SPARCS

SPARCS

Project’s lessons and application possibilities for **electric mobility** in **Kera**

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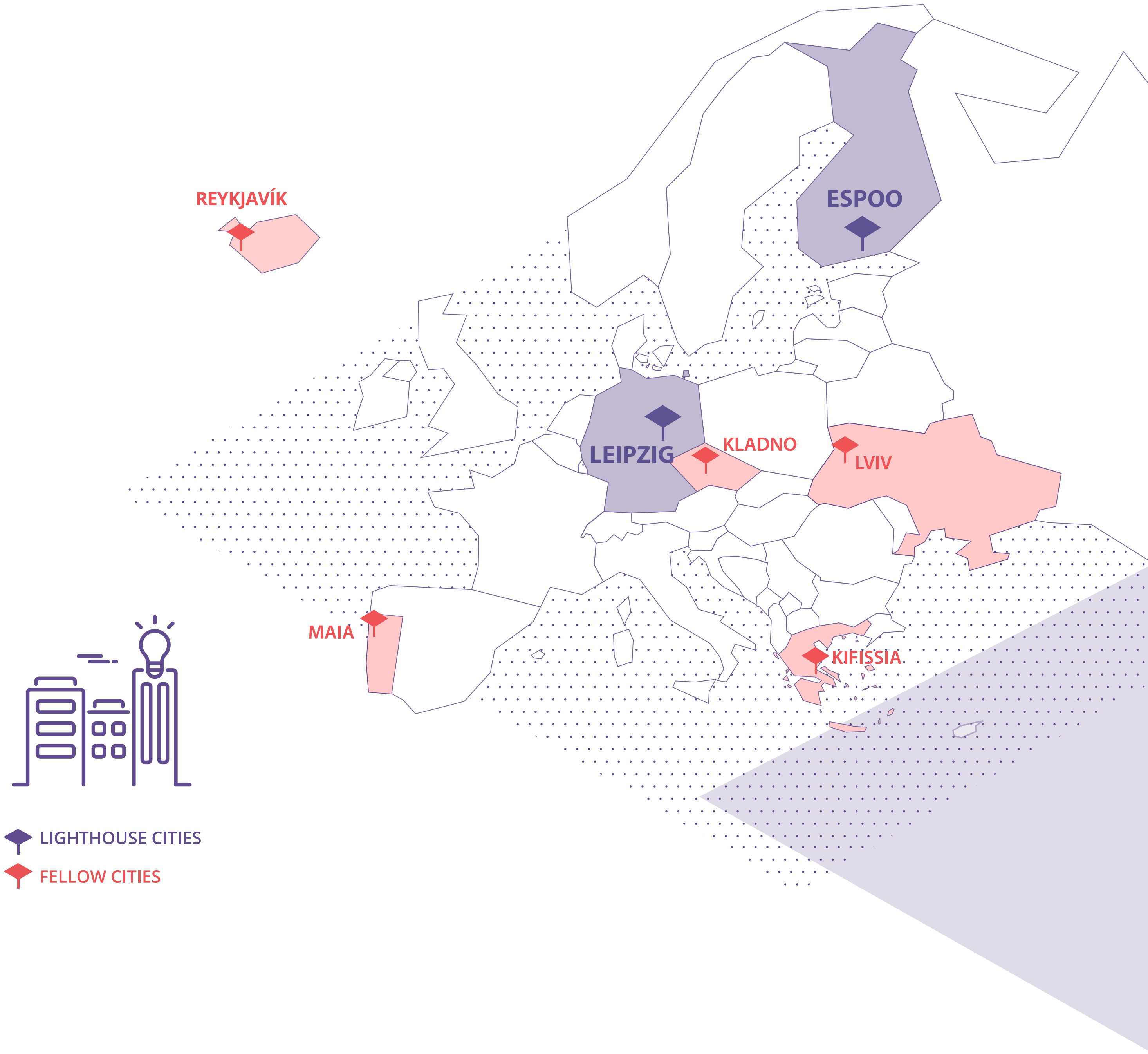
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Summary

Transport currently accounts for a significant proportion of greenhouse gas emissions. Urban mobility solutions based on sustainable development emphasise walking, cycling and public transport and are not only emission-free, but also equal, safe, affordable and accessible to different people.

In the Horizon 2020 SPARCS (**Sustainable energy Positive & zero cARbon CommunitieS**, 2019–2024) project, mobility is examined from the perspectives of electric transport, links between energy and transport systems, sustainable transport habits and new sustainable mobility models, as part of positive energy districts (PED). The solutions developed in the project and research can be utilised locally and globally.

This text brings together the key highlights and insights from sustainable mobility demonstrations conducted in the SPARCS project in Espoo to support the development of Kera, in particular. Kera is a future new district along a commuter train line, developed in accordance with sustainable development objectives. The aim is to develop the area based, in particular, on walking, cycling, public transport, and the shared mobility services of a sharing economy. The district will replace an old industrial logistics area. The developing new sustainable district also offers opportunities to create new solutions locally for sustainable mobility using co-creation methods. The content compiled in this document may also be used in other urban areas, particularly those that are currently being built and further developed.

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Texts: Jani Tartia, City of Espoo
Photos and figures: City of Espoo
Solution icons retrieved from Flaticon.com

1 Introduction

Transport currently accounts for a significant proportion of greenhouse gas emissions. It is the cause of one fifth of the total emissions worldwide and approximately a third in urban areas[1]. The proportion accounted for by transport emissions in cities is predicted to increase due to the rapidly continuing migration to cities and the growing need for mobility. In addition to emissions, transport has considerable, broader effects on the quality of the urban environment, lifestyles, accessibility and equality. Therefore, instead of transport, it is useful to talk more extensively about mobility as a comprehensive entity linked to numerous urban phenomena. For example, the development of the urban environment, spatial planning and socio-economic factors play a major role in mobility needs and opportunities, as well as in the attractiveness and accessibility of different modes of transport. In addition to being emission-free, sustainable mobility solutions are equal, safe, affordable and take diverse user groups into account. Therefore, walking, cycling and public transport play an important role as sustainable modes of mobility in cities.

In the Horizon 2020 SPARCS (Sustainable energy Positive & zero cARbon CommunitieS, 2019–2024)[2] project, mobility is examined from the perspectives of electric transport, links between energy and transport systems, sustainable transport habits and new sustainable operating models for mobility services, as part of positive energy districts (PED). The solutions developed in the project and research can be utilised locally and globally. This document contains the key highlights from demonstrations conducted in the Lighthouse City Espoo.

In Espoo, transport currently accounts for about one third of the carbon dioxide emissions. In future scenarios, these emissions are predicted to increase due to the area having Finland's fastest growing population, in particular. The fragmented urban structure also poses challenges to a sustainable transport system. In particular, the City's recent investments in rail-based public transport infrastructure (metro, light rail, development of commuter train transport), support the development of mobility towards sustainability. In the future, more attention should be paid to the prerequisites for sustainable transport in both existing and new urban areas.

One of these future districts in Espoo is Kera, where the goal is to create a sustainable development area along the existing suburban railway line. The district will replace an old industrial logistics area. The aim in terms of transport is to develop the area based, in particular, on walking, cycling, public transport and the shared mobility services of a sharing economy[3]. Kera is a city planning demonstration site in the SPARCS project. In this document, solutions demonstrated in SPARCS are compared to the development of Kera, its typology and the objectives set. The content compiled in this document may also be used in other urban areas, particularly in newly developing and evolving ones.

The text is based on a thematic report of the project[4] and other documents created during the project. The work is part of the project's WP3 Espoo Lighthouse Demonstrations work package and E13-2 Replication of e-mobility solutions.

1 https://www.c40.org
2 www.sparcs.info
3 hhttps://www.espoo.fi/en/future-kera
4 Deliverable 3.5 EV mobility integration and its impacts in Espoo https://sparcs.info/en/deliverables/d3-05-ev-mobility-integration-and-its-impacts-in-espoo/

2 Urban mobility and positive energy districts

Sustainable mobility solutions are low-emission and accessible to various types of users (Banister 2008[5]). Promoting sustainable mobility modes can partially address negative trends associated with urban mobility, such as an unnecessary rise in mobility needs, air pollution, problems with transport poverty and accessibility, inefficient use of space and localised noise pollution. Smart solutions, in turn, refer to utilising digital tools in the implementation of shared mobility services, guidance, information and various interconnected services, as well as coordinating them with each other. Intelligence is a tool, not an aim or a goal in itself.

Emissions caused by mobility can be tackled in many ways. The mode of mobility and length of journey are key factors that directly affect mobility emissions. Walking, cycling and public transport are the best forms of mobility in terms of emissions. Shared mobility services (e.g. city bikes and car-sharing) can also help reduce emissions from mobility since their usage is often intermittent and replaces, for example, the wider and more comprehensive use and acquisition of cars, making these mobility modes available to various users. In addition to «unavoidable» routine journeys, such as from home to work, school, shop or health centre, more attention should be paid to voluntary journeys and how they are made in terms of sustainability, such as journeys made for hobby and leisure purposes. A direct reduction of mobility needs, for example by reducing unnecessary journeys through digital applications or logistics services, will directly reduce vehicle-kilometres and, thereby, emissions. However, minimising and optimising all journeys is not practical, as mobility is an integral part of everyday life, well-being, and connections with our surroundings and other people.

The positive energy districts (PED) at the core of the SPARCS project are linked to mobility themes, particularly when it comes to local energy infrastructure, fuel and a service-oriented approach to mobility. The ratio of energy used for mobility to the overall energy consumption and production is included as part of a designated PED, depending on the calculation method chosen, either 1) for mobility within the area (territorial principle) or 2) for mobility due to the area (causal principle). Transport hubs, in particular, have a major role in connecting the energy and mobility sectors. At transport hubs, mobility modes can be optimised in terms of their energy consumption and different modes can be combined, taking into account their specific characteristics, including the temporal aspect of usage.

In many respects, the mobility and urban environment planning go hand in hand as they are closely linked. Mobility does not take place in a vacuum, but rather through various urban spaces, places and routes. The urban environment plays a central role in determining the types of mobility possible in different areas and shapes the experience for those on the move. This, in turn, partially influences the conscious or unconscious choice of mobility mode (if, indeed, there is a choice between different options, for example, due to a person's financial constraints). Promoting sustainable mobility is, in many ways, also the development of an attractive and appealing urban environment when the aim is to increase walking, cycling and use public transport in everyday mobility. For example, the quality and aesthetics of the built environment, as well as the locations of different functions in a given space, are important factors in the design of an attractive and appealing urban environment, such as the surroundings of public transport stations.

From the regional perspective, various recurring flows and rhythms in mobility are important considerations from a transport planning standpoint. The urban structure, including how various functions and services are distributed in the area, the connections between different

5 Banister, D. 2008. The sustainable mobility paradigm. Transport Policy 15(2): 73–80.

parts of the structure, and how they can be easily and quickly connected to each other, all impact the formation and development of mobility habits and routines. Information and knowledge sharing, for example about traffic emissions and the impact of mobility choices on each individual's carbon footprint, are not enough if the underlying physical, social, economic and cultural structures do not support the use of sustainable mobility modes.

3 Case Kera District

Kera is a city planning demonstration site in the SPARCS project. Kera is a former logistics area in the greater Leppävaara region, which is to be transformed into a new urban district over the coming decades. Homes for around 15,000 residents and facilities for 10,000 workplaces are planned for the area. The aim is to develop the area into a new type of model of sustainable development and a global reference site, where various circular economy solutions, in particular, are at the forefront. Kera is being actively developed in close cooperation with various operators, such as organisations, companies, associations, landowners, research institutes and (present and future) residents. Furthermore, Kera is being developed through a number of functionalities, such as energy, transport, logistics, circular economy and construction.

The area's planning will be carried out in three stages, the first of which is the Centre of Kera's plan, which entered into force in 2021. The two other plan areas, Karapelto and Karamalminrinne, will be completed in the near future. The street construction in the area began at the end of 2023. The construction of the first new buildings has begun in 2024. Many development projects and initiatives by the Centre of Excellence for Sustainable Development of the City of Espoo's Strategy Unit have developed and piloted new circular economy, mobility and energy solutions in Kera with various stakeholders, including the SPARCS project. Additionally, a number of businesses and a university of applied sciences operate in Kera, making the area an interesting learning and development platform for new solutions.

In recent years, Kera has also become known for its diverse temporary use of facilities, with Keran Hallit, i.e. the former logistics halls of the SOK Corporation, located in the main structure of the area, gaining particularly widespread attention. Keran Hallit has hosted various sports facilities, microbreweries, workspaces, event venues, art exhibitions and other facilities that enable similar functions. Furthermore, empty facilities have been used as test sites or «living labs» for various sustainable and smart circular economy solutions, including urban food production, autonomous transport, 5G data connections and inclusive street design. The plan is to demolish the halls around the middle of the decade as the area is built and developed.

3.1 MOBILITY SOLUTIONS IN KERA

The existing surroundings and the daily commuter train service of Kera station, which will continue to form the backbone of sustainable mobility in the area, have been highlighted in the transport plans for Kera. The new central area forming around the train station is designed with a focus on pedestrian and bicycle traffic, and it features green corridors and restrictions on car traffic. Walking and cycling as the area's main mobility modes will also enable the creation of attractive and appealing urban environments. Through the design of streets and green corridors, efforts have been made to minimise the through traffic of private cars in the area. Parking in the area is mainly concentrated in separate parking facilities. Car-sharing and other mobility services can find marketplaces around the station or as part of the parking facilities in the area.

Kera's area development commitment[6] (2021), formed through co-creation, guides the district towards sustainable development goals and a shared vision of the area between different operators. For transport and logistics, the Kera's development commitment describes the goal as follows:

> «Walking, cycling and public transport will be made the most attractive mobility modes in Kera. In Kera, shared modes of transport primarily operate on electricity or recycled fuel. All logistics in Kera will be organised efficiently in order to optimise the transport capacity and minimise disruption to the environment andother transport.»

The planned Espoo Rail Line will impact Kera, and a light rail connection has also been considered for the area. In terms of bus traffic, electrification is progressing through tenders organised by HSL (Helsinki Regional Transport Authority). The evolving station area can offer an attractive platform to test and pilot new mobility services and solutions. The culture of experimentation based on temporary use is already strong in the area, for example in the form of Keran Hallit, which may serve as a link to extending this culture to the development of mobility and the area's traffic hub.

The long period of construction poses a major challenge to designing sustainable mobility for the area. Sustainable mobility modes must remain the most attractive ones during construction as well, characterised by various temporary arrangements, such as traffic routes. In their planning, it is crucial to pay special attention to the long-term mobility goals of the area, ensuring that no self-reinforcing negative cycle is created there, for example due to fragmented cycling or pedestrian routes.

6 https://www.espoo.fi/en/news/2021/09/development-commitment-kera-will-make-it-pioneering-area-sustainable-development-unique-land-use.

3.2 TEMPORAL REVIEW OF KERA

Different areas have different hourly, daily, weekly, monthly and yearly rhythms that are formed by their usage patterns and temporal variations on varying scales and levels. Kera will be developed and built intensively over the coming years and decades, which will also shape its usage patterns and the current temporal profile.

At present, Kera is profiled as an area focused on workplaces and recreational facilities. Some of the key figures related to the use of Kera's central area have been summarised below.*

45%

Almost half (45%) of the area's daily use is related to activities other than housing, working or studying (e.g. use of recreational spaces, transit).

20%

A total of 20% of the area's users spend less than 20 minutes there (e.g. transit to other nearby areas, use of the train station).

9–15

The most popular times for the area's use are between 09:00 and 15:00.

25%

Daily visits to the area have increased by around 25% annually compared to the year of 2020 with COVID-19 pandemic related effects.

* Data: Telia Crowd Insight.

4 SPARCS: Solutions for sustainable urban mobility

The following pages describe sustainable mobility solutions developed, demonstrated and studied in the SPARCS project. They illustrate the key lessons and observations highlighted as part of the solution description. Additionally, each solution has been examined through «the lens of Kera», meaning that key observations have been highlighted on how the solutions can be applied to a new developing area like Kera. In the analysis, special attention has been paid to the area's long-term development, specific conditions and requirements during construction, the sustainability goals determined for Kera in the plan, envisioning work and the area's development commitment, as well as the current typology of the area.

The solutions have been divided into three themes:

1 **technologies,**
2 **concepts, and**
3 **participation and development.**

Each theme presents fundamental perspectives on sustainable mobility, ranging from technical solutions to new co-created mobility concepts, as well as factors that influence mobility behaviour and design solutions. The total number of solutions presented is 11.

Information about the solutions and their demonstrations during the project in the blocks of Espoonlahti's Lippulaiva and Leppävaara's Sello can be found in the publicly available project report, focused on mobility solutions, on which this document is also mostly based: Deliverable D3.5 EV mobility integration and its impacts in Espoo. Some of the descriptions also include QR code links to online materials, including a database maintained by the project partner BABLE of the project's usage cases for future utilisation. The SPARCS project's results will also be published as scientific, peer-reviewed articles.

TECHNOLOGIES

- Charging electric vehicles at transport hubs
- Charging points for electric bicycles at transport hubs
- Vehicle-to-Grid
- Simulating electric mobility charging needs

CONCEPTS

- Electric mobility service hub
- Opportunities and obstacles pertaining to electric bicycles
- Opportunities and obstacles pertaining to electric car sharing services
- 5G and autonomous mobility

PARTICIPATION AND DEVELOPMENT

- Sustainable mobility and area-level planning
- Electric mobility test runs
- Sustainable mobility measures amongst young people
- Mobility service design sprints
- Co-creation model as a tool

Further information

The SPARCS project report D3.5 «EV mobility integration and its impacts in Espoo» (language versions: ENG)

List of articles published on the project results (language versions: ENG)

4.1 SOLUTIONS I: TECHNOLOGIES

Charging electric vehicles at transport hubs

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project installed new electric car charging points in the blocks of Lippulaiva in Espoonlahti, studied and further developed the electric bus charging system in Leppävaara in the blocks of the shopping centre Sello, and examined the integration of vehicle charging into a smart energy system.

The growing number of electric cars means increased charging needs. A charging service for private consumers' electric cars can be created in a centralised way as a larger entity that includes as many as hundreds of charging points (e.g. as part of a car park or shopping centre) or a smaller solution of a few charging points, factoring in the space requirements of the equipment. Locations that drivers would visit anyway are often suitable for charging electric vehicles too. Charging points for professional traffic (e.g. logistics vehicles, taxis) can also be placed in the same areas, or a solution can be built at depots or other segregated locations. When deciding on the charging point capacity, the genuine demand and its future trends should be assessed, taking into account its temporal variation (e.g. hourly, daily or weekly charging profiles) and effects on other use of the space/area (e.g. attractiveness of an urban space).

Charging can be arranged as a monthly subscription service (CaaS, Charging-as-a-Service), where a single operator is responsible for hardware maintenance, consumer billing and application implementation, for instance, on behalf of the service provider in a specific area. The charging process can be initiated, for example, through remote identification or an application. Charging events generate real-time data on the use of charging points, allowing the demand trends to be anticipated over a longer period, for example.

CASE KERA

Kera mainly uses a centralised parking solution where parking buildings/facilities manage the parking needs of multiple blocks and housing companies. The area's charging solutions will probably be located at these facilities, where they can serve not only resident parking but also the needs of car-sharing users and professional transport (taxis, logistics vehicles). Car-sharing services can reduce the number of private cars and daily car journeys locally, thereby also reducing the charging needs. There will be little street-side parking in the area, so charging solutions along the streets will likely not play a major role in Kera. As the area will be built over several decades, the charging demand will increase progressively. It is advisable to make the necessary technical preparations for the charging points in parking facilities, allowing for a gradual increase in the number of actual charging points with less effort as demand and need grow.

Further information

Description of the charging system for electric buses in the BABLE database (language versions: ENG)

4.1 SOLUTIONS I: TECHNOLOGIES

Charging points for electric bicycles at transport hubs

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project developed electric bicycle infrastructure through an electric bicycle battery charging cabinet solution, indoor and outdoor bicycle parking and a DIY bicycle maintenance point in the blocks of Lippulaiva in Espoonlahti.

The number of electric bicycles is rising rapidly. In 2020, as many as 17% of new bicycles sold in the EU were electrically assisted, and both the Covid-19 pandemic and advances in battery technology have accelerated this trend.[7] At the same time, the appreciation for bicycles as a sustainable mobility mode has been on the rise.[8] Electric bicycles enable independent urban mobility and as an active mobility mode are beneficial for human health. Electric bicycles also allow users to travel longer distances without excessive physical effort. However, the purchase price of electric bicycles is currently relatively high.

An increase in the use of (electric) bicycles can be promoted with local infrastructure. Covered and heated bicycle parking facilities that allow bikes to be securely locked support the daily use of bicycles, including park and ride traffic, as part of sustainable travel chains and public transport. Furthermore, DIY bicycle maintenance points promote cycling. An electric bicycle battery charging cabinet allows cyclists to charge their batteries while shopping or working, for example. Unlike electric cars, electric bicycles do not have standardised charging cables, but they can be charged flexibly through traditional sockets. However, the range of modern bicycle batteries and the ability to charge them at home reduce the demand for on-site charging, for example in public places. For shared bicycles, such as electrified city bikes in the future, the charging needs may be high during the day. Instead of charging cabinet solutions, batteries that can be swapped or other charging solutions may be explored.

CASE KERA

In Kera, the vision for the focal points of cycling also supports the promotion of electric bicycle use. Bike routes, parking, and other infrastructure and spatial planning that enhance bicycle traffic typically also support the use of electric bicycles. The need for secure bicycle parking is growing due to the high price of bicycles and batteries. Local bicycle charging services are a valuable addition, but seem not to be a critical aspect in the use of electric bicycles, as charging mostly takes place at home or work and the battery's range is often sufficient for a day's use. Kera station is a natural hub linked to the use of electric bicycles in the area, but services must also be available elsewhere in the district. The use of electric bicycles as part of a shared mobility service (or future city bikes) is also possible and worth exploring.

7 European Mobility Atlas 2021
8 Fishman, E. 2016. Introduction: Cycling as transport. Transport Reviews 36(1): 1–8

Further information

Report on the SPARCS project on the current state of electric bicycles in Espoo (language versions: ENG)

Description in the BABLE database (language versions: ENG)

4.1 SOLUTIONS I: TECHNOLOGIES

Vehicle-to-Grid

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project involved a literature review of two-way charging, i.e. Vehicle-to-Grid.

The term Vehicle-to-Grid, or V2G, refers to a two-way charging event where energy can be transferred from a vehicle battery back to the power grid. V2G can be used as part of a wider «smart charging» solution, where the charging time can be adjusted automatically to suitable times, avoiding various negative effects pertaining to the energy system, such as network overload during peak times (mornings and afternoons are usually the busiest times). Two-way charging allows a car battery to be used for energy storage, meaning that energy can be temporarily stored in the car battery and fed back into the grid later, as necessary (or depending on the price level). As regards renewable energy sources, the importance of energy storage is high because renewable energy production and consumption do not always match, for example due to weather (no wind, cloudy). The impact of a single car battery as an energy storage component in the overall system is small, given that their capacity (20–100 kWh) is relatively modest in the big picture, but the potential effects of a broader combination of multiple vehicles on the system is more significant.

For individual consumers and operators, V2G gives an opportunity to participate in the energy market through charging, storage and selling energy back to the grid, but the effects of two-way charging on the lifespan of car batteries are still largely unknown. Private cars are parked most of the time, which technically creates a significant timeframe for usage cases that can benefit from V2G. However, in addition to actual charging points (charge & drive), the active use of the V2G solution would require charging points for long-term charging as part of the parking solutions (allowing energy to be charged to or discharged from cars when it is most beneficial for the grid or the user [price of energy]), which increases the amount of resources needed for the infrastructure. Similarly, vehicles remaining stationary for extended periods are not desirable in terms of local resource efficiency and sustainable mobility, and the high cost of electric cars also restricts many consumers from adopting them.

CASE KERA

Kera uses a centralised parking solution. Multi-story car parks could facilitate V2G-based solutions, particularly if a large proportion of vehicles are connected to the grid for long periods of time, but the real economic benefit of this approach may be limited, and it might not be an optimal option in terms of transport resources (parked vs. moving cars). For electric car-sharing vehicles, exploring the (V2G) solution, including its role in the economic viability of the service, for example, is advisable. The aim in Kera is to promote electric mobility services, one key example of which is car-sharing. Housing company cars and publicly available rental shared-use cars form a natural reserve for V2G functions.

Simulating electric mobility charging needs

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project simulated the charging demand of electric cars at various times of the day, and its impact on infrastructure and behaviour. The simulations were linked to the SPARCS demonstration sites, i.e. Espoonlahti, Leppävaara and Kera.

These simulations allow the optimal locations, number and required capacities of the charging points, as well as their development and alteration as the area grows and develops, to be assessed. In addition to a city information model, creating a simulation model requires existing information or forecasts on the vehicle numbers by type (cars, lorries, buses, etc.), their average driving distances, and the placement of residential and commercial spaces (existing or future) within the area under examination. This information will help create scenarios of future traffic volume trends in the area, for example as a result of construction and arrival of new residents. It can also be used to assess the impact of emissions if vehicles use electricity (cleanly produced) instead of fossil fuels.

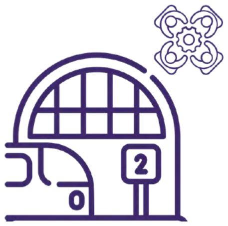
Vehicle charging is a time-dependent activity: people's behaviour and charging needs meet the capacity of the energy system. Simulations can be used to identify opportunities for various pricing mechanisms that guide consumers to use charging services less frequently during busy times (mornings and afternoons are usually the busiest) and different charging methods (slow charging, fast charging, mixed charging).

CASE KERA

Regarding the development of Kera, the need to charge electric vehicles and its trends during the construction of the area are crucial aspects of the area's sustainable mobility vision. The simulations can be used to form temporal scenarios for Kera in relation to how charging in the area will evolve, in order to support further planning and development. The charging solutions of housing companies, or in Kera's case, centralised parking facilities, are a key element in the energy system, as in home charging, the charging process can be scheduled at suitable times for the system as slow charging, which puts less strain on the grid. All new construction projects should take into account the charging needs of residents and/or users (customers, employees; different user profiles). For larger vehicles, charging fields (which may be located in the area) should enable overnight charging at higher power. When working on the scenarios, elements pertaining to the accessibility and attractiveness of car-sharing, public transport and active mobility modes (walking, cycling), which can significantly reduce overall vehicle-kilometres, should be taken into consideration.

4.2 SOLUTIONS II: CONCEPTS

Electric mobility service hub



DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project examined the key elements of the electric mobility hub through workshops arranged for various stakeholders. The workshops focused particularly on the identified needs of users and mobility service providers.

From the user's perspective, the key elements are connected to the availability of mobility services, up-to-date and real-time information on this availability, guidance and general information on the service provision. Up-to-date passenger information throughout the journey is an integral part of a smooth-functioning and high-quality passenger experience. Similarly, high-quality walking and cycling environments, secure bicycle parking solutions, benches and other solutions for hub users, as well as factors that affect the experience of a hub's social safety (lighting, cleanliness, design, monitoring), have been highlighted as important elements for users.

Spaces allocated for services, in terms of usability, accessibility and optimal utilisation of charging solutions, were identified as the key elements for mobility service providers. Operating methods that enable CaaS (Charging-as-a-Service), shared services and interfaces amongst service providers, and up-to-date information on the use of chargers and other mobility services, help optimise different functions as a whole. A fast response support service for users must be secured through the design of the hub's solutions. Short-term parking for maintenance is also important. The role of drones in future logistics as part of automation and robotisation should also be taken into account when designing the hub.

CASE KERA

The evolving and regenerating station area of Kera provides a natural testing and piloting platform for new sustainable mobility and shared-use mobility service solutions. The station and its surroundings can be extensively utilised for various pilots, such as in the development of new modes of mobility, the walking environment (expanding the Kera New Street1 concept to the transport hub, for example), (bicycle) parking solutions, guidance, and digital and augmented reality applications, in a real environment with real users. The station surroundings are spacious, which could also enable temporary and pop-up type solutions in the station's immediate vicinity. In addition to mobility services, these spaces could serve as facilities for other types of services and social interaction or as cultural spaces, which can enhance the area's evolving identity and functions.

The station will gradually develop hand in hand with the rest of the area. The growing local population will also make the mobility hub busier and allow commercial services to establish themselves there after the pilots. All services must take the local level and Kera's goals into account, as well as any disruptions to functioning mobility during construction.

Further information

Report on the SPARCS project on the current state of transport hubs in Espoo (language versions: ENG)

Report on the SPARCS project on sustainable mobility in Espoonlahti (language versions: ENG)

Opportunities and obstacles pertaining to electric bicycles in urban transport

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project identified the existing strengths, weaknesses, opportunities and threats (SWOT analysis) of the development of electric bicycle traffic through workshops arranged for experts.

The recognised strengths of electric cycling include the fact that it makes cycling and personal mobility possible for a wider user group than conventional bicycles, thanks to the assistance of an electric motor. Electric bicycles utilise the same infrastructure as conventional non-motorised bicycles, which makes them easier to adopt. Electric bicycles can enable sustainable travel chains, such as being part of the use of public transport, and function as a shared-use mobility service as a last-mile solution in urban transport. Many car journeys taken in the city at the moment are relatively short (under 5 km) and could be partially replaced by electric bicycle journeys. Electric cycling is also an active mobility mode, despite being electrically assisted, which supports physical health.

The identified obstacles are related to the currently suboptimal level of bicycle parking and the lack of secure parking solutions. Furthermore, common design problems related to cycling (lack of infrastructure and routes, fragmented route networks) are directly linked to the use of electric bicycles too. Electric bicycles are expensive to buy, which excludes some potential users. Likewise, inadequate winter maintenance of cycling routes does not facilitate year-round cycling. Also, the lifecycle emissions of electric bicycles, including the production of the battery minerals, should be increasingly considered as the number of electric bicycles rises. In addition to the development of the physical space and infrastructure, the growth of cycling requires a change of mindsets and attitudes.

CASE KERA

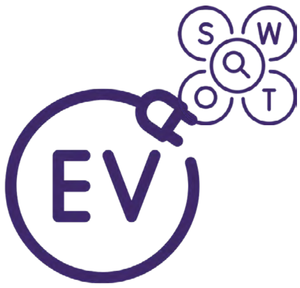
Kera's development commitment highlights cycling as one of area's key mobility modes. The above opportunities and obstacles can be addressed in Kera's transport network design, spatial planning and mobility service pilots. The workshops identified the following concrete measures as potential actions that could also be taken in Kera: a) development of the cycling network, the district's level of and connections to areas outside of it; b) year-round maintenance of cycling routes, with particular emphasis on promoting winter cycling; c) solutions for secure bicycle parking; d) electric bicycles as part of the public city bike system; e) taking cargo bikes into account in infrastructure development (routes, parking); f) opportunities to test electric bicycles.

Further information

Report on the SPARCS project on the current state of electric bicycles in Espoo (language versions: ENG)

4.2 SOLUTIONS II: CONCEPTS

Opportunities and obstacles pertaining to electric car sharing services in urban transport



DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project identified the existing strengths, weaknesses, opportunities and threats (SWOT analysis) of the development of shared-use electric car services through workshops arranged for experts.

The identified benefits and opportunities of shared-use electric cars and these mobility services are related, in particular, to themes such as reducing car ownership and supporting the use of public transport. Shared-use electric cars can provide an occasional solution to promoting sustainable transport habits as part of a diverse range of local mobility services. Private cars are parked and unused most of the time, which is why car-sharing can optimise the daily use of an individual car and, for example, reduce parking needs in a densely built urban area. A reduction in car numbers also has a positive effect on the appeal and attractiveness of the urban environment. At the moment, as many as one third of Espoo's households do not own a car. Car-sharing services can be targeted at areas where public transport services are scarce. The general interest in shared services has been on the rise lately, for example due to the lower usage costs compared to ownership. Also, the city organisation's own electric vehicles can be one way to implement a shared electric car service, but its practical implementation requires more detailed reviews of the area and specific usage cases, as well as assessments of various service models.

The currently identified barriers and threats to shared cars are related to a strong culture of car ownership, which can be challenging to overcome. Access to the service at the right time in the right place is important for its attractiveness and a transition from ownership to usage. The general lack of awareness of the services and real-time data on availability can also prevent the use of services. There may also be inequalities in the use of services between areas. Pricing is an important factor in car-sharing: a low price guarantees wider accessibility, but a price that is too low may increase the use of shared cars at the expense of public transport, which may further increase the amount of car traffic instead of reducing it.

CASE KERA

The development of shared electric mobility services supports the sustainable development commitment of Kera. Kera as a developing area that is being rebuilt offers a chance to focus, in particular, on various building and street-specific spatial solutions that support car-sharing. For instance, parking solutions can be examined primarily in the context of shared services as part of centralised parking facilities. The station area is also an important usage location for shared-use cars as part of sustainable travel chains, especially from areas outside Kera where the service level of public transport may be low. The city organisation's own electric vehicles can also be a way to implement a shared electric car service in Kera.

4.2 SOLUTIONS II: CONCEPTS

5G and autonomous mobility

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project involved a survey on the opportunities offered by the 5G network for the development of urban mobility, aimed at experts and operators in the field. A total of nine experts responded to the survey.

The development of 5G connections facilitates better communication solutions. The 5G network increases the reliability, non-interference, speed and capacity of the connection. This creates new service opportunities, especially for autonomous transport and last-mile solutions, as almost instantaneous and reliable connections can be established between a robotic vehicle and a remote control centre. The 5G network also allows for more efficient collection and utilisation of data in real-time, for example through sensors placed in the environment. This can support, for example, traffic control and real-time situational awareness, as well as the optimisation of various mobility services, which can, in turn, improve the level and scale of services.

However, the use of the 5G network involves risks, particularly in terms of data sharing and protection, increasing control and monitoring, data ownership models and costs, especially when it comes to initial investments.

CASE KERA

Kera has been equipped with a smart lamppost network as part of the LuxTurrim 5G and NeutralHost Pilot projects led by Nokia. The network covers the area between the Nokia campus and Kera station. The smart lamppost network has provided a testing and piloting platform for smart city solutions that use the local 5G network. Additionally, autonomous transport was tested in Kera in 2019.

Kera's developing urban environment and culture of experimentation also provide a place for testing autonomous mobility solutions. Due to the evolving nature of the area, the traffic volumes in Kera are lower than in many other places, which provides flexibility when piloting solutions as part of traffic. The area also has a lot of unbuilt plots and large paved open areas, which could serve as good testing grounds for mobility equipment. Autonomous logistics solutions, in particular, could benefit from temporary facilities for testing and piloting purposes.

Further information

Report from for the SPARCS project on the opportunities of utilising 5G in sustainable and smart transport (language versions: ENG)

4.3 SOLUTIONS III: PARTICIPATION AND CO-CREATION

Electric mobility test runs

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project involved a test run for electric vehicles in the blocks of Lippulaiva in Espoonlahti as part of the Espoo Day in August 2022.

Personal experiences with electric vehicles can increase their appeal and interest in them while reducing negative preconceptions associated with them. At the same time, the barrier to using shared mobility services may decrease when the vehicle is familiar. A test run in a controlled and restricted place, where discussions are possible and the sector's operators and experts can be asked questions on the topic, is one way to facilitate this. On the test run day, 26 August 2022, during the project, the participants could try out electric bicycles, city bikes and electric scooters. Additionally, information was available on electric cars and their charging solutions. The event was held in the blocks of Lippulaiva in Espoonlahti.

A survey on electric mobility modes (N = 59) was also carried out on the event day. The respondents used shared mobility services only seldomly due to their inaccessibility and location far from home. The respondents felt that to promote sustainable mobility, the availability of mobility services must be increased (including geographically), their cost reduced, cycling infrastructure improved and residents' influence enhanced, for example.

CASE KERA

It is possible to influence the various profiles of mobility mode users and mobility in Kera from the early stages of area development onwards. Positive progress should be supported, for example by identifying different user groups and their needs. Test runs and similar events can support nudging towards sustainable mobility habits, a concept familiar from the field of service design. The station area can serve as a natural venue and a living lab for new solutions. However, it is important to ensure the accessibility and supply of sustainable mobility modes, without which their use in everyday life will not be achieved as intended. It is vital to take action to guarantee the accessibility of sustainable mobility modes, both physically and financially, as the purchase prices of electronic mobility equipment are usually high in comparison to non-electric alternatives.

Further information

News article on the event at espoo.fi (language versions: FIN, SWE, ENG)

Sustainable mobility measures amongst young people

DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project involved sponsor class activities between 2020 and 2023 with two schools in Espoonlahti in connection with different themes of sustainable development. The young participants were from 7th–9th grades.

It is important to include young people in the development of sustainable mobility and the urban environment. Mobility habits and patterns evolve from a young age. The project involved unique collaboration for three years through sponsor activities with two classes from Espoonlahti middle school in 2020–2023. The activities focused on lessons characterised by dialogue on various sustainable development themes, including mobility.

During a lesson titled «Me as a mover», which focused on mobility modes and habits, the pupils examined their own thoughts on the modes and their use. Regarding walking, cycling and shared mobility services, the lesson involved an interactive exploration with the pupils on their current usage habits, usage barriers and generally the pros and cons of these modes. Station areas and walking environments were particularly emphasised.

During the «Urban Orienteering» lesson, the pupils ventured into the urban environment near their schools and followed a pre-defined route with task checkpoints along the way. The tasks focused on the pros and cons of the urban environment and various areas for improvement, especially regarding mobility, attractiveness, aesthetics and walking.

CASE KERA

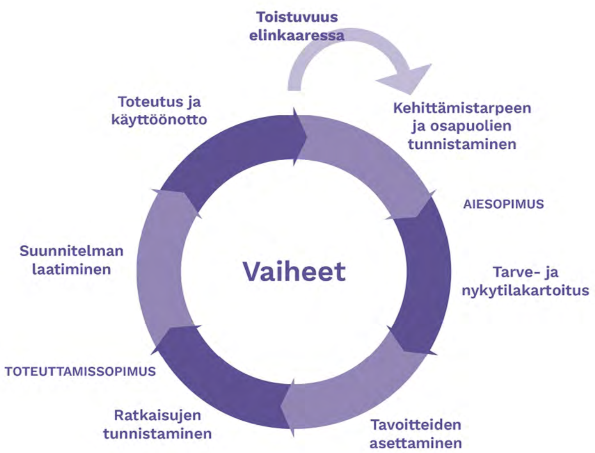
The development of the Kera area will span decades, meaning that the current plans are unlikely to accurately reflect the situation many years from now. Keeping the plans and measures up to date is key for sustainable mobility in the district. Young people constitute one of the main mobility profiles in the area and have their own specific mobility needs. In particular, the safety and attractiveness of the mobility environments, as well as accessibility of mobility services (especially public transport), are important factors. Working directly with young people will also help develop these aspects in the correct and desirable direction for young people, and identify any obstacles to functional daily life. The schools in Kera and its nearby areas are essential potential partners for working with young people.

Further information

Description in the BABLE database (language versions: ENG)

4.3 SOLUTIONS III: PARTICIPATION AND CO-CREATION

Co-creation model as a tool



DESCRIPTION AND LESSONS LEARNT FROM THE PROJECT

The project has developed a co-creation model for sustainable and smart urban areas to support multi-stakeholder collaboration towards sustainable solutions and development. The model itself has been further improved through co-creation with various stakeholders and gathering project examples. The co-creation model developed in the project is freely available in virtual format: www.co-creatingsparcs.fi.

The existing land-use planning system is unable to adequately address the current requirements concerning ecological, social and economic sustainability, the reformation and digitalisation of systemic operational models or the implementation of other new technologies and practices. Additionally, societal developments have become less predictableand the number of disruptions has increased. Area development requires new means to achieve sustainability goals and mobilise wide groups of stakeholders involved in systemic changes in the social structures to take part in this work.

Co-creation can achieve not only ecologically sustainable and smart urban areas, but also communal and incentivising environments. Co-creation helps develop a user-centred, lifecycle-flexible urban structure that can better withstand environmental challenges and services that best support the daily lives of residents. Moreover, through co-creation, resources from both the public and private sectors can be optimised, and the development of solutions catalysed by providing test environments for innovations.

CASE KERA

One of Kera's goals is to become a district firmly focused on walking, cycling and public transport, supported by a fast railway connection. Kera's station area can serve as a platform for mobility services. Collaboration, development, planning and implementation work with a broad network of stakeholders is required in order to coordinate different services. Mobility services together with active mobility modes and public transport form a local mobility system, where different mobility modes and the infrastructure they require are closely linked. From the perspective of resource efficiency, use of space, mobility experience and accessibility, there is a need for a shared vision, measures, objectives and metrics, constantly updated locally.

In a district such as Kera, special attention must be paid to the gradual development of the area, mobility needs and services over the course of years and decades. Mobility as a whole – or a system – must be able to respond to changing mobility habits and needs in the area and respond to the challenges posed by temporary arrangements during construction, as well as evolving technologies and services. For example, adaptable spaces in the station area support the gradual development of the area's level of mobility services. The temporary use of facilities, which is already an established tradition and operating culture in Kera, also allows new innovative services to be tested and piloted in the style of living labs, i.e. by collecting feedback and observations.

SPARCS Project Partners

Further information

The model's website (open access) (language versions: ENG, FIN)

Description in the BABLEdatabase (language versions: ENG)

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