2014: 1) [59].

Givoni (2014: 6) [59], drawing on Conklin (2005), suggests that complex ('wicked') problems have a relationship with characteristics of policy-packaging. This suggests that "policy packages cannot be assessed until implemented", "policy-packages have no stopping rules", "every policy package is essentially unique and novel", "every policy-package is a one-shot (but long and dynamic implementation operation" and that "a specific policy package has no clear alternatives (but countless variations of it)".

2.5. The need for an integrated systematic approach for Sustainable Urban Mobility and Energy Planning/Plans

SEAP and **SECAP** as well as **SUMP**, including guidance / processes, can in themselves be characterised as separate policy-packages. One could add to this also "Mayors Adapt"-The Covenant of Mayors Initiative on Adaptation to Climate Change, as it also covers energy, buildings, transport, and is urban focused:

> In parallel with reducing its greenhouse gas emissions to mitigate climate change, the European Union also needs to strengthen its resilience to the inevitable impacts of climate change, now and for the future. Adapting to climate change is the way to do this. The success of Europe's adaptation efforts is critically influenced by the action of cities and local authorities. Those major centres of population and infrastructure are particularly vulnerable to extreme weather events and other effects of climate change. Mayors **ADAPT** – the Covenant of Mayors Initiative on Climate Change Adaptation has been set up by the European Commission to engage cities in taking action to adapt to climate change. Cities signing up to the initiative commit to contributing to the overall aim of the **EU Adaptation Strategy** of the EU (2013), evaluated in 2018, [60] by developing a comprehensive local adaptation strategy or integrating adaptation to climate change into relevant existing plans. [61]

Integrating these packages will bring benefits regarding decarbonisation of energy production, generation, distribution, supply, and consumption as well as energy storage to achieve (ultra-) low carbon **SUMEP**. The integration needs to be made in the context of increasing electrification of energy infrastructure and transport together with the local and central electricity grid, as part of the move towards a "Smart Grid". The Smart Grid approach also entails an increase in **distributed energy sources** (usually renewables) and **'pro-sumers'** (who both produce and consume electricity), **electric Vehicle-for-Energy-Services** (**eV4ES**) also need to be considered and integrated here.

To achieve a significant decarbonisation of the transport sector, the electricity grid and the energy infrastructure, electricity generation, transmission and distribution need to be become much less dependent on fossil fuels. The better integration of renewable energy (e.g. solar, wind, hydro) therefore needs to be advanced and supported. The cost of production, and also increasingly the cost of use, of renewable energy is declining and is becoming competitive with fossil fuel energy. In additional, energy autonomy may in circumstances further reduce the cost of energy if based on locally (including self-) produced renewable energy, including for use in electric vehicles.

The **SEAP and SECAP Covenant of Mayors guidelines and planning processes** focus on the key assets of buildings, equipment and facilities (municipal and third party owned) as well as transport, and the SUMP guidelines focus on 'functional' municipalities. Therefore, there should in principle no conflict in terms of the overall objectives beyond the administrative boundaries for the **SUMP guidelines**. This is because of the way the traffic flows of both people and goods (including commercial) occur, which needs to be addressed with regard to economic, technical, environmental and social sustainability.

What is lacking so far is a fully integrated policy and guidelines on how to integrate **sustainable urban energy planning processes/plans** (**SUEP**s) and **sustainable urban mobility planning processes/plans (SUMP/s)** into **SUMEP/s**, despite some progress so far by some key European projects.

The SEEV4-City project advocates and supports, with evidence and suggestions, more holistic integration of these guidelines and planning process and resulting plans across the mobility and energy sectors, into a concept termed **Sustainable Urban Mobility and Energy Planning/Plans (SUMEP/s)**.

3. Sustainable energy (climate) action plan(ning) (SEAP/ SECAP)

In 2008 the **European Commission**, realising that cities are responsible for 80% of energy consumption and CO2 emissions, considered of the role of local governments in combating climate change and mitigating its consequences. The **Covenant of Mayors** (CoM), a multi-level governance network of local and regional authorities who wish to commit to sustainable energy policies and reduce their energy consumption and CO2 emissions by at least 20% by 2020, came into life as a consequence. The Covenant of Mayors started as a European initiative, but it was considered too exciting a project to remain within the borders of the European Union. Already in 2008, the Covenant got its first signatories from such non-EU countries as Norway, Croatia, and even as far as New Zealand. When the Ukrainian cities joined the Covenant in December 2008, it became clear that municipalities from other countries covered by the **European Neighbourhood Partnership Instrument** (ENPI) too would become members of this international agreement.

A **SEAP** is the key document in which the Covenant of Mayors signatory (a local authority) outlines how it intends to reach its CO_2 reduction target by 2020. It defines the activities and measures set up to achieve the targets, together with time frames and assigned responsibilities. Covenant signatories are free to choose the format of their SEAP, as long as it is in line with the principles set out in the Covenant SEAP guidelines [62].

The **SURE** (Sustainable Urban Energy in the ENPI region) project funded by the **CUIDAD** (Cooperation in Urban Development and Dialogue) Programme of the EU is a good example of SEAPs being prepared by local authorities, with a clear motivation and a reflection on the process of getting to a SEAP plan and submission to the Covenant of Mayors. For almost three years, the cities of Polotsk in Belarus and Salé in Morocco received comprehensive support from the city of **Friedrichshafen** in Germany which holds the **European Energy Award®** (eea®), the Spanish city of **Murcia** which signed the Covenant of Mayors in 2008, and the **Intermediterranean Commission of the Conference on Peripheral Maritime Regions** (France) on how to revise their energy policy and to bring it closer to European standards. Polotsk and Salé were offered help in drafting and launching their **Sustainable Energy Action Plans**), allowing them to implement the 20-20-20 strategy of the EU, which aims to reduce CO2 emissions by 20%, raise the share of renewable energy sources up to 20%, and increase energy efficiency by 20% by the year 2020 [63].

In 2015, after a consultation on the future of the CoM, launched in 2008 after the adoption of the **European Union's Climate and Energy Package**, with objectives then set for 2020) the **European Commission** launched the **new integrated Covenant of Mayors for Climate and Energy**, again targeted at local authorities. Signatories to this new Covenant commit to reduce their CO_2 (and other emissions if they include this in their ambition) and adopt a joint - including regional – approach to tacking mitigation and adaptation to climate change. Covenant of Mayors for Climate and Energy signatory local authorities must prepare (within 2 years of joining the initiative) and implement a Sustainable Energy and Climate Action Plan (SECAP) before 2030.

Signatories of the new Covenant of Mayors for Climate and Energy now commit to preparing and implementing a **SECAP**, addressing both climate mitigation and adaptation with a 2030 horizon. The action plan is the key document which shows how the Covenant signatory will reach its vision and target. The plan includes an assessment of the current situation, i.e. a Baseline Emission Inventory for the climate mitigation part and a Risk and Vulnerability Assessment for the adaptation part, clearly identified goals and targets; and the measures planned together with time frames, assigned responsibilities and estimated impacts.

The **Covenant of Mayors SEAP/ SECAP reporting templates** provide signatories with a structured manner of summarising the key elements of their action plan and tracking of implementation during the monitoring phase. When signatories submit their **action plan document** (in their national language), they are at the same time required to complete an **online template** available via the Covenant website restricted area: 'My Covenant' in English. Only after this process is completed, the **official submission** of the action plan to the Covenant of Mayors takes place [62].

Both a SEAP and a SECAP include an assessment of the geographical (linked to commuting for work, for instance), demographical and energy local context, a **Baseline CO_2 Emissions Inventory (BEI)** referring reference year, a clear identification of the emissions reduction target, and the proposed and to be implemented actions / interventions together with timeframes (and milestones), assigned responsibilities and estimated (for instance social) impacts and costs.

A SECAP, in contrast to a SEAP, is aimed at defining mitigation activities that allow cutting down on at least 40% of CO2 emissions and to achieve that objective by the year 2030.

A SECAP fundamentally consists of two parts, one on Mitigation and one of Adaptation.

The SECAP guidelines are supplemented by the **Urban Adaptation Support Tool (Urban-AST)** [64]

A **public inventory of all submitted SEAPs and SECAPs Action Plans** by Covenant of Mayors for Climate & Energy signatories either already accepted or currently under **assessment** by the **European Commission's Joint Research Centre** (JRC) can be found on the Covenant of Mayors website under 'plans and actions' [65], with examples from small towns/cities to large metropolises - typically in the national language but for some big cities additionally also in English.

The City of **Murcia** was one of the SURE project ENPI cities that decided in the field of energy management to include all the fields and activities in which the city can directly act or influence in their SEAP aimed at 2020. Their SEAP included two parts. The first part being the Energy Diagnosis as the picture of the all CO_2 emissions produced by energy consumption as the starting point. The second part being the SEAP itself, which includes the environmental and energy targets and the list of actions to be implemented during next years, including a program for the implementation. The SEAP is a document officially approved at political level, but produced on the basis of a prior technical work and quantitative analysis. The City of Murcia stated that the reason why many European cities are adopting a SEAP is because it consists of a scientific approach on energy management. The SEAP approach includes a calculation of the impact of each action in terms of environmental or financial efficiency for performing a more rational energy management, with Murcia's Energy Plan updated through a regular Energy Diagnosis every two years. For this purpose, the City of Murcia collects the data of local energy production and consumption in order to make strategic analysis to identify the key fields of action in which they have the highest potential of savings. In 2007, Murcia created its Local Energy Agency (ALEM) financed by the **Intelligent Energy Programme of the EU**. Its main duty is to provide technical assistance on energy management to the City Council of Murcia [63].

An Intelligent Europe funded project, **"Identification and mobilisation of Solar Potentials via Local Strategies"** of the **POLIS** network cities produced, inter alia, an overview of long-term solar targets of POLIS cities (Caamano-Martin et al., 2010 a) [66], as well as a systematic overview of the relevant action plans of POLIS cities (Caamano-Martin et al., 2010 b) [67].

In 2019, the **Energy Cities** network (the European association of 'local authorities in energy transition') published guidelines for cities to support local renewable energy communities (Bolle, 2019) [68]. Energy Cities is a member of the **Renewables Networking Platform** (RNP), a multi-level governance discussion project funded by the European Commission. Its aim is to analyse and boost renewable energy policies by connecting relevant European, national, regional and local players. Energy Cities. Just one of their projects highligted is the "**Smart Grid Development Partnership**", a " fair and smart grid" project in **Ghent**, Belgium:

> The EnerGent cooperative provides citizens with the opportunity to invest in local solar power production by acquiring the photovoltaic panels. In addition, an electric car-sharing cooperative called Partago is making electric vehicles and charging stations available to allow for the excess power that is not directly consumed to be used in the charging stations or stored in the car batteries. And to complete the picture, the project will experiment with storing electricity in batteries on household level. The partners include two energy cooperatives, Ghent university which acts as a trusted neutral contributor, a social protection association that is notably tasked with reaching out to vulnerable house-holds and the local distribution system operator. (...) The plan of this ambitious consortium is to maximize the potential for locally generated energy in the neighbourhood, equally sharing the costs and benefits without having to expand the present electricity grid. The two cooperatives each have different missions and provide various engagement opportunities to citizens. Ecopower, which is the largest energy cooperative in Belgium, plays the role of aggregator, incentivizing and empowering households to better control their energy consumption through demand response management via smart meters and open data applications. [68]

Amsterdam can be seen as a case of an ambition to become and be recognised as a "smart city", including in the domain of energy, indicated be its "**Energy Atlas**" project [69] [70]

Amsterdam City Council's "**Amsterdam Climate Neutral 2050 Roadmap**" is a good example of a SEAP with energy and mobility also linked in, and covered by headline targets across the sectors of the build environment, mobility, electricity, industry and harbour and the council itself. [71] (The ambition is to reduce CO_2 emissions by 95% by 2050 when compared to 1990 levels, as well as to completely phase out the use of natural gas before 2040.)

> For the **built environment** (28% of total CO_2 emissions), this is meant to cover all homes, offices, schools and other public properties. The existing properties as well as any new properties, Amsterdam City Council aims to a) switch to sustainable energy and b) reduce energy consumption. Challenges include that the largest part of existing properties still need to be taken off the natural gas grid. In addition, it is important that residents and businesses invest in the reduction of energy consumption.
>
> For the **mobility sector** (9% of total CO_2 emissions), between 2025 and 2030 all traffic in Amsterdam will need to become emissions free, meaning that all energy use for transport needs to be from sustainable sources.

With reference to **electricity** (51% of the total CO_2 emissions), Amsterdam will need to take any opportunity to generate sustainable energy, and make sure that all 'Amsterdammers' can benefit, including people who are less well-off. Before 2020, Amsterdam City Council intends to install a minimum of 250 megawatts worth of solar and 17 megawatts of wind energy, which compares to one million solar panels and six wind turbines.

With reference to **industry and the harbour** (11% of total CO_2 emissions), it is noted that this should be fully climate neutral by 2050, but many of the activities in industry and the harbour still depends on fuels which emit CO_2. There is a growing awareness of sustainability issues, but the low price for emitting CO_2 prevents the sector from making the switch to sustainably energy. In order to achieve the climate targets laid down in the **[Dutch] National Climate Agreement**, the Hemweg power plant needs to be replaced with sustainable sources. Amsterdam's harbour and industry will serve as a sustainable battery storage and supply system for Amsterdam and the wider region.

With reference to the **council itself** (1% of the total CO_2 emissions), Amsterdam's municipal organisation needs to be climate neutral and natural gas free by 2030. This ambition has been laid down in the climate initiative drafted in early 2018. Amsterdam City Council will obtain their energy from sustainable sources, reduce waste and take steps towards a circular organisation. The ambition to become climate neutral need to play a part in any project or activity that the council undertakes. Amsterdam City Council needs to install solar panels on all council roofs, take all of its buildings off the gas grid and replace all street lights with LED or other sustainable alternatives. [71]

A range of these approaches and learnings were covered by City of Amsterdam staff across departments, namely **Art van den Giessen, Programme Manager Solar Energy, City of Amsterdam and Jaap Burger, Strategy Advisor for EV Charging for the City of Amsterdam**, in their SEEV4-City Policy Learning from SEEV4-City Pilots Webinar contribution on the 20th of May 2020 6, such as illustrated in the visualisations used by them in Figure 4 and Figure 5:

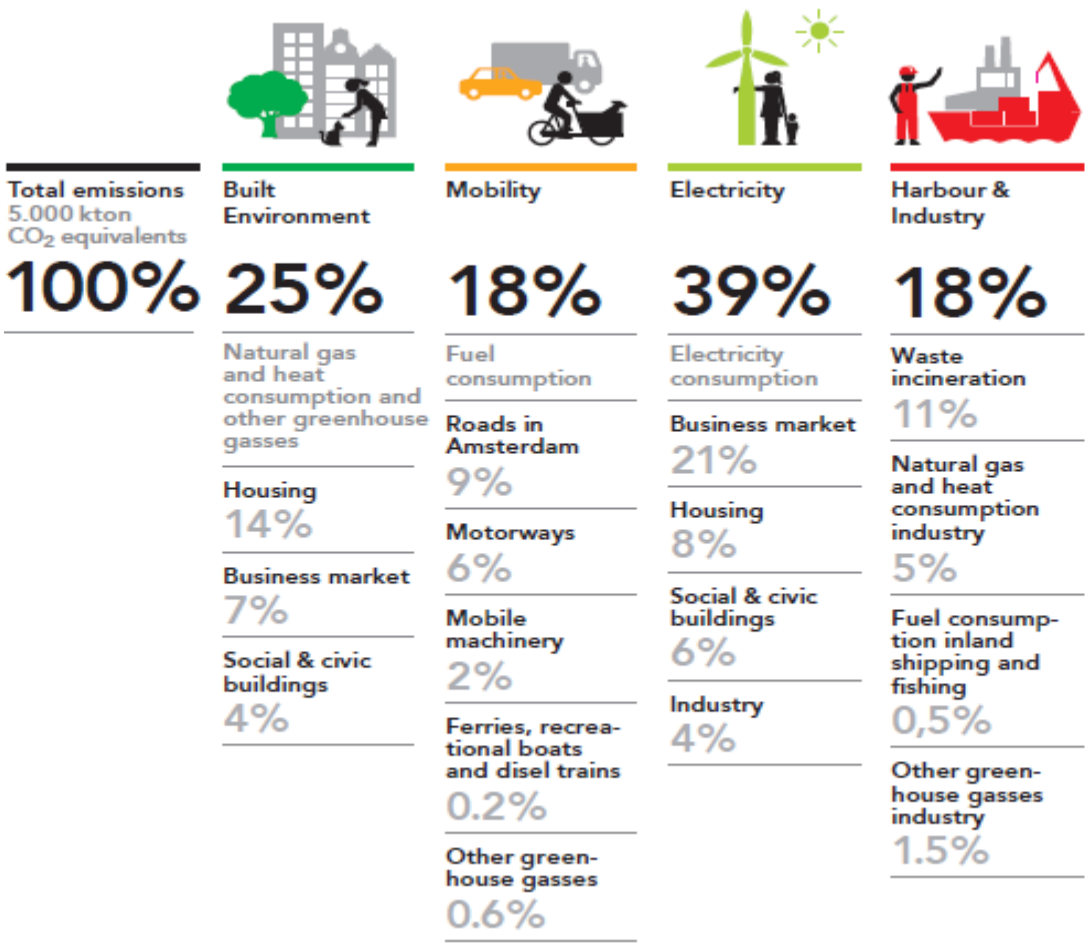


Figure 4: $C0_2$ equivalents emissions by sector in Amsterdam by defined sectors (2019/2020) (source: Amsterdam Climate Neutral 2050 Roadmap, City of Amsterdam 2020) [71]

[6] http://event.seev4-city.eu/

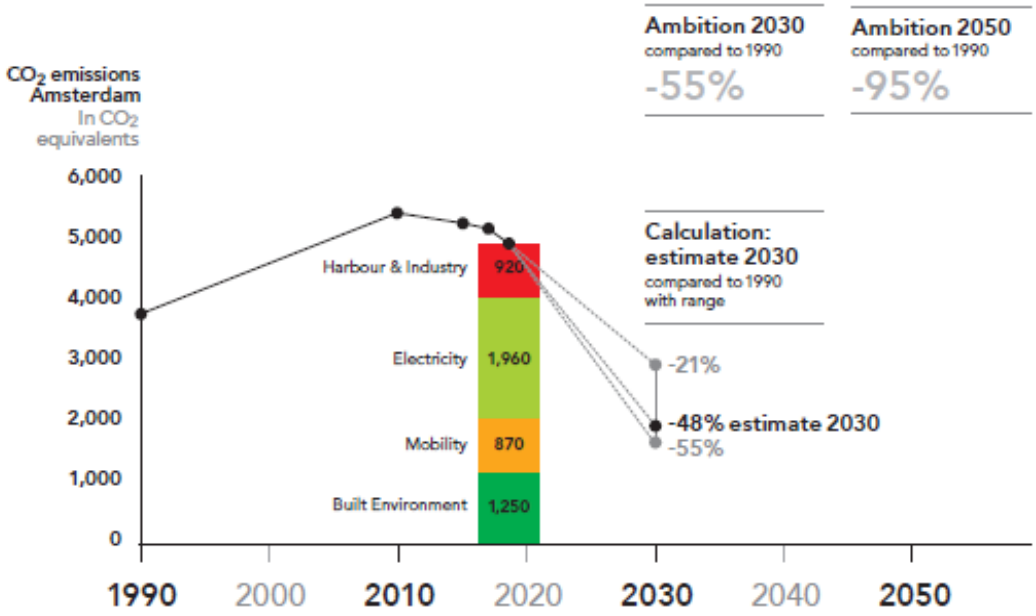


Figure 5: Ambitions of reducing CO_2 equivalents emissions reductions in Amsterdam by 2030 and 2050 (source: Amsterdam Climate Neutral 2050 Roadmap) [71]

The **Amsterdam Climate Neutral Roadmap** is an ambition document that sets out a vision of the energy transition in Amsterdam in the long term, and the actions to be taken in the short term. In the Roadmap, the City Council of Amsterdam describes the most important elements of its strategy for collectively launching and maintaining the transition from fossil fuels to renewable energy. The **Transition Path Electricity** tries to maximize solar energy generations on roofs, to optimize the use of potential wind energy, and to develop a future-proof electricity infrastructure.

According to **Art van Giessen and Jaap Burger of the City of Amsterdam** [7]:

> Electricity plays a key role in the transition from fossil fuels to renewable energy. Due to the transition to a natural gas-free city, we will need more electricity to heat our buildings and for induction cooking. Increasing digitization and growth in the number of electric vehicles is leading to a sharp rise in demand for electricity. We aim to replace fossil fuels with electricity use, because we can generate electricity sustainably. In order to become climate neutral, electricity must be generated sustainably. Amsterdam forms part of a larger electricity system in which every municipality, region and province contributes maximally to sustainable electricity production. We see many opportunities for generating solar energy on roofs in Amsterdam, and the liberalization of provincial regulations has also created new potential locations in Amsterdam for generating energy using wind turbines.
>
> There is a lot of roof surface in Amsterdam. We want to use this space optimally to generate sustainable energy. Electricity can be generated on roofs for 400-500,000 households. The advantage of solar panels is that installation is technically straight-forward, and it tends to be a profitable investment. We have opted for an approach whereby we inspire Amsterdam's citizens and remove obstacles, allowing them to make more effective use of the opportunities for generating solar energy.
>
> The number of solar panels in Amsterdam has risen sharply in recent years. The ambition is to use 50% of suitable roof surface to generate renewable energy by 2030. This means around 2 million solar panels. Together with the wind energy around 80% of the households can be provided with sustainable electricity. This will lead to more supply on the local net. On the other hand, there will be more demand of electricity from households and of course from electric mobility.

[7] http://event.seev4-city.eu/

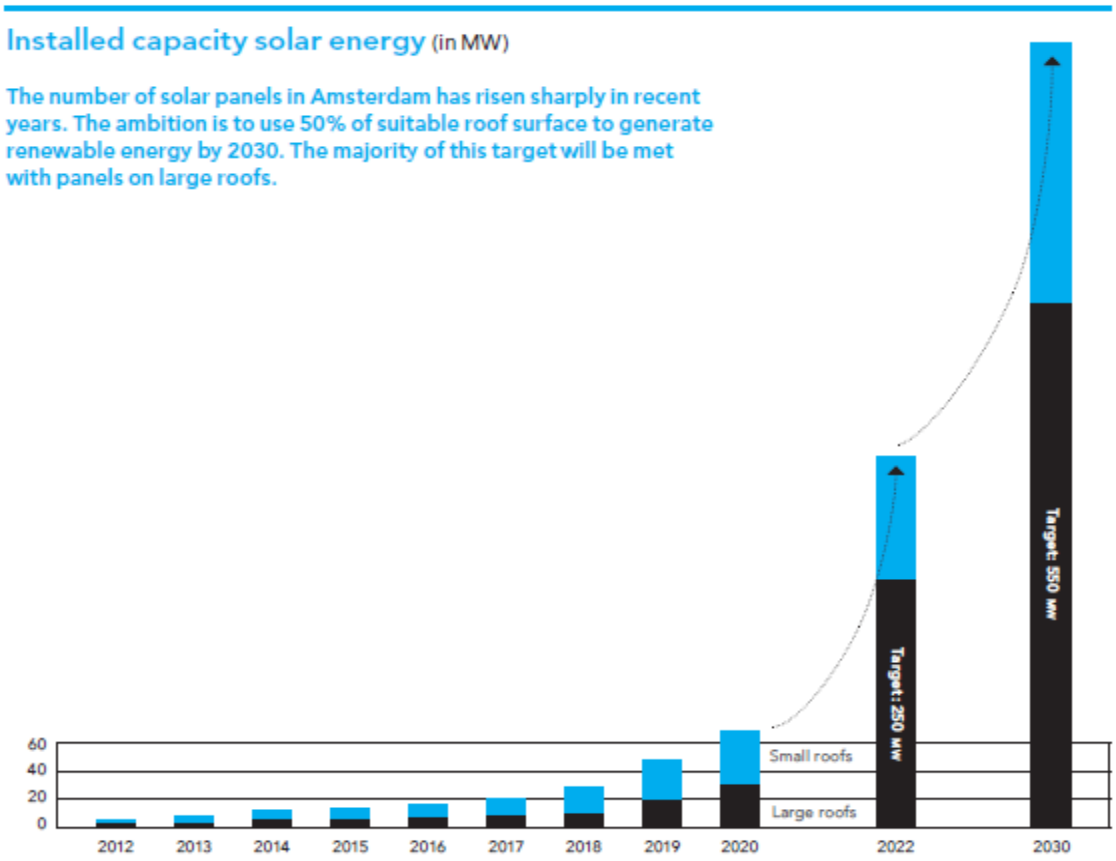


Figure 6: Amsterdam: (projected) cumulative installed capacity of solar energy in MW between 2012-2030 (Source: Art van Giessen and Jaap Burger, SEEV4-City Policy Learning from SEEV4-City Pilots Webinar contribution on the 20th of May 2020 [8])

[8] http://event.seev4-city.eu/

4. Sustainable urban mobility plan(ning) (SUMP)

4.1. Principles of Sustainable Urban Mobility Planning/Plans (SUMP)

According the **European Commission** (2013) [72]:

> The concept for the development of **Sustainable Urban Mobility Plans** that has emerged from a broad exchange between stakeholders and planning experts across the Union, which were supported by Commission initiatives like the **ELTIS Plus project**.
>
> The concept reflects a broad consensus on the main features of a modern and sustainable urban mobility and transport plan. It is not proposed that this concept represents a one-size-fits-all approach to urban transport planning. Instead the concept can and should be adapted to the particular circumstances of the Member State and urban areas. The elements below should be seen as guiding principles.
>
> A Sustainable Urban Mobility Plan has as its central goal improving accessibility of urban areas and providing high-quality and sustainable mobility and transport to, through and within the urban area. It regards the needs of the 'functioning city' and its hinterland rather than a municipal administrative region. In pursuit of this goal, a Sustainable Urban Mobility Plan seeks to contribute to the development of an urban transport system which:
>
> - Is accessible and meets the basic mobility needs of all users;
> - Balances and responds to the diverse demands for mobility and transport services by citizens, businesses and industry;
> - Guides a balanced development and better integration of the different transport modes;
> - Meets the requirements of sustainability, balancing the need for economic viability, social equity, health and environmental quality;
> - Optimises efficiency and cost effectiveness;
> - Makes better use of urban space and of existing transport infrastructure and services;
> - Enhances the attractiveness of the urban environment, quality of life, and public health;
> - Improves traffic safety and security;
> - Reduces air and noise pollution, greenhouse gas emissions, and energy consumption; and
> - Contributes to a better overall performance of the trans-European transport network and the Europe's transport system as a whole.
>
> A Sustainable Urban Mobility Plan presents, or is linked to an existing, long-term strategy for the future development of the urban area and, in this context, for the future development of transport and mobility infrastructure and services.
>
> A Sustainable Urban Mobility Plan equally includes a delivery plan for short-term implementation of the strategy. [72]

"**Sustainable Urban Mobility Planning**" refers to the process of planning, while "**Sustainable Urban Mobility Plan**" (or **SUMP**) is the essential (but not the only) outcome of the planning process. The abbreviation "SUMP" is used for the plan itself, terms such as "**SUMP concept**" or "**SUMP process**" are used for differentiation.

A Sustainable Urban Mobility Plan is based on the following principles:

1. Plan for sustainable mobility in the 'functional urban area';
2. Cooperate across institutional boundaries;
3. Involve citizens and stakeholders;
4. Assess current and future performance;
5. Define a long-term vision and a clear implementation plan;
6. Develop all transport modes in an integrated manner;
7. Arrange for monitoring and evaluation;
8. Assure quality.

The main differences between traditional approaches and Sustainable Urban Mobility Planning are summarised in Table 4:

Table 4: Differences between traditional transport planning and Sustainable Urban Mobility Planning
Source: Rupprecht Consult (editor) (2019) Guidelines for developing and implementing a sustainable urban mobility plan, second edition [73]

Traditional Transport Planning		Sustainable Urban Mobility Planning
Focus on traffic	→	Focus on **people**
Primary objectives: Traffic flow capacity and speed	→	Primary objectives: **Accessibility** and **quality of life**, including social equity, health and environmental quality, and economic viability
Mode-focussed	→	**Integrated development of all transport modes** and shift towards sustainable mobility
Infrastructure as the main topic	→	**Combination** of infrastructure, market, regulation, information and promotion
Sectoral planning document	→	Planning document **consistent with related policy areas**
Short and medium-term delivery plan	→	Short and medium-term delivery plan embedded in a **long-term vision and strategy**
Covering an administrative area	→	Covering a **functional urban area** based on travel-to-work flows
Domain of traffic engineers	→	**Interdisciplinary** planning teams
Planning by experts	→	Planning with the **involvement of stakeholders and citizens** using a transparent and participatory approach
Limited impact assessment	→	Systematic **evaluation** of impacts to facilitate **learning** and improvement

According to **Elits, the Urban Mobility Observatory and the European Platform on Sustainable Urban Transport** [74], "the **core SUMP principles** describe the main features of a modern and sustainable urban mobility and transport plan. It comprises the following main elements" – as illustrated in Figure 7:

Figure 7: The eight crucial principles for Sustainable Urban Mobility Planning
(Source: https://www.eltis.org/mobility-plans/sump-concept) [74]

"There is not an ideal sustainable city, however the **SUMP poster** [75], based on the revised SUMP guidelines, includes many crucial aspects of a sustainable mobility system and shows how the outcome for an urban area could look like. As the centrepiece, all eight fundamental SUMP principles demonstrate the way forward towards a sustainable planning process." [74]

According to **Admin Eltis** (updated on 25 Feb 2020) [76]:

> Preparing a SUMP is a complex undertaking. Guidelines developed with the European Commission's support offer concrete suggestions on how to apply the SUMP concept and prepare an urban mobility strategy that builds on a clear vision for the sustainable development of an urban area. This **process of developing and implementing a SUMP can be broken down into 12 main steps**:
>
> **Step 1**: Set up working structures;
>
> **Step 2**: Determine the planning framework;
>
> **Step 3**: Analyse mobility situation;
>
> **Step 4**: Build and jointly assess scenarios;
>
> **Step 5**: Develop vision and strategy with stakeholders;
>
> **Step 6**: Set targets and indicators;
>
> **Step 7**: Select measure packages with stakeholders;
>
> **Step 8**: Agree on actions and responsibilities;
>
> **Step 9**: Prepare for adoption and financing;
>
> **Step 10**: Manage implementation;
>
> **Step 11**: Monitor, adapt and communicate;
>
> **Step 12:** Review and learn lessons. [76]
>
> The **SUMP Self-Assessment Tool** [77] enables planning authorities to evaluate the SUMP of their city or functional urban area. If no plan exists, it can also be used to assess and improve planning activities in general.
>
> The Self-Assessment contains 30 to 45 questions that should take around 20 to 30 minutes to complete. The results help planning authorities understand the strengths and weaknesses of their approach. In addition, to feedback how well each of the SUMP principles is fulfilled, the results page also provides fitting good practice examples and tailored advice for further improvement. The tool is available to use for free on a non-commercial basis.
>
> The aim of the **SUMP Glossar**y [78] is to provide a single resource for practitioners to find a brief explanation of specialist terms and abbreviations related to the subject of sustainable urban mobility planning. The Glossary has been prepared by a team of experts reviewing relevant reports, guidance documents and existing glossaries. [76]

As can be seen in Figure 8, creating an inter-departmental core team as well as setting up stakeholder participation is one important part of the process early on, as is creating a link with other planning processes.

Identification of information sources and establishing cooperation with data owners is important, and joint scenario building and development for possible futures is required.

Creating a vision and strategy with all relevant stakeholders, taking into account identified problems and issues, needs to be accomplished, against which targets and indicators are set.

These inform policies / measure packages, as illustrated by Figure 9.

Figure 8: The SUMP Cycle (SUMP 2.0): The 12 Steps of Sustainable Urban Mobility Planning (SUMP 2.0) – A planner's overview.
(Source: Mourey and Backaus, 2019; https://www.eltis.org/mobility-plans/sump-process) [76]

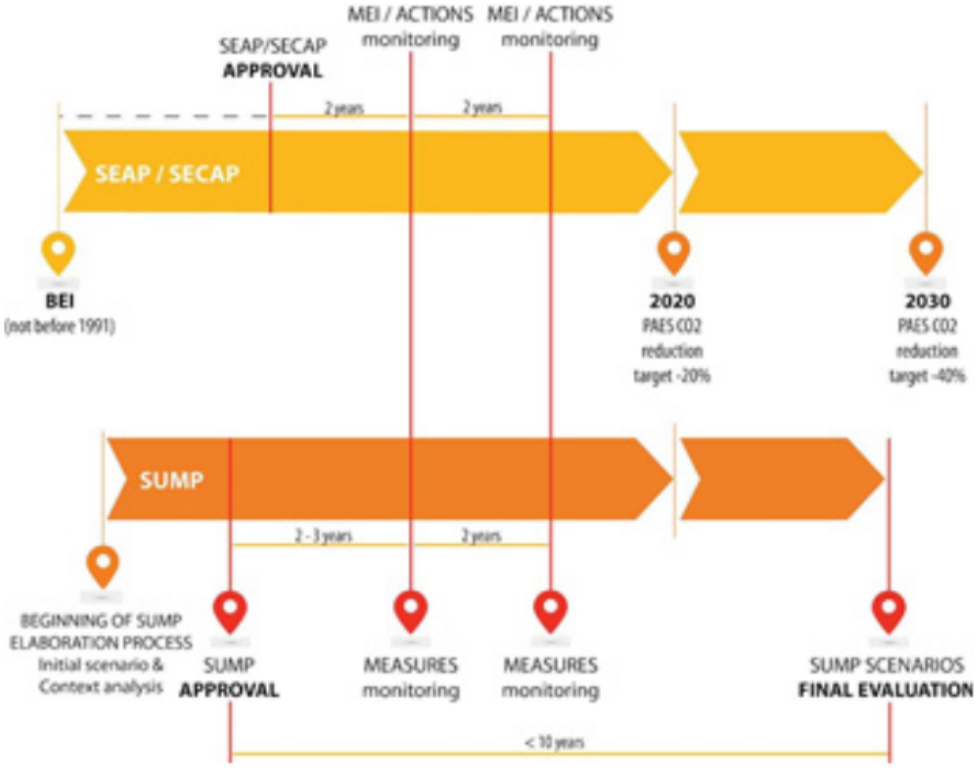


Figure 9: Harmonisation of Energy and Sustainable Urban Mobility Plans (Source: Fresner et al., 2019, p. 26 https://www.eltis.org/sites/default/files/harmonisation_of_energy_and_sustainable_urban_mobility_planning.pdf) [79]

The three approaches have a clear need for both vertical and horizontal integration, as different level of (local/regional and national, and at times EU) governance and different department of a local/regional public authority should be involved in planning for an effective action with at least satisfactory impact. The relevance of participatory processes in clear for all three approaches as it is highly relevant to inform, trigger activities and guarantee acceptance by stakeholders. There are many (with SUMP so far often implicit) overlaps in the fields of action, including regarding transport and buildings, as well as green public procurement and local energy production (Fresner et al, 2019: 9-10) [79], as is summarised in Table 5.

Table 5: Some key comparisons between the SEAP/SECAP and SUMP planning approaches and plans
(adapted from Fresner et al. 2019: 9-11) [79]

ISSUE	SEAP	SECAP	SUMP
Time-span	To 2020	To 2030	Long-term from starting date (minimum 10 years)
(selected) Fields of Action	• Municipal buildings (energy, heating and cooling plants); • Non-municipal buildings (energy, heating and cooling plants); • Residential buildings (energy, heating and cooling plants); • Transport; • Public lighting; • Green public procurement; • Local electricity production; • Local heat/cold production; • Other sectors.	• Municipal buildings (energy, heating and cooling plants); • Non-municipal buildings (energy, heating and cooling plants); • Residential buildings (energy, heating and cooling plants); • Transport; • Public lighting; • Green public procurement; • Local electricity production; • Local heat/cold production; • Other sectors; • Land use planning; • Environment & Biodiversity.	Mobility and transport of people and goods in urban and sub-urban areas ('functional urban areas').
Objectives	(At least) 20% CO_2 emissions reductions by 2020	(At least) 40% CO_2 emissions reduction by 2030 and climate adaptation	• Accessibility; • Integrated development of all transport modes, prioritising the more (environmentally) sustainable ones; • Reduced environmental impacts (including, amongst others, CO2 emissions as well as NO2 and particular matter (PM); • Improved road safety and security; • Optimised land use in urban areas; • More attractive cities; • Better quality of life for citizens/residents.
Definition of baseline	Comprehensive overview of energy generation and consumption in the municipality	Comprehensive overview of energy generation and consumption in the municipality; Risk and vulnerability assessment	Context analysis mainly based on socioeconomic data, transport infrastructure, mobility, supply-demand interactions
Indicators	A SEAP must include the following indicators: • % Reduction of CO_2 emissions, energy use,	A SECAP must include the following indicators: • % Reduction of CO_2 emissions	A SUMP should include environmental/energy indicators (e.g. reduction of CO2, CO, NOX, SOX, PM10, PM2.5, Volatile Organic

	generation from Renewable Energy Sources (RES), and savings indicators for each action (MWh). Moreover, a SEAP should include customised 'action indicators', including: • Energy delivered by electric vehicles charging stations (kWh/year) and • Photovoltaic systems electricity production (kWh/year).	• Energy use, generation from Renewable Energy Sources (RES), and savings indicators for each action [MWh] • Vulnerability-related indicators • Impact-related indicators • Outcome-related indicators. including: • % of transport, energy, ICT infrastructure retrofitted for adaptive resilience. Moreover, a SECAP should include customised 'action indicators', including: • Energy delivered by electric vehicles charging stations [kWh/year]; • Photovoltaic systems electricity production (kWh/year).	Compounds (VOCs), fuel consumption, increase in number of vehicles running on alternative fuels). Each SUMP measure, moreover, requires specific indicators used regarding: • Public transport; • Cycling; • Transport system: Limited traffic areas (extension); • Car sharing; • ICE vehicles trips/year; • Freight traffic in peak times; • Parking policies; • Motorization rate of population; • Modal split; • Road safety; • Public administration transport costs.
Elaboration of scenarios	Limited relevance, as there is only a single scenario: 2020 compared to the baseline year (Baseline Emission Inventory).	Limited relevance: Initial and final [2030] scenarios and optional 'long-term scenario' beyond 2030.	The elaboration of a range of contrasting scenarios is a distinctive feature in a SUMP elaboration.
Monitoring	Report to Covenant of Mayors Office		Each local authority is responsible for its own monitoring and evaluation
Cost & benefit analysis	Recommended but not mandatory		Recommended when selecting actions
Report	Monitoring Emissions Inventory (MEI) every four years, standardised and mandatory report submitted to Covenant of Mayors Office every two years		Not formalised
Process steps	• Political commitment; • Involvement of stakeholders; • Planning; • Baseline definition; • Adapting administrative structure; • Establishment of a long-term vision; • Identification of clear objectives; • SEAP/SECAP elaboration; • Actions implementation; • Monitoring and reporting progress.		• Set up working structure; • Determine planning framework; • Analyse mobility situation; • Build and jointly assess scenarios; • Develop vision and objectives with stakeholders; • Set targets and indicators; • Select measures packages with stakeholders; • Agree actions and responsibilities; • Prepare for adoption and financing; • Manage implementation; • Communicate, monitor and adapt; • Review and learn lessons.

4.2. Some cities leading the way on integrating SUMPs and SECAPs

The city of **Monzón** (Spain) has developed its SUMP and Sustainable Energy and Climate Action Plan (SECAP) in an integrated way. It has set up a harmonization team in charge of developing both plans and of exploiting synergies; shared the transport emissions inventory between both plans, identified common measures, and assessed their impact on both plans and objectives.

> The **SIMPLA project** coaching action of Monzon municipality consisted of harmonizing the development process of a SECAP with a SUMP. Before the coaching period the municipality had only a carbon footprint analysis corresponding to the year 2015 and a SUMP diagnosis made in 2017. At the end of the coaching period the municipality has approved both the SUMP and SECAP trough a city council plenary session at the end of February 2019. The team that carried out the development of both SECAP and SUMP was coordinated by the technician of the Environmental Department of Monzon and was formed by two teams: a team of technicians belonging to Monzon municipality and an external team subcontracted by the municipality. The external team was responsible of the technical development of the plan and was in constant communication with the head of the harmonization team in order to monitor the whole process and to collect all the information needed for the development of both plans. The main harmonization actions in the case of Monzon were undertaken to harmonize the reference year for the inventory of emissions (established for both plans as 2015), to align the monitoring of both plans in the years following their approval, to coordinate all face to face meetings between SUMP and SECAP external and the municipality teams, to use the same transport inventory of emissions and associated measures for both plans, to approve the both plans in the same city council. Another harmonization action undertaken from the beginning of the process was the involvement in the harmonization process of all municipal department in relation with the SUMP and SECAP development. Nevertheless, one of the main issues arisen during the last phases of the harmonization was related to the low stake of one of the departments of the municipality that slowed down the whole process. On the other hand, thanks to spreading among the departments the development of a SUMP, from the initiative of one of the technicians to the participation to a national funding programme that required a SUMP to participate, was carried out. [80]

Also assisted through the SIMPLA project,

> After a two-year process that involved figures from public administration (politicians and technicians), specialists, stakeholders, committees, associations, and citizens, **Parma**'s SUMP was approved in March 2017 by the City Council. Parma is the first Italian SUMP to be finalised in combination with a Strategic Environmental Assessment (SEA), thereby ensuring that environmental and other sustainability aspects are integrated into the plan. TRT Trasporti e Territorio provided technical support during the SUMP's development. Further to this, the city of Parma developed its SUMP and the second monitoring of SEAP in an integrated way. Parma promoted the setting up of a harmonization team in charge of developing both plans and exploiting synergies, with a common transport emissions inventory for both plans. The harmonization activity identified common measures, and assessed their impact on both plans and objectives. In 2020, Parma will draft and approve the SECAP; through it, plans will be aligned with data and indicators to better monitor and govern sustainability strategies. [81]

According to Art van Giessen and Jaap Burger's SEEV4-City Policy Learning from SEEV4-City Pilots Webinar contribution in May 2020 [9], the **City of Amsterdam's Climate Neutral 2050 Roadmap's Transition Path Mobility** is about limiting traffic in the city, and greening all polluting vehicles and vessels. See Figure 10. This responds to the phenomena that, according to Art van Giessen and Jaap Burger:

> Amsterdam is attracting increasing numbers of residents, visitors and jobs. More people mean more journeys: by road, rail, water, and also by air. The city is growing, too, meaning that the distances travelled are also getting longer. This has implications for the pressure on our surroundings, and if we do nothing, it will lead to more carbon emissions. By encouraging, facilitating and where necessary regulating the transition to sustainable transport, we are working to achieve fewer and cleaner vehicle kilometres. This transition path is specifically about the carbon emissions of passenger and goods transport in Amsterdam, and the aim is to minimise the number of polluting kilometres. We want to limit the growth in polluting vehicle kilometres in Amsterdam by switching to different, more sustainable forms of transport. We will ensure that the traffic that remains is clean. This will not only help to make Amsterdam cleaner and more peaceful, but it will also make the city more attractive and liveable for everyone.

According to Art van Giessen and Jaap Burger [10], the City of Amsterdam:

> Is working on the basis of the water transport programme (*Programma Varen*) and the *Clean Air Action Plan*, and we are broadening and accelerating our approach. We will take a tailormade approach to each target group, with specific measures for an emissions-free Amsterdam.
>
> Our measures will include:

[9] http://event.seev4-city.eu/

[10] http://event.seev4-city.eu/

- Introducing an environmental zone for passenger cars in 2020 and tightening up other environmental zones;
- Introducing subsidies for emissions-free vehicles;
- Agreeing covenants with sector organisations;
- Facilitating and tendering for more charging points and rapid-charging locations for electric vehicles, vessels, taxis, buses, and passenger and pleasure boats.

We are currently working on a new charging strategy. The goal is to facilitate everybody that wants to drive electric.

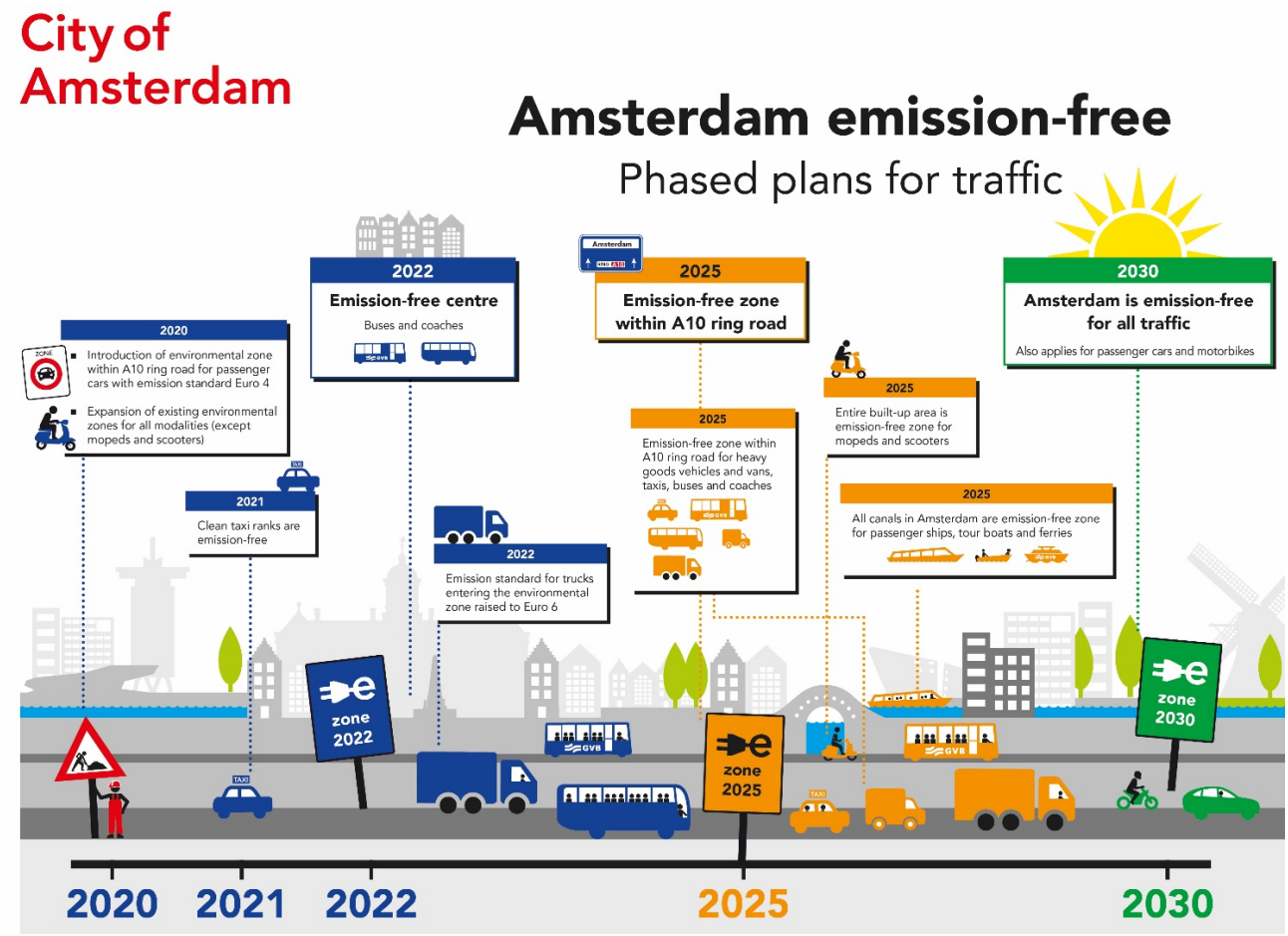


Figure 10: Amsterdam emissions-free -phased plans for traffic
(Source: Art van Giessen and Jaap Burger SEEV4-City Policy Learning from SEEV4-City Pilots Webinar contribution in May 2020, City of Amsterdam) [11]

According to **Sture Portvik, Manager Electro-mobility for the Agency for Urban Environment of the City of Oslo**, in his SEEV4-City Webinar presentation in May 2020 [12]

Oslo Municipality aims at and plans for:

- 100% of all passenger cars are battery electric within 2025;
- 100% of all light freight vans are battery electric within 2025;
- 100% of all new heavy freight vans are battery electric within 2030;
- 50% of new trucks are battery electric or hydrogen in 2030;
- 100% of new city buses are battery electric within 2025;
- 75% of long-distance buses are electric or hydrogen in 2030.

[11] http://event.seev4-city.eu/

[12] http://event.seev4-city.eu/

According to Portvik, there are three critical success factors:

- EVs must be *cheap to buy* (no purchasing tax, no VAT);
- *Cheap to use* (free parking, free electricity, free passing in tool gates);
- *Convenient* to use (easy access to charging, access to parking, bus lines).

And: You also need *the right product* to succeed!

Portvik states that "Green taxes are actually working, but you have to make it affordable for people to take green choices!"

According to Portvik, Oslo has challenges - despite all of its internationally/globally noted success. Major challenges include:

- EV sales are boosting. Hard to deploy chargers quick enough. From 1 (charger) - 4 (car), to 1 (charger)-28 (cars) in four years;
- 61% are living in multi-family buildings, apartments or town houses in Oslo;
- Electrification for professional users of EVs needs a boost.

According to Portvik: "private cars are a success in terms of EV uptake, but the sales of EVs are still low for professional users, as is also the case for taxi, vans, buses and lorries.

Professional vehicles have a much higher utilization but also shorter life time. Only 6 buses in Oslo are currently electric, but 70 new electric buses will come onstream in 2019. The bus fleet can be electrified much faster than private cars. The public transportation company has set 2028 as a target for no emissions in the public transport, including transport by boat."

The new Oslo approach/solution entails also the following:

In order to catch up we also need to:

- Establishing fast chargers in cooperation with private actors in the corridors in and out of the City;
- Indoor parking garages for EVs (Akershus, Vulkan). Akerhus: The World's first dedicated P-house [parking garages] for EVs only;
- Build a large "Centre of excellence" for professional users of EVs with flexible charging and pre-booking opportunities. Dualistic structure. The same garage offers free residential parking during night-time (see the SEEV4-City Vulkan car parking garage Operational Pilot report on this);
- Fossil-free public transportation (2020). 70 Battery electric buses arrive in Oslo in 2019, emission free public transportation by 2028;
- Making sure that everybody can charge at home (61% lives in apartments and town houses).

According to Portvik:

In 2019, the City of Oslo facilitated 20000 new charging points in the city, through a grants scheme for private citizens and businesses. Oslo City Council offers a grant 20% of all investments need for EV charging infrastructure in housing companies and housing cooperatives.

The users (installing organisations) must pay the physical hardware such as wall boxes.

Oslo City Council's strategy includes an emphasis on establishing and facilitating new 'green mobility houses', in partnership between the city council, shopping centres, property companies, EV charging infrastructure operators, retail chains, and housing cooperatives.

According to **Chris Randall, Transport Planning Officer for Leicester City Council**, the council is pursuing the development and implementation of a lower emissions concept from transport, as covered in his SEEV4-City Policy Learning Webinar contribution in May 2020 [13]:

This entails considering:

- Road traffic - a common source of NO_2 & CO_2;
- Land use & transport planning systems form an integrated approach to emissions reduction.

Measures include:

[13] http://event.seev4-city.eu/

- Parking policies;
- low emission infrastructure;
- fleet emission improvement;
- emission based tolling.

80% of Leicester's NO_2 emissions from road transport. Circa 25% of Leicester's carbon emissions from transport. Fully electric vehicles (& hybrids in electric mode) have zero tailpipe emissions. But the electricity should not come from carbon-intensive fuels such as coal & gas – and best comes from clean, renewable energy such as sun & wind.

Leicester City Council is updating its planning guidance on the % of bays which should have can EV charge point in car parks of different sizes serving different forms of development. Currently there are a total of c.160 public charge points, c.30 provided by the council, the rest by shopping malls, supermarkets, hotels, etc. The UK Secretary of State for Transport (as the relevant Cabinet Minister, with jurisdiction in England on this matter) has directed Leicester City Council to find the quickest way to reduce NO_2 levels. Leicester City Council, having undertaking the traffic & AQ modelling, is currently examining different scenarios for achieving this. The same range of measures can be used to address factors that affect the levels of NO_2 and CO_2 – although the factors themselves differ somewhat.

Air quality improvements across Leicester in recent years are thought to be related to partnership working with bus companies to introduce Euro 6 standard vehicles, and retrofit exhaust systems of earlier models with NOx abatement equipment – rather than a growth in e-mobility.

Reducing NO_2 entails:

- Reduce vehicle-km travelled – land-use planning, promote public transport, improve accessibility;
- Reduce emissions per vehicle-km – reduce congestion, encourage walking, cycling including eBikes & ULEVs (incl. public transport vehicles);
- Reposition traffic flows in relation to sensitive locations – land use planning, encourage walking, cycling & public transport.

Reducing CO_2 entails:

- Journey-specific factors governing how efficiently carbon-based fuels are used by vehicles – reduce congestion;
- Distance travelled – land use planning, improve accessibility;
- Carbon intensity of the travel mode & vehicle technology used – encourage walking, cycling including eBikes & Ultra-Low-Emissions-Vehicles (incl. public transport vehicles).

In June 2019, a UK law was passed that requires achievement of 'net zero' greenhouse gas (GHG) emissions by 2050. Leicester City Council's ambition is to be carbon neutral as a city by 2030. Leicester City Council considers itself to be on target to halve city-wide carbon dioxide emissions by 2025 from 1990 baseline. There are not enough EVs in Leicester yet to contribute their full potential contribution (…) but in 2017, Leicester City Council was operating 17 EVs. Emissions comparison were made with diesel equivalents scaled to intended replacement figure of 110 vehicles. A full switch over to (for example) Nissan Leafs would save 85 tonnes of carbon per year.

In terms of early e-mobility work undertaken by Leicester City Council, electric vehicle charge points at 6 Leicester City Council car parks, installed between 2012-2014, show a trend of patronage increasing at all locations, with three sites showing pronounced growth. Lessons include the need for publicity and marketing support, the need for Pay-As-You-Go (PAYG) access – not membership schemes. In terms of the Leicester City Council fleet, the EVs are popular with drives and both the EVs and the charge points are reliable. Leicester City Council's own EV fleet is expected to double in size to ca. 30 by the end of 2020 (comprising both cars and light vans). It is important for the City Council to lead by example, and no range problems have been experienced by operating within the city area, and no EV battery replacement has been necessary in four years of operation with the current EVs and charging modes.

To improve air quality and reduce carbon emissions Leicester City Council are offering grants towards the cost of an EV. The Leicester Low Carbon Transport Accelerator is part-funded by the European Regional Development Fund (ERDF). A key target group are city taxi drivers, to help them switch from diesel vehicles. Early grant allocations helped purchase electric hybrid taxis, ahead of fully electric versions becoming available. Even the electric hybrids can give passengers their first experience of the smoother, quieter ride available with an EV. Urban areas characterized by high density living; often without off-street parking. Domestic homes are the most popular places to charge in Leicester, but if off-road charging is not possible this could be a barrier to buying an EV. A public engagement exercise identified a trial project of 17 sites in residential areas, lacking off-street parking. Leicester City Council has also introduced 5 x 2 socket new posts & 12 x single socket lamp columns. LED conversion makes using lamppost with simultaneous EV charging possible – existing cables remain with capacity to provide max power rating of 5.7 kW.

Leicester City Council's Draft Local Transport Plan 4 (LTP4) for 2020-2036) has a vision of a growing city with cleaner air, with a fast progression to low emission vehicles.

To achieve this, Leicester City Council's LTP4 (as the statutory document, required by UK law) needs to:

- Ensure all programmes follow transport hierarchy giving preference to lower emission modes of transport; and that
- A carbon management hierarchy can also be mapped on.

This can be seen in Figure 11.

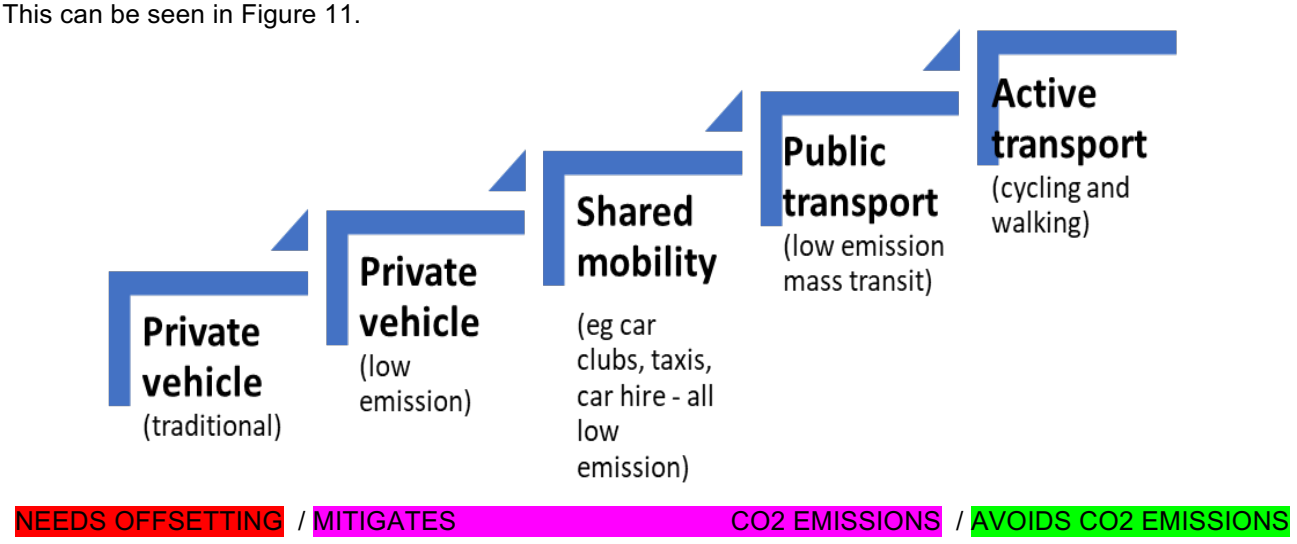


Figure 11: Carbon (CO_2 emissions) management hierarchy adopted by Leicester City Council for their Draft Local Transport Plan 4 (LTP4) for 2020-2036

According to Chris Randall's SEEV4-City Policy learning Webinar contribution in May 2020:

> Leicester City Council officers produced a vision of how they think Leicester will need to be as a carbon neutral, climate adapted city, as well as a list of potential actions that could move Leicester towards achieving that vision. Alongside many other cities and governments around the world, Leicester City Council has declared a Climate Emergency (in February 2019). This means that Leicester City Council has politically declared that it is prepared to play its part and take the action needed to prevent Climate Change becoming much worse. Leicester City Council undertook a 3 month-long engagement/ communication to get public's response on what it should do in order to get views of a cross-section of Leicester's population. Regarding possible e-mobility actions (marked out of five), the feedback received was as follows:
>
> - Public transport providers replace fleet with 'ultra-low emission' vehicles. 91% support;
> - (UK) Government to continue & increase the grants to individuals & businesses for ULEVs and charging points. 86% support;
> - Employers replace their existing vehicles with ULEV alternatives and install charging points for fleet and staff electric vehicles. 85% support;
> - Those with an EV and PV panels could buy 'vehicle to grid' equipment to store and trade their renewable electricity via the vehicle battery. 74% support.

Beyond the world of SUMPs and SE(C)APs, there are useful experiences and guidance to reflect on and to incorporate into strategic and implementation planning.

This includes, for instance, a recent (2019) ICLEI report on "Road to Replication – guiding cities on smart urban development" prepared by Barcelona City Council (Catalonia, Spain), Cork City Council (Republic of Ireland), Stockholm City Council (Sweden), Graz City Council (Austria), Suceava (Romania), Valetta (Malta) and Porto (Portugal) through the **GrowSmarter project** [82]. The guide concludes with a set of recommendations for decision-makers in local and regional governments to accelerate the adoption, replication and upscaling of smart city measures in their territories. They are:

- "Achieve scale by being socially and environmentally more comprehensive and ambitious;
- Govern smart developments effectively through the Integrated Management Cycle;
- Achieve meaningful replication by building on existing city targets, processes and plans;
- Embed smart measures into the core of urban planning;

- Ensure new staff capacity and a cross-departmental approach;
- Create an open alliance for Smart City applications;
- Align and ally with national and regional energy and climate policies;
- Make technical validations comparable to enable impact investments;
- Find synergies with other Smart Cities and Communities projects to implement more resource efficiently;
- Develop location-specific innovation schemes;
- Determine scalability based on experience of demonstration projects;
- Budget public participation and stakeholder engagement in your implementation plan;
- Allocate resources to mobilise public and private finance as well as create and maintain partnerships."

4.3. The critical relevance of the national policy level

A national context for SUMPs needs to be considered [as is true for SECAPs also], as has been highligted by the Joint Research Centre of the European Commission, the Urban Mobility Observatory/ European Platform on Sustainable Urban Mobility Plans (Eltis) and the Covenant of Mayors. This is provided in part, but not fully, by their respective climate action plans, as well as European Union regulations and policies. This is highlighted also by a **SUMP practitioner briefing on national support frameworks for sustainable urban mobility planning** produced by the **PROSPERITY project** [83].

According to a National SUMP Programmes Analysis (D5.1 32/762, from 6/02/2018) [84]:

> A first focus group meeting was organised in 2017 by SUMPs-Up with 18 representatives from 17 European cities (13 countries), with four groups exploring four set of questions. Some elements of the discussion are related to national SUMP programmes:
>
> - **Regarding measure selection, discussions at the national level could set the agenda and influence the interest of cities in determined policy fields** [Group 4 – Measure selection and action plan]. The national level could therefore help cities by **highlighting national policy priorities**;
> - **Lack of national support and an adequate regulatory framework is a barrier to SUMP implementation (e.g. low emission zones)** [Group 2 – Barriers]. This goes beyond just mobility planning, as it is clearly related to operational implementation. However, an inefficient regulatory framework for mobility is likely to prevent cities from being able to implement the whole range of SUMP measures.
> - **Drivers for SUMP can be non-mobility objectives: CO_2 / pollutant emissions, city attractiveness for business and tourism** [Group 1 – Drivers and challenges]. **Planning urban mobility is a way to address local mobility problems, but it also contributes to reaching other objectives, including objectives at the national level, such as compliance with national commitments under international environment protection agendas**.

For instance, **in Span, Portugal and Italy (but not in the UK), municipalities need to have a SUMP – as a plan – in place in order to obtain European and/ or national structural funding related to sustainable transport**.

A new **Special Report by the Court of Auditors (CoA) of the European Union on Sustainable Mobility in the EU published in early March 2020 [85]**, focusing on 8 cities (including Hamburg in the NSR region), investigated whether support from the EU had helped in making mobility in cities more sustainable, and assessed what progress had been made following the European Commission's €13 billion Urban Mobility Package.

> The findings of the report highlight that EU cities are failing to make necessary changes in their approaches to achieve a shift to sustainable urban mobility, and that issues such as air pollution from transport are still prevalent in many cities. The CoA report also highlights that little progress has been made in increasing the use of sustainable modes of transport, and that private car usage remains high in many cases. The report makes recommendations for the European Commission, including increasing the collection and publication of data on urban mobility in EU Member States, and linking the availability of funding for Sustainable Urban Mobility initiatives to the presence of strong plans at the city level for urban mobility. [85]

Leicester City Council for instance also notes that a UK Government policy paper of March 2020 ("Decarbonising Transport – Setting the Challenge") [86] as a first step towards Transport Decarbonisation Plan to be published later in 2020. This UK government policy paper recognises that current policies are insufficient

to bring transport in line with their legal net zero GHG emissions commitment by 2050. The notions entailed in this UK government paper include that:

- "The associated benefits of bold and ambitious action to tackle transport emissions are also significant. We can improve people's health, create better places to live and travel in, and drive clean economic growth.
- Success will require the sector, and its users, to embrace new technology and innovation like never before.
- Support for the transition to zero emission road vehicles will include:
  - A supportive regulatory framework;
  - A strong consumer base – developed by building trust in new technologies as providing a viable alternative;
  - Ensuring an adequate vehicle supply;
  - Ensuring the necessary refuelling and recharging infrastructure."

These points, amongst others, were also discussed by a contribution from Dr Myriam Neaimeh of Newcastle University at the public SEEV4-City Newcastle Vehicle 4 Energy Services Seminar organised by Northumbria University on the 8th of November 2019 [14].

The **UK government is also consulting on ending sales of new Internal Combustion Engine (ICE) vehicles (incl. hybrids) in 2035 or earlier (instead of 2040)** [15].

Separate from this, a **new campaign called "Badvertising"** is demanding an immediate end to adverts for large polluting cars (such as Sports Utility Vehicles, or SUVs) [87], although a car industry spokesperson said modern SUVs are the cleanest in history, and said many can run on batteries. A report from the green think tank The New Weather Institute and the climate charity Possible [88] says the trend towards big cars is propelled by aggressive advertising, with the global trend of rapidly-increasing sales of bigger and more polluting SUVs jeopardising (UK) climate goals. According to the report, SUVs now make up more than 4-in-10 new cars sold in UK, while fully electric vehicles account for fewer than two in a hundred. The report found that 150,000 new cars on the road are too big for a standard UK street parking space, at the same time as local authorities aim create space on the roads for walkers and cyclists. Steve Gooding from the RAC Foundation however suspects that banning adverts would not make a great deal of difference. Whilst the report is published at a difficult time for the UK car industry due to COVID-19, Professor Jillian Anable from the Leeds University Transport Studies Unit argues that the government needs to see the big picture on cars and consider banning large polluting models altogether. "(Given our CO_2 targets) there is a clear trade off to be made: the more we can shrink the size and weight of the cars we drive, the less we will have to restrict how much they are driven." She added: "Our research shows an approach where the most polluting cars are phased out from now over the next 10-15 years will be more effective than the government's proposed 'cliff-edge' target date in the future where petrol and diesel cars are suddenly no longer allowed to be sold."

[14] https://www.seev4-city.eu/2019/10/09/seminar-on-vehicle-for-energy-services-on-november-8th-2019-in-newcastle/

[15] https://www.gov.uk/government/consultations/consulting-on-ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans

5. Planning concepts developed by SEEV4-City

This section provides a short overview of evidence found for SUMEP/s at the six cities or towns where SEEV4-City Operational Pilots are located. These are:

- Amsterdam (the Netherlands);
- Kortrijk (Flanders, Belgium);
- Leicester (England, United Kingdom);
- Loughborough (as part of Charnwood Borough); and Burton-upon-Trent (as part of East Staffordshire Council) (both England, United Kingdom);
- Oslo (Norway).

There is no single SUMP, as defined by the European Commission [72] available on the above municipalities' websites. Note that the challenges for large metropolitan regions, such as the one surrounding Oslo and Amsterdam, present additional coordination issues for SUMP/s, as detailed in the recent SUMP topic guide "Sustainable Urban Mobility Planning in Metropolitan Regions" [89]. This has material on the Oslo metropolitan region (i.e. the city of Oslo and the county of Akerhus) (see Box 8 on p. 30 in the topic guide). Both Oslo and Amsterdam have extensively participated in SUMPs-related projects and fora.

Given the challenge of developing and implementing SUMPs, and the concept of a Sustainable Urban Mobility and Energy Plan (SUMEP) being new, it is no surprise that none of the SEEV4-City partner cities has a SUMEP in place. However, it is not necessary for a city to have named their plans as SUMP or SUMEP – it suffices that concrete actions have been undertaken. Using this as a definition, all five cities have a mobility strategy and/or a SEAP or similar, and possibly even SUMEP in place. Nevertheless, there is marked difference in the sophistication exhibited by the planning strategies and other instruments from the different cities, which roughly correlates to the publicly stated degree of (climate) ambition in the city plans to 2025, 2030 or 2050.

5.1. SUMEP evidence from the SEEV4-City context and practices

On the basis of degree of specificity and sophistication, the SUMEP/ss from the different cities can arguably be ranked as follows, though the first two could be interchanged depending on perspective and with a lot of dynamism at a large city scale, and Leicester is working now across the range:

1. Oslo;
2. Amsterdam;
3. Kortrijk;
4. Leicester;
5. Loughborough (as part of Charnwood Borough) / Burton-upon-Trent (as part of East Staffordshire Borough).

As listed in the overview in

Table 6 of evidence from SEEV4-City partner local authorities, in particular the plans by Oslo and Amsterdam are noteworthy as ambitious examples for other cities to follow. However, the relative wealth and scale benefits that these two cities have over the others in the above lists also play an important role. Kortrijk is focused on improving mobility for its citizens and aiming to become energy self-sufficient, whereas Leicester is making good progress on previous mobility improvement and carbon dioxide reduction targets. Leicester is taking its first steps in integrating the "E" of Energy into its mobility strategy, for which the next Sustainability Action Plan is expected to clarify the next steps to follow. Loughborough forms part of the Charnwood Borough, whose plans are noteworthy in that they clarify where new solar and wind developments may occur in its territory and the focus on mobility. Their plans are slightly more challenging than those of the cities due to the wider diversity of urbanisation, ranging from Loughborough proper to smaller towns and villages, all of which need to fit within the SUMEP whole.

Notes:

- Translations from Dutch (Amsterdam and Kortrijk) to English and Norwegian to English (Oslo) were made using online translators [16], and where possible subsequently corrected the grammar for improved readability;

[16] Google Translate and DeepL

- Each document and its (translated) citations are in a single row; the document is hyperlinked to the original source.

Table 6: Overview of SUMEP evidence from SEEV4-City partner local authorities as of July 2020

City	Document	Description	SUMEP evidence
Amsterdam	Coalitieakkoord stad Amsterdam 2018 "Een nieuwe lente en een nieuw geluid"	Gemeente (City of Amsterdam) Coalition Agreement from May 2018	"Amsterdam wants to make a substantial contribution to achieving the objectives from Paris [UNFCCC COP21], and therefore has the ambition to **reduce CO_2 emissions in Amsterdam by 55% in 2030 and 95% in 2050**. We strive for that Amsterdam becomes natural gas-free by 2040." "**The municipality is encouraging the number of solar panels in the city to grow to 250 MW in 2022. We do not want any roof in Amsterdam to be unused for sustainable objectives. We use all possibilities with residents, solar cooperatives, homeowners and corporations. Amsterdam wants to maximize the potential for wind turbines in our city.**" "We develop an ambitious agenda '**Agenda Low-Car Amsterdam**' ". "We will **continue with the current goal of an emission-free Amsterdam in 2025**."
Amsterdam	Ambities en uitvoeringsagenda Stad Amsterdam - 2019-2023	City of Amsterdam "Ambitions and Execution Agenda for the period 2019-2023"	"We are **fully committed to the energy transition** and the reuse of raw materials. That is why we opt for natural gas-free neighbourhoods, **more environmentally friendly generation of electricity and heat**, extensive energy saving and **emissions-free traffic**." "We propose a new **"Package of Measures for Emission Free Mobility 2019-2022**". This includes proposals tightening of current and new environmental zones, transition the public transport to become emission-free, incentive measures and more charging points."
Kortrijk	"Coalition Agreement" city of Kortrijk 2019-2024	City of Kortrijk coalition agreement with plans for the period 2019-2024.	"The city sets a good example. […]. We take the initiative for the **establishment of a local energy company in which citizens of Kortrijk can invest in solar panels and windmills**. There will be a roof insulation plan for 5,000 families. **The energy plan is being accelerated**. Kortrijk resolutely opts for energy-neutral city buildings and wants the first energy neutral city of Flanders. That means that the **city sustainably generates the energy it consumes**." "We **bring all services for cyclists in Kortrijk from city, Parko and bicycle company Mobiel together in one office for all questions and information about the use of the bicycle in Kortrijk: the Fietsambassade**. From here also new initiatives that stimulate the use of bicycles in Kortrijk can be initiated. We provide safe, covered bicycle parking where necessary including loading facilities. We are realising the plans for a bicycle parking lot with 170 places at Museum Texture. The first community bicycle sheds are a fact in the Passionistenlaan and Sint-Denijsestraat. Each year there are at least 3 community bicycle shelters in neighbourhoods where the inhabitants [currently] have little room to store their bikes. The Bicycle Embassy [Fietsambassade] is also for the distribution and maintenance of bicycle services such as bicycle pumps, **charging stations for electric bikes** and working out of a follow-up to the pilot project

			on **smart sharing of bicycles** of for example Mobit without the competition, the quality and the effective to lose sight of use." "**We set up Mobipoints where smooth switching from one means of transport to another is possible**."
Leicester	Leicester City Council Sustainability action plan (webpage)	Leicester City Council website on its Sustainability Action Plan	Our aims: • reducing carbon emissions; • improving air quality; • encouraging greener, healthier lifestyles; • improving green spaces and wildlife; • raising environmental awareness. Action we're taking: The **plan was launched in 2016 and updated in 2017 and 2018. It presents 92 actions we've committed to take by 2019** including: • **launching Fosse Energy - Leicester and Leicestershire's own affordable energy provider;** • upgrading boilers and insulating walls in council houses; • **replacing diesel vehicles with electric models;** • **'Connecting Leicester' with new and improved cycle routes and footpaths;** • **providing cycle training and walking programmes;** • creating wetlands and wildflower meadows and planting bulbs; • working with the Environment Agency to protect homes from flooding; • helping schools achieve the Green Flag Eco-Schools award. Sustainability Action Plan beyond 2020 is being worked on. ***Publication date unclear at this stage***.
Leicester	Leceister City Council Climate emergency (webpage)	Leicester City Council website on its response and actions regarding the self-declared Climate Emergency	• Converting the Park and Ride service at Birstall to use **electric buses, to reduce carbon emissions**. • Installing more solar PV panels on our buildings, including Euston Street Museum Store, to **generate clean electricity**. • Investing £150,000 a year to replace way lighting at council housing properties with LEDs to reduce energy use. • **Transforming cycling and walking infrastructure in the city through the Connecting Leicester programme and setting up a bike hire scheme**.
Leicester	Developing & delivering lower emissions strategies: a local authority perspective	Presentation given by Chris Randall, Transport Strategy Officer, Leicester City Council at the SEEV4-City Vehicle-for-Energy-Services (V4ES) seminar in Newcastle upon Tyne on 8 November, Newcastle	• Target: Halve city-wide carbon dioxide emissions by 2025 from 1990 baseline; • Target: Halve the City Council's carbon footprint by 2025 from 2008/9 baseline. Overall focus of Leicester Local Transport Plan 3 (LTP3) programme: • Supporting the economy & jobs; • **Reducing carbon emissions;** • **Sustainable transport;** • Improving air quality; • Encouraging active & safe travel. Leicester's SEEV4-City project. **Vehicle to Building project.**

Loughborough (part of Charnwood Borough)	Draft Charnwood Local Plan 2019-2036 Summary document	Summary document from Charnwood Borough Council for consultation review for new policies for the period 2019-2036	• Renewable and Low Carbon Energy: A new draft **policy supporting new wind and solar energy installations** where their impacts on the environment and local people have been addressed. The policy identifies opportunity areas for green energy production; • Sustainable Travel: The draft policies seek good **walking, cycling and public transport links** and **charging points for electric vehicles** to be provided on new developments.
Loughborough (part of Charnwood Borough)	Draft Charnwood Local Plan 2019-2036 full document	Full document from Charnwood Borough Council for consultation review for new policies for the period 2019-2036. Provides detail on policies.	• "…we are committed to making our operations carbon neutral by 2030 through using less energy, **producing more power from renewable energy sources** and reducing waste." • "We are aware that there are parts of the Borough where air quality is an issue. Our proposed **policies** on Sustainable Construction and **Sustainable Transport** also seek to address activities that can detrimentally affect air quality." **"Draft Policy LP29: Renewable and Low Carbon Energy Installations Proposals for wind and solar energy installations will be supported** where any adverse impacts on the environment including local amenity, the historic environment and the setting of heritage assets, noise and odour, the wider landscape, biodiversity and public safety have been fully addressed." **"Draft Policy LP 33: Sustainable Transport.** We will **improve the sustainable transport offer in our Borough**. We will do this by: • Requiring new major developments to provide walking, cycling and public transport access to key facilities and services; • Requiring **new developments to provide well-lit, safe and attractive walking and cycling routes**; • Securing new and enhanced bus services serving major developments to ensure the new development is no more than a 400m walk from a bus stop; • Ensuring that **sustainable transport infrastructure is well designed** and contributes towards making high quality places; • Requiring new residential dwellings with a dedicated car parking space (excluding apartments and residential care homes with communal parking areas) to include an appropriate means to recharge electric vehicles; and • Requiring non-residential developments that have at least 100 car parking spaces, to make **provision for at least 20 electric charging points**. We will require all major developments to have **robust transport assessments and travel plans** and to consider sustainable travel options at the outset so that they form an integral part of the development. We will work with our partners to: • Secure funding for and delivery of **sustainable transport improvements**; • **Prepare a Local Cycling and Walking Infrastructure Plan;** and • **Deliver infrastructure for electric vehicles and ensure charging points** are provided at appropriate locations."

Burton-upon-Trent **(part of East Staffordshire Council)**	East Staffordshire Borough Council Carbon Management Strategy and Implementation Plan: https://www.eaststaffsbc.gov.uk/sites/default/files/docs/climatechange/ClimateChangeStrategy.pdf	East Staffordshire Borough Council strategy and implementation document with references to policies, plans and actions at Staffordshire County Council, East Staffordshire Borough Council and Burton-upon-Trent levels.	ESBC "accepts that climate change is occurring and that **local government is seen as being central to reducing greenhouse gas emissions** (in particular carbon dioxide) at a local level. We have **signed up to the Staffordshire Declaration** and are committed to tackling climate change. This strategy sets in place a number of **aims and objectives** to ensure that the actions we take are coordinated and effective. In addition to **reducing carbon emissions**, there are often other associated benefits to having a strategy, such as helping to reduce fuel poverty, **improving air quality and lowering costs both for our organisation and for the wider community through the promotion of more sustainable practices**." The measures we have proposed in relation to this strategy have been set out in the form of an **Implementation Plan**, which covers a number of key areas, containing **actions** that will be undertaken over varying timescales. The **Energy Saving Trust** identifies that in addition to the direct climate change mitigation benefits, having a strategy in place can help have other benefits for ourselves and the wider community, such as: • Better housing, resulting in social and health benefits; • Financial savings for the Organisation. Lower fuel bills, helping tackle fuel poverty and achieve better standard of living. - Lower costs for businesses, making them more competitive. - More efficient use of resources in public services; • New employment and training opportunities locally; • **A better transport system, improving access for local residents and businesses**; • **Improved local air quality**; • **Increased resilience to the effects of climate change**, leading to greater protection and a better quality of life for people living and working in the local area." When considering the implementation plan proposals, it is important to consider the hierarchy that exists in relation to the various options available. **We will always seek to reduce energy consumption as the preferred option, followed by the replacement of fossil fuels with low/non-carbon alternatives**." Sitting **beneath international and national strategies, there are the following regional policies**: • The Staffordshire Declaration; • Sustainable Community Strategy for Staffordshire; • Local Area Agreement for Staffordshire (LAA); • Local Transport Plan for Staffordshire. **Beneath this there are local policies:** • Sustainable Community Strategy (East Staffordshire); • East Staffordshire Borough Council's Local Development Framework Strategies; • BUATMS (Burton Urban Area Transport Management Study); • ESBC"s Air Quality Action Plan; • East Staffordshire's Housing Strategy; • East Staffordshire Borough Council's Corporate Plan; • Environment Services Service Plan. **Implementation Plan Proposals** are, **in ordered sequence**:

			• Draft a Climate Change Strategy and Implementation Plan (as a 'living document'; • **Targets and timescales for energy use reductions in own estate and wider community**; • Adaptation Plans for ESBC; • **Energy Efficiency Action Plan** (first of Town Hall, then other council buildings); • **Cross-council data gathering system for energy efficiency**; • Evidence base to record activities towards NI 186 (that is -NI 188 "Adapting to climate change"); • ESBC will seek the further support of the **Carbon Trust through its Carbon Management Programme and Carbon Trust Standards**.
Oslo	City of Oslo plans to 2030 - Climate neutral dated 2019	Plans for the city to become CO_2 **negative** by 2030.	"Walking, cycling and public transport should be the first choices for travel in Oslo. Car traffic in Oslo will be reduced by one third by 2030, compared with 2015. **That all passenger cars on Oslo's roads should be emission-free in 2030. Public transport** **will be emission-free by 2028.** **That all vans should be emission-free. All heavy transport in Oslo shall be emission-free** **or use sustainable renewable fuels by 2030**. **Port operations and traffic on the fjord should be virtually emission-free."**  **Figure 12: Summary of City of Oslo plan Target Areas and the impact of each measure on the 5 key goals (1. Greenhouse gas emissions, 2. Carbon stock, 3. Energy Consumption, 4. Climate resilience, 5. Consumption emissions) –** Source: https://tjenester.oslo.kommune.no/ekstern/einnsyn-fillager/filtjeneste/fil?virksomhet=976819837&filnavn=byr%2F2019%2Fbr1%2F2019029283-2129575.pdf , p18/57 #3: "**Walking, cycling and public transport should be the first choices travel in Oslo. Car traffic in Oslo is to be reduced by one third by 2030, compared to 2015**" #5: "That all **vans should be emission-free. All heavy transport in Oslo shall be emission-free or use sustainable renewables fuel by 2030**."

			#6: "**Port operations and traffic on the fjord should be approximately emission-free**." #9: "**In Oslo, a larger share of the energy will be produced locally, and different energy solutions should complement and relieve each other**."

5.2. Integrating Mobility and Energy Plans: the case of the City of Amsterdam

Early in 2020 the **City of Amsterdam presented its *Roadmap Amsterdam Climate Neutral 2050*** [71]. The Roadmap can be seen as an exemplary case of a Sustainable Mobility and Energy Plan (SUMEP), as described in the SEEV4-City project. The Amsterdam Roadmap describes how CO2 emission reductions are to be achieved related to both energy and mobility; two sectors that were previously treated separately. The Roadmap was developed by different departments of the City of Amsterdam, and as such this provides interesting case material and possible lessons learned when it comes to developing more coherent strategies to tackle both energy and mobility emission challenges. For this purpose, **Bart Vertelman, project coordinator of the Roadmap Amsterdam Climate Neutral 2050, was interviewed (in June 2020)**.

Background

The development of the *Roadmap Amsterdam Climate Neutral 2050* can be characterized as a combination of bottom-up (collecting inputs from different city council departments) and top-down (where ambitions and objectives were formulated by the local government's elected politicians and executive management). As a result of this, the Amsterdam Roadmap consists of four transition paths:

1. Built Environment;
2. Mobility and traffic;
3. Electricity;
4. Port and Industry.

Elements of the Amsterdam Roadmap include the ambition to create energy neutral buildings, city districts to be decoupled from the natural gas grids, to covert all-mobility for all sectors to electric by 2030, establishing a high share of renewable energy generation in the city, and a major transition to clean energy for Amsterdam's industry and port.

The bottom-up approach is illustrated by the different backgrounds of the transition paths. The main driver for clean (electric) mobility has largely been air quality concerns since around 2010. Initiatives to stimulate electric mobility were carried out in the Amsterdam City Air Quality program amongst others as a response to increasingly necessary restrictions due to EU regulation for not reaching minimum air quality standards. In recent years, climate change has become more important in driving a transition towards more sustainable transport in Amsterdam, which includes both cleaner transport as well as reducing traffic movements and optimizing traffic flow. For energy transition, climate change has been the main driver all along, with city council programs on renewable energy generation and energy savings in the built environment and industry.

In the Amsterdam Roadmap, the topics of energy and mobility were combined as they cannot be seen as separate pillars: electric mobility will lead to additional electricity demand, and this will contribute to new peaks and grid investment requirements, but can in theory also contribute to local solutions (local energy storage, matching local generation with charging in EVs). Overall, the ambition of the Amsterdam Roadmap was to create awareness of these interlinkages and to better understand what the city can do to create synergies as well as prevent conflicts.

Establishing the Amsterdam Roadmap

A program (or Task Force) was set up for the Amsterdam Roadmap to coordinate all efforts to establish the roadmap. The program has a coordinating function to monitor progress, evaluate priorities and keep relevant departments involved. An important element is also to assess under which circumstances topics explored in more innovative programs can be translated and implemented by the more mainstream day to day business in the city council's departments. All relevant departments are involved and are contributing to the roadmap, including departments responsible for sustainability, built environment/living, area development, traffic and economic affairs. As such the Amsterdam Roadmap is a concentrated effort with all relevant departments leading to an integrated and coordinated effort.

Relevant is also the involvement of relevant external stakeholders in the development of the Amsterdam Roadmap – such as grid operators, housing associations, energy companies and port and industry

representatives. They are involved in several forms – varying from one on one consultations, steering groups and involvement in thematic studies.

A key take-away in this process has been to treat 'infrastructure' as a cross-cutting pillar across the transition paths. Infrastructures regarding electricity, heat, cold and possibly hydrogen are required along all the transition paths, and they have synergies as well as potential conflicting elements. It is critical to have a structured and coordinated approach to enable the large changes in all four transition paths, and establish how this impacts the underlying infrastructure and which changes are required. For this process, the program has the lead role; but relevant city council departments are continuously involved to understand the impact of their programs on the infrastructure. Illustrative of this is the so-called "thematic study energy and heat", in which the effects of different scenarios on the grid in 2030 are evaluated and communicated to relevant departments and alderman.

Implementing the roadmap

An important condition for the Amsterdam Roadmap to become mainstream is to foster climate actions being implemented within the relevant departments which are responsible for mainstream operations and day-to-day business and contacts in the city. To accelerate the implementation, funds were made available by the Amsterdam Roadmap program that city council departments could use to start, secure and implement actions within their respective departments.

Climate budget

An important element in the Roadmap was the setup of a joint climate budget, which basically provides an allocation model of CO_2 emissions per alderman (senior elected executive Amsterdam politicians, and of course a historic term and now gender-neutral). and corresponding city council departments. This approach has spurred discussion on responsibilities per department regarding the CO_2 emissions on city scale, and also allocates possible measures to achieve the ambitions (including the necessary financial budgets). This has led to rounds of discussions, negotiations and finally agreements between the relevant departments. Although allocating responsibilities to departments was agreed upon, the discussion on the climate budget has created an increased sense of joint responsibility between departments. A first concept of this climate budget is currently incorporated in the Amsterdam Roadmap, including a calculation of the results by 2030.

Governance

The Amsterdam Roadmap is the joint responsibility of different city council departments which report to different aldermen (senior elected executive Amsterdam politicians). This facilitates the roadmap as a joint undertaking: all aldermen and all departments contribute to the realization of the roadmap. Progress is monitored on a yearly basis, leading to renewed priorities and possibly aligned budgets.

Main recommendations

The main recommendations include the following:

- Set up a coordinator program or task force that is responsible for the monitoring and realization of the roadmap ambitions;
- Involve all relevant local government departments that are required to achieve the ambitions, and apply a climate budget to allocate which departments are responsible for particular dossiers and reduction goals;
- Keep external partners close, for instance through thematic studies and/or steering groups in order to align the roadmap ambitions with activities of these stakeholders;
- Regarding the topics of mobility and energy: explore the synergies as well as possible conflicts, for instance regarding infrastructure impacts, but coordinate activities on both topics in separate programs.

6. SEEV4-City recommendations and roadmap: sustainable urban energy and mobility planning (SUMEP)

6.1. Recommendations

The recommendations to policymakers are made at different levels, as follows.

6.1.1. Recommendations to policymakers at the EU/national levels

Regulatory framework:

- Harmonise the existing energy and mobility activities and plans/planning, including SUMPs, Sustainable Energy and Climate Action Plans (SECAPs) and SEAPs;
- Establish clear political commitment and explicit regulatory framework through the European Green Deal, specifically through the Strategy for Smart Sector Integration & Strategy on Sustainable and Smart Mobility, to fully enable smart charging and Vehicle-Grid-Integration's potential for climate protection, and a transport- and energy transition;
- Remove existing barriers (i.e. through the effective implementation of the Clean Energy Package) and allow for a full market participation of flexible electric loads such as smart charging infrastructure and V2G solutions, as well as flexible tariff structures, across the EU/ in EU Member States, European Free Trade Association (EFTA), and the UK;
- Use the revision of the Alternative Fuels Infrastructure Directive (AFID) to support the roll-out (where applicable) of smart-charging and V2G ready technologies in public, semi-public, and private infrastructure;
- Apply a system approach not only to support EVs but also smart charging and V2G, as well as the whole ecosystem around these;
- Provide a roadmap over a long enough period to stakeholders so that they can prepare and adapt accordingly, including making the appropriate investments and having the certainty of financial returns. Integrated Energy Management Systems, smart charging and V2X approaches should become an integral part of the plans, ensuring future-proof planning;
- Avoid the boom-and-bust cycle seen with support for photovoltaic (PV) energy in Europe through overly generous and inflexible feed-in-tariffs that typically did not adapt fast enough to the uptake by consumers;
- Assess and conclude whether electrified transport should fall under the umbrella of the European Union's Emissions Trading System (ETS) with a suitable carbon price incorporated. Ensure appropriate social access to both affordable electricity and mobility for all consumers and residents at both EU and national levels and in future mobility & energy plans/planning under the SUMEP concept;
- Consider European and state-level legislation on privacy (GDPR) when capturing data and making it available for further analysis.

Standardisation and communication protocols

- International level agreements should be reached to allow more standards such as the Combined Charging System (CSS) to be compatible with V2G in addition to the current standard CHAdeMO. Open standards should be further encouraged through the adoption of the Open Charge Point Protocol (OCPP) and the Open Smart Charging Protocol (OSCP), in their updated versions;
- Ensure that vehicle data (and specifically a vehicle identifier) is captured through the updated protocols and standards Ensure that vehicle data (and specifically a vehicle identifier) is captured through the updated protocols and standards.

Systems approach

- Foster the integration of the energy, mobility and digital sectors, allowing optimisation of the energy system as a whole;
- Enhance demand-side flexibility in order to smartly manage the energy system which has large shares of renewables and EVs. This will reduce the overall costs, including those for grid upgrades (central and local);

- Foster the value of flexible loads that allow shifting demand from peak to off-peak hours to reduce grid congestion and keep the grid stable.

Taxation and legislation

- Remove any legal and taxation barriers and facilitate the process for consumers becoming prosumers;
- Ensure the legislation (i.e. the EU Energy Taxation Directive) sets clear tax exemption for electricity not consumed in the EV battery, but stored to provide grid services, combined with a favourable taxation of electricity consumed off-peak could be set in order to encourage storage/ consumption at off-peak times;
- Introduce a new rate in legislation for a flexible connection (3 × 35 A with limitations) in countries where this is not the case (e.g. the Netherlands), which makes this more cost competitive rather than treating it the same as household connections. Introduce a new rate in legislation for a flexible connection (3 × 35 A with limitations) in countries where this is not the case (e.g. the Netherlands), which makes this more cost competitive rather than treating it the same as household connections.

Subsidies and incentives

- Closely link the incentives for e-mobility with the incentives for renewable energy by providing 'package incentives';
- Provide incentives to consumers, local authorities, local companies, and governmental public bodies in becoming active members of the local electricity distribution networks;
- "Green incentives", for the inclusion of centrally and locally generated and distributed renewable energy, need to be accompanied by infrastructure (i.e. parking, shared charging stations). It is important here to consider both affordability but also consumer convenience;
- Maintain a consistent and supportive policy and subsidy framework at all levels to avoid negative externalities and the creation of a 'boom and bust cycle' that could arise due to changing subsidies;
- Establish a specific V2G Feed-in Tariff which could be progressively reduced as EV battery costs decline (as projected) or allow V2G feed-in to be included in Export or Self-consumption schemes, so they are placed on a level playing field with other relevant technologies;
- Provide subsidies to reduce the currently high battery investment cost for Battery Energy Stationary Storage (BESS) to achieve higher energy autonomy, lower CO_2 emission and ensure better grid stress alleviation.

Communication and awareness raising

- Raise awareness among a broad spectrum of stakeholders (in particular of local actors) by developing targeted communication strategy that (1) outlines the economic and environmental benefits of 'pro-sumption' and (2) provides a step-by-step guidebook on the process of installation;
- Provide a toolkit to municipalities in local languages. This toolkit can include the Political, Economic, Social Technological, Environmental and Legal (PESTEL) benefits, information, specifications, requirements, list of (local, regional, national or EU), solution providers, promotional materials, examples of applicable and transferable business models, etc;
- Facilitate capacity building and peer-to-peer exchanges for local and regional authorities. Facilitate capacity building and peer-to-peer exchanges for local and regional authorities.

User Acceptability

- Consumer feedback (i.e. behaviour, receptiveness, needs and requirements) should be collected and measured to provide insights into EV owners' attitudes and their response to V2G products and services;
- Encourage desired behavioural or societal change, such as encouraging low-carbon active personal mobility or increased energy efficiency, while considering the positive externalities that such changes bring about;
- Publish a V2G 'Best Practice' code of conduct for V2G operators and system aggregators in order to ensure that the user experience is managed and batteries are not damaged by aggressive V2G activities.

Business model development

- Effectively use policies as an enabler to incentivize the development of business models with built-in distributional dimensions;
- Encourage and establish shared (including monetarized) benefits for stakeholders' built-in agreements which incentivize all the respective stakeholders – including the EV owners at domestic scale - to contribute to an aggregated eV4ES future.

Research and exchange of knowledge

- Support research collaboration and international knowledge exchange on different aspects of eV4ES and the interests of diverse stakeholders involved, such as research and education communities, original equipment manufacturers (OEM), Transmission and Distribution Systems/Networks Operators (TSO, DSO and DNO), policy makers, municipalities, service providers, EV owner/ user, etc.

6.1.2. Recommendations to policymakers at the local/ regional levels

Strategic planning

- Long-term, agile and integrated strategic planning in full alignment with the local/regional roadmaps, and based on the interdisciplinary and inter-organisational/interagency cooperation among public and private actors, including charge point operators (CPOs) and DSOs;
- Avoid working in silos. Instead, Local and Regional Authorities (LRAs) should consider setting up inter-departmental and cross-cutting task forces within the municipalities, ensuring both vertical and horizontal alignment and exchange. This approach should also allow a more harmonised approach reducing the danger for the process to become exclusively politically or business-driven. Avoid working in silos. Instead, LRAs should consider setting up inter-departmental and cross-cutting task forces within the municipalities, ensuring both vertical and horizontal alignment and exchange. This approach should also allow a more harmonised approach reducing the danger for the process to become exclusively politically or business-driven;
- Close cooperation between private and public stakeholders along the entire supply chain, namely: energy providers, charging solution providers, consumers, public authorities (mainly the above-mentioned cross-cutting task forces). This approach will help in reducing the danger for the process to become exclusively politically or business-driven;
- Develop strategies applicable to local circumstances instead of a 'one size fits all' approach;
- Promote smart charging and V2G solutions in the roll-out of the public charging infrastructure and include (whenever possible) concession granting and/or state aid as a requirement in the procurement;
- Green incentives need to be accompanied by infrastructure, i.e. parking, shared charging stations, etc. It is important not only to consider affordability but also consumer convenience.

Capacity-building

- Develop a more integrated skill sets for energy and transport intersection amongst planners, local authority managers, consultants and technologists;
- Participate in peer-to-peer exchanges and EU-funded/ national projects.

Empower the consumer

- Empower the consumer through the provision of appropriate prices incentives;
- Create indoor parking garages for Electric Vehicles with smart charging and V2G solutions;
- Create centres for professional users of EVs, including flexible charging structures and pre-booking. Dual purpose: charging during the day, residential parking during the evening.
-

6.1.3. Recommendations to researchers and modellers

Aimed at researchers and modellers, who can then locally inform policymakers, to promote the introduction of a tailor-made system, rejecting the predominance of the one-size fits all approach.

Creation of systems based on data collection and analysis:

- Creation of urban observatories and monitoring to provide stakeholders with a better of understanding of the range of local systems factors (i.e. vehicle types, fleet composition and the EV charger occupancy rates, for a better and more optimal systems design and performance, through real-time measurements for a large amount of EV charging sessions);
- Collection of meter-values (i.e. 15-minute data on the smart meter of the charging station), allowing for additional analysis of actual charging levels per type of vehicle;
- Combine data of EV charging with data on the local electricity grid to better understand the interaction between household and EV contributions on the LV load, considering sensitivities of sharing public data.

More flexible and dynamic approaches for optimal consumer service:

- Introduction of more dynamic charging levels, considering transformer space and renewable energy generation, considering the trade-off in investing in more dynamic profiles and more insecure outcomes (e.g. for consumers) and the lower investments and higher predictability of static profiles.

Grant control to the consumer, possibly combined with a price incentive:

- Calculating an optimal user profile depending on the estimated connection time and amount of required energy, avoiding the effect of impacting vulnerable charging sessions, but reaching almost the same overall effect;
- Incentivise additional research on the combination of incentives and forms of consumer influence.

6.1.4. Recommendations to practitioners

The overreaching recommendation for practitioners regarding meeting technical requirements for Smart Charging and Vehicle-Grid-Integration mainly cover **fostering competition by creating a level playing field for all grid stabilizing asset classes which fully utilizes their different characteristics.** The following actions will help in this regard:

- Exemption of grid stabilising storage of energy (with mobile and stationary batteries) from levies and taxes;
- Grid stabilising products and services should consider and respect the size, decentralized nature and aggregation ability of vehicle batteries;
- The smart-meter-gateway roll-out and the development of a bidirectional charging standard accelerated by a clear target date;
- While (home) battery storage seems to be a similarly useful proposition, significant developments in the whole supply chain and ecosystem need to occur;
- Allow remote configuration time-dependent current limits charging stations to be able to allow and such as provided by OCPP1.6 and with improved and added functionalities in OCPP2.0 (and now also OCCP2.0.1) compared to OCPP 1.6;
- Adapt EV charging infrastructure charging profiles to stimulate EVs to absorb future peaks in local solar power: by, for instance, reducing charging speeds in the morning and increasing them during the day (based on irradiation forecasts). Possible impacts on users (with short morning session) should then be evaluated against the increased matching with RE generation.

6.2. Roadmap

An important element in the promotion of electric mobility and also the further integration of renewable energy in the electricity grids are roadmaps.

The **United Nations' Electric Mobility Programme**, as part of the UN environment programme, for instance is a global programme supporting electric mobility for developing and transitional countries, with a special focus on emerging economies in introducing electric mobility. The Programme intends to make a major contribution to UN Environment's work on air quality, in specific the UN Environment Assembly's Air Quality Resolution and the implementation of the Paris Climate Agreement. [90]

The **Global EV Outlook 2020 report** [91] by the **International Energy Agency** (June 2020) identifies and discusses recent developments in electric mobility across the globe. This annual report is developed with the support of the members of the **Electric Vehicles Initiative (EVI)**. The 2020 report identifies and discusses recent developments in electric mobility across the globe. The report includes policy recommendations that incorporate learning from frontrunner markets to inform policy makers and stakeholders that consider policy frameworks and market systems for electric vehicle adoption. The 2020 edition features an update on the performance and costs of electric vehicle batteries. The 2020 report further extends the life cycle analysis conducted in Global EV Outlook 2019, assessing the technologies and policies needed to ensure that EV battery end-of-(automotive)life treatment contributes to the fullest extent to sustainability and CO_2 emissions reductions objectives. Finally, the 2020 report analyses how off-peak electricity demand charging, dynamic controlled charging (V1G) and vehicle-to-grid (V2G) could mitigate the impact of EVs on peak demand, facilitate the integration of variable renewables and reduce electricity generation capacity needs. This tallies with topics discussed in the SEEV4-City Summary and Full State-of-the-Art reports.

At European level, the "**European Roadmap Electrification of Road Transport**" from June 2017 (its 3rd edition, updated from 2012) to last until 2022) [92] **published jointly by the European Technology Platforms ERTRAC, EPoSS and ETIP SNET** provides background information and R&D&I roadmaps for the electrification of the different vehicle categories. They state that this European Roadmap "has been the major source of recommendations for the projects funded by the European Green Cars Initiative in FP7, followed by the European Green Vehicles Initiative in Horizon 2020. The task of the roadmap is to set the scene, give clear objectives, and list the milestones that require funding or policy action at European level."

The European Roadmap covers technology, R&I, demonstration but also industrial/commercial, societal/public policy framework/regulation domains. "Following the definition of milestones, the involved companies and organisations from the automotive and energy sectors agreed on actions to be taken in order to achieve the stated objectives. Roadmaps were drafted for the four dedicated initiatives introduced above considering the fact that the five biggest hurdles for user acceptance of electric vehicles are, high cost, inconvenient and slow charging, limited range, perceived lack of added value and concerns of limited mobility. These roadmaps indicate what has to be done and when in order to overcome these hurdles and to move of Europe towards the electrification of road transport. (p. 38). Those roadmaps are

termed "User-friendly affordable EV passenger car + infrastructure" (p. 40), "Non-compromise electric urban bus system" (p. 41) and "Sustainable electrified long-distance trucks and coaches" (p. 42).

The *European Green Cars Initiative* (EGCI) was of the three **Public Private Partnerships** included in the "European Economic Recovery Plan" endorsed by the European Council on 11-12 December 2008. The financial envelope for this initiative was €5 billion, aiming to boost the European automotive industry at a time of economic hardship, and maintaining support for the development of new, sustainable forms of road transport, in particular electric vehicles. Electrification of transport (electromobility) was established as a priority in the Community Research Programme. It also figures prominently in the European Economic Recovery Plan presented in November 2008, within the framework of the European Green Cars Initiative. Inter alia, the European Commission supported a Europe-wide electromobility initiative, Green eMotion[17], worth €41.8 million, in partnership with forty-two partners from industry, utilities, electric car manufacturers, municipalities, universities and technology and research institutions. The aim of the initiative was to exchange and develop know-how and experience in selected regions within Europe as well as facilitate the market roll-out of electric vehicles in Europe. The Commission made €24.2 million available to finance part of the initiative's activities. Currently the European Green Cars stakeholders are working on the follow-up of the EGVI that will be called "2Zero partnership" (Towards Zero emission road transport) as part of the Horizon Europe public-private sector research funding framework [18]. Arguably, this is still very much vehicle-focused.

The European Union is currently discussing the shape, volume/funding, scope and contents of the EU "Green Deal" package, which is being amended now to try and also help in post-Covid-19 recovery across the EU Member States. The nature of this package which will likely consist of programmes and may also rely in part on legislation is complex and would last over many years this decade at least. The **European Green Deal** is a key policy plank of the new European Commission led by President Ursula von der Leyen. It is a package of measures, based on political guidelines and strategies, and partly based on new EU legislation to be developed, drafted and to be negotiated between the European Commission, the Council of Ministers of the EU and the European Parliament through the co-decision making procedures, that aims to radically cut emissions of greenhouse gases while creating jobs in clean industries. **Its main objectives are for the EU to become climate neutral by 2050, radically reduce other types of pollution, help European companies to become world leaders in green products, and offer aid to regions affected by this economic transition**. This

[17] http://www.greenemotion-project.eu/

[18] https://egvi.eu/mediaroom/2zero-a-draft-proposal-for-a-new-european-partnership/

intended EU "Green Deal" package, intended also to be a flagship part of the political programme of the new European Commission under its President Ursula von der Leyen, will be parallel and likely have a complex relationship with the – at least for a significant stretch of time - parallel **new Multi-Annual Budget of the European Union**, which is also currently being negotiated for the next 7 years to take effect from the 1st of January 2021. The current EU Budget for 2014-2020 expires at the end of December 2020, at the same time when the current extension to the negotiated transition period following the exit of the UK from the EU runs out.

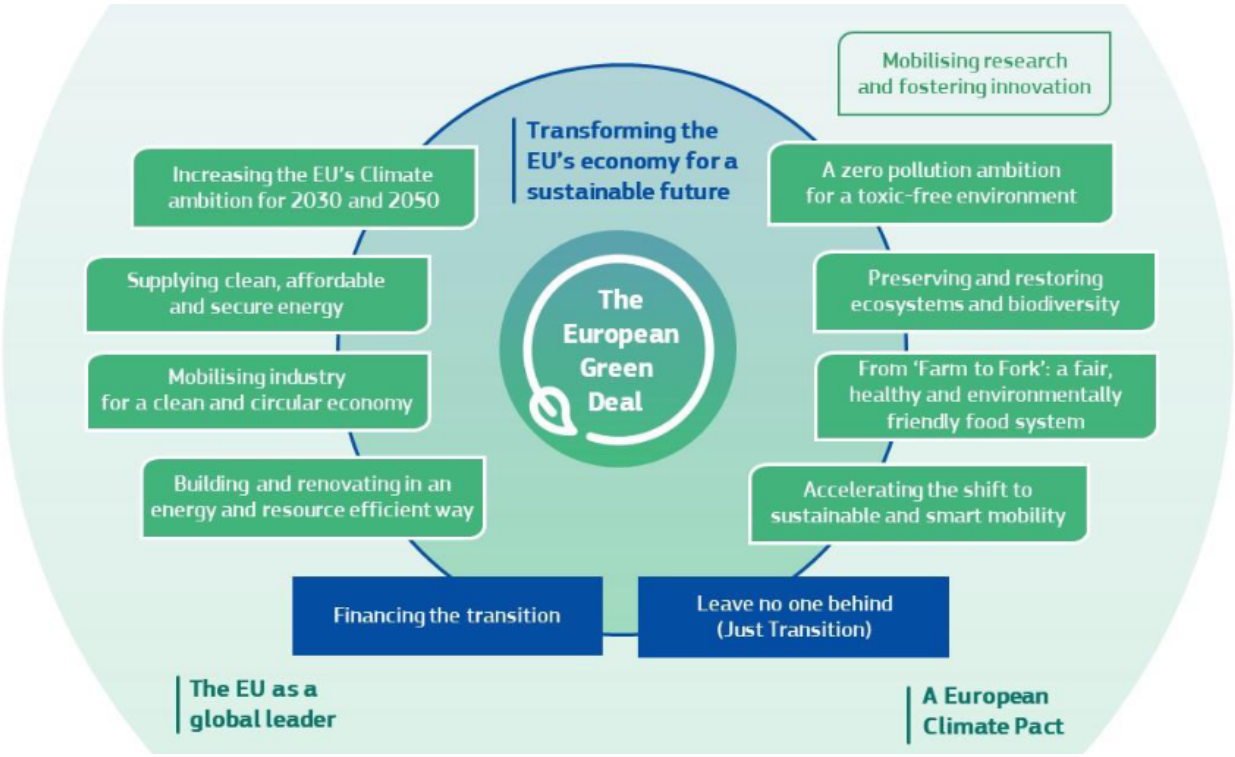


Figure 13: The European Green Deal
(source: https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf)

In May 2020, a range of associations (such as SEEV4-City project partner AVERE, the European Association for Electromobility), NGO Transport & Environment and companies from different sectors (including EV charging infrastructure, technology, retail, and consumer goods production) wrote a public letter to the European Commission [19] to advocate for e-mobility to be placed at the heart of the upcoming EU Recovery Plan:

> We welcome your commitment to 'strengthen our economies by focusing on common priorities like the European Green Deal' in response to the COVID-19 crisis. Similarly, we support that the European Parliament recently agreed in an overwhelming majority that the €2 trillion economic recovery and transformation plan should have the European Green Deal at its centre. In this context, we are writing today to highlight how an economic recovery plan that promotes e-mobility will support public health and climate change objectives as well as boosting the economy. Following our previous letter dated 16 April 2020, we urge you to ensure that that the European e-mobility sector is put at the heart of any EU recovery plan for the transport sector. Zero emission mobility, and electrified transport specifically, is the most effective way to meet short term and long-term climate and CO2 emission-based targets for Europe, while dramatically reducing toxic air pollutants. We therefore call on you to ensure that the recovery plans prioritise public funding to electric vehicles needed to return to the unprecedented growth in EV sales that Europe has seen over the first quarter of 2020. Prior to lockdown, EV supply was just beginning to catch up with the vast pent up demand of private customers and corporate fleets (as demonstrated by The Climate Group's EV100 initiative). We are also concerned about the possibility of EU or national money being used to support all Euro 6d temp cars regardless of CO2 emissions, as this would include even large diesel or petrol SUVs. We ask the Commission to ensure, through its new recovery programmes and guidelines to member states, that no taxpayer money goes to subsidising legacy technologies run on fossil fuels. At the same time, subsidising outdated and traditional fossil fuelled technologies (i.e. internal combustion engine vehicles) with public funding would go against the key objectives of the Green Deal and the clean mobility transformation in overall. In fact, taking advantage of a potential EU-wide 'purchasing facility' for Clean Vehicles that prioritises zero emission (electric) vehicles and drive trains and boosting sales on segments where supply is still lagging (e.g. heavier duty vehicles) would be key in this

[19] https://www.avere.org/letter-to-the-european-commission-e-mobility-at-the-heart-of-the-upcoming-eu-recovery-plan/

regard. Further relief actions such as revising the current EU VAT Directive to provide exemptions for zero emission vehicles will provide concrete and long-term certainty for investment in the sector. The roll-out of charging infrastructure also has vast potential as a green stimulus measure. The crisis has put a brutal stop to both its deployment and use and will affect the sector's financing capacities. As such, we call on the Commission to drastically increase the target and funding available for the development of public charging points by 2025 previously set out in the original Green Deal Communication. Effectively using new and existing funding instruments to steer private and commercial investments into charge points, notably via InvestEU & CEF, would create jobs across the continent, in both urban and rural settings. Providing the market with the right investment signals will help get the charging network ready for the mass volumes of EVs expected over the next five to ten years. The coronavirus has impacted the world greatly and will have long-lasting consequences for the recovery of Europe in particular. But a revised Multiannual Financial Framework (MFF) combined with a transformational economic recovery plan, that has the green mobility transition at its heart, will ensure its businesses emerge from the crisis stronger and greener, ready for the climate challenge ahead of them.

In May 2020, The Electrification Alliance – which includes SEEV4-City project partner AVERE (the European Association for Electromobility) - welcomed the European Commission's initiative to set out a comprehensive strategy for smart sector integration, which they believe:

Can greatly contribute to a 'green' and 'digital' recovery from the COVID-19 crisis. A well-managed transition towards a resilient European energy system, exploiting synergies between different sectors, will be an essential element of the cost-effective decarbonisation of our economy by 2050. It will also further ensure the international competitiveness of the European industries, that will deliver climate neutrality. Enhanced smart sector integration is mostly a matter of making electrification work, as shown by the European Commission's Long-Term Decarbonisation Strategy 1.5 Tech and 1.5 Life scenarios. Direct electrification must be the top priority of the Strategy as we must ramp up rates of direct electrification from today's 24% to at least 50% by 2050. Investing in power grids and in the technologies and supply chains that will deliver climate neutrality must be central to the EU's plan for a speedy and future-proof recovery.

The Electrification Alliance proposed **5 priorities** for a successful roadmap on the Smart Sector Integration Strategy:

1. Prioritise direct electrification (combined with energy efficiency and the massive deployment of renewables), as it is the most cost-effective way to decarbonise the EU economy:
    - Direct electrification of end-use sectors like buildings, heating and cooling, transport and industry can bring huge macroeconomic benefits in terms of economic growth and employment. Up to €23 billion could be saved on energy bills with breakthrough levels of smart electrification and deep buildings efficiency, leading to the net creation of potentially 1.8 million jobs in Europe. A recent report by IRENA also shows that scaling up the deployment of renewables and boosting direct electrification would already generate 1.5 million new jobs in the EU's energy sector;
    - Direct electrification with cost-effective technologies can accelerate today. Heating and cooling are responsible for 50% of EU final energy demand, and most of that heat is generated by burning fossil fuels. Green, digital and cost-efficient technologies such as heat pumps (electric and hybrid) are three to five times more energy efficient today than traditional fossil fuels boilers and have lower running and maintenance costs for consumers. They bridge power and thermal needs, while contributing to improved air quality and grid flexibility. In the transport sector, electric vehicles (EVs) have an efficiency of 80-90% from tank to wheel today compared to 20-30% for internal combustion engines (ICEs). Integrating the zero-emission transport and the energy sectors brings substantial benefits for the decarbonisation of both sectors, specifically with the development of smart charging. The further integration of all sectors should be at the centre of the upcoming Renovation Wave Strategy, to harness the benefits of direct electrification and cost-effective technologies.

2. Enhance demand-side flexibility across all sectors to smartly manage an energy system with large shares of renewables and reduce costs for grid extension:
    - For a more reliable and digital energy system, demand-side flexibility from all sectors needs to be enhanced. The Smart Sector Integration Strategy should recognise and foster the value of flexible loads that allow shifting power from peak to off-peak hours to reduce grid congestion and keep the grids stable. Therefore, it is crucial to remove barriers and allow for a full market participation of flexible electric loads such as heat pumps, smart charging infrastructure for electric vehicles, vehicle-to-grid and storage solutions;
    - Element Energy and Cambridge Econometrics (2019). Towards Fossil-free Energy in 2050;

- Accelerate deployment of distributed electric loads to reduce cost for grid extension. The Strategy should foster valuing distributed flexible electric loads and self-consumption to reduce investments in additional grid infrastructure and contribute to reduce energy system cost.

3. Accelerate the deployment of a smart and climate-resilient electricity grid infrastructure
   - Optimise the existing power grid and significantly step up its build out, as increasing the electricity share in Europe's energy mix will require larger and more flexible electricity grids (TSO and DSO). It is a "no regret option" to be evaluated against some investments in the gas infrastructure that could become stranded assets and make European energy costs globally uncompetitive. A coordinated infrastructure planning is therefore needed, taking into account all sustainability concerns, as well as the need for increased flexibility in the power system;
   - Enhance the deployment of smart grids to improve operating efficiency, increase security of supply and prepare the power system for the growing penetration of distributed renewable energy and flexibility sources. It is crucial that the revised TEN-E regulation prioritises digitally smart and climate-resilient infrastructure, in full compliance of EU energy targets and Climate Law.

4. Revise the Energy Taxation Directive to ensure that all energy sources can compete on an equal footing, promote clean innovative technologies and ensure competitive energy costs in Europe
   - Undue taxes and levies on electricity that are a barrier to electrification should be removed and taxation should be harmonised across all energy carriers. Taxation rules should prevent the distortions of grid tariffs, unlock the potential of smart and efficient electric-based renewable heating and cooling solutions and power-to-X, as well as of energy storage in buildings and EV batteries (e.g. no double taxation when providing grid services);
   - E-mobility will drive the evolution of the tax base for energy fuels taxation, and thus of taxation. In the short and medium term, it is necessary to gradually adapt fuel taxes to maintain a stable tax revenue base for Member States, as fuel use declines. It is crucial that these changes factor in climate performance of energy sources and not result in a disincentive to electromobility.

5. Allow renewable-based indirect electrification to play a key role for 'harder to abate' sectors
   - After direct electrification, indirect electrification through power-to-gas technologies should be given consideration to provide additional decarbonisation flexibility to the energy system. These technologies should be integrated in a functioning market design that integrates electricity and gas infrastructure planning based on a future-proof cost-benefit analysis;
   - Green/renewable hydrogen (produced from renewable electricity using electrolysis pathways – currently only 4%) needs to be supported with a clear focus on the decarbonisation of the 'harder to abate' sectors, such as the steel, cement, chemicals sectors or some heavy-duty transport segments. EU policy support to green/renewable hydrogen and other renewable gases (such as biomethane) should be preceded by clear definitions informed and by real-life lifecycle emissions assessments.

In conclusion, the Electrification Alliance recommends that "the upcoming Smart Sector Integration Strategy should make use of the numerous advantages that further electrification can offer to speed up a 'green' and 'digital' recovery in line with the European Green Deal objectives [20]. This will give Europe's citizens and industries the opportunity to invest in growth that drives green jobs (based on a still to be upskilled workforce), industrial innovation, digital and market competitiveness, and improved quality of life."

The **SEEV4-City Policy Learning Webinar (20 May 2020) contribution by Jayson Dong, Policy Manager of AVERE on "The EU's Role in Enabling V2G and Smart Charging" covered a number of these dimension** (PPP downloadable from SEEV4-City website) [21]. The presentation covered the EU's Clean Energy Package (Clean Energy for All European's) completed and agreed in 2019 as a "comprehensive update of its energy framework to facilitate the transition away from fossil fuels towards cleaner energy and to deliver on the EU's Paris Agreement commitments for reducing greenhouse gas emissions." The European Commission sees "the agreement on this new energy rulebook – called the Clean energy for all Europeans package. marked a significant step towards the implementation of the energy union, published in 2015." According to the SEEV4-City Policy Webinar presentation by Jayson Dong of AVERE, the EU Clean Energy Package entails:

[20] https://ec.europa.eu/commission/presscorner/detail/en/fs_19_6714

[21] http://event.seev4-city.eu/wp-content/uploads/2020/05/JVD-SEEV4City-V2G-and-SC.pdf

- EU Legislation on the internal market for electricity established common rules, with a view to creating a truly integrated competitive, consumer-centred, flexible, fair and transparent electricity market;
- Customers are entitled to direct contracts with aggregators, without prior consent of the supplier, who then may sell the flexible (EV) loads to balance the grids;
- Member States must also facilitate the connection of charging points to distribution networks, mandating cooperation between electricity network operators and charging point operators, and requires Member States to remove administrative barriers to the rollout of charging infrastructure;
- Member States also need to ensure that every final customer is entitled to a dynamic electricity price contract from their supplier, allowing end consumers to adjust their consumption according to real-time price signals.

At the time of Jayon Dong's Webinar presentation, discussions of provisions within the European Green Deal – with the target of aiding the EU and her Member States to become 'Climate-Neutral' by 2050, including by achieving a 90% reduction of greenhouse gas emissions against the 1990 baseline by 90%, were ongoing, Some targets being discussed then, but perhaps currently increased, were of installed EV recharging points to reach 1 million by 2025, and a volume of 13 million (ultra-) low-emissions vehicles by 2025 across the EU.

A **recent Transport & Environment advocacy** report (2020: 3) [93] suggests that

> To keep up with this electric surge – estimated to be between 33 million electric cars in the current policy scenario and 44 million in the climate neutral one in 2030 – needs to prioritise electric charging and be in line with the increasing demand for public and private charge points across Europe, including both the numbers of public chargers needed and the funding mechanisms to nudge the market in the right direction. A new EU policy framework for alternative fuels infrastructure (AFID) and the funding mechanisms currently discussed in the European Green Deal are the two cornerstones to deliver an ambitious EU recharging infrastructure masterplan. As of the end of 2019, there will be around 185,000 public charge points in the EU, or 7 cars for each point, which is enough for the current market. There is a clear preference for slow (AC) public charge points (61% public chargers) but the network of fast and ultra-fast charge points is progressing well with around 9,000 CCS fast charge points and 640 ultra-fast chargers across Europe. Fast chargers are mostly located in the urban corridor stretching from the southern UK to the Netherlands, through German Rhineland, Southern Germany and Switzerland. But beyond 2020 much more charging infrastructure will be needed to keep pace with the growing e-mobility market. More effort is also needed to ensure seamless and reliable charging within and across countries for drivers. This is why it is crucial to revise the [AFID] Directive in 2020 and turn it into a European Regulation to guarantee a swift harmonised pan-European deployment of public charge points in line with market developments. The charging deployment should be fairly spread across Europe to ensure all Europeans get the same chance to shift to zero emission mobility. To set an effective future-proof infrastructure framework, T&E has designed a new methodology -called the Public Charging Supply metric -on how to count and mandate infrastructure deployment across the member states in the new regulation. Instead of simply counting each energy they can provide to the electric vehicle fleet and how available they are to the public. This metric should be used to set the EU public charging infrastructure deployment targets for each country for 2025 and 2030, corresponding to 1.3 million public charge points EU-wide in 2025 and close to 3 million in 2030. In total this would require investment of € 1.8 billion in the year 2025, or only 3% of the EU's annual investment in road transport infrastructure. [93]

The Transport & Environment report (2020: 4) [93], inter alia, makes explicit mention about charging from renewable energy:

> While the quantity of charging infrastructure is important, where they are and how they operate, or the quality of the charging infrastructure is equally key. A European masterplan should ensure:
>
> - The full coverage of all European road networks, or the TEN-T Comprehensive network by 2025 at the latest to guarantee coverage of all of Europe's highway network.
> - Recharging an electric car should be as simple and transparent for consumers as refuelling at a petrol station. Prices should be fair, and offered in EUR/kWh, alongside a harmonised automatic authentication system and ability to pay ad hoc using a credit/debit card.
> - Charging systems should be smart so they are able to align charging events with the generation of renewable electricity thanks to charge session monitoring and control features (which adapt to flexible electricity pricing).
>
> Public charging systems should at the minimum have an intelligent metering system. Commercial properties such as large shops, leisure and sports facilities with parking facilities, as well as petrol stations are ideal locations for public charging. These are convenient places where many drivers park their cars for some time, and can therefore help alleviate the need for every driver to have a dedicated charge point in urban areas. The new EU Regulation should set minimum targets aiming for a fifth by 2025 and half by 2030 for chargers on parking spots of medium and large commercial properties. In making Recharge EU a flagship of the European

Green Deal, the cabling and preparation of residential and workplace buildings should ensure that EV drivers wait no longer than three months to get charging, whether at home or work. This should go hand in hand with a funding programme to cable buildings and upgrade grids where necessary aiming at a fifth of buildings cabled in 2025 and half in 2030. Finally, the supply of charging infrastructure in cities should be assessed in the light of the need to reduce the dependency on private cars. We need a transition towards fewer vehicles in urban areas so we need to prioritise the deployment of charging solutions for a growing fleet of shared cars, electric taxis and ride hailing services, as well as delivery electric trucks and vans. The latter might require significant investment to upgrade the grid at some locations which the EU and national funds should help with.

The new SUMP topic guide on electrification in sustainable urban mobility planning (Mourey and Backaus 2019: 21) [34] provides some examples of indicators for performance assessment of charging processes, as shown in

Table 7.

Table 7: Examples of indicators for performance assessment of charging processes (source: Mourey and Backaus, 2019: 21) [34]

Area of user experience	1. Availability and accessibility	2. Charging demand	3. Pricing	4. Convenience of the charging process	5. Specific preferences and concerns
Indicators	Adequate accessibility of chargers (distance, location, waiting time, connector types) – Match with user parking habits – Reliability/ prediction of availability incl. reservation options – Failed sessions – Availability of alternatives to preferential location	Range after charging (state of charge) – Time spent on charging – Transparency/ predictability of charging times	Price perception – Transparency of payment system – Price modelling (fixed, variable, connection) – Flexible + interconnected payment systems – Tariffs for special charging solutions (compensations for reservations, schedules charging, V2G; etc.)	Useful time spent at location – Physical convenience (cable handling) – Availability of other facilities/ services at site – Distance to final destination	Meeting user preferences on electricity supply – Attractiveness of site (spatial/ design/ pleasant environment) – Perceived safety at charging point

The roll-out on the ground of smart EV charging infrastructure would still have to intelligently deployed, based on locational prediction, use intensity and demand-reactive strategies (see Namdeo et al, 2014 [94]; Wirges, 2016 [95]; Funke et al., 2015 [96]; El Banhawy, 2015 a [97] and b [98] for some of those). This should be done in conjunction with urban design principles to supplement spatial, mobility/transport and environmental planning to make the multi-modal active travel and e-mobility infrastructure across all vehicle types accessible, user-friendly and attractive (Knese, 2019) [99]. Forms of shared/social housing such as co-housing should also be thought of and provide in this manner (Gautama et al, 2015) [100].

The European Union's Clean Vehicles Directive (CVD) was already revised between 2017-2019. It aims at the use of clean and energy-efficient road transport vehicles. It also applies to all public procurement of vehicles, which represents a significant share of new vehicle registrations (especially buses). The European Union's Clean Vehicles Directive sets targets by 2025 and 2030 regarding the minimum share of clean vehicles to be procured by the public sector (i.e. organisations covered by public procurement rules) at the national level for each EU Member State. The minimum proportions of clean vehicles required at minimum vary across countries (according to their GDP and population) and the types of vehicles (Mourey and Backaus, 2019: 26) [34]. Further to this, in the domain of procurement and logistics, in Norway (EFTA), the City of Oslo has adopted guidelines to be used for all services and goods delivery contracts which involve an element of transportation. These guidelines recommend to set a minimum requirement. In a second stage, points must be given according to the type of fuels – with the highest number of points given to electric and hydrogen vehicles and a starting date for using the specified fuel. To ensure the quality of the information provided, tenderers must also submit a list of the vehicles to be used, their fuel and their availability (Mourey and Backaus 2019: 30) [34] [101].

The SEEV4-City Policy Webinar presentation by Jayon Dong also covered the EU's Smart Sector Integration Strategy. According to the presentation, the strategy will look into how to better integrate the various sectors (electricity, gas, buildings, mobility, industry), allowing to optimize the energy system as a whole by harnessing synergies across sectors. Additionally, it aims to identify the main barriers that currently prevent exploiting these synergies and develop a set of actions to be followed up by the European Commission. Furthermore, the SEEV4-City Policy Webinar presentation by Jayson Dong dealt with the current features and implications of the EU Energy Taxation Directive of 2003, which will be revised during 2021. Currently, EV batteries are considered merely as consumption points –their ability to provide flexibility services by charging and discharging when the system needs it, is not taken into account. In fact, if EV batteries provide flexibility services, they are taxed when

they withdraw electricity from the grid although this electricity will not be used but fed back later into the grid. This puts EV batteries' flexibility at a competitive disadvantage when providing flexibility. De facto forcing consumers to pay double grid fees.

The EU's Energy Taxation Directive 2003/96/EC will be revised in June 2021, as part of the European Green Deal. The preparatory work is underway, as a roadmap and an inception impact assessment were published in March 2020. and a public consultation is open for feedback from stakeholders and citizens until 14 October 2020 [22]. The European Commission has documented some current issues, shortcomings and contradictions in a factsheet in April 2019 [23], as well as an evaluation report published in September 2019 [24].

Furthermore, the SEEV4-City Policy Webinar presentation by Jayson Dong covered the current 2014 Alternative Fuels Infrastructure Directive, covering Recharging of EVs. The Directive should ensure that EV charging infrastructure equipped with smart charging technology –the precondition for successful and cost-effective EV grid integration i.e., when the charging of the vehicle can be controlled, slowed, accelerated, stopped, or postponed. The European Commission put out an Evaluation and Fitness Check Roadmap for consultation in early 2019, with a range of feedback responses received by 20th of March 2020, and also to the follow-on public consultation by the end of June 2020 [25].

Last but not least, the SEEV4-City Policy Webinar presentation by Jayson Dong covered the **EU's Batteries Directive of 2006 (2006/66/EC)**. Issues highlighted here were connected by battery data and second-life of EV batteries. Regarding EV battery data, access to in-vehicle-data is essential to enable smart charging and V2G services. Market actors need the State of Health (SoH) data to adapt the charging process to provide demand response services (i.e. V2G), and subsequently remunerate consumer for the extra capacity. With regard to second life, the current EU Batteries Directive does not clearly define the legal framework within which the second life of batteries can develop.

Also, with regard to the Warranty and Extended Producer Responsibilities (EPR) provisions in the current EU Batteries Directive, for the second life of EV batteries there is currently not sufficient clarity on ownership of the battery, recovery and testing of used batteries, the right to sell, the transport to workshop, and potential authorisations to repurpose recovered EV batteries.

Moving to the national level, the **"German Standardisation Road Map Electric Mobility"** provides an illustrative example of two specific standardisation projects [102], see Figure 14.

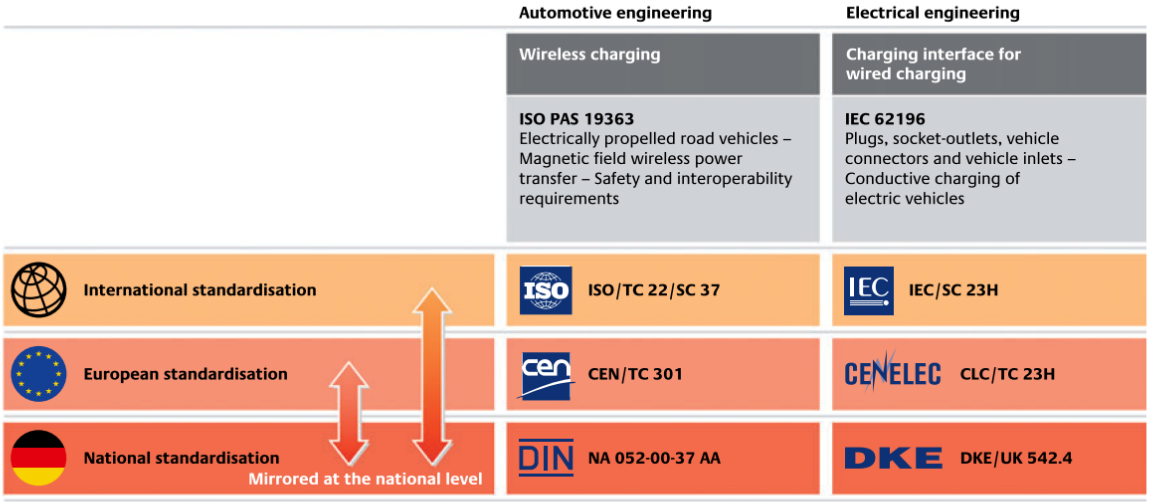


Figure 14: illustrative example of two specific standardisation projects (source: "German Standardisation Roadmap Electric Mobility 2020" (Nationale Platform Elektromobiliät, 2020) [102]

[22] https://ec.europa.eu/energy/topics/markets-and-consumers/energy-taxation_en

[23] https://ec.europa.eu/energy/sites/ener/files/qmv_factsheet_on_taxes.pdf

[24] https://ec.europa.eu/taxation_customs/sites/taxation/files/energy-tax-report-2019.pdf

[25] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/2111-Evaluation-of-the-Alternative-Fuels-Infrastructure-Directive

The “German Standardisation Roadmap Electric Mobility 2020” (Nationale Platform Elektromobiliät, 2020) [102] states that:

> With a view to the mass market, we need to embed the categories considered in the NPE Vision 2020 into a user-orientated overall system. This includes automotive engineering as well as charging infrastructure, energy and environmental issues and urban planning aspects. For this, the German Standardisation Roadmap Electric Mobility 2020 provides the necessary tools. The Electric Mobility Act and the German Charging Station Provision established the necessary legal framework for electric mobility in Germany. A Federal Government funding programme supporting the expansion of charging infrastructure and the general expansion of electric mobility in Germany took effect in 2016. Now, we face the challenge of bringing the familiar fields of action to a successful conclusion.

Another recent national example is the **Swiss Federal “Roadmap for Electric Mobility 2022”** [103], implelemtation of which began in January 2019. The Swiss government and representatives of various industries agreed to work towards a 15 percent market share of electric vehicles by 2022. To get there, the Swiss ‘Roadmap for Electric Mobility 2022’ includes measures for advancing infrastructure as well as information campaign. The broad level of support behind the Roadmap is indicated by decision makers on both the federal as well as the municipal level taking part. They were joint by representatives from all affected industries such as automotive, energy, real estate, fleet managers and their associations. The Roadmap for Electric Mobility 2022 contains concrete measures in three priority fields of action, which are to be promoted jointly. These actions include the installation of charging facilities in buildings, the establishment of a national rapid charging network, the targeted training and qualification of specialist personnel and regulatory adjustments, for example [104].

The SEEV4-City recommendations can also be seen to be in different interlinked and supportive domains, with different short-to-medium and also long-term mile time horizons.

In terms of the implementation of the recommendations to EU and national level, many of those should be under consideration during 2020 and 2021, during the review (already underway in many instances), negotiations, and (legislative and policy) decisions. For the European Union, a new EU budget needs to be agreed by the end of 2020 for the next 7 years (**Multi-Annual Financial Framework or MMF, 2021-2027,** proposed to be at a volume of €1074.3 billion) [26], The package includes, most notably: 1) a multiannual financial framework regulation, which lays down how much the EU can spend and 2) an own resources decision, which defines where EU revenue comes from. The European Commission also makes proposals for sectoral programmes for the new programming period, which is then negotiated with the Council of Ministers and the European Parliament. A **European Green Deal** is meant to be agreed also (after it was proposed in principle by the new European Commission in 2019) during 2020 or 2021 to last for several years. The European Green Deal will be smaller than, and likely to be coordinated with a bigger volume of European investments (with public borrowing in additional to the EU budget which is calculated and negotiated based in part on the GDP of the EU member States) will be the proposed **EU Recovery Plan**, an extraordinary recovery effort known as the **Next Generation EU** (proposed to be €750 billion), the package will help the EU to rebuild after the COVID-19 pandemic and will support investment in the green and digital transitions. In principle these decisions were taken politically at a special Council of the EU Summit on the 21st of July 2020, but the financial public crisis as a fall-out from COVID-19 may lead to (substantial) revisions of this during the remainder of 2020 or into 2021.

[26] https://www.consilium.europa.eu/en/policies/the-eu-budget/long-term-eu-budget-2021-2027/

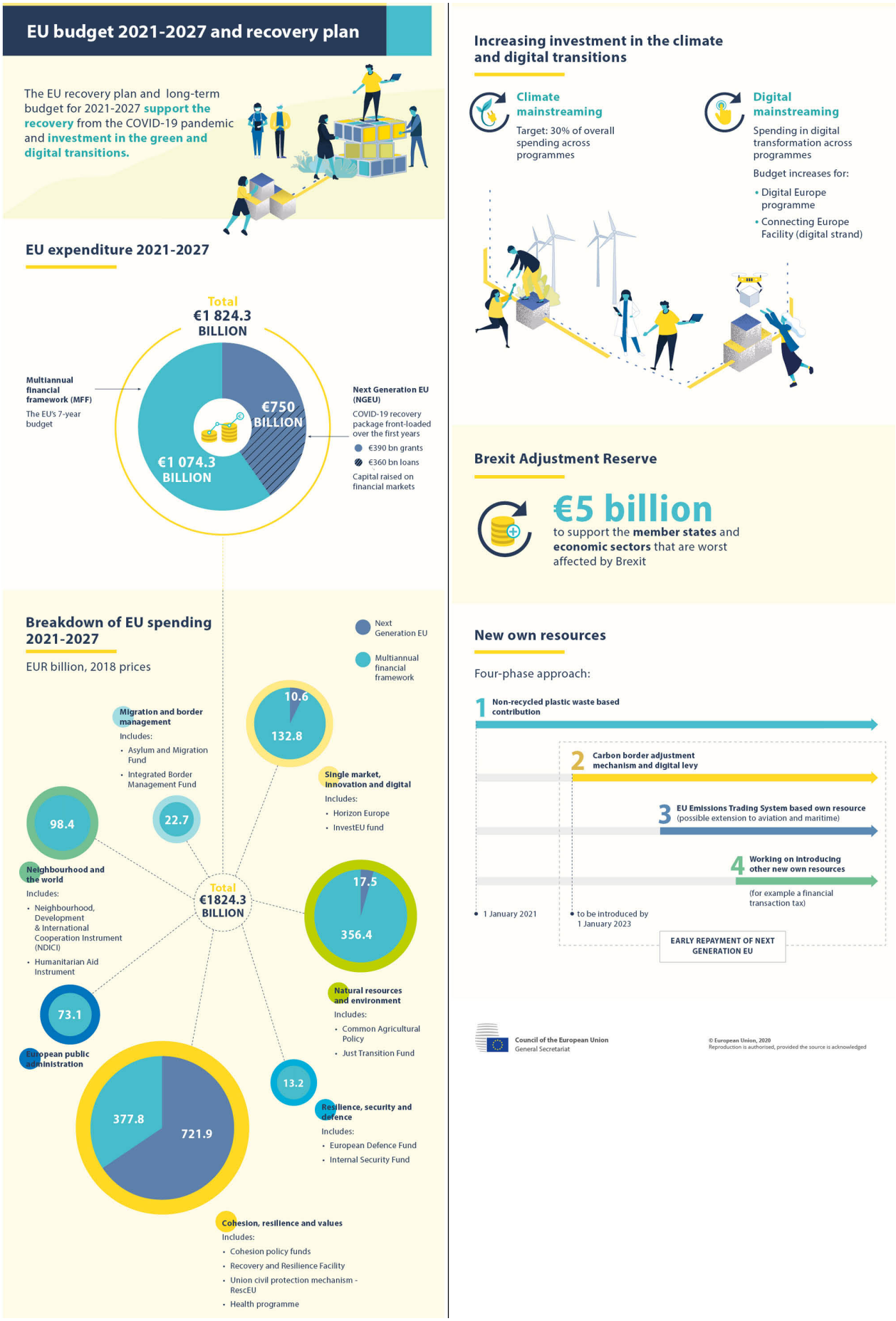


Figure 15: EU budget 2012-2027 and EU Recovery Plan
(source adapted from: https://www.consilium.europa.eu/en/infographics/recovery-plan-mff-2021-2027/)

It remains to be seen during 2020 and 2021 how much of these various budgets is made available or reserved for the Energy and Transport Transitions, linked also to the Digital Agenda and Climate Change Mitigation and wider environmental policy concerns, as well as stimulating a “Green Economy”.

The distinction set out by Lehnert (2013) [105] between ecological (or environmental) innovation policy (based a set of economic theories) as opposed to simply an industrial policy, and as part of overall environmental policy complex, seems relevant here.

In terms of the EU level regulatory domain with regards to a systems level approach, regulatory, taxation and legislation issues, subsidies and incentives, the support for research and knowledge exchange, and also connected with standardisation and communications protocols, as discussed above also with regard to broad financial frameworks for funding, the EU’s Smart Sector Integration Strategy is expected to be agreed during 2020 or 2021, with a set of actions to be followed up by the European Commission. The EU Energy Taxation Directive is planned to be revised in June 2021 as part of the European Green Deal. Likewise, the EU’s Alternative Fuels Infrastructure Directive, covering Recharging of EVs, is also due to be revised during 2021. Similarly, the EU’s Batteries Directive is also up for revision, also expected for 2021.

The EU Strategy for a Sustainable and Smart Mobility, as part of the new EU Green Deal, is also meant to be agreed by the end of 2020.

The pending EU decisions above will also have – hopefully positive - impacts of business model developments over the next few years and for the remainder of this decade towards a more mainstream and mass adoption market. For current national renewable energy and also e-mobility policies, please see the SEEV4-City Full State-of-the-Art report.

As suggested by Figure 16, the different SEEV4-City KPIs of CO_2 emissions (Clean transportation and energy infrastructure), Energy Autonomy (EA), Grid Investment Savings, and a Modified Total Cost of Ownership (MTCO)/ Modified Total Cost of Use (MTCU) have different intensity of relationships with the respective business model pillars within them. The idea is that different supportive policies regulatory frameworks can made a contribution to stretch the contributions of the respective business model pillars to the KPIs if not in the derived business models then at least for the proposed ones, some of which are only feasible with a changed policy and regulatory landscape.

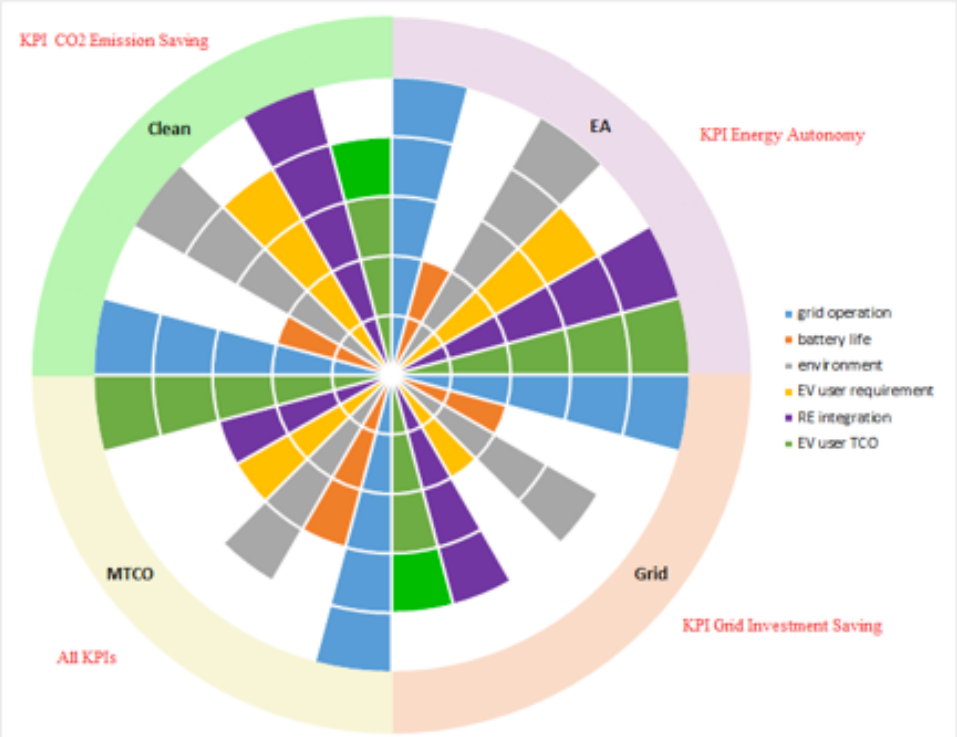


Figure 16: SEEV4-City KPIs of CO_2 emissions (Clean transportation and energy infrastructure), Energy Autonomy (EA), Grid Investment Savings, and a Modified Total Cost of Ownership (MTCO)/Modified Total Cost of Use (MTCU) with different intensity of relationships with the respective business model pillars within them.

Communications and awareness raising and user acceptance issues will need to be continued to be addressed for the next years/entire decade, with much of the work to be done also by national governments and local/regional public authorities and the respective industries themselves in conjunction with non-governmental organisations the media in all forms.

As for the national levels, the timelines will differ but there are relevant national political policy funding decisions to be taken and settled for the next few years and the parliamentary legislative period at least, with medium-term impact (see the SEEV4-City Full State of the Art for the current state of affairs in the relevant sectors of mobility/ transport [106], energy/ electricity and ICT, and note that a comparative perspective – such as by Van der Steen et al (2015) [107], - can make a contribution to not just policy analysis but also policy learning. This includes of course the UK post-Brexit, including to replace mechanisms, policies and funding arrangements after the end of the transition period following the UK leaving the EU in 2020, and in Norway for instance a review and likely revisions of the national policies in the electric mobility domain by the Norwegian parliament and government by the end of 2021. Similarly, policies of renewable energy support are due for revisions in some countries in the new few years.

In terms of the recommendations for local/regional policy-makers, these will be needing to be worked on continuously, intensified in the next few years (even more) but also lasting the venture decade. Strategic planning, that is preparing and implementing, as well as reviewing and revising the relevant policy frameworks and measuring and ensuring their full and holistic systems integration across sectors takes years, as is well evidenced from the examples covered for instance in this report. Likewise, this is true for capacity building. Empowering the consumer can be done continuously, but should be helped hopefully by the revisions to EU level policies and regulatory frameworks, and also national ones, during 2021.Good practice in SUMP/s [108] can be built on further, with increasing intensification efforts of harmonizing and integrating SUEP/s (SEAP/s/SECAP/s) SUMPs [109], not forgetting also to support medium-sized and small(er) local municipalities/local authorities [110].

Recommendations for research and modelers are for the next few years at least, with more innovation in research tools and methods of course always developing, and those researchers and modelers needs to stay up to date and offer evidence-based policy advice to the European, national local/regional levels based on changed or to be changed circumstances and frameworks, including scenario and impact-based research.

In terms of the overarching recommendations to practitioners in the domains of smart charging and Vehicle-to-Grid, they need to secure and be offered up-to-date advice and training, especially in light of regulatory changes in the next couple of years and ongoing technological innovations.

The timelines for updated technical and standardisation developments and agreements at international, European and national levels, are known in principle but not fully in exact detailed timelines, but are expected to fall in the next few years in this decade [111] [112], as illustrated by Figure 17.

This also in part depends on industry choice being made, for instance the reported decision by Nissan to adopt the CCS EV charging technology in Europe. [27] CCS was already expected to be able to perform Vehicle-to-Grid by 2025, which CHADeMO and apparently since some time in 2020 also Tesla's Model 3 (which uses CCS2 plug standards) can do already.

[27] https://electrek.co/2020/05/19/tesla-bidirectional-charging-ready-game-changing-features/

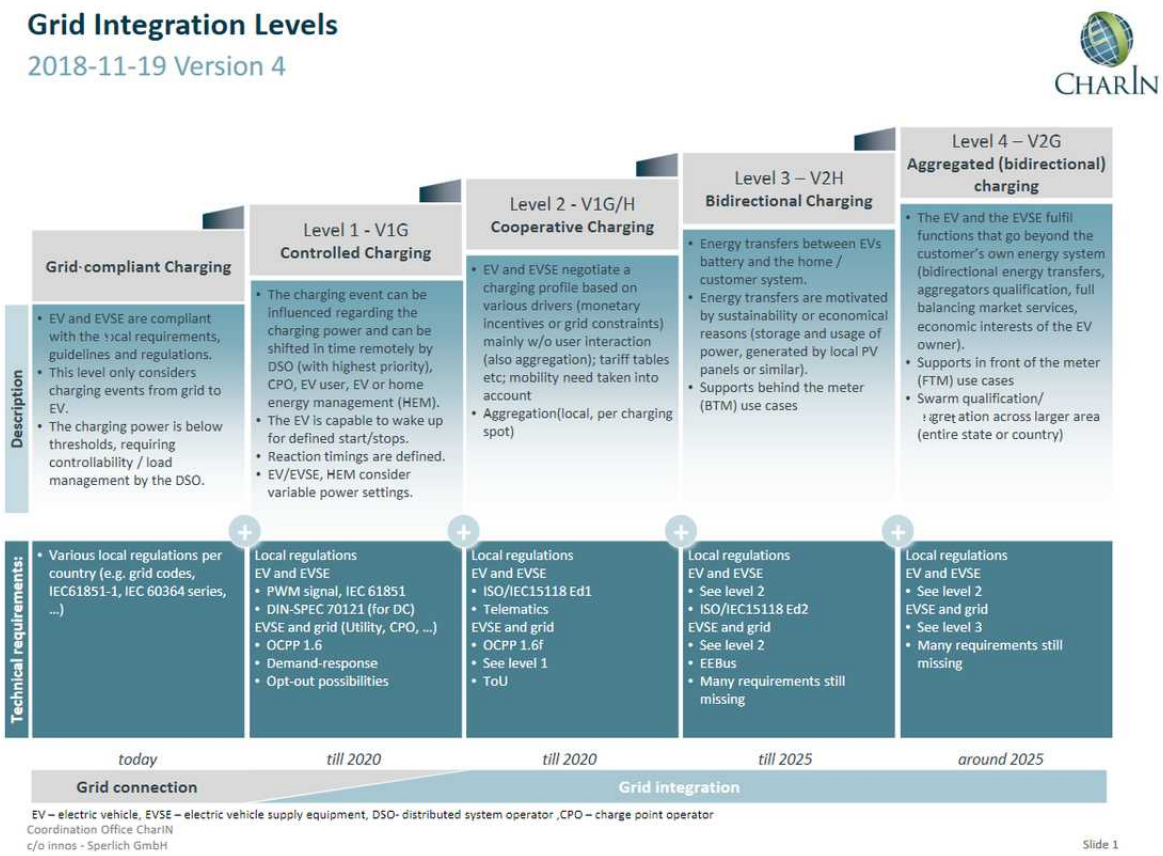


Figure 17: EV Grid Integration Levels Roadmap (source: https://insideevs.com/news/342354/charin-ccs-combo-standard-to-offer-v2g-by-2025/ [111]; http://www.pr-electronics.nl/en/news/85/roadmap-electric-vehicles-and-grid-integration-v1g-versus-v2g%20/ [112])

List of references

[1] Knodt, M. and Kemmerzell, J. (2020) Governanceprobleme der Sektorenkopplung. Über die Verknüpfung der Energie- mit der Verkehrswende. In: Brunnengräber, A. and Haas, T. (eds) (2020) *Baustelle Elektromobilität Sozialwissenschaftliche Perspektiven auf die Transformation der (Auto-) Mobilität*, 355-382. Bielefeld: transcript Verlag.

[2] Bentley, E., Kotter, R., Wang, Y., Das, R., Putrus, G., Van der Hoogt, J., Van Bergen, E., Warmerdam, J., Heller, R., Jablonska, B. (2019) Pathways to Energy Autonomy - challenges and opportunities. *International Journal of Environmental Studies* 76(6), 893-921.

[3] United Nations Sustainable Development Goals Knowledge Platform (no date) "Agenda 21". https://sustainabledevelopment.un.org/outcomedocuments/agenda21 (last accessed on 20/08/2020).

[4] UN Habitat and ICLEI (2009) *Sustainable Urban Energy Planning: A Handbook for Cities and Towns in Developing Countries*. https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=293&menu=1515 (last accessed on 20/08/2020).

[5] Petersen, R. and Reinert, S. (2018) Mobilität für morgen. In: Schwedes, O. (ed.) *Verkehrspolitik. Eine interdisziplinäre Einführung*. 2nd Edition, pp. 467-489. Wiesbaden: Springer VS.

[6] La Greca, P. and Martinico, F. (2016) Energy and Spatial Planning: A Smart Integrated Approach. In: Papa, R. and Fistola, R. (eds): *Smart Enery in the Smart City*, pp. 43-59. Cham: Springer International Publishing.

[7] Warnecke, D., Wittstock, R., Teuteberg, F. (2019) In: Marx Gomez, J., Solsbach, A., Klenke, T., Wohlgemuth, V. (eds) *Smart Cities/Smart Regions – Technische, wirtschaftliche und gesellschaftliche Innovationen*, 13-25. Wiesbaden: Springer Vieweg.

[8] Stock, J. (2016) Alltagsmobilität und die Ideologisierung des Klimawandels, 293-315. In: Besio, C. and Romano, G. (eds) *Zum gesellschaftlichen Umgang mit dem Klimawandel. Kooperationen und Kollisionen*. Baden-Baden: Nomos.

[9] Wilde, M. and Klinger, T. (2017) Integrierte Mobilitäts- und Verkehrsforschung: zwischen Lebenspraxis und Planungspraxis. In: Wilde, M., Gather, M., Neiberger, C., Scheiner, J. (eds) *Verkehr und Mobilität zwischen Alltagspraxis und Planungstheorie*, 5-23. Wiesbaden: Springer VS.

[10] Hille, C. (2017) Handlungsmotive für die Nutzungen von Carsharing mit Elektrofahrzeugen: Ergebnisse einer qualitativen Untersuchung. In: Wilde, M., Gather, M., Neiberger, C., Scheiner, J. (eds) *Verkehr und Mobilität zwischen Alltagspraxis und Planungstheorie*, 65-76. Wiesbaden: Springer VS.

[11] Riedel, V. and Schwedes, O. (2017) Die Nutzerinnen und Nutzer im Blick der Verkehrsplanung – nachfrageorientierte Planung am Beispiel der Ladeinfrastruktur. In: Wilde, M., Gather, M., Neiberger, C., Scheiner, J. (eds) *Verkehr und Mobilität zwischen Alltagspraxis und Planungstheorie*. Wiesbaden: Springer VS.

[12] Bauriedl, S. (2020) Luxusmodelle für den Klimaschutz? E-Carsharing in Großstädten als Experimentierfeld der Automobil- und Digitalwirtschaft. In: Brunnengräber, A. and Haas, T. (eds) (2020) *Baustelle Elektromobilität Sozialwissenschaftliche Perspektiven auf die Transformation der (Auto-) Mobilität*, 161-180. Bielefeld: transcript Verlag.

[13] Manderscheid, K. (2020) Antriebs-, Verkehrs- oder Mobilitätswende? Zur Elektrisierung des Automobilitätsdispositivs. In: Brunnengräber, A. and Haas, T. (eds) *Baustelle Elektromobilität Sozialwissenschaftliche Perspektiven auf die Transformation der (Auto-)Mobilität*, 37-68. Bielefeld: transcript Verlag.

[14] Karle, A. (2020) *Elektromobilität. Grundlagen und Praxis*. 4th ed. München: Carl Hanser Verlag.

[15] Leal Filho, W. and Kotter, R. (eds) *E-Mobility in Europe. Trends and Good Practice*. Cham: Springer International.

[16] Hülsmann, M. and Fornahl, D. (eds) (2014) Evolutionary paths towards the mobility patterns of the future. Berlin: Springer.

[17] Fornahl, D. and Hülsmann, M. (eds) (2016) *Markets and Policy Measures in the Evolution of Electric Mobility*. Berlin: Springer.

[18] Brunnengräber, A. and Haas, T. (eds) (2020) *Baustelle Elektromobilität Sozialwissenschaftliche Perspektiven auf die Transformation der (Auto-)Mobilität*. Bielefeld: transcript Verlag.

[19] EVUE (2013) *Electric Vehicles in Urban Europe*, Final report. Brussels: URBACT. https://urbact.eu/sites/default/files/import/Projects/EVUE/outputs_media/EVUE_report_280912_FINAL.pdf (last accessed on 20/08/2020).

[20] BSR Electric (2020) "Use Cases". Baltic Sea Region Interreg Programme. https://www.bsr-electric.eu/use-cases (last accessed on 20/08/2020).

[21] BSR Electric (2020) "Results". Baltic Sea Region Interreg Programme. https://www.bsr-electric.eu/results (last accessed on 20/08/2020).

[22] Clean Mobil Energy (2020) "Project Summary". North West Europe Interreg Region Programme. https://www.nweurope.eu/projects/project-search/cleanmobilenergy-clean-mobility-and-energy-for-cities/#tab-1 (last accessed on 20/08/2020).

[23] EV Energy Project (2020) "Good Practices". Interreg Europe Programme. Lille. https://www.interregeurope.eu/evenergy/good-practices/ (last accessed on 20/08/2020).

[24] Jegu, M. and Dubois, F. (2017) Städte im Umbau für nachhaltige Mobilität: das Beispiel Dijion. In: Hawig, D., Jegu, M., Klatt, R., Steinberg, S. and Wendt, R. (eds.) *Elektromobil durch die Zukunft. Zukunftsszenarien und neue Dienstleistungen für die Elektromobilität 2030*, pp. 188-209. Kie-Lab – Kunden-Innovationslabor Elektromobilität.

[25] ICLEI (2019) "Think beyond the grid: Superblocks (Vitoria-Gasteiz)". Freiburg: ICLEI Local Governments for Sustainability - European Secretariat GmbH. (last accessed on 20/08/2020).

[26] SMARTEES (2020) "The SMARTESS project – local social innovation". Horizon 2020 programme. European Commission. https://local-social-innovation.eu/ (last accessed on 20/08/2020).

[27] Roberts, D. (2019) Barcelona's superblocks are a new model for "post-car" urban living. Vox. 11/04/2019. https://www.vox.com/energy-and-environment/2019/4/11/18273896/barcelona-spain-politics-superblocks (last accessed on 20/08/2020).

[28] ICLEI (2019) *"*The tale of Turin's transformative SUMP*". Freiburg: ICLEI Local Governments for Sustainability - European Secretariat GmbH.* https://iclei-europe.org/publications-tools/?c=search&uid=hdcigQZQ**.** (last accessed on 20/08/2020).

[29] SHARE-North (2020) *S*hared Mobility Solutions for a Liveable and Low-Carbon North Sea Region*. Interreg North Sea Region Programme.* https://share-north.eu/ (last accessed on 20/08/2020).

[30] SUITS (2020) Sustainable Urban Integrated Transport Systems: Transferable Tools for S-M authorities. Brussels: CIVITAS**.** https://www.suits-project.eu/tools/ (last accessed on 20/08/2020).

[31] CIVITAS PROSPERITY (2019) http://sump-network.eu/about/ Brussels: CIVITAS (last accessed on 20/08/2020).

[32] CIVITAS SUMPs-UP (2019) https://sumps-up.eu/the-project/ Brussels: CIVITAS (last accessed on 20/08/2020).

[33] Kotter, R (2020) "From Operation Pilot Insights to SUMEPS – Why and How Do We Need Integration of Mobility, Energy and Grid Planning?", SEEV4-City Webinar on the 20th of May 2020. http://event.seev4-city.eu/wp-content/uploads/2020/05/SEEV4-City-Webinar-3-Presentation-Richard-Kotter-UNN.pptx

[34] Mourey, T. and Backaus, W. (2019) SUMP topic guide: *Electrification in sustainable urban mobility planning. Planning for electric road mobility solutions in urban areas in a SUMP context*. Brussels: European Platform on Sustainable Urban Mobility Plans / European Commission.

[35] Tomassini, M., Kearns, S., Nussio, F. (2017) *Planning, Consultation and Design of Urban Vehicle Access Regulations (UVARs) schemes. Technical report*. Brussels: ISINOVA /PWC / European Commission.

[36] Fitte, C., Berkemeier, K., Teuteberg, F., Thomas, O. (2019) Elektromobilität in ländlichen Regionen. In: Marx Gomez, J., Solsbach, A., Klenke, T., Wohlgemuth, V. (eds) *Smart Cities/Smart Regions – Technische, wirtschaftliche und gesellschaftliche Innovationen*, 37-51. Wiesbaden: Springer Vieweg.

[37] Fornahl, D. and Wernern, N. (2015) New electric mobility in fleets in the rural areas of Bremen/Oldenburg, 237-251. In: Leal Filho, W. and Kotter, R. (eds) *E-Mobility in Europe: Trends and Best Practice*. Cham: Springer International.

[38] Baasch, S. (2020) E-Mobilität als Baustein einer ländlichen Mobilitätswende. Kommunale E-Mobilitäts- und Carsharing-Strategien. In: Brunnengräber, A. and Haas, T. (eds) (2020) *Baustelle Elektromobilität Sozialwissenschaftliche Perspektiven auf die Transformation der (Auto-)Mobilität*, 211-228. Bielefeld: transcript Verlag.

[39] Radtke, J. and Daub, J. (2020) Verkehrswende im Suburbanen Raum. Herausforderungen von Regiopolen bei der Entwicklung neuer Mobilitätskonzepte. In: Brunnengräber, A. and Haas, T. (eds) (2020) *Baustelle Elektromobilität Sozialwissenschaftliche Perspektiven auf die Transformation der (Auto-)Mobilität*, 181-2010. Bielefeld: transcript Verlag.

[40] Bergmann, G. and Daub, J. (2016) *Alternative Mobilität? - Möglichkeiten neuer Wege in der Automobilgesellschaft*. Münster: LIT Verlag.

[41] SUMPs-up CIVITAS (2020) Implementation of a Clean Air Zone in Birmingham's City Centre Green Travel District. Birmingham: Good Practice Factsheet. European Platform on Sustainable Urban Mobility

Plans. https://sumps-up.eu/fileadmin/user_upload/Tools_and_Resources/Publications_and_reports/Good_Practice_Fact_Sheets/SUMPs-Up__-_City_Good_Practice_Factsheets_compressed.pdf (last accessed on 20/08/2020).

[42] Birmingham City Council (2010) *Sustainable Energy Action Plan (SEAP), 2005-2020*. http://www.special-eu.org/assets/uploads/SEAP_Birmingham.pdf (last accessed on 20/08/2020).

[43] Birmingham City Council (2020) *Draft Transport Plan*. January 2020. https://www.birmingham.gov.uk/transportplan (last accessed on 20/08/2020).

[44] Tyseley Energy Park (2020) *Powering Clean Energy Growth*. https://www.tyseleyenergy.co.uk/ (last accessed on 20/08/2020).

[45] Kennedy, C. (2020) "Energy regulator 'action plan' prioritises clean transport and renewables", *New Civil Engineer*, 04 Feb, 2020. https://www.newcivilengineer.com/latest/energy-regulator-action-plan-prioritises-clean-transport-and-renewables-04-02-2020/ (last accessed on 20/08/2020).

[46] Ribeiro, C. (2020) *"*Report on new mobility services published by the Partnership on Urban Mobility*".* 08 Apr 2020. Eltis – the Urban Mobility Observatory. Brussels. https://www.eltis.org/in-brief/news/report-new-mobility-services-published-partnership-urban-mobility (last accessed on 20/08/2020).

[47] Longo, M. Foidelli, F. and Yaïci, W. (2018) "Electric Vehicles Integrated with Renewable Energy Sources for Sustainable Mobility". In: Romeral Martínez, L. and Delgado Prieto, M. (eds) *New Trends in Electrical Vehicle Powertrains*. IntechOpen, DOI: 10.5772/intechopen.76788. Available from: https://www.intechopen.com/books/new-trends-in-electrical-vehicle-powertrains/electric-vehicles-integrated-with-renewable-energy-sources-for-sustainable-mobility (last accessed on 20/08/2020).

[48] Auwerx, P., Robert Pressl, R., Cré, I., Kocak N. and Ry, T. (2019) *SUMP practitioner briefing: parking and sustainable urban mobility planning. How to make parking policies more strategic, effective and sustainable*. Brussels: European Platform on Sustainable Urban Mobility Plans /European Commission. https://www.eltis.org/sites/default/files/parking_and_sustainable_urban_mobility_planning.pdf (last accessed on 20/08/2020).

[49] POLIS/EPA (2019) "Polis Paper - Parking and Urban Development". https://www.polisnetwork.eu/document/polis-parking-paper-2019/ (last accessed on 20/08/2020).

[50] OECD/IEA/NEA/ITF (2015) *Aligning Policies for a Low-carbon Economy.* Paris: OECD Publishing. http://dx.doi.org/10.1787/9789264233294-en (last accessed on 20/08/2020).

[51] Ernst, T., Scheuerle, S., Seidensticker, S. (2013) Strategien von Städten zur Elektromobilität, In: Prof, H., Pascha, W., Schönharting, J., Schramm, D. (eds) *Schritte in die zukünftige Mobilität: Technische und betriebswirtschaftliche Aspekte*, 351-364. Wiesbaden: Springer Gabler.

[52] European Commission (2020) "Sustainable and Smart Mobility Strategy. About this initiative". Brussels. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12438-Sustainable-and-Smart-Mobility-Strategy (last accessed on 20/08/2020).

[53] Eurelectric (2020) *Roadmap on the EU Strategy for a Sustainable and Smart Mobility. Eurelec's response*. July 2020. Brussels: Union of the Electricity Industry. https://cdn.eurelectric.org/media/4599/response_to_roadmap_on_sustainable_and_smart_mobility_strategy-2020-030-0484-01-e-h-D0D94805.pdf (last accessed on 20/08/2020).

[54] Eurelectric (2019) *Decarbonisation Pathways.* Brussels: Union of the Electricity Industry. https://www.eurelectric.org/decarbonisation-pathways (last accessed on 20/08/2020).

[55] Price, P., Carretero Lopez, D., Domenech, A., et al. (2019) "Intelligent Mobility for Energy Transition: Accelerating towards more sustainable societies". Brussels: Intelligent Mobility for Energy Transition (IMET) initiative. https://eu-smartcities.eu/sites/eu-smartcities.eu/files/2019-11/IMET%20White%20Paper%20FINAL%281%29.pdf (last accessed on 20/08/2020).

[56] Schuller, A. and Stuart, C. / Carbone4 (2018) *"From cradle to grave: e-mobility and the energy transition".* Addendum for Italy, the United Kingdom, Spain and the European Union to "Le véhicule électrique dans la transition écologique en France". Brussels: Carbone4/ European Climate Foundation.

[57] National Grid (2019) Future Energy Systems. July 2019 report for the UK. http://fes.nationalgrid.com/media/1409/fes-2019.pdf (last accessed on 20/08/2020).

[58] Robb, J. (2018) "Making Stadiums and Arenas more resilient and energy efficient. EATON X-storage Buildings white paper". EMEA Headquarters. Morges, Switzerland. https://www.eaton.com/content/dam/eaton/markets/buildings/resiliency/documents/xstorage-peak-shaving-whitepaper.pdf (last accessed on 20/08/2020).

[59] Givoni, M. (2014) Editorial: Addressing transport policy challenges through Policy-Packaging, *Transportation Research Part A*, Vol. 60, pp. 1-8.

[60] European Commission (2013) *EU Adaption Strategy*. https://ec.europa.eu/clima/policies/adaptation/what_en (last accessed on 20/08/2020).

[61] Climate ADAPT: Mayors Adapt -The Covenant of Mayors Initiative on Adaptation to Climate Change. https://climate-adapt.eea.europa.eu/metadata/portals/mayors-adapt-the-covenant-of-mayors-initiative-on-adaptation-to-climate-change (last accessed on 20/08/2020).

[62] Covenant of Mayors (no date) "Glossary" https://www.covenantofmayors.eu/glossary.html (last accessed on 20/08/2020).

[63] City of Friedrichshafen (2012) *Tips for ENPI Cities on How to Develop a Sustainable Energy Action Plan*. (https://www.covenantofmayors.eu/IMG/pdf/SEAP-ENG-final.pdf (last accessed on 20/08/2020).

[64] https://climate-adapt.eea.europa.eu/knowledge/tools/urban-ast/step-0-0 (last accessed on 20/08/2020).

[65] https://www.covenantofmayors.eu/plans-and-actions/action-plans.html (last accessed on 20/08/2020).

[66] Caamano-Martin, E-, Higueras, E., Neila, F.J. (2010 a) *Deliverable 4: Action Plans of POLIS cities. Work Package 3: Development of City Action Plans & Pilot Actions*. Technical report of the project "Identification and mobilization of solar panels via local strategies (IEE/08/603/DI2.529237, supported by Intelligent Energy Europe. Brussels: POLIS.

[67] Caamano-Martin, E-, Higueras, E., Neila, F.J. (2010 b) *Deliverable 7: Overview of long-term solar targets of PLOIS cities. Work Package 3: Development of City Action Plans & Pilot Actions*. Technical report of the project "Identification and mobilization of solar panels via local strategies (IEE/08/603/DI2.529237, supported by Intelligent Energy Europe. Brussels: POLIS.

[68] Bolle, A. / Energy Cities (2019) *How Cities can back Renewable Energy Communities. Guidelines for Local and Regional Policy Makers*. Brussels: Energy Cities / Renewables Networking Platform (RNP).

[69] Amsterdam Smart City (no date) Energy Atlas project. https://amsterdamsmartcity.com/projects/energy-atlas (last accessed on 20/08/2020).

[70] Putra, Z.D.W. and Van der Knaap, W. (2019) A smart city needs more than just technology: Amsterdam's Energy Atlas project, 129-147. In: Anthopoulos, L. (ed) *Smart City Emergence: Cases from Around the World*. Amsterdam: Elsevier.

[71] Gemeente Amsterdam (2019) *Amsterdam Climate Neutral 2050 Roadmap leaflet*. www.amsterdam.nl/klimaneutraal (last accessed on 20/08/2020).

[72] European Commission, "Sustainable Urban Mobility Plans", 2019. [Online] https://ec.europa.eu/transport/themes/clean-transport-urban-transport/urban-mobility/urban-mobility-actions/sustainable-urban_en ; https://ec.europa.eu/transport/sites/transport/files/legislation/com%282013%29913-annex_en.pdf.

[73] Rupprecht Consult (editor) (2019) *Guidelines for developing and implementing a sustainable urban mobility plan, second edition*, 2019. https://www.eltis.org/sites/default/files/sump-guidelines-2019_mediumres.pdf (last accessed on 20/08/2020).

[74] Amin Eltis (2020) "SUMP Concept". https://www.eltis.org/mobility-plans/sump-concept (last accessed on 20/08/2020).

[75] Figg, H. (2020) "New SUMP Poster: Planning the Sustainable City". https://www.eltis.org/in-brief/news/new-sump-poster-planning-sustainable-city (last accessed on 20/08/2020).

[76] Eltis (2020) "SUMP process". https://www.eltis.org/mobility-plans/sump-process (last accessed on 20/08/2020).

[77] Ilbrunner / Elist (2020) https://www.eltis.org/resources/tools/sump-self-assessment-tool (last accessed on 20/08/2020).

[78] Elits (2020) "SUMP Glossary". https://www.eltis.org/mobility-plans/glossary. (last accessed on 20/08/2020).

[79] Fresner, J., Krenn, C., Morea, F., Mercatelli, L., Alessandrini, S., Tomasi, F. (2019) *Harmonisation of Energy and Sustainable Urban Mobility Planning. SUMP Topic Guide*. European Platform on Sustainable Urban Mobility Plans, European Commission, Directorate-General for Mobility and Transport. https://www.eltis.org/sites/default/files/harmonisation_of_energy_and_sustainable_urban_mobility_planning.pdf (last accessed on 20/08/2020).

[80] SIMPLA (2019) "Harmonised Plans. Monzon, Spain". http://www.simpla-project.eu/en/plans/?city=7022 (last accessed on 20/08/2020).

[81] SIMPLA (2019) "Harmonised Plans. Parma, Italy". http://www.simpla-project.eu/en/plans/?city=7016 (last accessed on 20/08/2020).

[82] ICLEI Europe/ Torres, A.D. and Rothballer, C. et. al. (2019) *Road to Replication – guiding cities on smart urban development*, *Process and Lessons Learnt in GrowSmarter*. Report prepared by Barcelona City Council (Catalonia, Spain), Cork City Council (Republic of Ireland), Stockholm City Council (Sweden), Graz City Council (Austria), Suceava (Romania), Valetta (Malta) and Porto (Portugal).

https://grow-smarter.eu/fileadmin/editor-upload/Reports/Concluding_report_on_Replication_online.pdf (last accessed on 20/08/2020).

[83] Plevnik, A., Balant, M. and Rye, T. (2019) National support frameworks for sustainable urban mobility planning. National SUMP supporting programmes. SUMP practioner guide produced by the PROSPERITY project. https://www.eltis.org/sites/default/files/national_support_frameworks_for_sustainable_urban_mobility_planning.pdf (last accessed on 20/08/2020).

[84] Durlin, T. (2019) A National SUMP - Supporting Programme. Policy Paper for national decision-makers. Deliverable Number D5.2. SUMPS-Up project. CIVITAS. file:///C:/Users/zehn/AppData/Local/Temp/Attachment_0-1.pdf (last accessed on 20/08/2020).

[85] POLIS (2020) "European Court of Auditors: More action needed on Sustainable Urban Mobility".https://www.polisnetwork.eu/news/european-court-of-auditors-more-action-needed-on-sustainable-urban-mobility/ (last accessed on 20/08/2020).

[86] Department of Transport (2020) Decarbonising Transport. Setting the Challenge. Policy Paper. London: DfT. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878642/decarbonising-transport-setting-the-challenge.pdf (last accessed on 20/08/2020).

[87] Harrabin, R. (2020) "Adverts for large polluting cars 'should be banned' ", BBC News, 02/08/2020. https://www.bbc.co.uk/news/uk-53607147 (last accessed on 20/08/2020).

[88] Beevor, J., Murray, L., Simms, A., Tricarico, E. and Gillet, R. (2020) *Upselling Smoke. The case to end advertising of the largest, most polluting new cars*. Report from the green think tank The New Weather Institute and the climate charity Possible as part of the "Badvertising campaign". https://static1.squarespace.com/static/5ebd0080238e863d04911b51/t/5f21659998148a15d80ba9be/1596024223673/Upselling+Smoke+FINAL+23+07+20.pdf (last accessed on 20/08/2020).

[89] Chinellato, M. and Morfoulaki, M. (2019) Sustainable urban mobility planning in metropolitan regions. Sustainable urban mobility planning and governance models in EU metropolitan regions. SUMP topic guide, Version 2. https://sumps-up.eu/fileadmin/user_upload/Tools_and_Resources/Publications_and_reports/Topic_Guides/sump_metropolitan_region_guide_v2.pdf (last accessed on 20/08/2020).

[90] United Nations Electric Vehicles Programme (2020) *UN Environment's Electric Mobility Programme supports developing and transitional countries shift from fossil fuel to electric vehicles.* https://www.unenvironment.org/explore-topics/transport/what-we-do/electric-mobility (last accessed on 20/08/2020).

[91] International Energy Agency (2020) *Global EV Outlook 2020.Entering the decade of electric drive?* Paris. IEA. https://webstore.iea.org/global-ev-outlook-2020 (last accessed on 20/08/2020).

[92] RTRAC, EPoSS and ETIP SNE (2017) European Roadmap Electrification of Road Transport" from June 2017 (its 3rd edition, updated from 2012) to last until 2022) [92] published jointly by the European Technology Platforms ERTRAC, EPoSS and ETIP SNET. https://egvi.eu/wp-content/uploads/2018/01/ertrac_electrificationroadmap2017.pdf (last accessed on 20/08/2020).

[93] Todt, W. et al. (2020) RechargeEU. How many charging points will Europe and its Member States need in 2020, Brussels: European Federation for Transport and Environment - Transport & Environment. https://www.transportenvironment.org/sites/te/files/publications/01%202020%20Draft%20TE%20Infrastructure%20Report%20Final.pdf (last accessed on 20/08/2020).

[94] Namdeo, A., Tiwary, A. and Dziurla, R. (2014) Spatial planning of public charging points using multi-dimensional analysis of early adopters of electric vehicles for a city region. *Technological Forecasting and Social Change* **89**, 188-200.

[95] Wirges, J. (2016) *Planning the charging infrastructure for electric vehicles in cities and regions*. Karlsruhe: KIT Publishing.

[96] Funke, S.A., Gnann, T, Plötz, P. (2015) Addressing the Different Needs for Charging Infrastructure: An Analysis of Some Criteria for Charging Infrastructure Set-up, 73-90. In: Leal Filho, W. and Kotter, R. (eds) *E-Mobility in Europe. Trends and Good Practice*. Cham: Springer International.

[97] ElBanhawy, E. (2015 a) *To Cluster the Mobility Recharging Facilities*. In: Leal Filho, W. and Kotter, R. (eds) *E-Mobility in Europe: Trends and Best Practice*, 255-279. Cham: Springer International.

[98] ElBanhawy, E. (2015 b) To understand, model and design an e-mobility system in its urban context. Doctoral thesis, Northumbria University. http://nrl.northumbria.ac.uk/id/eprint/30320/1/elbanhawy.eiman_phd.pdf (last accessed on 20/08/2020).

[99] Knese, D. (2019) *Integration der Elektromobilität in die Stadtplanung und Straßenraumgestaltung – Lösungsansätze für Strategien, Konzepte und Maßnahmen*. Kassel University, Institut für Verkehrsplanung und Verkehrssysteme: Kassel University Press

[100] Gautama, S., Gillis, D., Pace, G., Semanjski, I. (2015) Cohousing and EV Sharing: Field Tests in Flanders, 209-235. In: Leal Filho, W. and Kotter, E. (eds) *E-Mobility in Europe: Trends and Good Practice.* Cham: Springer International.

[101] Van Amstel, W.P. (2019) "BuyZET handbook: public procurement for sustainable transport"- 13/05/2019, International news about City Logistics from Lectorate Hogeschool van Amsterdam (Amsterdam University of Applied Sciences). http://www.citylogistics.info/policies/buyzet-handbook-public-procurement-for-sustainable-transport/ (last accessed on 20/08/2020).

[102] German National Platform for Electric Mobility (NPE) (2017) *The German Standardisation Roadmap Electric Mobility 2020*. Berlin: The Federal Government's JointOffice for Electric Mobility (GGEMO). https://www.din.de/resource/blob/235254/a0d14b63b9685859b1c0c297827e50f8/roadmap-en-2020-data.pdf

[103] Swiss Confederation - Federal Department of Environment, Transport, Energy and Communications DETEC (2019). *Roadmap for Electric Mobility 2022*. https://thedriven.io/wp-content/uploads/2019/04/55164.fr_.en_.pdf (last accessed on 20/08/2020).

[104] Electrive.com (2020). *Roadmap.* https://www.electrive.com/tag/roadmap/ (last accessed on 20/08/2020).

[105] Lehnert, N.M. (2013) *Möglichkeiten und Grenzen der ökologischen Innovationspolitik im Pkw-Verkehr*. Frankfurt am Main: Peter Lang Academic Research.

[106] Lah, O., Fulton, L. and Arioli, M. (2019) Decarbonization Scenarios for Transport and the Role of Urban Mobility. In: Lah, O. (ed) *Sustainable Urban Mobility Pathways*, pp. 65-80. Elsevier.

[107] Van der Steen, M., Van Schelven, R.M., Van Twist, M.J.W., Kotter, R., Van Deventer, P. (2015) Policy strategies for an emergent technology: lessons from the analysis of EV-policy in 8 North-European countries. *World Electric Vehicle Journal* **7** (4), 710-721.

[108] May, A.D. (2015) Encouraging good practice in the development of Sustainable Urban Mobility Plans, *Case Studies on Transport Policy* **3(1)**, pp. 3-11.

[109] Sanchez, B., Zambrana-Vasquez, D., Fresner, J., Krenn, C., Morea, F., Mercatelli, L. (2018) Harmonizing Spatial Plans: A Methodology to Integrate Sustainable Mobility and Energy Plans to Promote Resilient City Planning, *International Journal of Transport and Vehicle Engineering* **12(8**).

[110] Melica, G., Bertoldi, P., Kona, A., Iancu, A., Rivas, S. and Zancanella, P. (2018) Multilevel governance of sustainable energy policies: The role of regions and provinces to support the participation of small local authorities in the Covenant of Mayors. *Sustainable Cities and Society* **39**, 729-739.

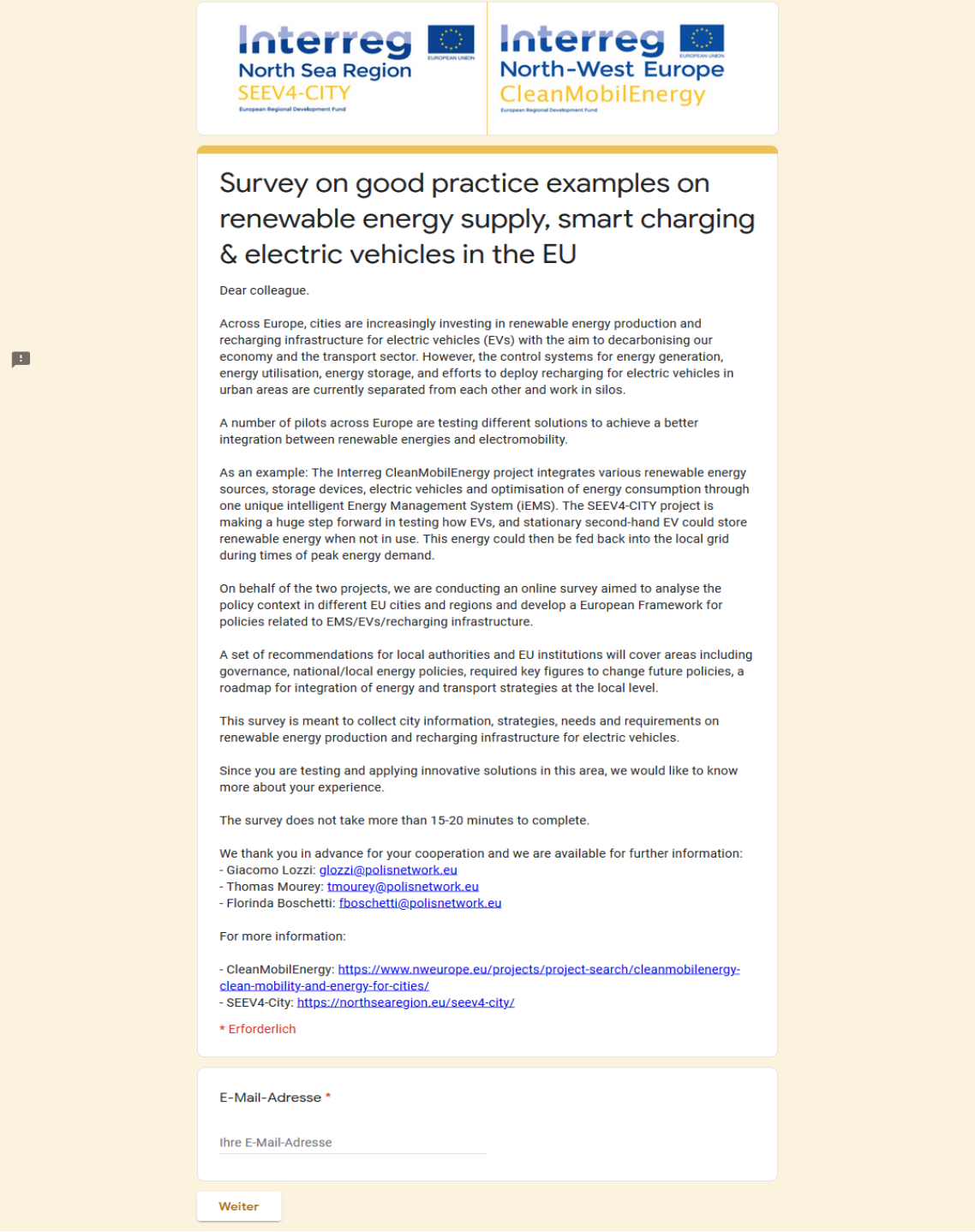
[111] Insideevs (2020). *CharIN: CCS Combo Standard to Offer V2G by 2025.* https://insideevs.com/news/342354/charin-ccs-combo-standard-to-offer-v2g-by-2025/ (last accessed on 20/08/2020).

[112] Ram, G. and Kardolus, M. (2020) Roadmap Electric Vehicles and Grid Integration (V1G versus V2G). *Power Research Electronics B. V.* (2020). http://www.pr-electronics.nl/en/news/85/roadmap-electric-vehicles-and-grid-integration-v1g-versus-v2g/ (last accessed on 20/08/2020).

Appendices

Appendix A: SEEV4-City and CleanMobilEnergy joint survey of local and regional authorities

A survey was distributed to a wide sample by POLIS, and also hosted on SEEV4-City Twitter (twice). Returned by 9 local authority (or their municipal agencies) representatives from 7 European countries (UK, Sweden, Norway, Spain, Germany, the Netherlands, and Poland) between the end of November 2019 and the end of January 2020, including 2 from SEEV4-City project (but partly different to the partner colleagues with the project) and 1 from CleanMobilEnergy.



Interreg North Sea Region SEEV4-CITY

Interreg North-West Europe CleanMobilEnergy

Survey on good practice examples on renewable energy supply, smart charging & electric vehicles in the EU

Dear colleague.

Across Europe, cities are increasingly investing in renewable energy production and recharging infrastructure for electric vehicles (EVs) with the aim to decarbonising our economy and the transport sector. However, the control systems for energy generation, energy utilisation, energy storage, and efforts to deploy recharging for electric vehicles in urban areas are currently separated from each other and work in silos.

A number of pilots across Europe are testing different solutions to achieve a better integration between renewable energies and electromobility.

As an example: The Interreg CleanMobilEnergy project integrates various renewable energy sources, storage devices, electric vehicles and optimisation of energy consumption through one unique intelligent Energy Management System (iEMS). The SEEV4-CITY project is making a huge step forward in testing how EVs, and stationary second-hand EV could store renewable energy when not in use. This energy could then be fed back into the local grid during times of peak energy demand.

On behalf of the two projects, we are conducting an online survey aimed to analyse the policy context in different EU cities and regions and develop a European Framework for policies related to EMS/EVs/recharging infrastructure.

A set of recommendations for local authorities and EU institutions will cover areas including governance, national/local energy policies, required key figures to change future policies, a roadmap for integration of energy and transport strategies at the local level.

This survey is meant to collect city information, strategies, needs and requirements on renewable energy production and recharging infrastructure for electric vehicles.

Since you are testing and applying innovative solutions in this area, we would like to know more about your experience.

The survey does not take more than 15-20 minutes to complete.

We thank you in advance for your cooperation and we are available for further information:
- Giacomo Lozzi: glozzi@polisnetwork.eu
- Thomas Mourey: tmourey@polisnetwork.eu
- Florinda Boschetti: fboschetti@polisnetwork.eu

For more information:

- CleanMobilEnergy: https://www.nweurope.eu/projects/project-search/cleanmobilenergy-clean-mobility-and-energy-for-cities/
- SEEV4-City: https://northsearegion.eu/seev4-city/

* Erforderlich

E-Mail-Adresse *

Ihre E-Mail-Adresse

Weiter

Figure 1: SEEV4-City & CleanMobilEnergy survey form (source: https://docs.google.com/forms/d/e/1FAIpQLSf4L-lrTfkPpJZVKEYQridQyY9sgINHQ6X9jOpWELZm6JtAIQ/viewform)

18 questions were asked, with results indicated as follows:

Q1: Please describe briefly the solution(s) that you are testing regarding renewable energy production and EV recharging infrastructure.

- Integrating small scale renewable energy generation into the energy mix for transport, V2G, integrated district energy schemes, smart energy management.
- EV-charging with load balancing, PV Production and stationary battery to overcome limitations caused by limited grid.
- Deployment of fast EV charging stations, and V2B stations.
- On the side of Energy Generation, there are projects realised of wind energy, PV and there is an urban hydropower station. On the side of EV charging, we have to emphasise that e-mobility covers more than cars - it ranges from electrically supported bicycles, e-cars to electric buses etc. Electric charging project see EU H2020 project Green Charge (esp. integration of e-car sharing) www.greencharge2020.eu. There are about 170 publicly accessible charging points for e-cars in the City of Bremen.
- We promote e mobility in full. From e-bikes to e-busses and e-freight including charging. Also in combination with clean energy.
- Photovoltaic panels to produce solar energy to be fed into the grid, making more use of recuperation energy.
- Integrating 40 V2G EV chargers with an Energy Storage System and solar PV array.
- Within the V2X - 'Vehicle to Infrastructure' category of bi-directional charging Leicester will be testing a Vehicle to Building system at its City Hall headquarters.

Q2: Can you indicate any local strategies including targets and objectives for energy use and production; reduction of CO2 emissions; deployment of electromobility in your city/region?

- (London) Mayor's Transport Strategy.
- We have targets for the city organisation to be CO2-free by 2030 and the entire city by 2040; multiple energy targets; 4000 public charging points by 2022, etc.
- Oslo's target is to reduce CO_2 emissions by 95% within 2030.
- Barcelona has its own plans regarding energy use, mobility, etc. The most relevant are: Climate Plan, Mobility Urban Plan etc.
- CO_2 reduction is overall policy goal in Bremen. It is also a core part of SUMP - setting active modes first ("the bicycle is the ultimate zero-emission-vehicle"). E-mobility strategies are part of SUMP and Green City Masterplan. (Bremen was also coordinator of H2020 project ELIPTIC).
- We embrace the Paris target: - 49% CO_2 emission from 1990. With this target we aim at zero emission mobility. We allow other fuels, but the only field we support is zero emission.
- Gdynia has adopted SUMP and Low Carbon Economy Plan.
- 2028 Carbon neutral target.
- Current city-wide CO_2 target = halve city wide CO_2 emissions by 2025 from 1990 baseline. Progress = 45.7% reduction by 2017 - on track to meet target. Current target for council's footprint; halve the City Council's carbon footprint by 2025 from 2008/09 baseline. Progress = 45.5% reduction 2018/19 - on track to meet target. Road and rail travel produce 16% of carbon emissions in Leicester (292kt CO_2 emissions). Flights by residents and local businesses and organisations are responsible for a further 10% of emissions. When the responses to Leicester's Climate Emergency consultation have been analysed, they will inform a new edition of Leicester's Sustainability Action Plan - due summer 2020. The results will also inform our upcoming Local Transport Plan 4, which is expected to be for the period 2020 to 2036. There are c.100 electric vehicle charge points in Leicester, putting it in the top 20% of provision in the UK. Circa. 30 have been provided by the council. In addition to the SEEV4-City bi-directional chargers, other electromobility work upcoming in the next 18 months/ 2 years includes; £120k on-street charging trial in residential areas, £500k e-taxi charging points, £500k new public charging points, gradual expansion of council's electric vehicles (cars & light vans) from 17 to c.25, commence transition of Leicester's three Park & Ride services to electric bus operation from early 2021.

Q3: Are these strategy documents required and/or driven by the central government (national level) or any other public authority?

- Other public authorities. Please specify: Mayor of London.
- In most cases the City develops its own strategies but of course there are related national and regional documents.
- The local plans are commonly aligned with other plans from different high(er) level authorities.
- Funding programmes by national government as part of Germany Climate Protection Program;
- Central government.
- Other public authorities. Please specify: local government.
- Central government. The main driver are government policies, but this target exceeds those.
- Central government. The Local Transport Plan is a statutory document.

Q4: What are the (quantified) targets included in these strategies and objectives? (Please check the boxes that apply to you, and give more information in the 'Other' section)

- (Zero-emission) targets (long-term) on the deployment of electrification of urban vehicles: Zero/Low/Ultra Low emission zones currently implemented or planned? If so: how large, which type / vehicle restrictions? Building regulations e.g. mandatory EV chargers installed (in parking spaces, new apartment building, …), Climate Change GHG reductions/ Climate Neutral objective, Renewable Energy targets, improved Air Quality and Noise Reduction.
- (Zero-emission) targets (long-term) on the deployment of electrification of urban vehicles, Zero/Low/Ultra Low emission zones currently implemented or planned? If so: how large, which type / vehicle restrictions? Buildings regulations e.g. mandatory EV chargers installed (in parking spaces, new apartment buildings, …), Climate Change GHG reductions / Climate Neutral objective, Renewable Energy targets, Improved Air Quality and Noise Reduction, Procurement protocols promoting Greenhouse Gas Reduction.
- (Zero-emission) targets (long-term) on the deployment of electrification of urban vehicles.
- Zero/Low/Ultra Low emission zones currently implemented or planned? If so: how large, which type / vehicle restrictions? Climate Change GHG reductions / Climate Neutral objective, Improved Air Quality and Noise Reduction.
- Zero/Low/Ultra Low emission zones currently implemented or planned? If so: how large, which type/ vehicle restrictions?, Buildings regulations e.g. mandatory EV chargers installed (in parking, new apartment buildings,…), Climate Change GHG reductions/ Climate Neutral objective, Improved Air Quality and Noise Reduction, Bremen has the highest share of cycling of German large cities and the lowest level of NO2 – once again: going beyond e-cars https://www.greencharge2020.eu/wp-content/uploads/2019/06/leaflet_GreenCharge_e-mobility_and_SUMP.pdf
- (Zero-emission) targets (long-term) on the deployment of electrification of urban vehicles, Zero/Low/Ultra Low emission zones currently implemented or planned? If so: how large, which type / vehicle restrictions? Buildings regulations e.g. mandatory EV chargers installed (in parking, new apartment buildings, …), Climate Change GHG reductions/ Climate Neutral objective, Renewable Energy targets, Improved Air Quality and Noise Reduction, Procurement protocols promoting Greenhouse Gas Reduction, Air Quality or other specific goals?
- (Zero-emission) targets (long-term) on the deployment of electrification of urban vehicles, Buildings regulations e.g. mandatory EV chargers installed (in parking spaces, new apartment buildings, …), Renewable Energy targets, Improved Air Quality and Noise Reduction.
- Climate Change GHG reductions/ Climate Neutral objective, Renewable Energy targets, Procurement protocols promoting Greenhouse Gas Reduction, Air Quality.
- (Zero-emission) targets (long-term) on the deployment of electrification of urban vehicles, Zero/Low/Ultra Low emission zones currently implemented or planned? If so: how large, which type / vehicle restrictions?, Building regulations e.g. mandatory EV chargers installed (in parking spaces, new apartment buildings, …), Climate Change GHG reductions / Climate Neutral objective, Improved Air Quality and Noise Reduction, Procurement protocols promoting Greenhouse Gas Reduction, Air Quality or other specific goals?, To move towards zero emission transportation will require the prioritising of low emission modes of transport as well as strongly encouraging a transfer to electric vehicles. All new transport projects will need to be assessed against these requirements using the transport hierarchy: 1st= active transport (walking & cycling), 2nd = public transport, 3rd = shared mobility (car clubs, taxis,

car hire), 4th = private vehicle (low emission), 5th = private vehicle (traditional). Bus operations Clear Air Zone agreement (2018) Euro VI standard by end 2020. Remodelling traffic flows and testing scenarios for improving air quality (& reducing carbon emissions) in Leicester. Leicester is updating its planning guidance advice on the % of bays which should have a charge point in car parks of different sizes serving different forms of development. GHG reductions have been mentioned above. Leicester has an Air Quality Management Area declared for exceedances in NO2 and an Air Quality Action Plan containing 'low emission' actions which can also help reduce transport carbon emissions. Leicester follows sustainable procurement procedures.

Q5: Is there a dialogue/partnership between the public and private sectors (energy suppliers and distributors, network managers, etc.), to expand public policies regarding electromobility (e.g. to use renewable energy for publicly accessible e-chargers)? [If Yes, please elaborate in the 'Other' section]

- Ongoing work to engage the private sector in delivering clean and sustainable transport in London, regulation of bus and taxi fleets to drive electrification.
- See CIVITAS Eccentric measure on campaign for private households and "charging map".
- Yes.
- The LIVE initiative includes different stakeholder in the Barcelona electromobility field.
- See Bremen Green City Masterplan [1].
- Yes.
- No.
- Commissionaire contract for EVSE installation in city with Chargemaster.
- Leicester & Leicestershire Enterprise Partnership (LLEP) - The LLEP is a strategic body led by a Board made up of local government and business leaders as well as senior education and third sector representatives. The LLEP Energy Infrastructure Strategy sets the level of ambition, and guides investment in the low carbon energy sector, which has been identified as one of the LLEP's priority sectors for economic growth. The strategy identifies a set of concrete project opportunities that can be pursued immediately and over the coming years. The projects proposed span the LLEP area, and involve a wide range of sectors including homes, businesses, transport, power generation and energy networks. The strategy takes into account national policy (including the Clean Growth Strategy) and local policies and will feed into the development of the LLEP's Industrial Strategy. Leicester has just embarked on a major 12-week programme of consultation activities launched by the city council to let people have their say on how Leicester will need to respond to the global climate crisis. Leicester's DNO Western Power Distribution are becoming more proactive in helping local authorities deliver charge point networks - Stakeholder workshop: "Working with you to deliver the EV charging network" - Nov 2018; and "A Guide on EV Charging & DNO Engagement for Local Authorities".

Q6: What are the existing framework documents in your country? [Please check the boxes and that apply to you, and give more information in the 'Other' section]

- European documents (such as Directive for Deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), Mayor's Transport Strategy sets out the London response to national and international regulation and the city response to issues such as air quality and climate change.
- European documents (such as Directive for Deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), Are Mobility & Renewable energy strategies/plans properly harmonized?

[1] https://www.bauumwelt.bremen.de/sixcms/media.php/13/20180813%20Masterplan%20Green%20City%20Bremen%20V1.1%20-%20Leseversion.39677.pdf

- National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans).
- National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans).
- European documents (such as Directive for Deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), very current political strategies along COP and with the national climate protection strategies.
- European documents (such as Directive for Deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), We are in the process of harmonising.
- European documents (such as Directive for deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), Are Mobility & Renewable energy strategies/plans properly harmonized?
- European documents (such as Directive for Deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), Are Mobility & Renewable energy strategies/plans properly harmonized?
- European documents (such as Directive for Deployment of Alternative Fuels Infrastructure, Clean Vehicles Directive, Renewable Energy Directive, EU Clean Air Policy Package, etc.), National documents (Ministries or Agencies) for air quality, Renewable Energy Sources (RES) production, energy consumption, electromobility, etc., Regional or local documents such as Mobility strategies/plans (e.g. Sustainable Urban Mobility Plans considering electrification), Renewable energy strategies/plans (e.g. Sustainable Energy and Climate Action Plans), The Government's Road to Zero document (July 2018) details new measures to move the UK closer to having clean road transport. Much of Leicester's work to improve air quality is driven by EU Clean Air Policy. Following the current Climate Emergency consultation in Leicester, our Sustainability Action Plan will be thoroughly revised to also serve as a Climate Action Plan. Leicester's Local Transport Plan 4 will also be informed by the findings of the current Climate Emergency consultation. Mobility & Renewable Energy plans are yet to be properly harmonized.

Q7: Which difficulties have you encountered while implementing your solution(s)? [Please check the boxes that apply to you, and give more information in the 'Other' section]

- Lack of city financial support, Regulatory difficulties (strict procurement procedures, lack of harmonisation at national or European level, etc.), Immature market of products and services needed for effective implementation, Regulation of electricity markets is a particular problem. Immature markets in areas such as V2G is also slowing progress owing to the chicken and egg problem, no one wants to develop V2G infrastructure till there are sufficient V2G capable vehicles and drivers willing to participate but no one wants to buy V2G capable vehicles as there is no V2G infrastructure.
- We started over ten years ago, most of these issues have been encountered and addressed and are not problems now. The main concerns for the near future are coordination between actors (i.e. so works take place in a coordinated way), the overall capacity of the grid during peak hours, and emerging

issues e.g. vehicle-to-grid, battery safety and recycling, etc. Plus, the general issue - should we make charging visible to enable a vehicle transition or should we try to reduce vehicle use first?

- Planning misalignment problems (public vs. private delays).
- Regulatory difficulties (strict procurement procedures, lack of harmonisation at national or European level, etc.), Planning misalignment problems (public vs. private delays), Immature market of products and services needed for effective implementation.
- Lack of city financial support, Lack of staff capacity, expertise, Technical difficulties or lack of technical support from the region/central government, Immature market of products and services needed for effective implementation, false expectations (e-mobility will solve all problems? space consumption, congestion, safety...????).
- Managing large numbers of actors involved (or governance, lobbies...), lack of city financial support, accessing European and/or national financial grants (or knowledge of the existence of such grant, administrative complexity of cases, etc.).
- Technical difficulties or lack of technical support from the region/central government, the installation of a larger grid connection to implement the project has caused significant delays.
- Lack of staff capacity, expertise, Accessing European and/or national financial grants (or knowledge of the existence of such grant, administrative complexity of cases, etc.), Technical difficulties or lack of technical support from the region/central government, Regulatory difficulties (strict procurement procedures, lack of harmonisation at national or European level, etc.), Immature market of products and services needed for effective implementation, The Leicester SEEV4-City OP is an innovative energy management project, however the Council's Energy Team did not have the staff capacity to lead the project, and instead it is being led by the Transport Strategy Team, who lack an energy background, and this has meant a steep learning curve for those involved. The project is dependent on the Council's Facilities Management department for advice, guidance and authorisation. At just the time that the project was seeking such assistance Facilities Management were going through a major reorganisation and losing staff, with remaining staff often unsure of their responsibilities to a small, innovative project being led by another department. When engagement was finally achieved, Facilities Management confirmed they had no resource to help and a further lengthy process was endured to procure an electrical engineer from a consultancy. Fortunately, there remains high level support for this project and it will be completed. The early stage market for bi-directional chargers currently results in long lead times. We do have strict procurement procedures to adhere to and this can be time consuming, but the bigger problems are the long product lead times. WIDER EXPERIENCE - Leicester failed in its bid for the UK Government's GoUltraLow funding in 2015. More recently, Leicester has succeeded in securing funds from the Government's Office for Low Emission Vehicles (OLEV) and from the ERDF, for a number of electromobility projects mentioned.

Q8: Which other stakeholders did you reach out to for further support/cooperation with DESIGNING and PREPARING your solution(s)?

- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.
- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.
- Academic and Research Institutions.
- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.
- Academic and Research Institutions, Consultancy services, Service providers, Grid operators.
- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.
- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.
- Consultancy services, Service providers, Product suppliers.
- Consultancy services, Product suppliers. The principal source of technical support has been Cenex UK, who have played a similar role in previous electromobility projects. Information from product suppliers, often via web-searches has also played a role.

Q9: Which other stakeholders did you reach out to for further support/cooperation with IMPLEMENTING and OPERATING your solution(s)? e.g. operation of the solar or wind farm, the e-vehicles, the e-charging station, energy management system, etc.

- Academic and Research Institutions, Service providers.
- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.

- Consultancy services, Service providers, Product suppliers.
- Consultancy services, Service providers, Product suppliers.
- Academic and Research Institutions, Consultancy services, Service providers.
- Academic and Research Institutions, Consultancy services, Service providers, Product suppliers.
- Consultancy services, Service providers, Product suppliers.

Q10: Have you reach out to any other public authorities to exchange information, seek for advice, share good practices?

- Yes, other public authorities from within my region. Yes, other public authorities from with my country. Yes, other public authorities in Europe.
- Yes, other public authorities from within my region. Yes, other public authorities from with my country. Yes, other public authorities in Europe.
- Yes, other public authorities from within my region.
- Yes, other public authorities from within my region. Yes, other public authorities from with my country. Yes, other public authorities in Europe.
- Yes, other public authorities from within my region. Yes, other public authorities from with my country. Yes, other public authorities in Europe.
- Yes, other public authorities from with my country. Yes, other public authorities in Europe.
- Yes, other public authorities from within my region, Yes, other public authorities from with my country, Yes, other public authorities in Europe, Nottingham in Leicester's region. Portsmouth & Oxford in the UK. Through SEEV4-City; Oslo & Amsterdam. Also extremely useful, and arising from Nottingham's GoUltraLow funding; https://level-network.com/ – skill development & knowledge transfer in low emission transportation. Several useful workshops attended.

Q11: What type of information were you looking for? E.g. guidelines, data, suppliers, etc.

- Comparing experience and sharing knowledge.
- Everything!
- Data, experiences.
- The possibility to find funds to co-finance the planned big photovoltaic plant on the roofed spaces of the depot (over 5000m2). The energy will be fed straight to the trolleybus grid and it will suffice for 5% of the overall energy usage. It is going to be a very innovative solution and to our best knowledge the first of its kind in the world (battery trolleybuses and IMC e-buses running partially on solar energy). So far, PKT has not found a programme to co-finance the investment.
- Tender guidance from Arnhem. Other authorities have approached us asking for advice.
- Nottingham - info on procuring a concessionaire to operate a charge point network. Portsmouth & Oxford - info on developing on-street charging in residential areas. Via SEEV4-City first-hand information on electromobility developments from two cities who are much more advanced in this field than Leicester.

Q12: What kind of advice did you receive? Can you please elaborate.

- We could write a book on this... the basic message is that you have to have chargers (using renewables) for drivers to embrace e-vehicles. But there are so many issues to address ... so exchange is important.
- Wide range of advice - sometimes very helpful, sometimes only driven by political or business interests.
- To look further.
- From Arnhem: copies of their tenders.
- Nottingham - a presentation. Portsmouth & Oxford – phone call discussions. Oslo and Amsterdam – site visits and presentations.

Q13: What has worked well, and success factors? (Please type in bullet points and short sentences).

- Implementing emission control zones. Utilising metro system electricity infrastructure.

- City plays an orchestrating role - facilitating and using its mandate to do what it can, good cooperation with private sector.
- Finding good solutions to Reach the goal of the Project. Cooperation on European Level. Technical installations.
- Collaboration between research institutions and private sector worked very well in V2B. Alignment of project objectives and city EV strategies.
- The market penetration of electrically supported bikes worked best - no governmental programmes required - but good cycling infrastructure. All the implementation of e-cars did not work well - despite billions of national and European Funding. As long as we keep petrol and diesel cheap, there is no real chance for decarbonisation of transport.
- Working together, political consistency and commitment.
- PKT has applied in 2017 for the funds to co-finance the photovoltaic power plant to the call organized by the Marshall Office, and although the application went through the company did not get the funding because there many more applicants with a better score (also individual ones, not only the companies).
- Nothing has been easy or simple up to now. However, we have yet to commence project delivery so difficult to comment further at this stage.
- SEEV4-City. The problems of working with Facilities Management have been hugely detrimental. Support from Cenex UK and some of the LEVEL workshops has been extremely useful.

Q14: What is needed for upscaling the solution(s) in your city/region?

- We have seen some cities rush to buy expensive prototypes or fleets of vehicles without thinking about energy supply, charging, etc. It is important to have a holistic view!
- Just changing 1:1 from fossil cars to e-cars or even worse: adding e-cars on top.
- PKT would like to look for funds more actively.
- The initial grant application, although technically in-depth, had not been sufficiently scoped for on-site impacts by the council e.g. the pre-project requirement to consolidate and enhance power supplies, which created a whole new tranche of work. The potential roll-out of technical projects needs to be understood by all internal stakeholders (to understand organisational risks fully) when ideas are being formulated for grant applications.
- If we are involved in another project that is simultaneously infrastructure delivery and policy research it may be useful to consider what is the appropriate allocation of staff resource. Hopefully some lessons will be learnt internally about successful working between departments, even at times of reorganisations and budget cuts.

Q15: Based on your experience so far, which additional solutions integrating energy production and transport are being developed to reach emission reduction objectives?

- Smarter energy management involving distributed generation and energy storage.
- More work, lots of it. Alignment of approaches over municipal boundaries. More e-vans, e-trucks, machinery, etc.
- Willingness to invest in chosen solutions.
- Regulation of V2X.
- Higher prices for petrol and diesel.
- Monitoring what kind of solutions work, what kind of people are involved.
- More joint action of all stakeholders (public and private).
- Successful trial results will be an important factor in incentivising the expansion of V2G & RES technology ...
- First, to complete our initial project and study the results from that. Nottingham's CME V2G project will be 10 times bigger than our V2B scheme! It also features additional elements such as the stationary battery storage and the interoperable energy management system. Our SEEV4-City V2B project will introduce Leicester to the concept and potential benefits of using renewable energy to charge EVs, and in turn for EVs to return residual charge for other uses at times of high energy demand. Nottingham's

CME project represents a possible next step for Leicester in this area of e-mobility work; at a larger scale and with a wider scope. Leicester is seeking to become a CME 'follower city'.

Q16: Based on your experience so far, which additional solutions integrating energy production and transport are being developed to reach emission reduction objectives?

- Further research on V2G and novel charging methods such as inductive charging for taxis, integrated energy systems involving district schemes and all forms of energy.
- V2X, V2B etc... inductive charging, cable-based electric roads etc... new batteries etc... lots, but more can be done.
- See SUMP guidelines: active modes and collective modes first.
- Pilots with apps, batteries etc.
- The objectives PKT is pursuing right now, namely their own electricity production (photovoltaic power plant, perhaps a wind farm in the future) and optimisation of the recuperation braking energy usage.
- The only one I am aware of is the growing production of hydrogen, not all of which is generated using renewable energy.
- Complete Leicester's OP, learn from that; learn from the similar but larger and more ambitious CME V2G project in Nottingham. Consider whether the PV we are soon to install at two city centre car parks and our St Margaret's bus station can usefully be developed into V2B/V2G schemes. The Council intends to continue the roll out of PV installations at further corporate buildings, council housing and some schools. As the council is gradually growing its fleet of electric vehicles, and with the Climate Emergency becoming ever more important to tackle, it seems highly likely that further V2X schemes will be introduced in the coming years, additional to the SEEV4-City related work.

Q17: Are you familiar with the European Sustainable Urban Mobility Plans (SUMP) concept? [2]

Q18: Are you familiar with the Sustainable Energy and Climate Action Plan (SECAP) framework? [3]

[2] Link: https://www.eltis.org/mobility-plans/sump-concept

[3] Link: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/guidebook-how-develop-sustainable-energy-and-climate-action-plan-secap

Appendix B: SEEV4-City Stakeholders Validation Webinar 24th June 2020

SEEV4-City Stakeholders validation webinar on the 24th of June 2020 [4]:

'How to make the charging infrastructure and local electricity grids future-proof?'

During this webinar, the participants had the opportunity to gain insights and have a say on the list of recommendations SEEV4-City partners propose for seamless integration of smart charging and V2X concepts to boost the uptake of the clean vehicles as well as harmonisation of energy and mobility plans.

Speakers, Slots and Topics:

15.00 – 15.05: Introduction to objectives of the webinar
Richard Kotter (Northumbria University, UK), Sabina Asanova (POLIS)

Setting the scene

15.05 – 15.15: Intelligent Mobility for Energy Transition: Accelerating towards more sustainable societies
Anna Domenech Abella, Nissan Europe "Intelligent Mobility for Energy Transition" initiative within the EIP Smart Cities

15.15 – 15.25: Benefits of smart charging infrastructure and V2X identified in the SEEV4-City project
Robert Van Den Hoed, University of Applied Sciences Amsterdam

15.25 – 15.35: Implementation & upscaling smart charging: Barriers & Drivers
Hugo Niesing, Resourcefully, CleanMobilEnergy

How to make it happen?

15.35 – 15.50: Presentation of the main SEEV4-City policy recommendations on further integration of the urban mobility and energy plans as well as the integration of the V2X and smart charging concepts
Richard Kotter (Northumbria University, UK), Sabina Asanova (Polis)

15.50 – 16.15: Discussion and validation of the policy recommendations
All participants

16.15 – 16.20: Break

Getting practical

16.20 – 16.30: Lessons learnt in procuring smart charging technologies
Jorden van der Hoogt (Cenex Group Netherlands)

16.30 – 17.00: Final conclusions and next steps
Richard Kotter (Northumbria University, UK), Sabina Asanova (POLIS)

Results from the polls taken, based on the policy topics, strategies and measures taken and the proposed SEEV4-City recommendations with the Webinar participants. The results appear to be in line with expected results of the SEEV4-City Webinar organisers, and the range of reports – including this one, including the SEEV4-City recommendations – prepared by the SEEV4-City project team.

[4] http://event.seev4-city.eu/; https://youtu.be/pNQQFzvMNuk

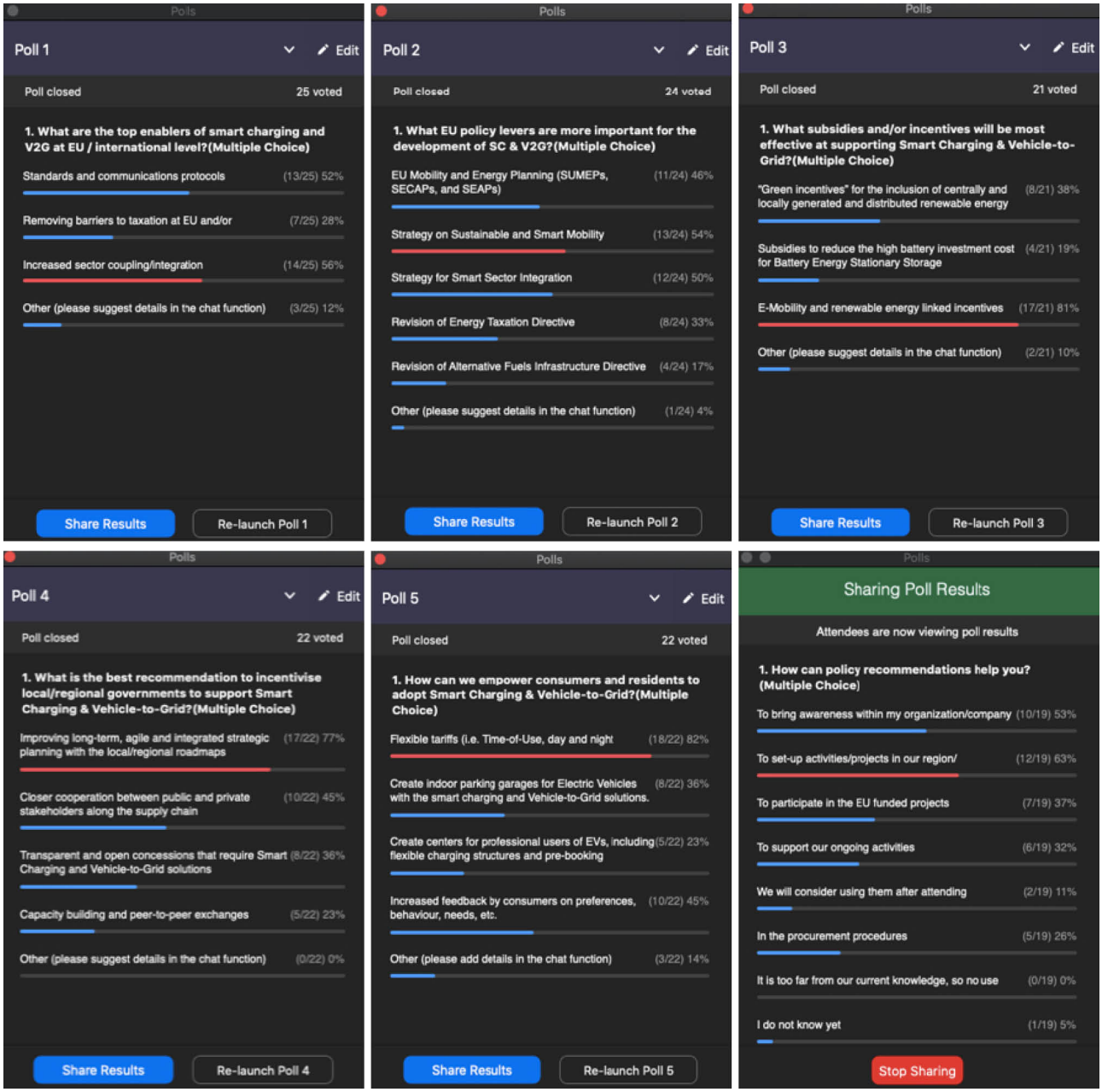


Figure 2: Poll results from the 24th of June SEEV4-City Stakeholder Validation Webinar
(source: https://youtu.be/pNQQFzvMNuk)