Kera area carbon neutrality road map

Steering group of the City of Espoo: Rosa Väisänen, Emmi Kauhanen, Pekka Vikkula, Mika Huttunen, Jenni Mikkola, Tessa Armour, Paula Kuusisto-Hjort
Ramboll working group: Anna-Maria Rauhala, Saila Pahkakangas, Sanni Heikkinen, Jukka Kopra, Tapio Kinnunen, Jaakko Kemppainen

28/10/2021

Contents

Kera and carbon neutrality objectives

Kera as an area

- Kera will be a pioneer in sustainable urban development, where solutions supporting a carbon-neutral circular economy are tested and developed.
  - The new Kera is the future of urban development.
- The City of Espoo plans to construct a 14,000-strong city centre in Kera, which will be built around the existing rail traffic between the Nokia campus and the Kutoja area. The area will be transformed from an old industrial and logistics area into an urban centre oriented towards walking and cycling.
- The objective of Kera is to develop into an international example of a circular economy.
  - The new Kera will be built sustainably according to the principles of the circular economy, favouring carbon-neutral solutions.
- The existing rail traffic and the 5G technology under development in the area enable the implementation of modern mobility solutions as early as the construction phase.

Photo: Arkkitehtitoimisto B&M Oy (source: https://www.espoo.fi/fi/kera-alueena)

Source: https://www.espoo.fi/fi/kera-alueena

Climate commitments

International level:

The Paris Agreement: The objective of the 2015 Paris Agreement is to limit the global average temperature increase to well below 2°C compared to pre-industrial levels and to pursue measures to limit global warming to less than 1.5°C.

EU 2050: The goal is to reduce greenhouse gas emissions by at least 40% of 1990 levels by 2030. The goal is to cut greenhouse gas emissions by 80 per cent by 2050.

Finland 2035:

Finland will be carbon neutral in 2035 and carbon negative soon after that.

Uusimaa 2035:

Uusimaa is trying to reach carbon neutrality by 2035. Uusimaa Regional Council is currently preparing together with the municipalities a Carbon Neutral *Uusimaa 2035* road map, which defines concrete milestones for achieving the goal.

Espoo 2030:

One of the most important goals of the City of Espoo's strategy, i.e. the Espoo story, is to become carbon neutral by 2030.

Espoo's carbon neutrality goals and their reflection to Kera

- Espoo has defined as its carbon neutrality goal an 80% emission reduction from the 1990 level by the year 2030.
  - In 1990, Espoo's greenhouse gas emissions were 1,224 kt CO_2 eq.
  - In accordance with the 2030 goal, emissions in Espoo would be 245 kt CO_2 eq.
- Goals for Kera's development:
  - close cooperation,
  - **carbon neutral area 2030**,
  - significant circular economy solutions,
  - reference site for sustainable solutions and the
  - obligation to prepare a development plan for the project in order to achieve its goals
- The city will focus on activities based on sustainable urban solutions in Kera that support achieving the carbon neutrality goals
  - Emission calculation of the area as base data - cooperation brought already significant emission reductions
  - Kera area development commitment as part of land use agreements:
    - As part of the land use agreement for the Kera city centre, a development commitment will be made, which will guide the development of the Kera area in accordance with Espoo's carbon neutrality and sustainable development goals.
    - The goals of the commitment have been defined in extensive cooperation with operators in the area and have been signed by both Espoo and the landowners in the area.
    - The themes are, for example, clean energy, circular economy services, housing and smooth everyday life, design and construction, mobility and logistics, smart urban solutions as well as communication and branding

Climate panel: At its simplest, carbon neutrality means that the set of actions in question emits only as much CO2 as can be absorbed over a period of time.

Green Building Council: A carbon-neutral built environment means a situation where annual climate emissions and the positive climate impacts of the built environment are in balance.

Source: https://www.espoo.fi/fi/kestava-kehitys; https://www.espoo.fi/fi/uutiset/2021/09/keran-kehittamissitoumus-ohjaa-kestavan-kehityksen-edellakavijaksi-ainutlaatuinen-maankayttosopimus

Carbon neutral Kera

Energy

Intended impacts

- The energy system is implemented to efficiently produce and distribute carbon neutral heat, cooling and electricity, enabling intelligent usage and two-way operation.
- Energy users receive and utilise information about their own energy consumption to support decisions and reduce consumption.

Infra

Intended impacts

- Infrastructure construction in the area is planned and implemented in a sustainable manner to minimise emissions during the whole life cycle.
- During the planning, the aim is to take into account the indirect and direct impacts on the usability, transformation flexibility and related structures of the area.

Carbon neutral Kera

1. Kera aims to become carbon neutral, which will support Espoo's carbon neutrality goal for 2030
2. Kera is developed in close cooperation.
3. Significant circular economy solutions are created in Kera
4. As a sustainable district, Kera is a national and international reference site

- The promotion of carbon neutrality can be seen as:
  - resource-wise building
  - innovative and low-emission energy solutions
  - new types of digital services and applications
  - the overall flexibility of the area, taking into account the different aspects
  - involving different operators and informing them about the goals during the development of the area
  - taking care of housing needs during construction

House

Intended impacts

- The buildings will be implemented to effectively serve the current and future needs of the area’s users.
- In the implementation, climate impacts and the entire life cycle of the building are taken into account in the selection of materials, and the lowest-emission material solutions available are preferred.
- Efforts will be made to also promote carbon neutrality and the circular economy through new construction solutions and stakeholder cooperation.
- Building construction solutions support the use of low-emission energy and mobility

Traffic

Intended impacts:

- Getting around the area is largely based on carbon neutral public transport, especially the city line between Leppävaara and the centre of Espoo, as well as walking and cycling connections.
- Flexible and centralised parking solutions in the area will reduce the need for car ownership, promote shared usage and support electric transportation.
- During the construction of the area, it is ensured that an adequate level of sustainable mobility service is achieved in the area at the earliest possible stage.

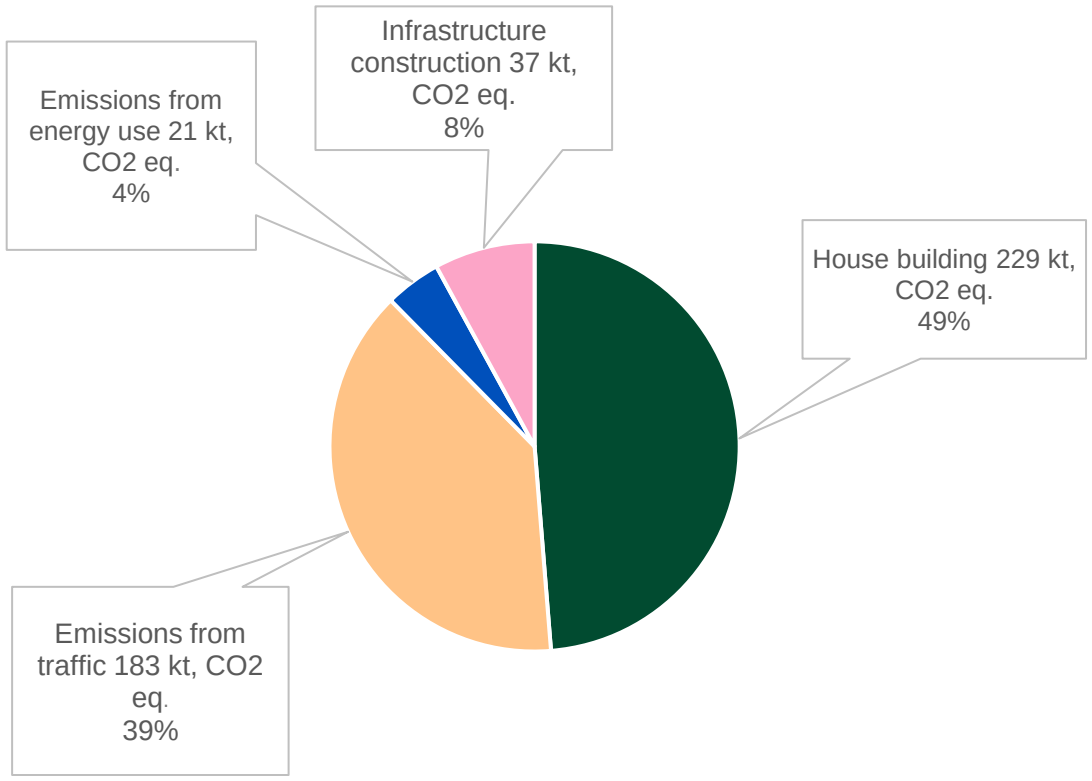
Previous studies

Emission balance sheet of the area (1/2)

- Greenhouse gas emissions have been estimated for Kera, based on the town plan solution:
  - Emissions from infrastructure construction in the area (CO_2 eq.)
  - Emissions from building construction (CO_2 eq.)
  - Emissions from energy use (CO_2 eq.)
  - Emissions from transportation (CO_2 eq.)

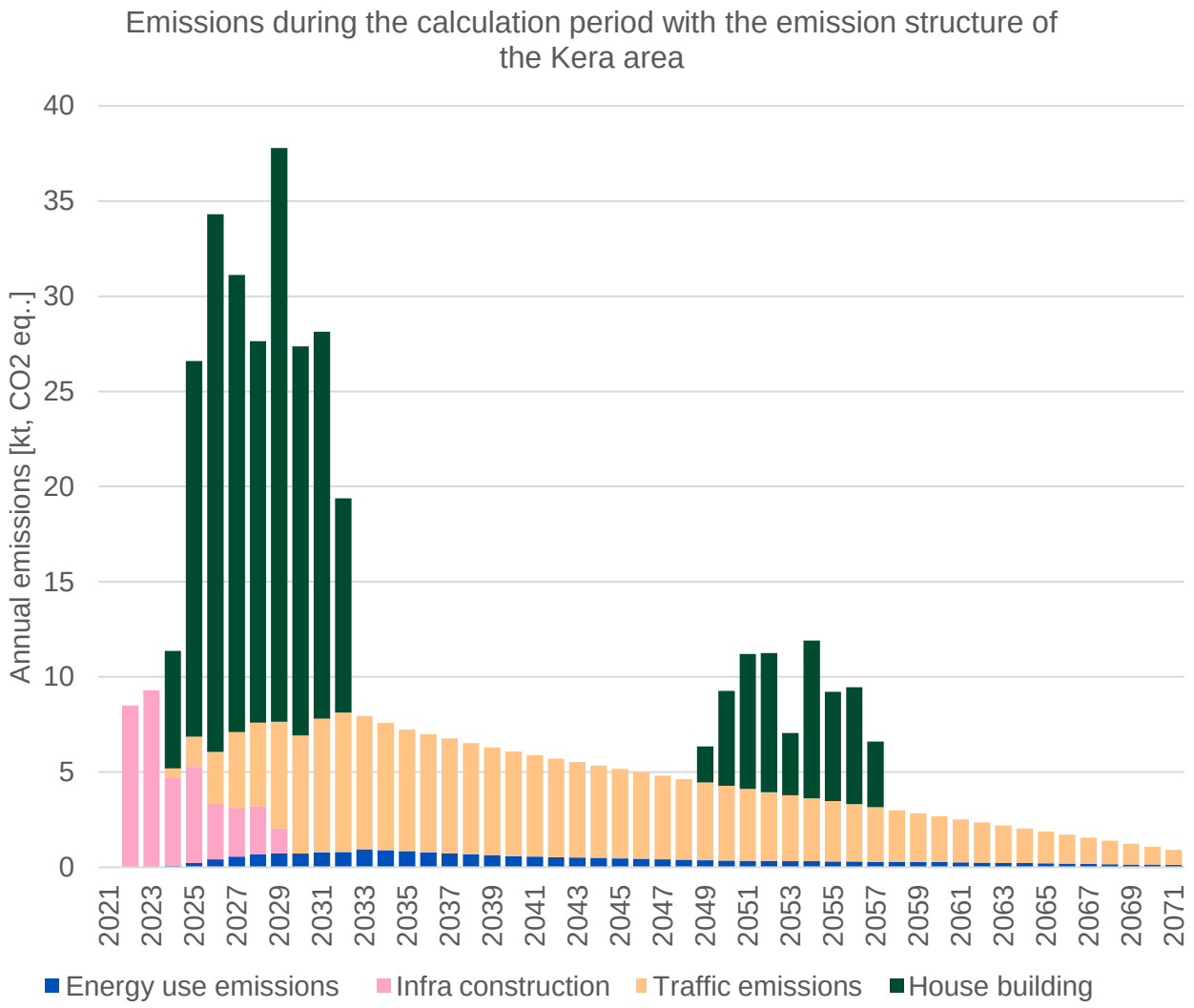
- The calculation period used was 50 years, starting from 2021. Demolition work in the area was not included in the review.

Emission distribution of the design solution area



Emission balance sheet of the area (2/2)

- The largest amount of emissions is concentrated at the beginning of the calculation period, when the emissions were generated from infrastructure and building construction.
- Renovation of building components is expected to take place 25 years after the completion of the buildings, leading to an increase in material emissions in 2049-2057.
- Emissions from transportation will increase as residents move to the area.
  - Traffic emissions will decrease over the calculation period and are expected to reach zero in about 2070.

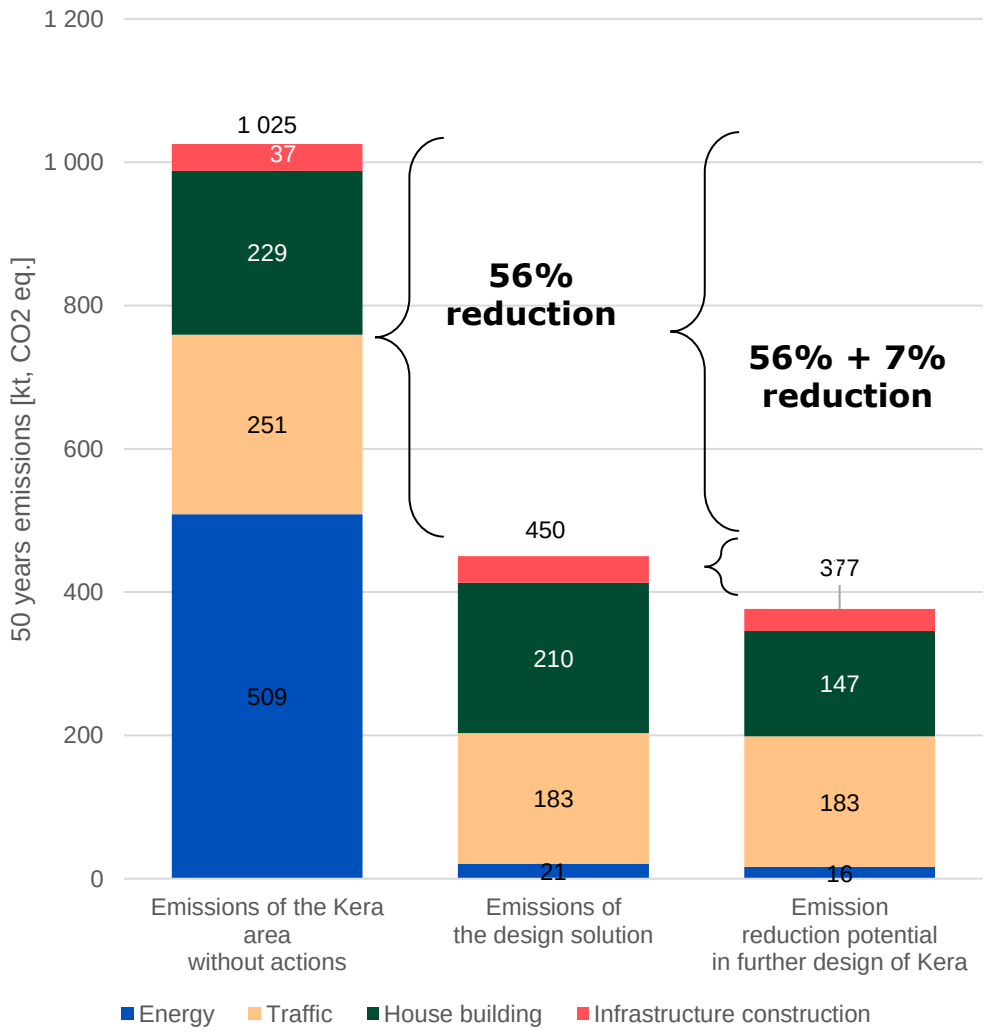


Emission balance sheet of the area

Summary

- Measures to reduce emissions have already been planned for the area and their implementation has been decided upon:
  - The most significant factor influencing the Kera area's carbon emissions is heating, which is based on heat pumps and intelligent energy solutions.
  - Thanks to Kera's land use planning and good public transport connections, the need for cars is about a quarter lower than elsewhere in Espoo, which reduces traffic emissions by **27%** compared to the rest of Espoo.
  - Crushed-concrete waste from the demolition of buildings in the area is to be utilised in the construction of the area's infrastructure, which will reduce the use of crushed stone and emissions from transportation.

- As a result of these actions, the area's emissions are calculated to be about **56%** lower than the average emissions in a similar size area in Espoo.



Preparing a road map

The preparation process of the road map

- The road map tells the user how, on a larger scale, the various actions are divided into the implementation of carbon neutrality in the Kera area.
- This makes it possible to detect, understand and communicate between different stakeholders on how the measures will be timed and what their synergies will be.
- In connection with the preparation of the road map, for example, a stakeholder workshop was held and the City of Espoo's steering group commented on the work.
- Ramboll Finland Oy was responsible for preparing the road map.

Means and solutions to achieve carbon neutrality

Traffic

- The transport sector is diversified and involves several operators and decision-makers.
- The decisions made outside of Kera have the greatest impact on emissions in the transport sector, as the most significant emission reduction potentials are in reducing the energy efficiency, renewable energy and transport performance of passenger cars.
- The City of Espoo can also take significant emission reduction measures that target a wider region beyond the Kera area.
  - These include parking policy guidelines, enabling electric charging infrastructure, investing in dense public transport, and improving the conditions for walking and cycling, for example, through planning principles, network design, and travel chain thinking.
- The active operators in the Kera area are the city, HSL, developers, housing associations, companies and residents of the area:
  - The city may order the implementation of car and bicycle parking lots in town planning, ensure their proper implementation in building supervision, ensure pedestrian and bicycle connections in the area as well as parking restrictions in public areas, and promote cooperation with other operators through experiments and agreements.
  - The city can also through branding and marketing emphasise Kera's carbon neutrality goals and thus attract residents whose attitudes and customs are favourable for the area.
- HSL is the competent authority for public transport in the area, which plans and orders public transport in the area, including commuter train services. In the Kera area, HSL can, in co-operation with the city, ensure the adequacy of park-and-ride and city bike stations. The city can also use funding to influence the frequency of the public transport service.
- Developers will eventually make decisions on the number of parking spaces for cars and bicycles, the quality of implementation and electrification within the town plan. The large number of parking spaces also leads to an increase in the shared car use, so care must be taken with the parking spaces. It is important to make the parking spaces unnamed, so that they can be flexibly assigned to different operators and enable, e.g. car sharing services.
- Housing companies can guide residents' mobility behaviour by purchasing shared cars, bikes, or other mobility services. Companies, in turn, can have a significant impact on the mobility of their own employees by promoting paid parking, for example, and various incentives such as company bikes and travel tickets, mobility services and teleworking.
- Ultimately, residents will make the decisions about the choice of transportation. Residents can be encouraged to choose low-emission solutions in a variety of ways, but too much guidance can lead to less demand for the area.

House building

- In building housing, different implementation solutions can significantly reduce the impact of emissions from the estimated baseline situation.
- All the means presented are ultimately at the discretion of the constructors in the area. The city can strive to implement the proposed low-carbon solutions in its own construction projects.
    - The goals of several other stakeholders significantly guide the constructor's willingness to implement low-carbon solutions:
- Landowners may seek to promote low-carbon measures in their land use agreements.
- City zoning provides guidelines for, among other things, massing and city-based themes, but it does not directly guide the implementation of lower carbon solutions in building construction in Kera.
- All low-carbon solutions may not be feasible in all buildings or across the site due to the requirements of the zone. For example, façade requirements can lead to specific planning and material solutions.
- Designers, contractors and product suppliers play a major role as commercial developers, providers and implementers of low-carbon building solutions.
- Green financing can drive investors to finance the implementation of lower carbon projects on better terms
- For future users in the area, i.e. businesses, housing providers and private consumers, low carbon may become an even more important decision criterion.
- The willingness to choose low-carbon solutions can thus be indicated, for example, in zoning, land transfer and land use agreements, to the extent that these are still feasible in the area. The national legislation and stakeholder goals will also guide solutions, but the final decision on design and material choices are with the builder. Here, the city as a developer can serve as a model.

Infrastructure construction

- About a quarter of the carbon footprint of the built area is generated in infrastructure construction, where the emissions are especially generated from the production emissions of the materials used during construction.
  - Such emission-intensive materials are, in particular, concrete, steel, cement and asphalt.
- Emissions during the construction of low-emission stone and earth materials may significantly increase in high-volume projects as material transport volumes increase.
- Emission reduction potential for infrastructure construction is high especially in site operations, in regional utilisation that reduces the need for transport as well as the use of recycled and secondary materials.
- The climate impact of infrastructure construction is especially focused on the construction phase: it is not possible to change the material choices and design solutions made during the use of the structure without renovation and refurbishment work.
  - Then, the importance of climate-wise planning is already emphasised in the zoning phase, and resource-wise solutions can also be made in later planning phases.
- The solutions made in the planning and construction phase also have an impact on maintenance and decommissioning as the materials have different technical properties, which in turn still affect, for example, the durability and service life of the structure.
  - Life cycle sustainability can be influenced by, for example, careful work planning and quality control.
  - Working with the right methods and materials can reduce the cost of maintaining and repairing structures.
- Sustainable life cycle planning requires planning and cooperation from operators in the region. In addition to the life cycle of an individual structure, the life cycle of the entire area can be affected by influencing the climate effects arising from the phased construction of the area as well as the combined effects with other areas.
  - For example, traffic solutions can influence the structural solutions used in infrastructure construction.
- In addition to the customer and the planning organisation, the most significant players in the infrastructure construction in the Kera area are the developers, contractors and material suppliers.
  - Cooperation between operators through the design, construction and implementation phases enables sustainable regional construction.

Energy

- The goal is to generate carbon-neutral zone heat in the Kera region with Fortum's centralised heat pump solution.
  - Arithmetically, no other emission reduction measures would be needed for heating solutions.
  - The work compares the emission reductions of other heat production alternatives with the zone heating emissions in Espoo, so that the means are comparable.
  - When Kera's district heating network is connected to the Espoo district heating network, it is conceivable that each amount of energy saved will benefit the entire district heating network in Espoo and the achievement of Espoo's carbon neutrality goals.
- The energy efficiency of new buildings is at a good level due to building regulations, especially for heat loss reduction.
  - Energy efficiency can be enhanced with efficient heat recovery and heat pump solutions.
- Alongside energy efficiency, the mart energy usage is becoming increasingly important, which helps reduce energy emissions.
  - This requires efficient energy networks (district heating and electricity networks) that enable efficient energy transfer and two-way transmission.
- In addition to functional centralised solutions, block level solutions enable the piloting and use of new technologies and measures.
  - A new possibility is, for example, a block level energy community model, where surplus energy can be utilised locally between properties.
- All energy usage is important, which is based on making energy usage on a construction site as low as possible.
  - This sets an example for the energy usage for the whole area as the area is being built.

Summary of means and solutions

Recommendations for means and solutions in different areas

Listed below are the most effective means and solutions for each of the areas presented earlier, taking into account the emission reduction impact, cost-effectiveness and technology maturity. The means in question lead most effectively to the construction of carbon neutral Kera.

INFRASTRUCTURE CONSTRUCTION

- **Use of low carbon materials in construction**
  Utilised in emission-intensive materials such as steel and concrete
- **Regional mass coordination**
  Utilising surplus masses and demolition materials formed in the area in construction.
- **Design of structures while taking into account life cycle emissions**
  The design takes into account the effects of emissions on maintenance and other functions and structures
- **Sustainable construction phasing and implementation**
  Infrastructure construction is planned in a sustainable manner, taking into account the entire construction period, factors depending on the phasing and the use of the area during the construction period

HOUSE BUILDING

- **The utilisation of low-carbon materials** which are best suited to the objectives of the project
- **Circular economy solutions,** in construction, there is a need to make greater use of the opportunities for recycling and reusing materials
- **Space utilisation, flexibility of transformation, longevity and demolition of building components,** necessity and increasing the carbon footprint as a starting point for the design **Optimisation of the massing and location of buildings,** taking it into consideration as part of zoning
- **Low carbon construction site operations:** Introduce best practices on construction sites and collaborate between construction sites to promote goals

ENERGY

- **Regional smart energy grids:** Intelligent electricity and heat networks enable the efficient use and transmission of energy. Low-temperature district heating network enables the efficient utilisation of heat pumps.
- **Carbon neutral forms of heat production:** Carbon neutral district heating and property-specific heat pump solutions play a major role in reducing emissions. Utilising waste heat flows in properties reduces the need for primary energy. Surplus energy can also be sold to the grid.

TRAFFIC

- **Flexible parking solutions:** With parking, special focus is on centralised parking facilities to control demand for parking, reduce car ownership and promote electric transportation.
- **Reliance on public transport:** Getting around the area is based on walking and cycling; getting out of the area is based on strong public transport connections and park-and-ride bike parking.
- **Diverse design:** The transport solutions in the area involve several operators, so it is important to connect developers, the city, residents and employers behind the same goal.

The most significant synergies and cooperation needs for the transport sector

The greatest emphasis on building construction, infrastructure construction and energy technology is in the early stages of the area's construction, while the greatest impact on emissions from transport will only occur when the area's population and number of jobs have grown significantly.

However, the development of traffic emissions is significantly affected by the measures taken in the initial phase of building and infrastructure construction. The following are the most important needs for cooperation, which will bring significant synergy benefits to the region:

- Implementation of parking facilities in phases, supporting the construction of different areas. Centralised parking works best by building regionally integrated blocks instead of patchwork construction.
- Energy systems must take into account the possibility of charging electric cars throughout the area. Charging electric cars is mainly long-term and focuses on the night-time, which balances the load on the electricity grid.
- The quality development of bicycle parking should be taken into account at a very early stage in the construction of the building, as the bicycle parking serves the best on the ground level and it needs to be sufficiently spacious.
- The placement of building masses in the area should take into account smooth walking and cycling routes so that moving around the area is appealing.
- Walking and cycling roads enable less stressful street structures and more green surroundings

Recommendations for different areas in preparing for and adapting to climate change

INFRASTRUCTURE CONSTRUCTION

- The need for updating the design instructions is checked and, if necessary, the adequacy of the zoning is anticipated
- Develop a monitoring program for climate risks and guidelines for necessary changes
- Prepare for measures and repairs due to extreme weather events in maintenance
- Particular attention will be paid to storm water treatment and management
- Possibilities of transformation flexibility in terms of climate change are to be checked
- Utilising natural solutions

HOUSE BUILDING

- Preparing for the coming low-carbon regulations and for changes in the operating environment related to climate change mitigation
- Project-specific preparation for physical climate risks e.g. temperature fluctuations, extreme weather events and flood risks must be taken into account in the design solutions and design assumptions

ENERGY

- By 2050, climate change is expected to increase annual cooling demand by 40% and reduce heating demand by 20%.
- During the development of the area, changing weather conditions must also be taken into account from the energy aspect, e.g. consideration of cooling needs on a project-by-project basis
- Decentralisation of energy production at the local level and the diversification of energy sources will reduce the risks associated with climate change and improve the security of supply.

TRAFFIC

- There is not very much snow during the winters anymore, but the likelihood of snowstorms is increasing. This puts pressure on new types of maintenance equipment and operating principles. Attention should also be paid to anti-slip properties when the temperature is often around zero.
- Winters are warmer and darker, which increases the need for autumn and winter lighting on pedestrian and bicycle routes, as well as in parks and recreation areas.
- The location of the buildings can be used to protect walking and cycling routes from the wind.
- Underpasses are particularly risky for flooding and can even completely prevent movement on both sides of the track if the floods are not prepared for.
- Floods and snowstorms can cause significant problems for public transport, especially rail transport. These must be prepared for by means of adaptation planning, e.g. exploring alternative routes and obliging operators to be prepared for emergencies.

GENERAL

- Climate change must be widely prepared for by all operators. Alongside mitigation measures, adaptation solutions are needed.
- Urban structure allows for mitigation, but it is also vulnerable in a changing climate. It is good to recognise these things when designing and building Kera because the solutions made now are long lasting.

Road map and measures

Measures road map Measures and key operators in Kera (1/3)

Measure	Description	Operator
Communication and implementation of carbon neutrality goals	Achieving carbon neutrality goals requires key operators to be aware of the goals and the means. When new operators enter the area, they need to be aware of the goals, willingness, means and processes. Implementing measures in supply chains by actively communicating the willingness of the city and key operators.	The City, Espoo Centre of Expertise for Sustainable Development, landowners
The development platform for the circular economy in building construction	In housing construction, reuse involves even more questions than answers, but the potential for reducing emissions is huge. Development project or platform or taking this forward in Kera, so that developers and demolition contractors and other operators in a key role can be made to promote the matter in a timely manner.	The City, Espoo Centre of Expertise for Sustainable Development
Sustainability assessment of infrastructure construction	Consider the overall durability of infrastructure construction at the zoning stage or early planning stage. Optimisation of structures and functions reduces the intensity of construction, increases life cycle sustainability and e.g. the utilisation of existing infrastructure can be assessed. The assessment should be performed before setting determinative decisions, such as street policies.	City, developer, planning organisation
Parking organisation	A regional parking management organisation will be established in Kera, which will provide facility parking and paid street parking. In order to differentiate between the cost of parking spaces and housing, it is most effective if the spaces are owned by a private investor. Parking operations should be commercial to maximise efficiency and versatility.	City (urban development)
Parking fees and time limits in public areas	Limit parking to a minimum in the streets and yards of the services. In terms of services, the reduction of seats can be offset by bicycle transport, rental bicycle trailers, etc.	City (urban development)
Charging points for electric cars in public areas	Implement electric recharging points close to the most important services, jobs and public transport.	City (urban development), electric charging service providers
Walking and cycling connections inside and outside the area	Build a sufficiently comprehensive, attractive and straightforward network to increase the popularity of cycling. Particular attention should be paid to the accessibility of public transport, services and the main cycling path network. The conditions for walking in internal traffic are being developed to be safe, unobstructed, attractive and smooth.	City (urban development)

Measures roadmap Measures and key operators in Kera (2/3)

Measure	Description	Operator
Zoning level low carbon mechanisms	Zoning can be used to steer infrastructure and building construction towards low carbon in areas where the zoning process is still ongoing. At the zoning level, the most effective mechanisms for promoting low carbon should be considered, taking into account the longevity of the mechanisms. Some mechanisms are already in use in other areas and their application in Kera can be considered e.g. setting project-specific target levels, guiding the usage of certain materials or materials that meet certain properties. In addition, the use of new types of zoning mechanisms can be conceived, e.g. a green coefficient-like listing of effective low-carbon measures to be used.	City of Espoo, zoning
Utilisation of an energy expert in zoning	At the town plan level, the future massing of the area will be largely influenced, which will define many of the low-carbon and energy-using characteristics of buildings. Utilising an expert in zoning planning could help to take these into account at an earlier stage	Espoo, zoning
Developers' forum	The carbon footprint of site operations can be reduced e.g. shared site activities and sharing low-carbon site best practices. Open communication can be used to develop and learn from others.	City, Regional cooperation group
Emission-free construction site	The measures and goals set out in the Emission free construction site - Green Deal commitment will be monitored. The low-emission nature of site operations in the construction of the area will be actively exported and implemented.	City
Material suppliers to cooperate with	Low carbon can be achieved with different material solutions, but many solutions are not yet widely used. It is important to involve manufacturers of low-emission concrete and steel, wood and other construction materials in the development process in order to take the various measures forward.	Espoo Center for Competence for Sustainable Development
Parking facilities in which no parking spaces have been designated	The centralised parking facilities in the area will be implemented in such a way that the spaces will not be allocated per apartment or plot. This way, the capacity is utilised efficiently. Alternating parking between evening and day users is preferred. The modularity of the facilities will make it easier to use the remaining parking spaces in the future, and even to expand the bicycle parking. Based on previous calculations, the area needs about 5,000 parking spaces, in addition to about 500 public parking spaces and about 300 park-and-ride spaces.	City (zoning), developers, (parking company)

Measures road map Measures and key operators in Kera (3/3)

Measure	Description	Operator
Enabling low carbon procurement	The use of low carbon materials can be supported through the procurement process. Considering sustainability in procurement, in addition to the overall economy, facilitates the introduction of recycled materials in the implementation phase and supports the sustainability of projects.	Developer, city
Environmental permit review	Recycled materials can be utilised in infrastructure under the boundary conditions of the MARA regulation. Utilisation that does not meet the MARA requirements requires an environmental permit. The environmental permitting process can be time consuming, with a review at the beginning of the planning phase and the start of the permitting process helps the design and construction process	Developer, city, planning organisation
Review of recycled materials	Reconstruction is regulated by e.g. MARA setting and technical boundary conditions. The possibilities of rebuilding must be considered at the beginning of the design so that the material choices can be taken into account in the design. The review can also be done at the zoning stage.	Developer, city, planning organisation
Carbon neutral zone heat	The heating market is a competitive market, but based on statistics, many properties see district heating as a good option for heating. Producing district heating in a carbon-neutral way offers good potential for reducing emissions at the regional level.	District/zone heat producer
Low-temperature district heating network	The low-temperature district heating network enables the efficient utilisation of heat pumps in heat production and the recovery of waste heat.	District heating network supplier
Smart electricity grid	The smart electricity grid enables the efficient and secure supply of electricity as society becomes more electrified. With the help of the electricity grid, own small-scale power generation can be transferred and sold to the grid.	Transmission network supplier

Measures road map Measures and key operators at zone and block level

Measure	Description	Operator
Carbon neutralisation of implementers	In the activities of the regional co-operation group, joint development towards low carbon can be made. Building supervision authorities can also be involved in developing support and consistency in the assessment.	Building supervision, developers
Energy communities	With the help of the energy community operating model, it is possible to inspire housing companies to implement and pilot block-level energy solutions. In this way, there is a greater responsibility for our own energy solutions.	Housing companies
Charging points for electric cars in car parks	A normal electric car charging point will be implemented for a large number of parking spaces. In addition, some of the charging points will be implemented with high capacity (especially visiting traffic).	Developers, housing companies
City bike system	The stations of the city bike system must be implemented in the area as soon as its construction begins, in order to enable bicycle traffic also during the construction phase of the area. The stations and their range of bikes must be increased as the area expands.	City (urban development), HSL
High-quality bicycle parking in public areas, services and workplaces	Bicycle parking spaces in public areas must be adequate for various activities. In the case of grocery stores, public transport stations or stops, kindergartens, schools and other frequently used everyday services, it is necessary to invest in a sufficient amount of high-quality bicycle parking and to be close to the destination. In connection with park-and-ride, the possibilities of electric charging must also be increased, in which case special attention must be paid to theft and vandalism security (e.g. bicycle lockers, camera surveillance, access control).	City (urban development), employers, property owners

Measures road map Measures and key operators at plot level (1/2)

Measure	Description	Operator
Charges and flexibility for on-site parking	It is estimated that about 3,000 jobs will be created in the area. Some workplace parking is located in the vicinity of centralised parking facilities, but significant workplace areas are also located further away. In order to increase the efficiency of parking in these areas, paid parking for workplaces based on daily or hourly pricing should be encouraged. Especially long commutes that cross municipal boundaries are emission-intensive, even with hybrid cars.	Employers, city (Espoo Centre for Sustainable Development)
Workplace mobility plans and incentives	Incentives can be used to control mobility in the workplace. Paid parking is discussed in the section “parking arrangements”, but employers can promote the sustainable mobility of their employees, e.g. through public transport or employment bike benefits, building quality bike parking, acquiring shared bikes, electric cars or kick scooters, and conducting various communication campaigns. It can all be guided by a goal-oriented movement plan.	Employers, city (Espoo Centre for Sustainable Development)
High quality bicycle parking in residential properties	Bicycle parking should be in residential buildings near the front door of the dwellings, preferably at the ground level and easily accessible. Bicycle parking must be dimensioned in such a way that there is enough space for each occupant to store at least one bicycle reliably and loosely enough. Bicycle parking must be in a warm room, allow for frame locking and be covered (excluding visitors’ spaces). Space must also be allocated to special bikes and bike trailers. Adequate charging capacity for electric bicycles must also be ensured in a fire-safe manner.	Developers
Service entrance or parcel machines in properties	Improving logistics reduces the need to move when goods are delivered to a resident close to the resident, regardless of whether they are at home. Block-specific parcel machines, on the other hand, reduce the traffic performance of small logistics as the problem of the last kilometre is reduced.	Developers, housing companies, logistics companies
Property/Apartment energy metering	Energy metering makes energy consumption data visible to residents, so residents can see the effects of their own actions on energy consumption	Developers/housing companies

Measures roadmap Measures and key operators at plot level (2/2)

Measure	Description	Operator
Project commitment to developing carbon neutrality	Development commitments can be drawn up on a project-by-project basis, taking into account project-specific carbon neutrality development plans.	Landowners, (developers)
Public building projects as examples	Public projects implement low-carbon development plans and select a construction concept that supports the realisation of low carbon goals in the entire Kera area, while also setting an example for other developers and supporting the city's own carbon neutrality goals. Solutions and operating models are communicated openly to those interested.	Espoo, space services
Property/Apartment energy management	Intelligent energy management can contribute to efficient and low-emission energy production. Demand elasticity of electricity and heat reduce peak energy production. Peak production is mainly based on fossil fuels, so reducing it will reduce emissions. The elasticity of electricity demand can also help manage the frequency of the electricity grid and reduce the price of electricity.	Housing companies
Shared cars for housing companies	Fewer parking spaces can be provided by purchasing shared cars for housing companies (1 shared car replaces 5 parking spaces). The emissions impact is greatest if the shared cars are electric cars. Shared cars must also be appointed to employers in the area.	Housing companies, employers, city (Espoo Centre for Sustainable Development)

Kera’s carbon road map– schedule of measures

Step checks on orange background. Source: Keran kaupunkitaloudellisten vaikutusten Cityfier-analyysi. The City of Espoo and A-insinöörit / Summary of the project meeting material 2.9.2021

Time/observation level	Through planning and implementation	2021–2023	2024–2026	2027–2029	2030–2035	2036–2040
Kera	Co-creation	Parking organisation	Parking fees, time limits and electric car parking in public areas	Walking and cycling connections inside and outside the area		
	Enabling low carbon procurement	Reviews of environmental permits and recycled materials	Construction will begin in 2023, first on south of the track		Light rail 2030	
	Material suppliers for cooperation	Zoning level low carbon mechanisms	Gradual demolition of Kera halls (2022, 2025)			
		Regional smart energy grids	The development platform for the circular economy in building construction	Emission-free construction site		
Regional and block level		City bike system	High-quality bicycle parking in public areas, services and workplaces		Supermarket south of the track 2033	Supermarket north of the track 2035
			Parking facilities in which no parking spaces have been designated/Charging points for electric cars			
		Sustainability assessment of infrastructure construction	Enabling energy communities at the block level		School north of the track 2032	Private day-care centre 2032
		Day-care centre 2021	Sports services 2023	Supermarket 2024 in Tallberg area	Day-care centre 2027	School south of the track 2030	Health Centre 2032	Day-care centres 2030, 2032, 2034
Plot level	Plot-specific carbon neutrality development plans	Service entrance or parcel machines in properties	Charges and flexibility for on-site parking	Shared cars for housing companies		
		High quality bicycle parking in residential properties				
		Public building projects as examples	Workplace mobility plans and incentives		Public building projects as examples	
		Designin plot-specific energy solutions (production, intelligent controlling).				

Proposed monitoring indicators for achieving the goals

Monitoring targets is important to achieve the region's carbon neutrality targets, but monitoring must be clear and effortless. Monitoring must also take into account the resourcing and controllability of the monitoring. The development of the area can be monitored by regular emission calculations and by comparing the carbon footprint of the residents with the development of the carbon footprint of other Espoo residents, for example. In this case, however, special attention must be paid to the comparability of the calculation methods and the assumptions made in them. Residents' carbon footprint calculations should also consider how the result is compared, taking into account the carbon spike in the developing region at the beginning of construction. The indicators presented in the work are not an alignment, but recommendations for possible indicators. Stakeholders should be consulted when setting indicators in order to commit to data collection and reporting in commonly agreed ways.

Measure	Area	Indicator	Monitoring responsibility
The operators promoted and mapped the measures in place to promote carbon neutrality	All	Yes/no	All
Implemented experiments / measures / solutions promoting carbon neutrality and communicated about them openly	All	Yes/no	All
Low carbon criteria utilised in procurement	All	Used/not	All
Carbon neutrality goals/short-term set for projects	Construction	Goal set (how many)	Developer
Carbon neutrality goals set for projects achieved/longer time frame	Construction	Goal achieved: yes/no	Developer
Development of specific emissions of zone heat in the area	Energy	gCO2/kWh	Fortum
Solar electricity generation in the area	Energy	MWh/v	Caruna
Charging points for public electric cars in the area	Traffic	How many	City?
Workplace mobility plans made	Traffic	Yes/no	Employers
Emission-free construction site concept in use in the area	Infra	Yes/no	City
Recycled material reviews done	Infra	Yes/no	City, developers

ESPOO
ESBO

RAMBOLL

Bright ideas.
Sustainable change.